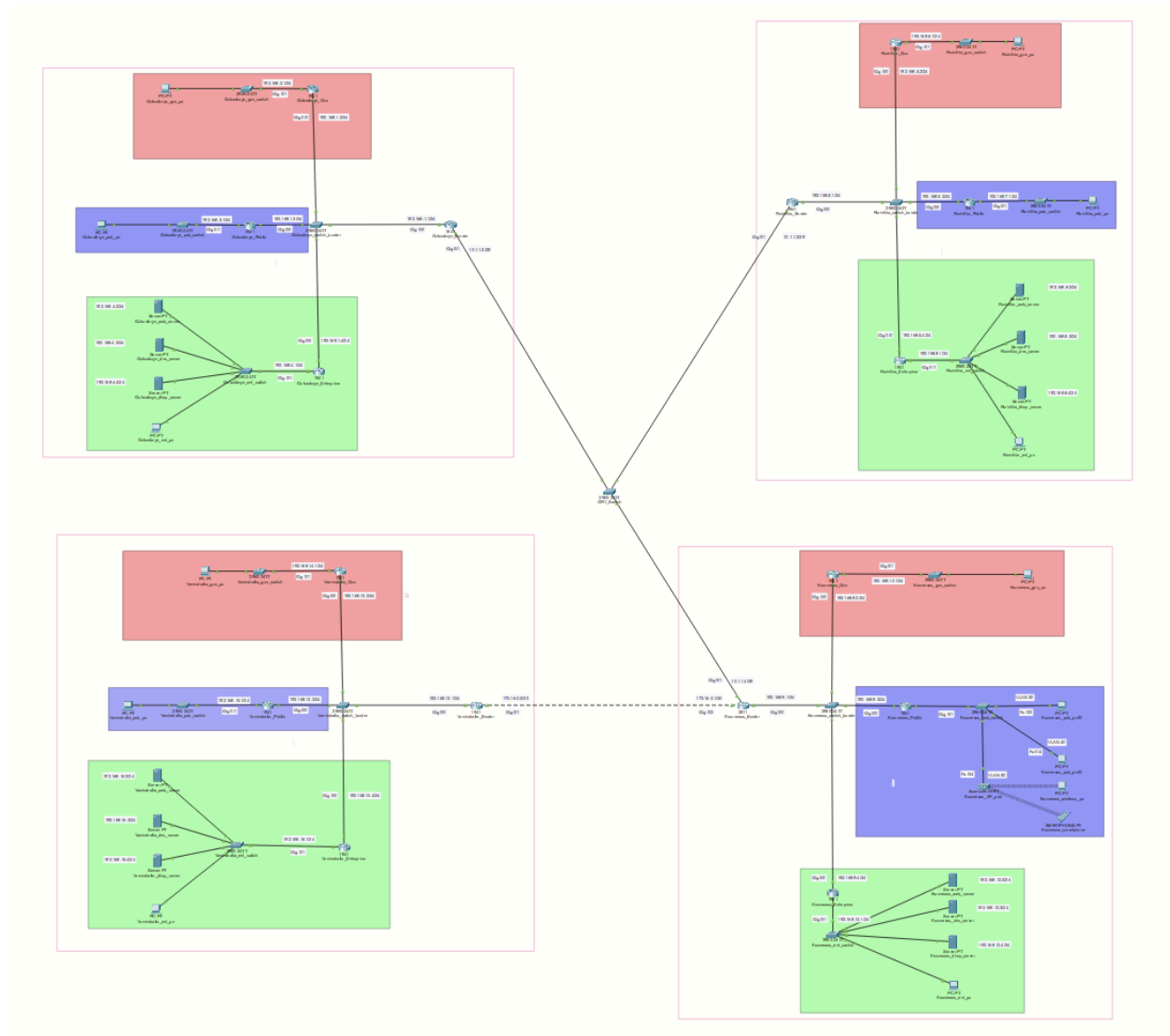
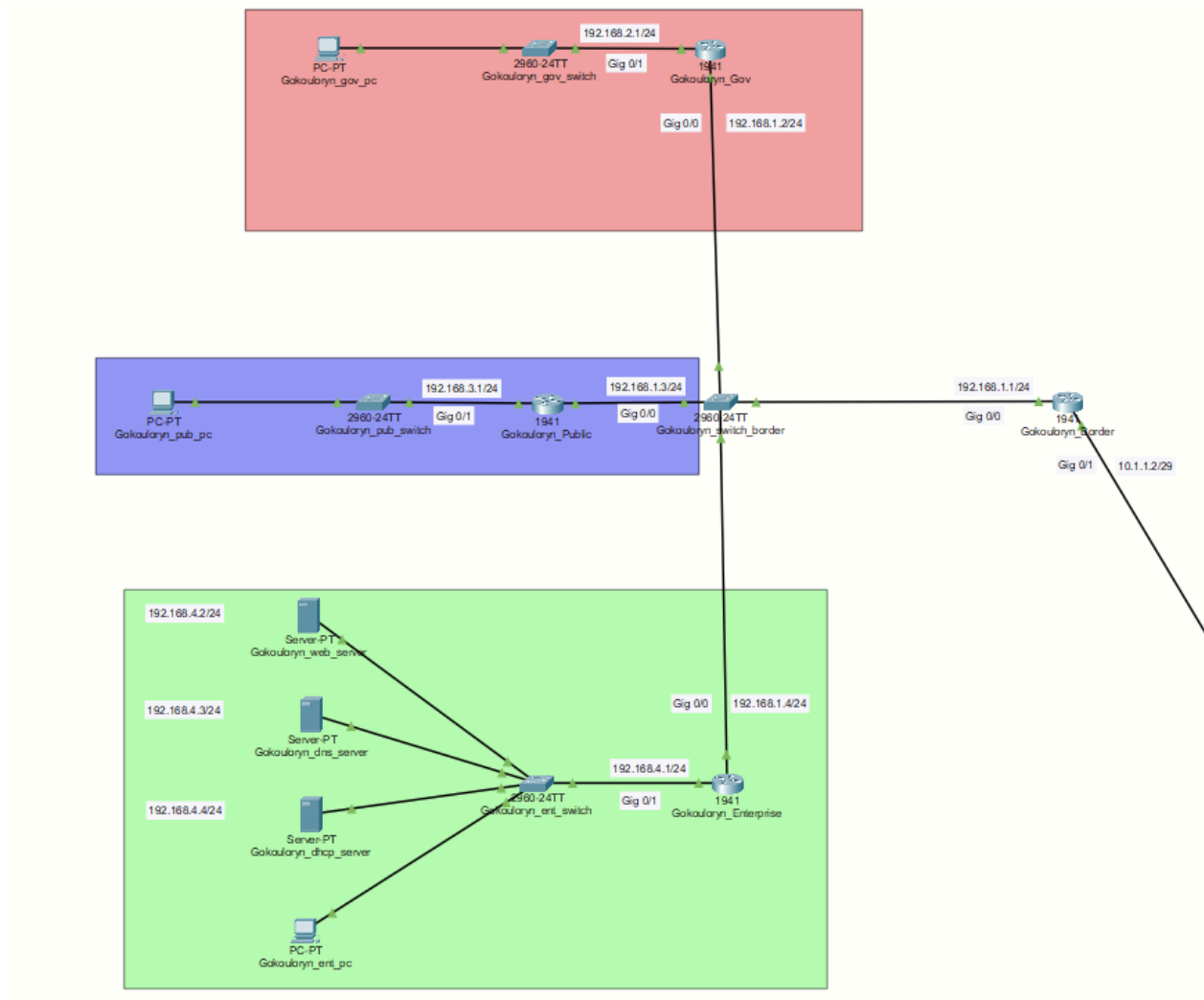


