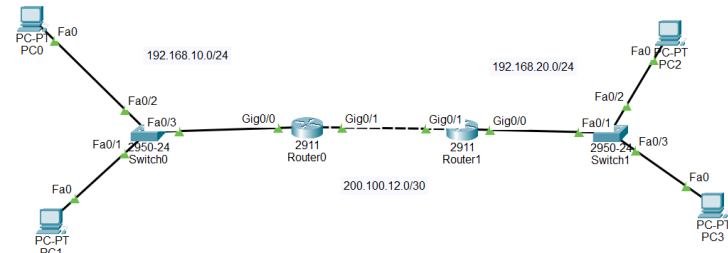


# TP N° 3

1. Realiser la topologie suivante et configurer uniquement les adresses et gateway:



configuration Des PCs :

PC0

Physical Config **Interface** Programming Attributes

Interface: FastEthernet0

IP Configuration

☒ DHCP

IPv4 Address: 192.168.10.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.10.1

DNS Server: 0.0.0.0

IPv6 Configuration

☒ Static

IPv6 Address: [ ]

Link Local Address: FE80:207:ECFF:FE01:E369

Default Gateway: [ ]

DNS Server: [ ]

802.1X

☐ Use 802.1X Security

Authentication: [ ]

Username: [ ]

Password: [ ]

PC1

Physical Config **Interface** Programming Attributes

Interface: FastEthernet0

IP Configuration

☒ DHCP

IPv4 Address: 192.168.10.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.10.1

DNS Server: 0.0.0.0

IPv6 Configuration

☒ Static

IPv6 Address: [ ]

Link Local Address: FE80:240:8FF:FE2E:1067

Default Gateway: [ ]

DNS Server: [ ]

802.1X

☐ Use 802.1X Security

Authentication: [ ]

Username: [ ]

Password: [ ]

PC2

Physical Config **Interface** Programming Attributes

Interface: FastEthernet0

IP Configuration

☒ DHCP

IPv4 Address: 192.168.20.2

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.20.1

DNS Server: 0.0.0.0

IPv6 Configuration

☒ Static

IPv6 Address: [ ]

Link Local Address: FE80:266:5CFF:FE96:80E9

Default Gateway: [ ]

DNS Server: [ ]

802.1X

☐ Use 802.1X Security

Authentication: [ ]

Username: [ ]

Password: [ ]

PC3

Physical Config **Interface** Programming Attributes

Interface: FastEthernet0

IP Configuration

☒ DHCP

IPv4 Address: 192.168.20.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.20.1

DNS Server: 0.0.0.0

IPv6 Configuration

☒ Static

IPv6 Address: [ ]

Link Local Address: FE80:206:5FFF:FEAC:E0BA

Default Gateway: [ ]

DNS Server: [ ]

802.1X

☐ Use 802.1X Security

Authentication: [ ]

Username: [ ]

Password: [ ]

Configuration des routeurs :

Router0

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

GigabitEthernet0/0

Port Status

Link Speed

Duplex

MAC Address

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

GigabitEthernet0/0

1000 Mbps

100 Mbps

10 Mbps

On

Auto

Auto

0003.E43E.B001

192.168.10.1

255.255.255.0

10

Router0

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

GigabitEthernet0/1

Port Status

Link Speed

Duplex

MAC Address

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

GigabitEthernet0/1

1000 Mbps

100 Mbps

10 Mbps

On

Auto

Auto

0003.E43E.B002

200.100.12.1

255.255.255.252

10

Router1

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

GigabitEthernet0/0

Port Status

Link Speed

Duplex

MAC Address

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

GigabitEthernet0/0

1000 Mbps

100 Mbps

10 Mbps

On

Auto

Auto

0009.7C8B.B501

192.168.20.1

255.255.255.0

10

Router1

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

GigabitEthernet0/1

Port Status

Link Speed

Duplex

MAC Address

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

GigabitEthernet0/1

1000 Mbps

100 Mbps

10 Mbps

On

Auto

Auto

0009.7C8B.B502

200.100.12.2

255.255.255.252

10

Remarque

On a mis comme mask 255.255.255.252 dans le reseau 200.100.12.0/30 car la partie machine prend 30 bits :

$$\underbrace{11111111}_{8\text{bits}=255} \cdot \underbrace{11111111}_{8\text{bits}=255} \cdot \underbrace{11111111}_{8\text{bits}=255} \cdot \underbrace{11111100}_{6\text{bits}=252}$$

