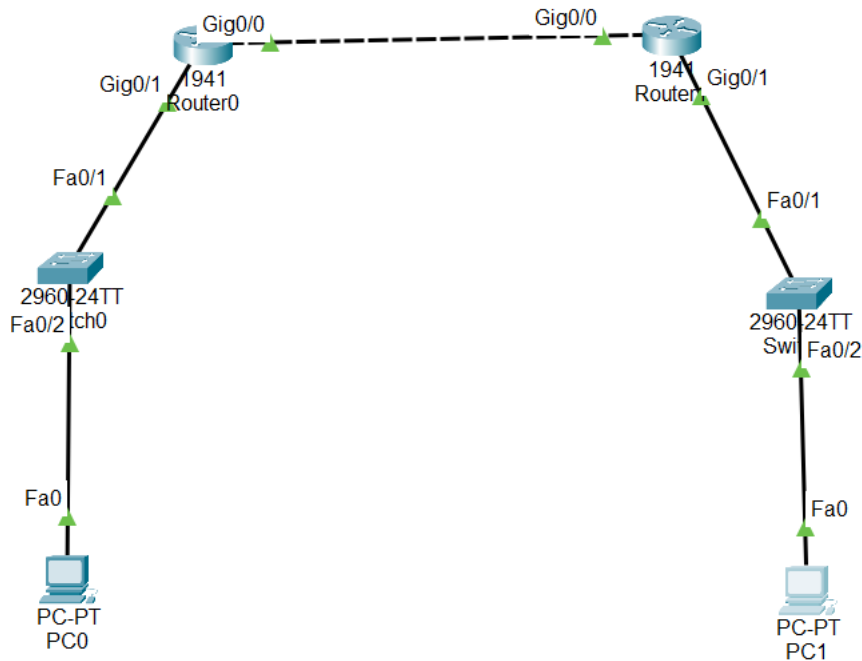


Nama : M Rayhan Naufal Putra
NIM : 09010282327037
Jurusan : Manajemen Informatika
Kelas : MI 3A

PRAKTIKUM JARINGAN KOMPUTER

A. Percobaan 1 (OSPF)



Pengalamatan PC

No	Nama device	Alamat	Gateway	Netmask
1.	PC0	192.168.10.2	192.168.10.1	255.255.255.0
2.	PC1	192.168.20.2	192.168.20.1	255.255.255.0

PC0

Physical Config Desktop Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.10.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.10.1

PC1

Physical Config Desktop Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.20.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.20.1

Konfigurasi setiap router

- Router1

```
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#
Router(config)#hostname Router1_09010282327037
Router1_09010282327037(config)#int gig0/1
Router1_09010282327037(config-if)#ip add 192.168.10.1 255.255.255.0
Router1_09010282327037(config-if)#no shutdown

Router1_09010282327037(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

Router1_09010282327037(config-if)#exit
Router1_09010282327037(config)#int gig0/0
Router1_09010282327037(config-if)#ip add 10.10.10.1 255.255.255.0
Router1_09010282327037(config-if)#no shutdown

Router1_09010282327037(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

Router1_09010282327037(config-if)#exit
Router1_09010282327037#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
```

- Router2

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Router2_09010282327037
Router2_09010282327037(config)#int gig0/1
Router2_09010282327037(config-if)#ip add 192.168.20.1 255.255.255.0
Router2_09010282327037(config-if)#no shutdown

Router2_09010282327037(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

Router2_09010282327037(config-if)#exit
Router2_09010282327037(config)#int gig0/0
Router2_09010282327037(config-if)#ip add 10.10.10.2 255.255.255.0
Router2_09010282327037(config-if)#no shutdown

Router2_09010282327037(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

Router2_09010282327037(config-if)#exit
Router2_09010282327037#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
```

Konfigurasi router OSPF

- PC0

```
Router1_09010282327037(config)#router ospf 10
Router1_09010282327037(config-router)#network 192.168.10.0 0.0.0.255 area 0
Router1_09010282327037(config-router)#network 10.10.10.0 0.0.0.255 area 0
```

- PC1