Topologi Overview

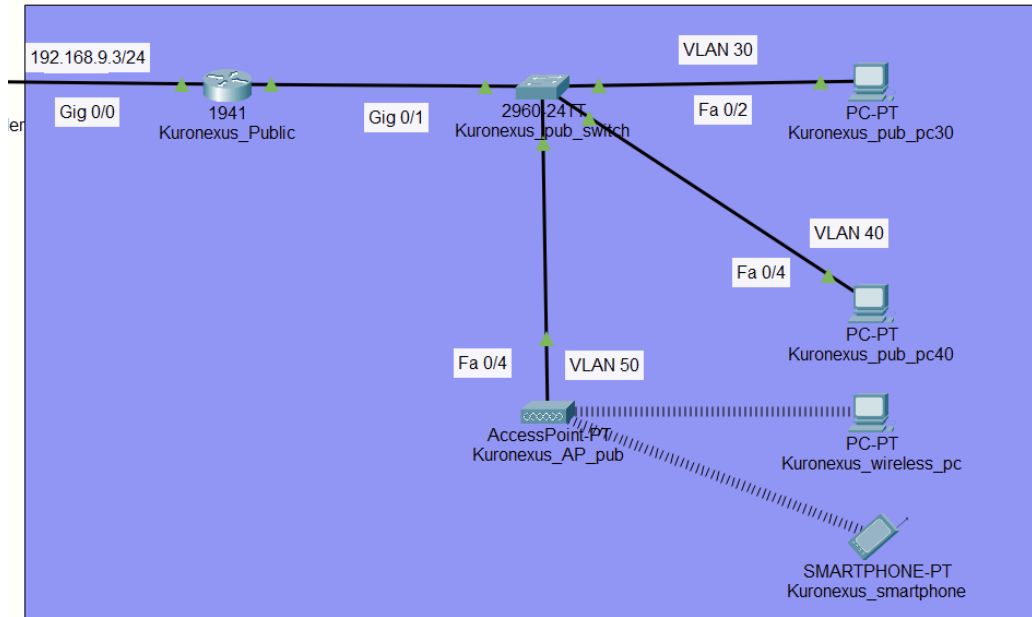


Link to the packet file: [click me!](#)

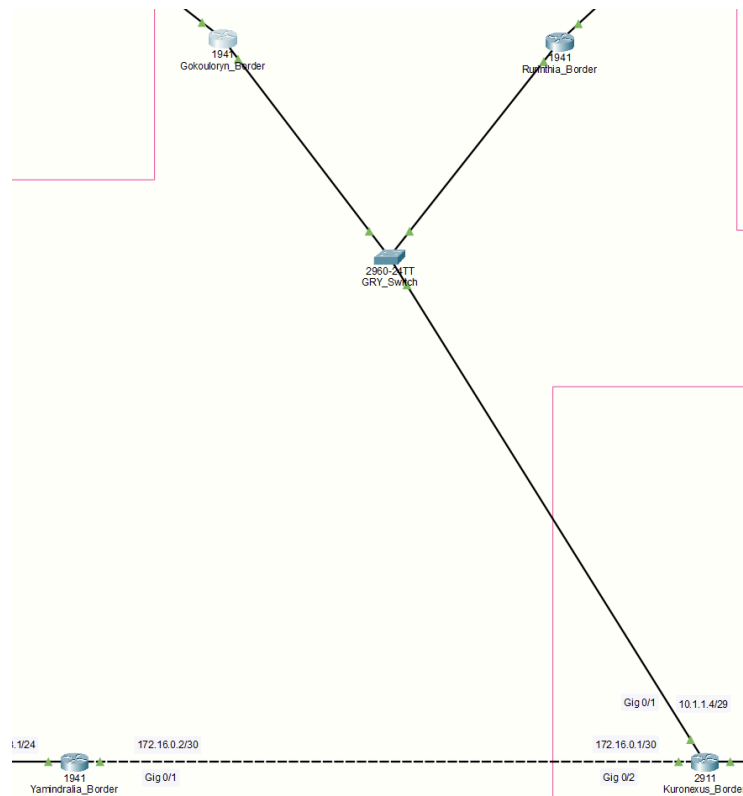
Topologi dirancang sesuai dengan spesifikasi, setiap negara memiliki *subzone*-nya masing - masing, yaitu sebuah *Government Zone*, *Enterprise Zone*, dan *Public Zone* .Ketiga *subzone* memiliki “border” routerterhubung oleh sebuah 2960-24TT switch bernama “<country>_switch_border”, dimana switch ini juga terhubung dengan router bernama “<country>_border”. Berikut merupakan contoh topologi suatu negara:



Setiap negara memiliki spesifikasi topologi yang sesuai dengan gambar, tetapi topologi untuk negara Kuronexus terdapat pengecualian, dimana terdapat sebuah Access Point yang terhubung dengan *Public Zone* switch untuk menyediakan layanan wireless:



