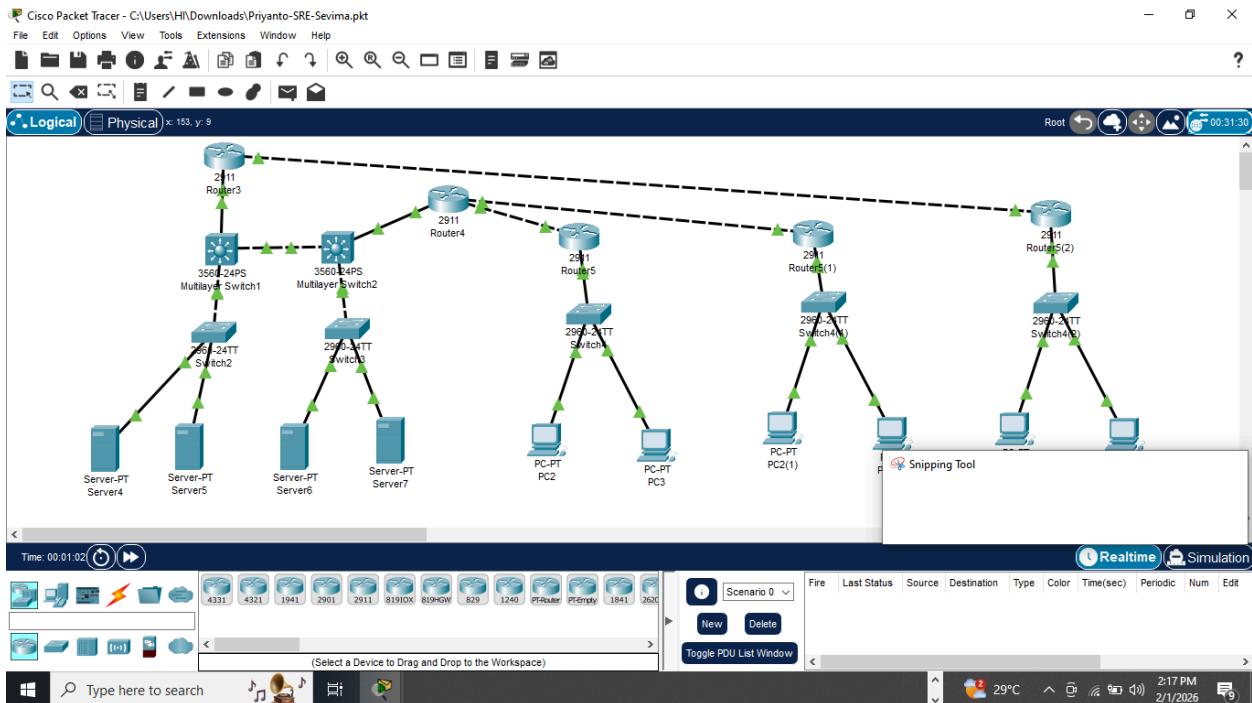


LAPORAN IMPLEMENTASI TOPOLOGI JARINGAN PT SEVIMA - DATA CENTER & 3 CABANG



Latar Belakang

PT Sevima, perusahaan yang bergerak di bidang teknologi informasi, membangun infrastruktur data center untuk menunjang performa aplikasi dan menyediakan sistem backup/recovery yang handal. Infrastruktur ini juga menghubungkan 3 cabang di kota besar: Jakarta, Bandung, dan Surabaya.

Tujuan

1. Membangun data center dengan sistem redundancy
2. Menghubungkan 3 cabang ke data center
3. Menyediakan layanan server (Web, Database, Backup, DNS)
4. Memastikan koneksi antar lokasi dengan routing dinamis

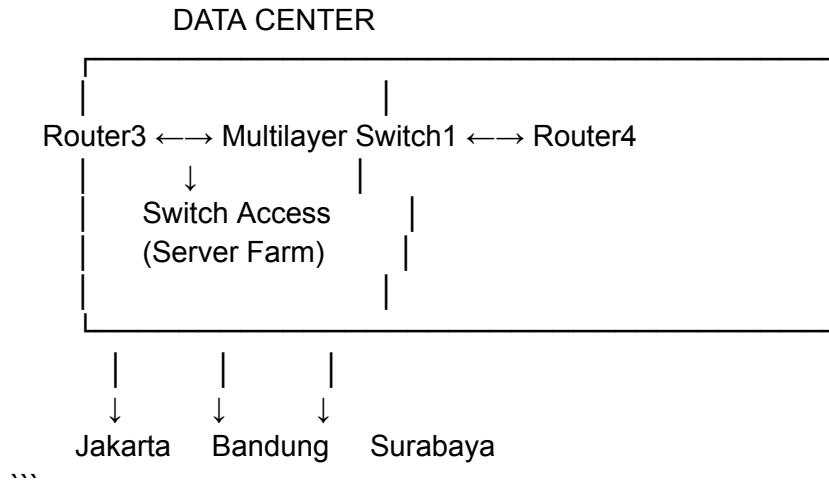
Tools

- Cisco Packet Tracer
- Routing Protocol: OSPF (Open Shortest Path First)
- DHCP untuk automatic IP assignment