```
Router2_09010282327037(config)#router ospf 10
Router2_09010282327037(config-router)#network 192.168.20.0 0.0.0.255 area 0
Router2_09010282327037(config-router)#network 10.10.10.0 0.0.0.255 area 0
```

Uji coba menggunakan PING

No	Sumber	Tujuan	Hasil	
			Ya	Tidak
1.	PC0	PC1	Ya	
2.	PC1	PC0	Ya	

- PC0 ke PC1

```
C:\>ping 192.168.20.1

Pinging 192.168.20.1 with 32 bytes of data:

Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

- PC1 ke PC0

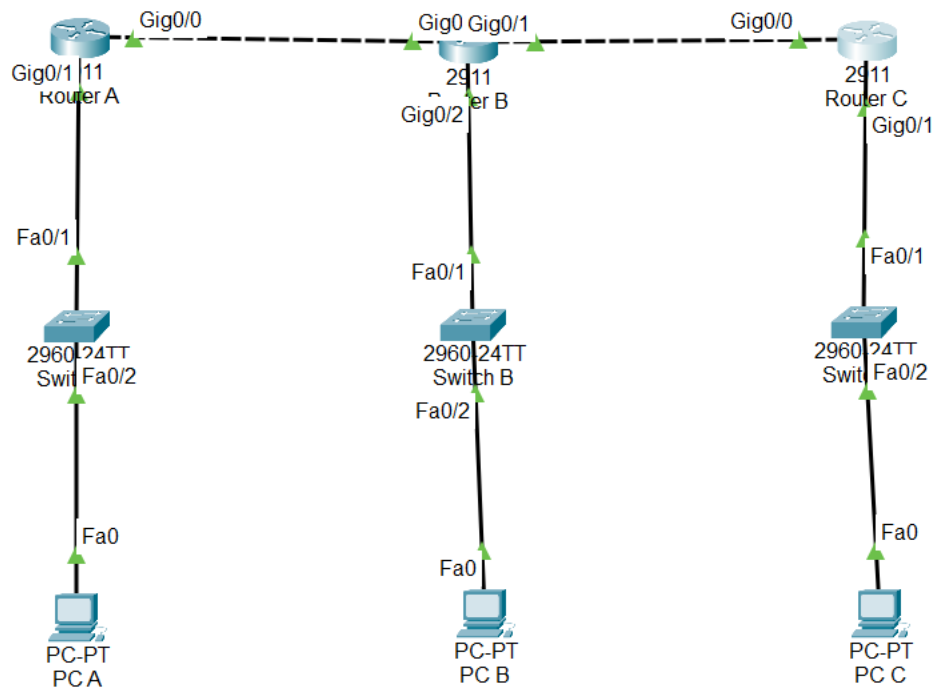
```
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=254
Reply from 192.168.10.1: bytes=32 time<1ms TTL=254
Reply from 192.168.10.1: bytes=32 time<1ms TTL=254
Reply from 192.168.10.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

B. Percobaan 2 (Topologi BGP)



Pengalamatan 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	192.168.30.1	255.255.255.0

PC A

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP
☒ Static

IPv4 Address 192.168.10.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.10.1

PC B

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface FastEthernet0

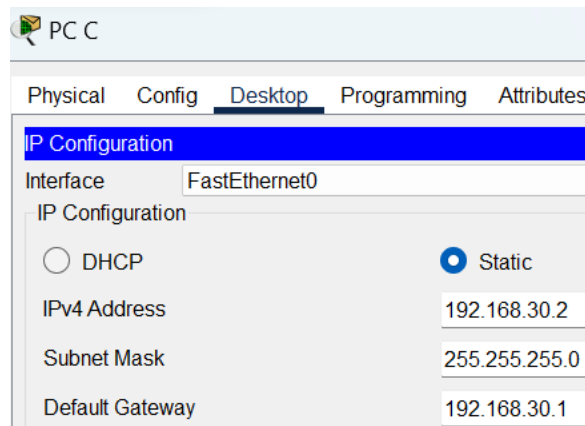
IP Configuration

☐ DHCP
☒ Static

IPv4 Address 192.168.20.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.20.1



Konfigurasi IP Address setiap router

- Router A

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname RouterA_09010282327037
RouterA_09010282327037(config)#int gi0/0
RouterA_09010282327037(config-if)#ip address 10.10.10.1 255.255.255.0
RouterA_09010282327037(config-if)#no shutdown

RouterA_09010282327037(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

RouterA_09010282327037(config-if)#exit
RouterA_09010282327037(config)#int gi0/1
RouterA_09010282327037(config-if)#ip address 192.168.10.1 255.255.255.0
RouterA_09010282327037(config-if)#no shutdown

RouterA_09010282327037(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_09010282327037(config-if)#exit
```