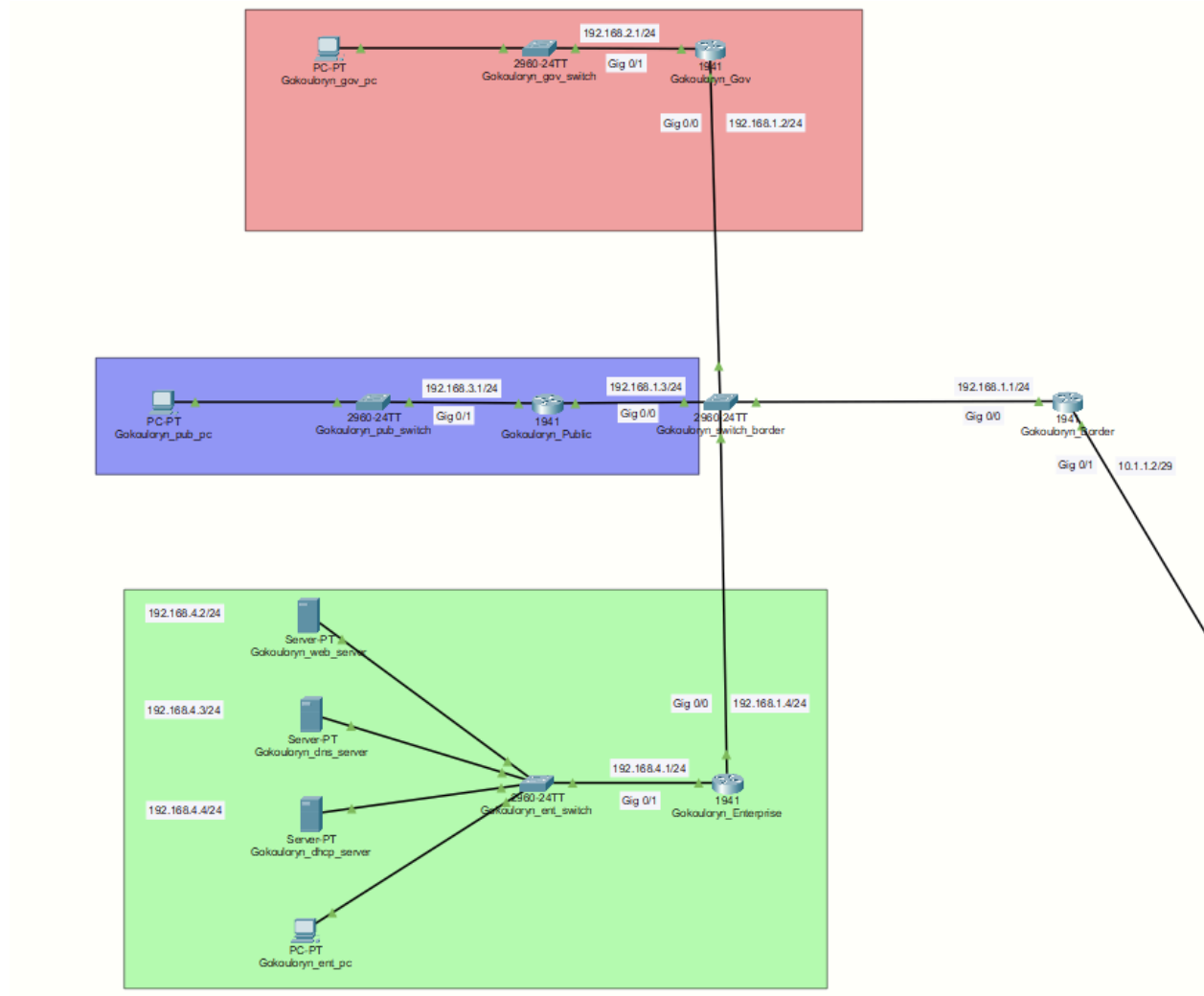
Router border negara Gokourolyn, Rurinthia, dan Kuronexus terhubung pada sebuah 2960-24TT switch, tetapi negara Yamindrallia terhubung langsung dengan border router Kuronexus sebagai berikut:



OSPF Routing

OSPF digunakan agar setiap *subzone* dapat saling berkomunikasi, dimana setiap *subzone* memiliki subnet yang berbeda. Konfigurasi routing OSPF dilakukan untuk setiap router subzone. Penting untuk memperhatikan bahwa area 0 ditunjukkan kepada network yang terhubung dengan router border.

Image of Reference:



Template konfigurasi setiap zona negara:

```
### <Country> Gov Router
...
router ospf <ospf_id> # 1
router-id <router_id> # 1.1.1.1
```

```
network <border_network> <wildcard> area <area_id> # 192.168.1.0 0.0.0.255
area 0
network <subzone_network> <wildcard> area <area_id> # 192.168.2.0 0.0.0.255
area 1
```
```

### ### <Country> Pub Router

```
```
router ospf <ospf_id> # 1
router-id <router_id> # 1.1.1.2
network <border_network> <wildcard> area <area_id> # 192.168.1.0 0.0.0.255
area 0
network <subzone_network> <wildcard> area <area_id> # 192.168.3.0
0.0.0.255 area 2
```
```

### ### <Country> Ent Router

```
```
router ospf <ospf_id> # 1
router-id <router_id> # 1.1.1.3
network <border_network> <wildcard> area <area_id> # 192.168.1.0 0.0.0.255
area 0
network <subzone_network> <wildcard> area <area_id> # 192.168.4.0 0.0.0.255
area 3
```
```

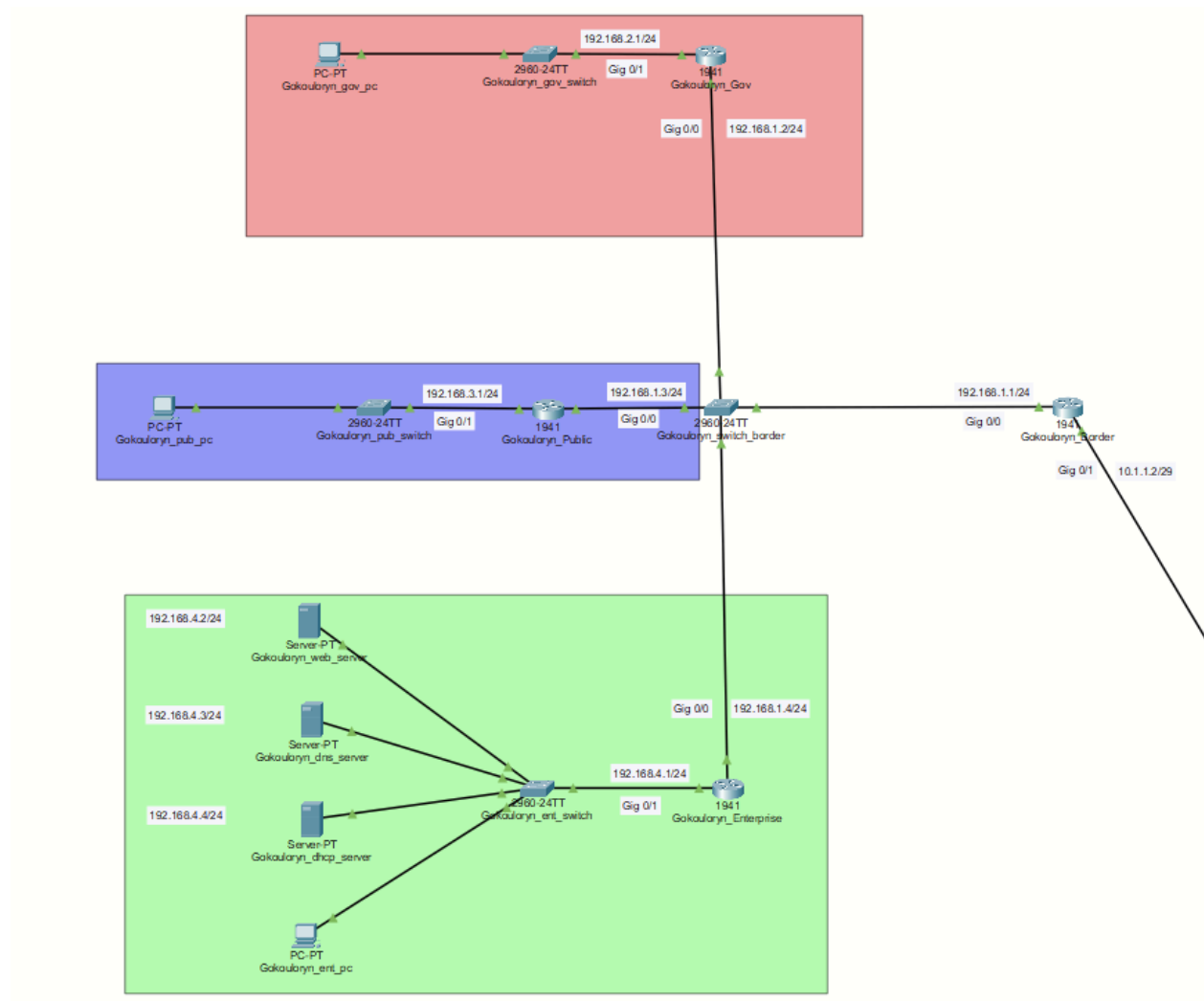
### ### <Country> Border Router