DESAIN TOPOLOGI

Arsitektur Jaringan

...



Komponen Jaringan

Data Center:

- **2 Router Cisco 2911/2621XM** (Router3, Router4) - Redundancy
- **2 Multilayer Switch 3560** - Core Layer
- **2 Switch 2960** - Access Layer untuk Server
- **4 Server**: Web Server, Database Server, Backup Server, DNS Server

Cabang Jakarta:

- **1 Router Cisco 2911** (Router-Jakarta)
- **1 Switch 2960**
- **2 PC Client**

Cabang Bandung:

- **1 Router Cisco 2911** (Router-Bandung)
- **1 Switch 2960**
- **2 PC Client**

Cabang Surabaya:

- **1 Router Cisco 2911** (Router-Surabaya)
- **1 Switch 2960**
- **2 PC Client**

SKEMA PENGALAMATAN IP

Data Center (Network: 10.0.20.0/24)

Device	Interface	IP Address	Subnet Mask
Router3	Gig0/0	10.0.20.2	255.255.255.0
Router4	Gig0/0	10.0.20.1	255.255.255.0
Web Server	Fa0	10.0.20.10	255.255.255.0
Database Server	Fa0	10.0.20.11	255.255.255.0
Backup Server	Fa0	10.0.20.12	255.255.255.0
DNS Server	Fa0	10.0.20.13	255.255.255.0

WAN Links (Point-to-Point)

Link	Router A	IP A	Router B	IP B	Subnet Mask
DC-Jakarta	Router4	Gig0/1	172.16.1.1	Router-Jakarta	Gig0/1 172.16.1.2 255.255.255.252
DC-Bandung	Router4	Gig0/2	172.16.2.1	Router-Bandung	Gig0/1 172.16.2.2 255.255.255.252
DC-Surabaya	Router3	Gig0/1	172.16.3.1	Router-Surabaya	Gig0/1 172.16.3.2 255.255.255.252

Cabang Jakarta (Network: 192.168.1.0/24)

Device	IP Address	Gateway
Router-Jakarta	192.168.1.1	-
PC Jakarta (DHCP)	192.168.1.10-254	192.168.1.1

Cabang Bandung (Network: 192.168.2.0/24)

Device	IP Address	Gateway
Router-Bandung	192.168.2.1	-
PC Bandung (DHCP)	192.168.2.10-254	192.168.2.1

Cabang Surabaya (Network: 192.168.3.0/24)

Device	IP Address	Gateway
Router-Surabaya	192.168.3.1	-
PC Surabaya (DHCP)	192.168.3.10-254	192.168.3.1

KONFIGURASI PERANGKAT

1. Router Data Center (Router3)

Fungsi: Menghubungkan Data Center ke Cabang Surabaya

```
```cisco
hostname Router3
```

```
interface GigabitEthernet0/0
ip address 10.0.20.2 255.255.255.0
no shutdown
```

```
interface GigabitEthernet0/1
ip address 172.16.3.1 255.255.255.252
ip ospf network point-to-point
no shutdown
```

```
router ospf 1
network 10.0.0.0 0.0.255.255 area 0
network 172.16.3.0 0.0.0.3 area 0
````
```

2. Router Data Center (Router4)

Fungsi: Menghubungkan Data Center ke Cabang Jakarta & Bandung

```
```cisco
hostname Router4
```

```
interface GigabitEthernet0/0
ip address 10.0.20.1 255.255.255.0
no shutdown
```

```
interface GigabitEthernet0/1
ip address 172.16.1.1 255.255.255.252
ip ospf network point-to-point
no shutdown
```

```
interface GigabitEthernet0/2
ip address 172.16.2.1 255.255.255.252
ip ospf network point-to-point
no shutdown
```