- Router B

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname RouterB_09010282327037
RouterB_09010282327037(config)#int gi0/0
RouterB_09010282327037(config-if)#ip address 10.10.10.2 255.255.255.0
RouterB_09010282327037(config-if)#no shutdown

RouterB_09010282327037(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_09010282327037(config-if)#exit
RouterB_09010282327037(config)#int gi0/1
RouterB_09010282327037(config-if)#ip address 10.10.20.1 255.255.255.0
RouterB_09010282327037(config-if)#no shutdown

RouterB_09010282327037(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

RouterB_09010282327037(config-if)#exit
RouterB_09010282327037(config)#int gi0/2
RouterB_09010282327037(config-if)#ip address 192.168.20.1 255.255.255.0
RouterB_09010282327037(config-if)#no shutdown

RouterB_09010282327037(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_09010282327037(config-if)#exit
```

- Router C

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#hostname RouterC_09010282327037
RouterC_09010282327037(config)#int gi0/0
RouterC_09010282327037(config-if)#ip address 10.10.20.2 255.255.255.0
RouterC_09010282327037(config-if)#no shutdown

RouterC_09010282327037(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_09010282327037(config-if)#exit
RouterC_09010282327037(config)#int gi0/1
RouterC_09010282327037(config-if)#ip address 192.168.30.1 255.255.255.0
RouterC_09010282327037(config-if)#no shutdown

RouterC_09010282327037(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_09010282327037(config-if)#exit
```

Konfigurasi BGP pada setiap router

- Router A

```
RouterA_09010282327037(config)#router bgp 10
RouterA_09010282327037(config-router)#neighbor 10.10.10.2 remote-as 20
RouterA_09010282327037(config-router)#network 10.10.10.0 mask 255.255.255.0
RouterA_09010282327037(config-router)#network 192.168.10.0 mask 255.255.255.0
RouterA_09010282327037(config-router)#exit
RouterA_09010282327037(config)#exit
RouterA_09010282327037#
%SYS-5-CONFIG_I: Configured from console by console

RouterA_09010282327037#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

      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
```

- Router B

```

RouterB_09010282327037(config)#router bgp 20
RouterB_09010282327037(config-router)#neighbor 10.10.10.1 remote-as 10
RouterB_09010282327037(config-router)%%BGP-5-ADJCHANGE: neighbor 10.10.10.1 Up

RouterB_09010282327037(config-router)#neighbor 10.10.20.2 remote-as 30
RouterB_09010282327037(config-router)#network 10.10.10.0 mask 255.255.255.0
RouterB_09010282327037(config-router)#network 10.10.20.0 mask 255.255.255.0
RouterB_09010282327037(config-router)#network 192.168.20.0 mask 255.255.255.0
RouterB_09010282327037(config-router)#exit
RouterB_09010282327037(config)#exit
RouterB_09010282327037#
%SYS-5-CONFIG_I: Configured from console by console

RouterB_09010282327037#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
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

```

- Router C

```

RouterC_09010282327037(config)#router bgp 30
RouterC_09010282327037(config-router)#neighbor 10.10.20.1 remote-as 20
RouterC_09010282327037(config-router)%%BGP-5-ADJCHANGE: neighbor 10.10.20.1 Up

RouterC_09010282327037(config-router)#network 10.10.20.0 mask 255.255.255.0
RouterC_09010282327037(config-router)#network 192.168.30.0 mask 255.255.255.0
RouterC_09010282327037(config-router)#exit
RouterC_09010282327037(config)#exit
RouterC_09010282327037#
%SYS-5-CONFIG_I: Configured from console by console

RouterC_09010282327037#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