```
```
router ospf <ospf_id> # 1
router-id <router_id> # 1.1.1.4
network <border_network> <wildcard> area <area_id> # 192.168.1.0 0.0.0.255
area 0
```
```

# DHCP

Setiap perangkat harus mendapatkan *IP Address*-nya melalui DHCP server masing - masing zona. Setiap *subzone* akan memiliki DHCP *pool*-nya sendiri sesuai dengan default gateway pada masing - masing router *subzone*. Berikut merupakan konfigurasi yang dilakukan:

Image of Reference: (DHCP Static IP: 192.168.4.4)



DHCP

Interface FastEthernet0 v

Pool Name g\_ent

Default Gateway 192.168.4.1

DNS Server 192.168.4.3

Start IP Address : 192 168 4 2

Subnet Mask: 255 255 255 0

Maximum Number of Users : 254

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Service ☐ On ☒ Off

Add
Save
Remove

| Pool Name  | Default Gateway | DNS Server  | Start IP Address | Subnet Mask  | Max User | TFTP Server | WLC Address |
|------------|-----------------|-------------|------------------|--------------|----------|-------------|-------------|
| g_ent      | 192.168.4.1     | 192.168.4.3 | 192.168.4.2      | 255.255.2... | 254      | 0.0.0.0     | 0.0.0.0     |
| g_pub      | 192.168.3.1     | 192.168.4.3 | 192.168.3.2      | 255.255.2... | 254      | 0.0.0.0     | 0.0.0.0     |
| g_gov      | 192.168.2.1     | 192.168.4.3 | 192.168.2.2      | 255.255.2... | 254      | 0.0.0.0     | 0.0.0.0     |
| serverPool | 0.0.0.0         | 0.0.0.0     | 192.168.4.0      | 255.255.2... | 512      | 0.0.0.0     | 0.0.0.0     |

Pada saat konfigurasi, *Start IP Address* di-set untuk agar tidak interferensi dengan default gateway, contohnya pada g\_ent dimulai dengan 192.168.4.2 karena default gateway bernilai 192.168.4.1. Lalu konfigurasi semua *subzone* router untuk menunjuk pada DHCP server sebagai berikut:

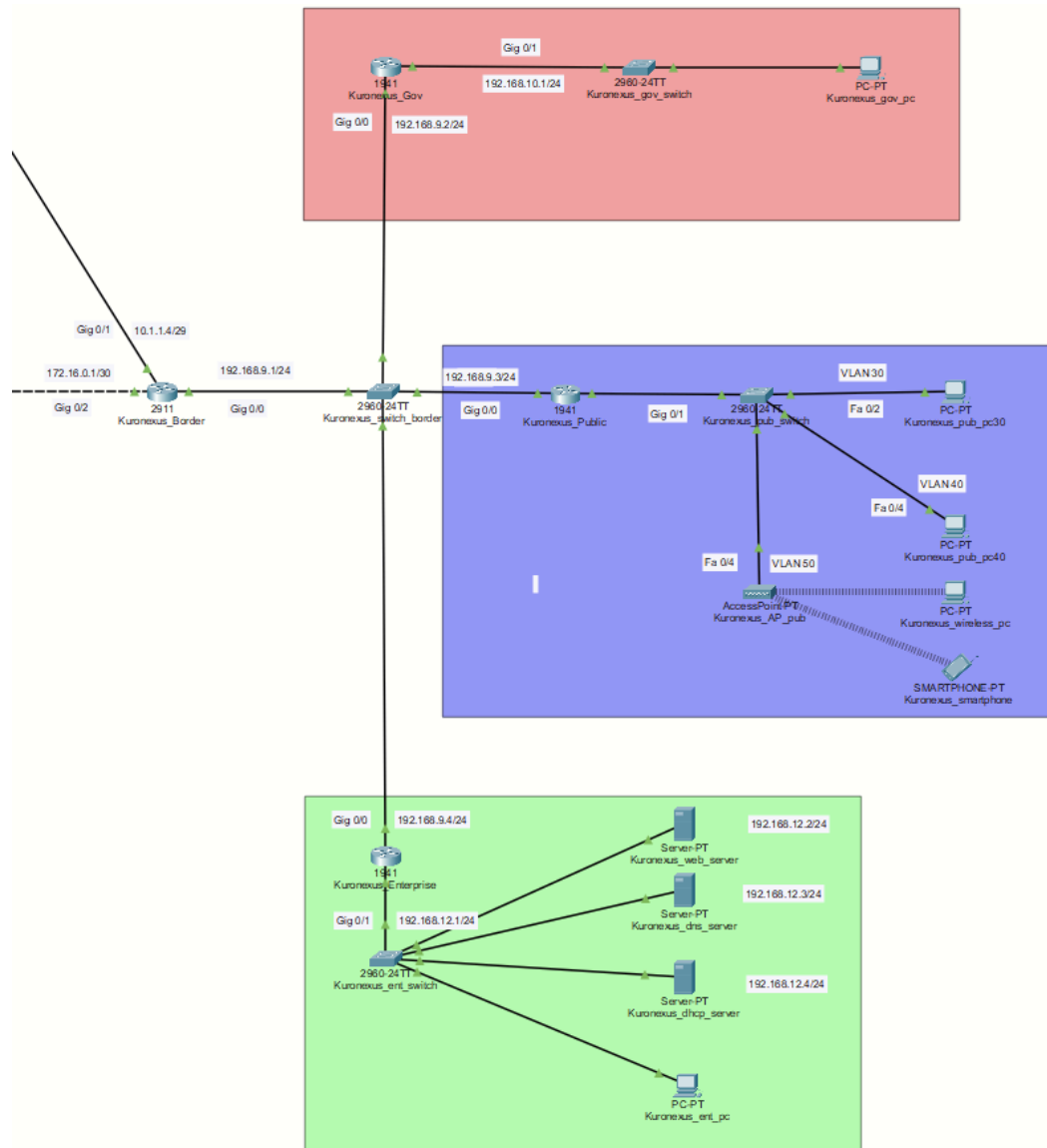
```
interface GigabitEthernet0/1 # Points to LAN
ip helper-address 192.168.8.4 # Points to DHCP server
```



# External Routing

Setelah konfigurasi OSPF dan DHCP dilakukan pada setiap zona negara, konfigurasi BGP dilakukan untuk *Border Router* setiap negara agar semua perangkat pada sistem jaringan dapat berkomunikasi antar zona negara.

Image of Reference:



```
router bgp <bgp_id> # 40 is the BGP id of this router
bgp router-id <router_id> # 3.1.1.4 router id set different from OSPF

Broadcast to Neighbors
```

```
neighbor <other-border-router-ip> remote-as <bgp_id>
neighbor 10.1.1.2 remote-as 20 # 20 is Gokouloryn
neighbor 10.1.1.3 remote-as 30 # 30 is Rurinthia
neighbor 172.16.0.2 remote-as 50 # 50 is Yamindrallia