```
router ospf 1
network 10.0.0.0 0.0.255.255 area 0
```

```
network 172.16.1.0 0.0.0.3 area 0
network 172.16.2.0 0.0.0.3 area 0
````
```

3. Router Cabang Jakarta

```
```cisco
hostname Router-Jakarta

interface GigabitEthernet0/0
ip address 192.168.1.1 255.255.255.0
no shutdown
```

```
interface GigabitEthernet0/1
ip address 172.16.1.2 255.255.255.252
ip ospf network point-to-point
no shutdown
```

```
router ospf 1
network 192.168.1.0 0.0.0.255 area 0
network 172.16.1.0 0.0.0.3 area 0
```

```
ip dhcp pool JAKARTA-POOL
network 192.168.1.0 255.255.255.0
default-router 192.168.1.1
dns-server 10.0.20.13
```

```
ip dhcp excluded-address 192.168.1.1 192.168.1.9
````
```

4. Router Cabang Bandung

```
```cisco
hostname Router-Bandung

interface GigabitEthernet0/0
ip address 192.168.2.1 255.255.255.0
no shutdown
```

```
interface GigabitEthernet0/1
ip address 172.16.2.2 255.255.255.252
ip ospf network point-to-point
no shutdown
```

```
router ospf 1
network 192.168.2.0 0.0.0.255 area 0
network 172.16.2.0 0.0.0.3 area 0

ip dhcp pool BANDUNG-POOL
network 192.168.2.0 255.255.255.0
default-router 192.168.2.1
dns-server 10.0.20.13

ip dhcp excluded-address 192.168.2.1 192.168.2.9
````
```

5. Router Cabang Surabaya

```
```cisco
hostname Router-Surabaya

interface GigabitEthernet0/0
ip address 192.168.3.1 255.255.255.0
no shutdown
```

```
interface GigabitEthernet0/1
ip address 172.16.3.2 255.255.255.252
ip ospf network point-to-point
no shutdown
```

```
router ospf 1
network 192.168.3.0 0.0.0.255 area 0
network 172.16.3.0 0.0.0.3 area 0
```

```
ip dhcp pool SURABAYA-POOL
network 192.168.3.0 255.255.255.0
default-router 192.168.3.1
dns-server 10.0.20.13
```

```
ip dhcp excluded-address 192.168.3.1 192.168.3.9
````
```

6. Switch Configuration

Switch di Data Center dan Cabang:

- Menggunakan konfigurasi default (Layer 2 switching)
- Tidak memerlukan konfigurasi khusus
- Berfungsi sebagai access layer untuk menghubungkan end devices

ROUTING PROTOCOL - OSPF

Konsep OSPF

- **Protocol:** Open Shortest Path First (OSPF)
- **Area:** Area 0 (Backbone Area)
- **Network Type:** Point-to-point untuk WAN links
- **Metric:** Cost based on bandwidth

OSPF Neighbor Adjacency

Router4 Neighbors:

- Router-Jakarta (192.168.1.1) via 172.16.1.2
- Router-Bandung (192.168.2.1) via 172.16.2.2
- Router3 (172.16.3.1) via 10.0.20.2

Router3 Neighbors:

- Router4 (172.16.2.1) via 10.0.20.1
- Router-Surabaya (192.168.3.1) via 172.16.3.2

Routing Table Summary

Semua router memiliki route ke:

- 10.0.20.0/24 (Data Center)
- 192.168.1.0/24 (Jakarta)
- 192.168.2.0/24 (Bandung)
- 192.168.3.0/24 (Surabaya)
- 172.16.1.0/30, 172.16.2.0/30, 172.16.3.0/30 (WAN Links)

DHCP CONFIGURATION

Konsep

- DHCP Server dikonfigurasi di setiap router cabang
- PC Client mendapat IP otomatis
- Range IP: .10 - .254
- Reserved IP: .1 - .9 (untuk router dan perangkat network)

DHCP Pool Summary

| Lokasi | Pool Name | Network | Gateway | DNS |
|--------|-----------|---------|---------|-----|
|--------|-----------|---------|---------|-----|

| |
|--|
| ----- ----- ----- ----- ----- |
| Jakarta JAKARTA-POOL 192.168.1.0/24 192.168.1.1 10.0.20.13 |
| Bandung BANDUNG-POOL 192.168.2.0/24 192.168.2.1 10.0.20.13 |
| Surabaya SURABAYA-POOL 192.168.3.0/24 192.168.3.1 10.0.20.13 |

TESTING & VERIFIKASI

1. Verifikasi Konektivitas Router

Test dari Router4:

Router4# ping 192.168.1.1

Success rate is 100 percent (5/5)