```

Test PING ke masing-masing PC

No	Sumber	Tujuan	Hasil	
			Ya	Tidak
1.	PC A	PC B	Ya	
		PC C	Ya	
2.	PC B	PC A	Ya	
		PC C	Ya	
3.	PC C	PC A	Ya	
		PC B	Ya	

- PC A > PC B dan PC C

```
C:\>ping 192.168.20.1

Pinging 192.168.20.1 with 32 bytes of data:

Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.30.1

Pinging 192.168.30.1 with 32 bytes of data:

Reply from 192.168.30.1: bytes=32 time<1ms TTL=253
Reply from 192.168.30.1: bytes=32 time<1ms TTL=253
Reply from 192.168.30.1: bytes=32 time<1ms TTL=253
Reply from 192.168.30.1: bytes=32 time<1ms TTL=253

Ping statistics for 192.168.30.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

- PC B > PC A dan PC C

```
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=254
Reply from 192.168.10.1: bytes=32 time<1ms TTL=254
Reply from 192.168.10.1: bytes=32 time<1ms TTL=254
Reply from 192.168.10.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.30.1

Pinging 192.168.30.1 with 32 bytes of data:

Reply from 192.168.30.1: bytes=32 time<1ms TTL=254
Reply from 192.168.30.1: bytes=32 time<1ms TTL=254
Reply from 192.168.30.1: bytes=32 time<1ms TTL=254
Reply from 192.168.30.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.30.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

- PC C > PC A dan PC B


```

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=253
Reply from 192.168.10.1: bytes=32 time<1ms TTL=253
Reply from 192.168.10.1: bytes=32 time=10ms TTL=253
Reply from 192.168.10.1: bytes=32 time<1ms TTL=253

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms

C:\>ping 192.168.20.1

Pinging 192.168.20.1 with 32 bytes of data:

Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254
Reply from 192.168.20.1: bytes=32 time=1ms TTL=254
Reply from 192.168.20.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

```

Hasil praktikum diatas

1. OSPF:

- Digunakan untuk routing di jaringan IP dengan pendekatan *link-state*.
- Menggunakan algoritma Dijkstra untuk menemukan jalur terpendek berdasarkan *cost*.
- Mendukung hierarki jaringan dengan membagi area, seperti Area 0 (*backbone*) dan area lainnya.
- Mendukung autentikasi untuk keamanan dan memiliki kecepatan konvergensi tinggi.
- Implementasi melibatkan konfigurasi IP address pada router, membuat koneksi antar router, dan memastikan jaringan berfungsi melalui uji *ping*.

2. BGP:

- Protokol routing dinamis untuk jaringan dengan sistem otonom (AS).
- Banyak digunakan oleh ISP dan perusahaan besar.
- Memanfaatkan tabel routing berdasarkan jalur (*path vector*) untuk pertukaran data.
- Memungkinkan notifikasi perubahan jalur secara otomatis kepada tetangga (*neighbor*).

Analisa

1. Implementasi OSPF

Topologi OSPF membutuhkan konfigurasi jaringan yang mencakup pemberian alamat IP pada router dan PC. Kemudian, touting dilakukan melalui area yang sama, yaitu Area 0, untuk semua jaringan dalam percobaan. Pengujian konektivitas dengan *ping* menunjukkan bahwa semua perangkat berhasil terhubung.

2. Implementasi BGP

Pada BGP, setiap router didefinisikan dalam sistem otonom (AS) yang berbeda. Neighbor atau tetangga diatur secara manual dengan ID AS masing-masing. Proses notifikasi dan pembaruan tabel routing mempermudah sinkronisasi antar router.

Kesimpulan

OSPF dan BGP adalah protokol routing yang efisien dan cocok untuk jaringan besar. OSPF unggul dalam skenario internal dengan kebutuhan hierarki, sementara BGP ideal untuk komunikasi antar-AS. Hasil diatas yang menunjukkan jaringan dapat bekerja dengan baik untuk penggunaan besar.