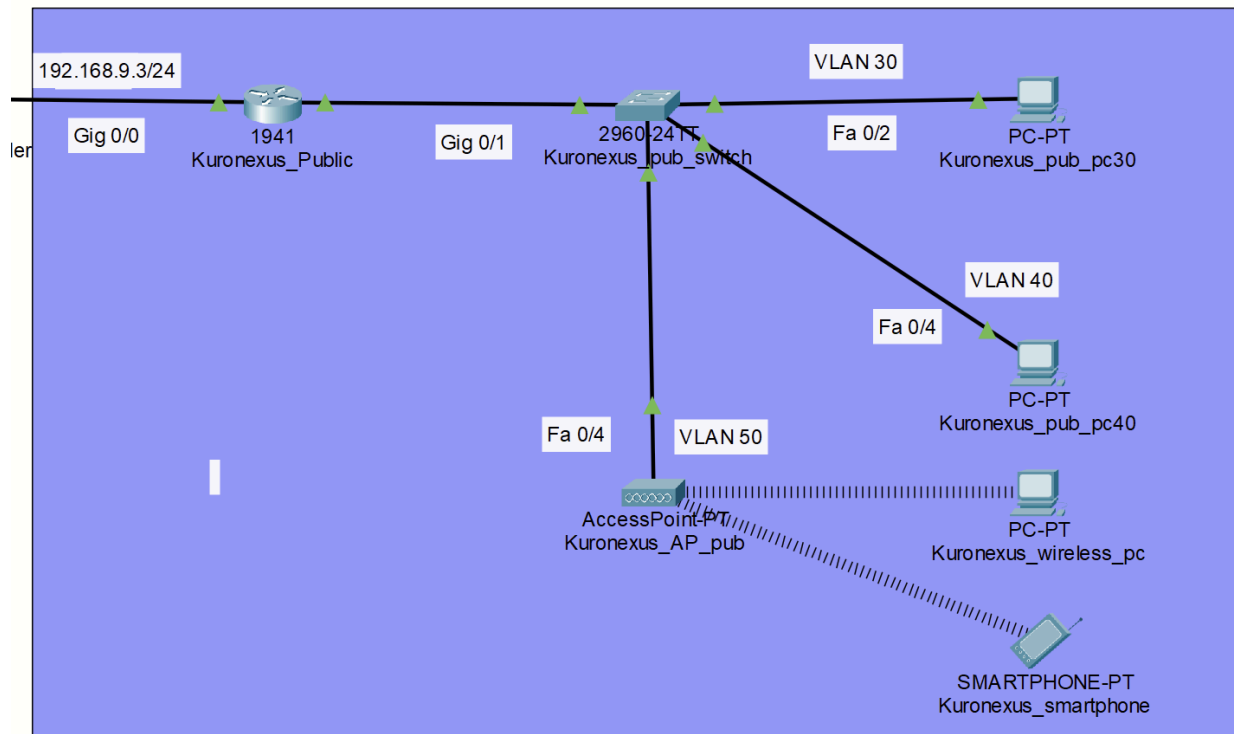
Advertise Networks to Neighbor
network <network-ip> mask <subnet>
network 192.168.9.0 mask 255.255.255.0 # LAN
network 192.168.10.0 mask 255.255.255.0 # Gov
network 192.168.30.0 mask 255.255.255.0 # Pub VLAN
network 192.168.40.0 mask 255.255.255.0 # Pub VLAN
network 192.168.50.0 mask 255.255.255.0 # Pub VLAN
network 192.168.12.0 mask 255.255.255.0 # Ent

Access OSPF
Redistribute bgp <bgp_id> subnets
router ospf 3
redistribute bgp 40 subnets
```

# VLAN

Kuronexus memanfaatkan VLAN pada *Public Zone* untuk keperluan Access Point dan PC yang terhubung switch oleh kabel. VLAN dibuat menjadi 3, VLAN 30 – Academy, VLAN 40 – Business, dan VLAN 50 – Communal (Terhubung dengan Access Point).

Image of Reference:



```
Kuronexus Public Switch
```

Vlan configuration overview:

```
vlan <vlan_id>
name <vlan_name>
```

Assigning Vlan to interface:

```
interface <interface_name>
switchport mode access
switchport access vlan <vlan_id>
```

```
Switch(config)#vlan 30
```

```
Switch(config-vlan)#name Academy
Switch(config-vlan)#exit
Switch(config)#vlan 40
Switch(config-vlan)#name Business
Switch(config-vlan)#exit
Switch(config)#vlan 50
Switch(config-vlan)#name Communal
Switch(config-vlan)#exit
Switch(config)#interface range fa0/2-4
Switch(config-if-range)#sw m a
Switch(config-if-range)#exit
Switch(config)#interface FastEthernet0/2
Switch(config-if)#sw a vlan 30
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/3
Switch(config-if)#sw a vlan 40
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/4
Switch(config-if)#sw a vlan 50
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/1
Switch(config-if)#sw m t
Switch(config-if)#sw t a vlan 30,40,50
```

### ### Kuronexus Public Router

#### Interface configuration overview:

```
Interface <interface_name>.<vlan_id>
Encapsulation dot1Q <vlan_id>
ip address <default_gateway ip> <subnet_mask>
ip helper-address <DHCP server ip>
```

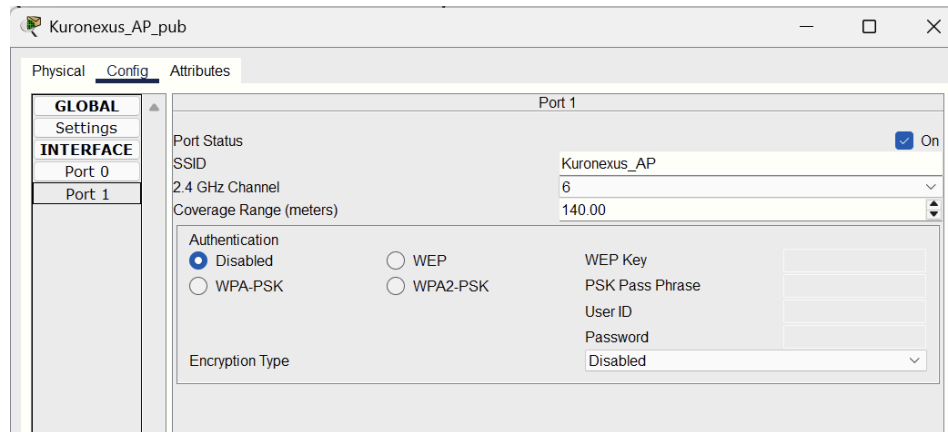
```
Router(config)#interface GigabitEthernet0/1.30
Router(config-subif)#encapsulation dot1Q 30
Router(config-subif)#ip address 192.168.30.1 255.255.255.0
Router(config-subif)#ip helper-address 192.168.12.4
```