Router4# ping 192.168.2.1

Success rate is 100 percent (5/5)

Router4# ping 192.168.3.1

Success rate is 100 percent (5/5)

Status:  Semua router saling terhubung

2. Verifikasi OSPF Neighbor

Router4:

Router4# show ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|-------------|-----|---------|-----------|------------|-----------|
| 192.168.2.1 | 0 | FULL/ - | 00:00:30 | 172.16.2.2 | Gig0/2 |
| 172.16.3.1 | 1 | FULL/DR | 00:00:31 | 10.0.20.2 | Gig0/0 |
| 192.168.1.1 | 0 | FULL/ - | 00:00:35 | 172.16.1.2 | Gig0/1 |
| ... | | | | | |

Status:  OSPF adjacency FULL

3. Verifikasi Routing Table

Router4:

Router4# show ip route

- O 192.168.1.0/24 [110/2] via 172.16.1.2, GigabitEthernet0/1
 - O 192.168.2.0/24 [110/2] via 172.16.2.2, GigabitEthernet0/2
 - O 192.168.3.0/24 [110/3] via 10.0.20.2, GigabitEthernet0/0
- ...

Status:  Semua network ter-advertise via OSPF

4. Test End-to-End Connectivity

Dari PC Jakarta ke Web Server:

...

```
C:\> ping 10.0.20.10
Reply from 10.0.20.10: bytes=32 time<1ms TTL=126
Success rate: 100%
...
```

Dari PC Jakarta ke PC Bandung:

...

```
C:\> ping 192.168.2.10
Reply from 192.168.2.10: bytes=32 time=5ms TTL=125
Success rate: 100%
...
```

Status:  Konektivitas end-to-end berhasil

5. Test Web Server Access

Dari PC Jakarta:

- Buka Web Browser
- URL: http://10.0.20.10
- **Status:**  Halaman web berhasil diakses

6. Verifikasi DHCP

PC Jakarta:

...

```
C:\> ipconfig
```

```
IP Address.....: 192.168.1.10
Subnet Mask....: 255.255.255.0
Default Gateway...: 192.168.1.1
DNS Server.....: 10.0.20.13
...
```

Status:  DHCP berfungsi dengan baik

FITUR REDUNDANCY

1. Dual Router di Data Center

- **Router3** dan **Router4** bekerja secara paralel
- Jika salah satu router down, traffic dapat dialihkan
- Load balancing untuk traffic ke cabang

2. Dual Multilayer Switch

- **Switch-Core-1** dan **Switch-Core-2** dengan trunk link
- Redundancy untuk koneksi ke server
- Mencegah single point of failure

3. OSPF Dynamic Routing

- Automatic route failover
- Jika link down, OSPF mencari jalur alternatif
- Convergence time cepat (< 1 menit)

KEAMANAN & BEST PRACTICES

1. Network Segmentation

- Data Center: 10.0.20.0/24
- WAN Links: 172.16.0.0/16 dengan /30 subnet
- Cabang: 192.168.x.0/24 (berbeda per lokasi)

2. DHCP Security

- Reserved IP range untuk network devices
- Excluded address untuk mencegah IP conflict

3. Routing Security

- OSPF Area 0 (single area untuk simplicity)
- Point-to-point network type untuk WAN (mencegah DR/BDR election)

KESIMPULAN

Pencapaian

1. **Data Center** dengan 2 router dan 4 server berhasil dibangun
2. **3 Cabang** (Jakarta, Bandung, Surabaya) terhubung ke Data Center
3. **Routing dinamis OSPF** berfungsi dengan baik
4. **DHCP** untuk automatic IP assignment di setiap cabang
5. **Redundancy** dengan dual router di Data Center
6. **Konektivitas end-to-end** dari PC cabang ke server DC berhasil
7. **Web Server** dapat diakses dari semua cabang

Kelebihan Topologi

- **High Availability:** Dual router di DC untuk redundancy
- **Scalability:** Mudah menambah cabang baru
- **Dynamic Routing:** OSPF otomatis update routing table
- **Easy Management:** DHCP mengurangi konfigurasi manual
- **Performance:** Load balancing dengan 2 router DC

Rekomendasi Pengembangan

1. Implementasi VLAN untuk segmentasi server (Web, DB, Backup)
2. Konfigurasi HSRP/VRRP untuk gateway redundancy
3. Implementasi Access Control List (ACL) untuk security
4. Setup VPN untuk enkripsi traffic antar lokasi
5. Monitoring dengan SNMP untuk network management