```
Router(config)#interface GigabitEthernet0/1.40
Router(config-subif)#encapsulation dot1Q 40
Router(config-subif)#ip address 192.168.40.1 255.255.255.0
Router(config-subif)#ip helper-address 192.168.12.4
Router(config)#interface GigabitEthernet0/1.50
Router(config-subif)#encapsulation dot1Q 50
Router(config-subif)#ip address 192.168.50.1 255.255.255.0
Router(config-subif)#ip helper-address 192.168.12.4
^^^
```

# Wireless Network

Konfigurasi Access Point dan perangkat yang ingin dihubungkan pada jaringan wireless.

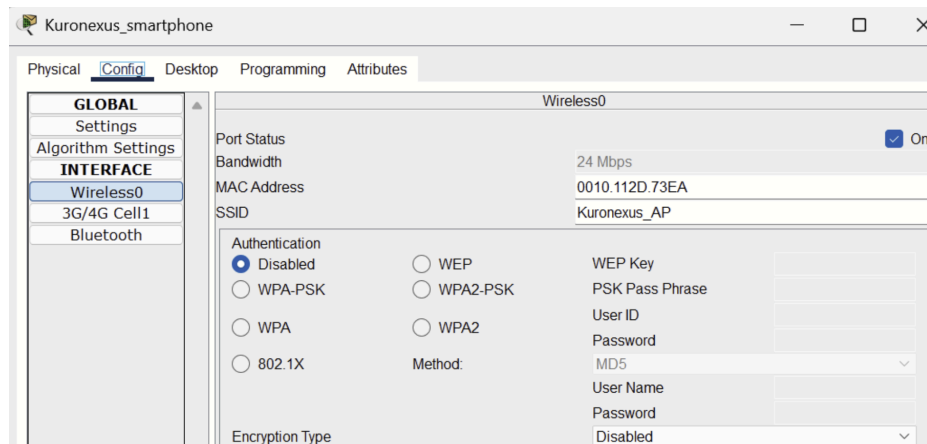
Access Point SSID Configuration:



The screenshot shows the configuration window for 'Kuronexus\_AP\_pub'. The 'Config' tab is active. On the left, under 'INTERFACE', 'Port 1' is selected. The main area shows settings for 'Port 1':

- Port Status: ☒ On
- SSID: Kuronexus\_AP
- 2.4 GHz Channel: 6
- Coverage Range (meters): 140.00
- Authentication: ☒ Disabled, ☐ WEP, ☐ WPA-PSK, ☐ WPA2-PSK
- Encryption Type: Disabled
- Other fields: WEP Key, PSK Pass Phrase, User ID, Password (all empty)

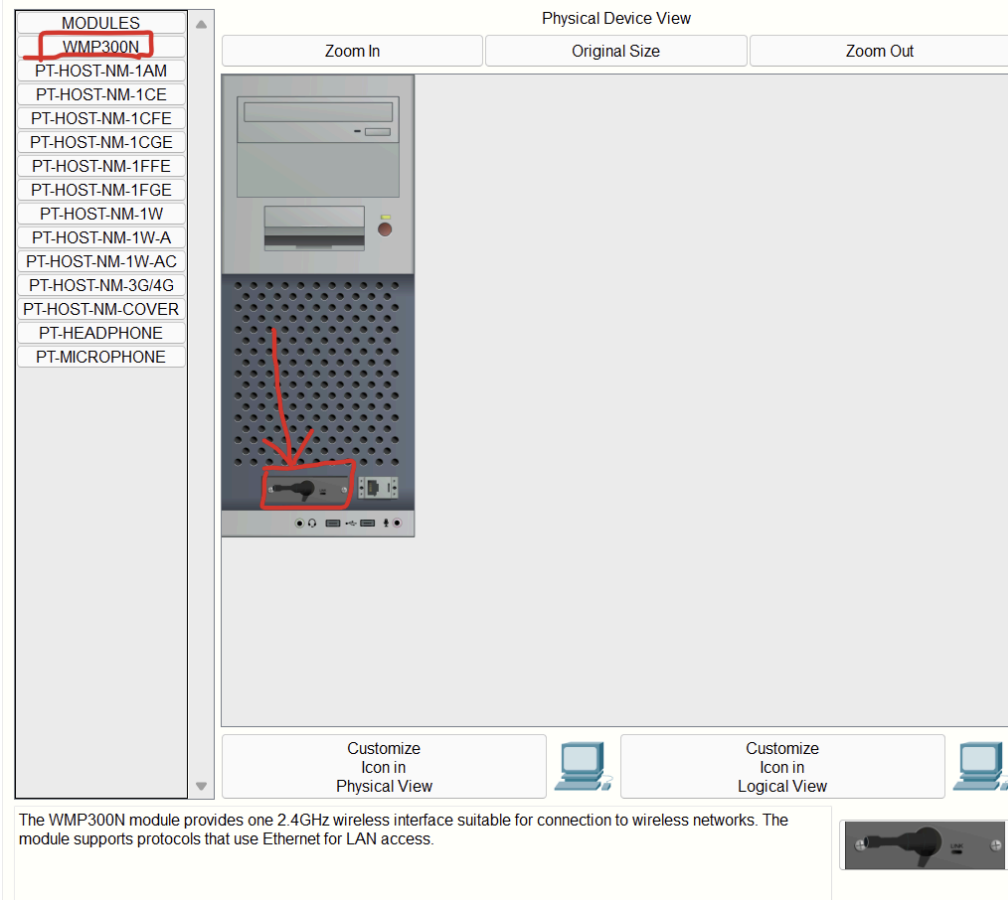
Smartphone Connection Configuration:




The screenshot shows the configuration window for 'Kuronexus\_smartphone'. The 'Config' tab is active. On the left, under 'INTERFACE', 'Wireless0' is selected. The main area shows settings for 'Wireless0':

- Port Status: ☒ On
- Bandwidth: 24 Mbps
- MAC Address: 0010.112D.73EA
- SSID: Kuronexus\_AP
- Authentication: ☒ Disabled, ☐ WEP, ☐ WPA2-PSK, ☐ WPA, ☐ 802.1X
- Encryption Type: Disabled
- Other fields: WEP Key, PSK Pass Phrase, User ID, Password, MD5, User Name, Password (all empty)

Wireless Computer Connection Configuration:



Ganti module menjadi wireless module WMP300N. Lalu konfigurasi *Wireless Connection* melalui Desktop - Wireless PC dan connect ke AP sebagai berikut:



Link Information

Connect

Profiles

Below is a list of available wireless networks. To search for more wireless networks, click the **Refresh** button. To view more information about a network, select the wireless network name. To connect to that network, click the **Connect** button below.

| Wireless Network Name | CH | Signal |
|-----------------------|----|--------|
| Kuronexus_AP          | 1  | 53%    |

Site Information

Wireless Mode Infrastructure

Network Type Mixed B/G

Radio Band Auto


Security Disable

MAC Address 0001.965C.0904

Refresh

Connect

2.4GHz



Adapter is Inactive

Wireless-N Notebook Adapter

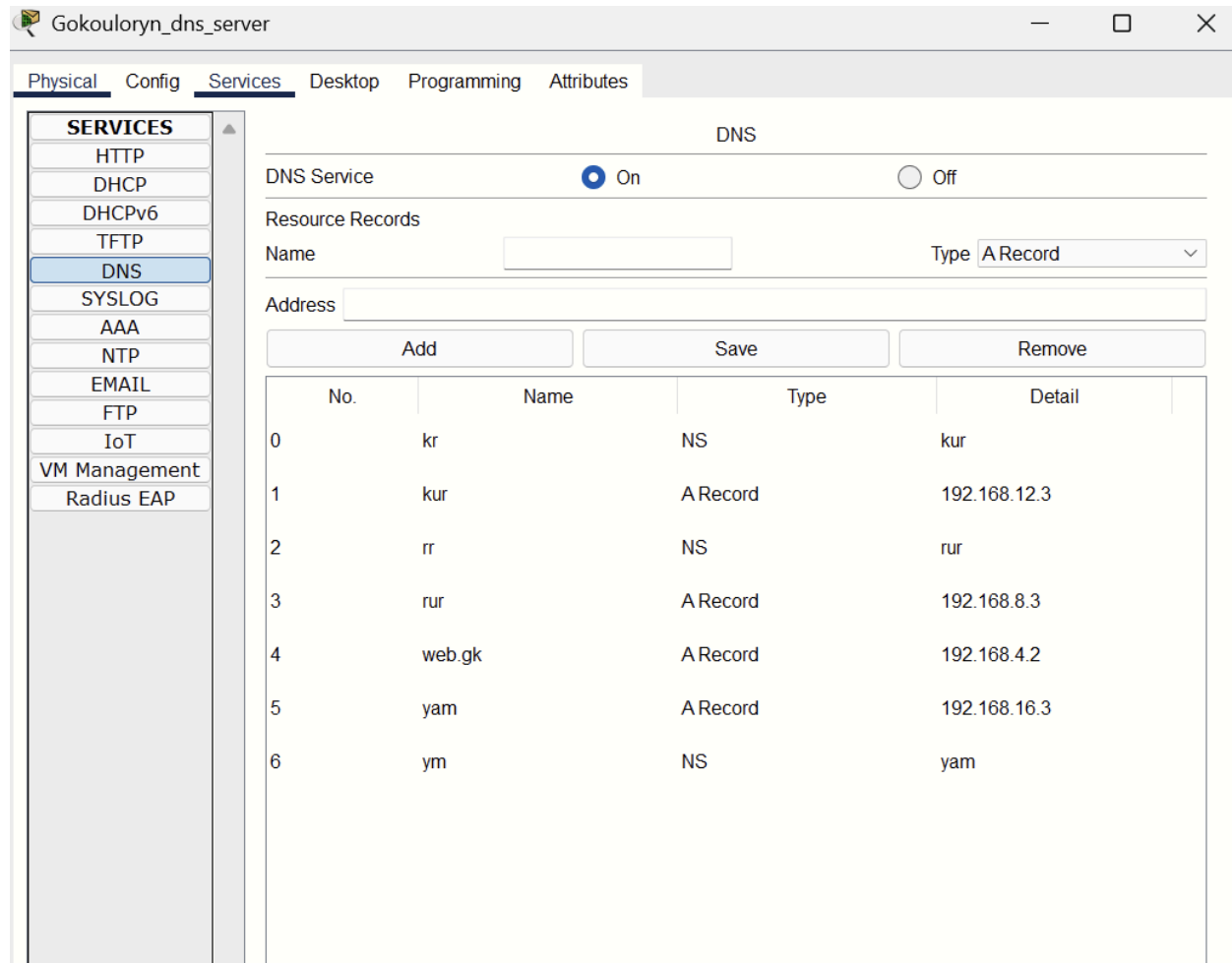
Wireless Network Monitor v1.0

Model No. WPC300N



# DNS

Untuk setiap DNS Server pada masing - masing zona negara, ubah konfigurasi “DNS Server” pada setting sendiri menjadi 0.0.0.0. Lalu lakukan konfigurasi A-record untuk website terkhusus zona, dan lakukan konfigurasi NS-record dan A-record untuk TLD zona negara lain, sehingga dapat mengakses website pada zona lain.

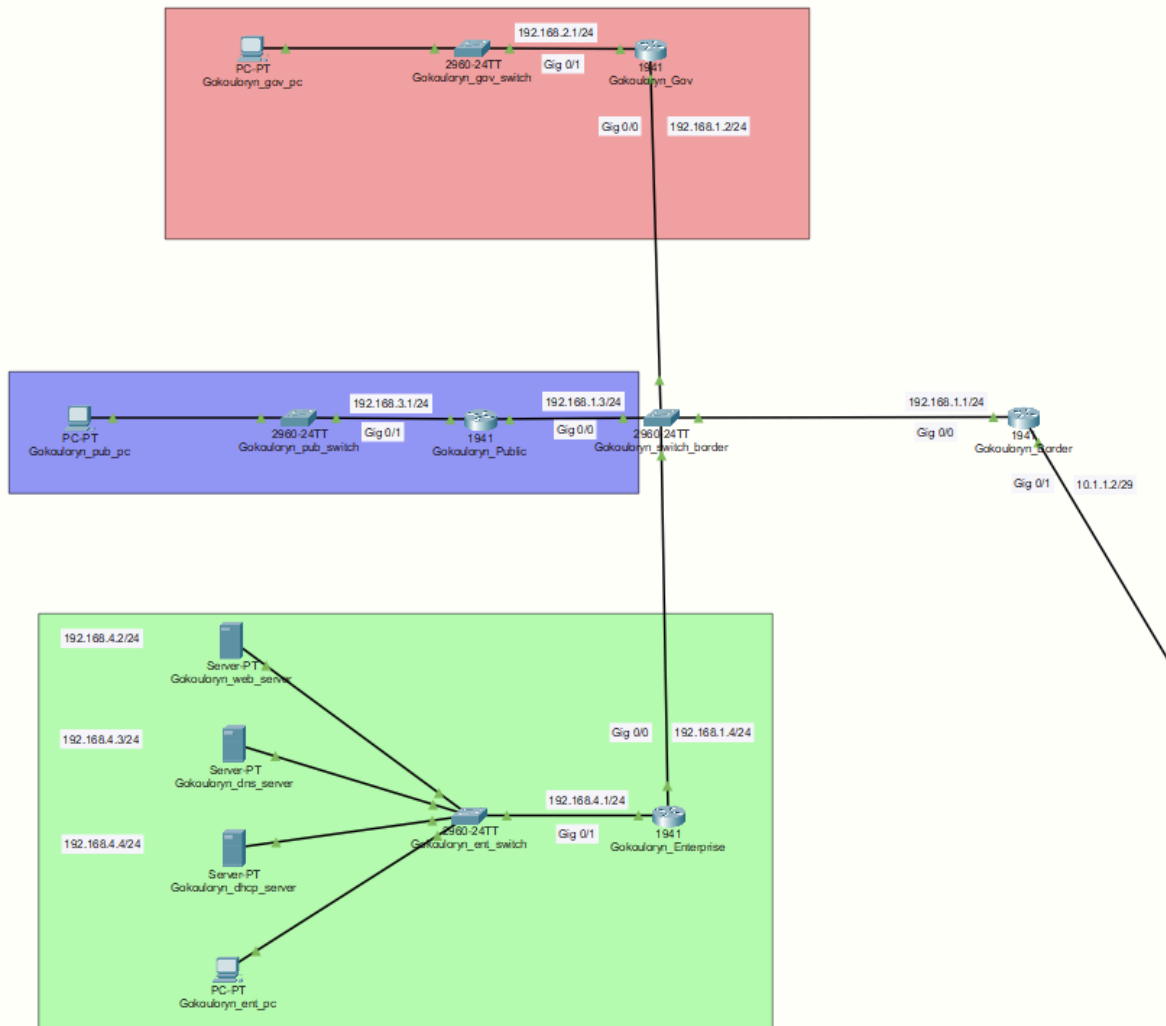


Berikut contoh konfigurasi DNS pada zona Gokouloryn. TLD .kr (Kuronexus), .rr (Rurinthia), dan .ym (Yamindralia) disimpan pada NS dan menunjuk pada sebuah nama, dan nama ini akan digunakan kembali pada A record, yang akan menunjuk pada DNS server zona negara lain.

# ACL

ACL dikonfigurasi unik untuk setiap router sesuai spesifikasi. Setiap router akan memiliki dua konfigurasi ACL, konfigurasi untuk jaringan yang diperbolehkan memasuki *subzone* dan konfigurasi untuk jaringan yang diperbolehkan keluar dari *subzone*. Konfigurasi Access-list diberikan pada interface yang menunjuk pada *Border Router* zona negara.

Image of Reference:



Gokouloryn Government Router Configuration:

Create new access list:

```
ip access-list extended <access_list_name>
```

```
permit ospf any any # permit the OSPF first so it won't get blocked
```

```
permit ip <allowed_source> <wildcard> <allowed_destination> <wildcard>
```

```

Router(config)#ip access-list extended gov_in
Router(config-ext-nacl)#permit ospf any any # Routing
Router(config-ext-nacl)#permit tcp any 192.168.2.0 0.0.0.255 established #
HTTPS
Router(config-ext-nacl)#permit icmp any 192.168.2.0 0.0.0.255 echo-reply # Ping
Router(config-ext-nacl)#permit udp any eq 53 192.168.2.0 0.0.0.255 # DNS
Router(config-ext-nacl)#permit udp any eq 67 192.168.2.0 0.0.0.255 eq 68 # DHCP
Router(config-ext-nacl)#permit ip 192.168.4.0 0.0.0.255 192.168.2.0 0.0.0.255
Router(config-ext-nacl)#permit ip 192.168.6.0 0.0.0.255 192.168.2.0 0.0.0.255
Router(config-ext-nacl)#permit ip 192.168.10.0 0.0.0.255 192.168.2.0 0.0.0.255
Router(config-ext-nacl)#permit ip 192.168.14.0 0.0.0.255 192.168.2.0 0.0.0.255
Router(config-ext-nacl)#exit
Router(config)#ip access-list extended gov_out
Router(config-ext-nacl)#permit ospf any any
Router(config-ext-nacl)#permit ip 192.168.2.0 0.0.0.255 192.168.4.0 0.0.0.255
Router(config-ext-nacl)#permit ip 192.168.2.0 0.0.0.255 192.168.6.0 0.0.0.255
Router(config-ext-nacl)#permit ip 192.168.2.0 0.0.0.255 192.168.10.0 0.0.0.255
Router(config-ext-nacl)#permit ip 192.168.2.0 0.0.0.255 192.168.14.0 0.0.0.255
Router(config-ext-nacl)#exit

```

#### **Apply Access List to Interface:**

```

interface <interface_name>
ip access-group <access_list_name> <in/out>

```

```

Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip access-group gov_in in
Router(config-if)#ip access-group gov_out out

```

#### **Gokouloryn Enterprise Router Configuration:**

##### **Create new access list:**

```

ip access-list extended <access_list_name>
permit ospf any any # permit the OSPF first so it won't get blocked
permit ip <allowed_source> <wildcard> <allowed_destination> <wildcard>

```

```
Router(config)#ip access-list extended ent_in
Router(config-ext-nacl)#permit ospf any any
Router(config-ext-nacl)#permit ip 192.168.2.0 0.0.0.255 192.168.4.0 0.0.0.255
Router(config-ext-nacl)#permit tcp any 192.168.4.0 0.0.0.255 eq 443
Router(config-ext-nacl)#permit udp any 192.168.4.0 0.0.0.255 eq 53
Router(config-ext-nacl)#permit udp any 192.168.4.0 0.0.0.255 eq 67
Router(config-ext-nacl)#permit udp any 192.168.4.0 0.0.0.255 eq 68
Router(config-ext-nacl)#permit udp any eq domain 192.168.4.0 0.0.0.255
Router(config-ext-nacl)#exit
Router(config)#ip access-list extended ent_out
Router(config-ext-nacl)#permit ospf any any
Router(config-ext-nacl)#permit udp host 192.168.4.4 any eq 67
Router(config-ext-nacl)#permit ip 192.168.4.0 0.0.0.255 192.168.2.0 0.0.0.255
Router(config-ext-nacl)#permit tcp 192.168.4.0 0.0.0.255 any established
Router(config-ext-nacl)#permit udp 192.168.4.0 0.0.0.255 eq 53 any
Router(config-ext-nacl)#exit
```

**Apply Access List to Interface:**

```
interface <interface_name>
```

```
ip access-group <access_list_name> <in/out>
```

```
Router(config)#interface GigabitEthernet0/0
```

```
Router(config-if)#ip access-group ent_in in
```

```
Router(config-if)#ip access-group ent_out out
```

# SSH & Telnet

SSH dikonfigurasi menggunakan “line vty 0 4” sedangkan Telnet dikonfigurasi menggunakan “ine vty 5 8”. Konfigurasi dilakukan sedemikian agar konfigurasi telnet tidak mengganggu konfigurasi SSH (terutama password pada SSH). DNS Server diberikan konfigurasi A-record baru dengan nama border.tld yang menunjuk pada *Border Router* masing - masing zona negara.

## ### Gokouloryn Border Router

Configure Hostname and Secret:

```
hostname <hostname_name>
ip domain-name <domain for router>
username <username> secret <password>
crypto key generate rsa
```

```
Router(config)#hostname Gokouloryn_Border
Gokouloryn_Border(config)#ip domain-name border.gk
Gokouloryn_Border(config)#username admin secret adminssh
Gokouloryn_Border(config)#crypto key generate rsa
```

How many bits in the modulus [512]: 1024

Configure SSH:

```
line vty <range>
login local
transport input ssh
```

# SSH Configuration

```
Gokouloryn_Border(config)#line vty 0 4
Gokouloryn_Border(config-line)#login local
Gokouloryn_Border(config-line)#transport input ssh
```

Configure Telnet:

```
line vty <range>
password <password_for_telnet>
transport input telnet
login
```

```
Telnet Configuration
```

```
Gokouloryn_Border(config)#line vty 5 8
```

```
Gokouloryn_Border(config-line)#password admintelnet
```

```
Gokouloryn_Border(config-line)#transport input telnet
```

```
Gokouloryn_Border(config-line)#login
```

# NAT

Didn't implement sorry twin 🌹🌹

# IPv6

Didn't implement sorry twin 🌹🌹