## OSPF

On a deux methodes :

- **Configuration Mode Routeur :**

- On doit etre au niveau 3 pour activer le protocole **OSPF** avec la commande :  
`router ospf <id_processus>`
- Apres avoir executer la commande on passe au niveau 4.
- Pour ajouter une route dynamic on utilise la commande :  
`network <reseau_connu> <mask_inverse> area <id_region>`
- Le masque inverse c'est prendre chaque partie du mask normal et lui soustraire 255 :  
$$255.255.255.0 \Rightarrow (255 - 255).(255 - 255).(255 - 255).(255 - 0) \Rightarrow 0.0.0.255$$

- **Configuration Mode Inteface :**

- On doit etre au niveau 3 pour acceder a une interface avec la commande :  
`interface <nom_interface>`
- Apres avoir executer la commande on passe au niveau 4.
- Pour activer le protocole **OSPF** pour l'interface on utilise :  
`ip ospf <id_processus> area <id_region>`

## Remarque

- On peut faire une configuration **multi-regional** ou chaque region a une collection de routeurs pour faciliter le **managment**
- Dans notre cas simple on va utilise une configuration **mono-regional** on va juste utilise region id = 0 pour dire qu'on a **une seule region globale**.
- L'id processus permet d'executer plusieurs instances de l'**OSPF** sur le meme routeur.

### 3. Configurer l'OSPF sur le routeur 0 avec la premiere methode et afficher la table de routage :

```
Router0

Physical Config CLI Attributes

IOS Command Line Interface

Router con0 is now available.

Press RETURN to get started.

Press RETURN to get started!

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.168.10.0 0.0.0.255 area 0
Router(config-router)#network 200.100.12.0 0.0.0.3 area 0
Router(config-router)#

Activate Windows
Go to Settings to activate Windows.
```

```
Router0

Physical Config CLI Attributes

IOS Command Line Interface

Press RETURN to get started!

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.168.10.0 0.0.0.255 area 0
Router(config-router)#network 200.100.12.0 0.0.0.3 area 0
Router(config-router)#
OSV6126: VOSPP-1-AJNDMS: Process 1, Mbr 200.100.12.2 on GigabitEthernet0/1 from LOADING to FULL, Loading Done

Router(config-router)#do show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, IA - OSPF inter area, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, S - BGP
        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 - OGN
        P - periodic downloaded static route

Gateway of last resort is not set

C        192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C         192.168.10.0/24 is directly connected, GigabitEthernet0/0
L         192.168.10.1/32 is directly connected, GigabitEthernet0/0
O         192.168.20.0/24 [110/2] via 200.100.12.1, 00:00:00, GigabitEthernet0/1
O         200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C         200.100.12.0/30 is directly connected, GigabitEthernet0/1
L         200.100.12.1/32 is directly connected, GigabitEthernet0/1

Router(config-router)#

Activate Windows
Go to Settings to activate Windows.
```

### 4. Configurer l'OSPF sur le routeur 1 avec la deuxieme methode et afficher la table de routage :

```
Router1

Physical Config CLI Attributes

IOS Command Line Interface

Press RETURN to get started!

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g 0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g 0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#
OSV6119: VOSPP-1-AJNDMS: Process 1, Mbr 200.100.12.1 on GigabitEthernet0/1 from LOADING to FULL, Loading Done

Router(config-if)#do show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, IA - OSPF inter area, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, S - BGP
        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 - OGN
        P - periodic downloaded static route

Gateway of last resort is not set

O         192.168.10.0/24 [110/2] via 200.100.12.1, 00:00:00, GigabitEthernet0/1
C         192.168.20.0/24 is variably subnetted, 1 subnets, 1 masks
C         192.168.20.0/24 is directly connected, GigabitEthernet0/0
L         192.168.20.1/32 is directly connected, GigabitEthernet0/0
O         200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C         200.100.12.0/30 is directly connected, GigabitEthernet0/1
L         200.100.12.2/32 is directly connected, GigabitEthernet0/1

Router(config-if)#

Activate Windows
Go to Settings to activate Windows.
```

## 5. C'est quoi la distance administrative et le cout de l'OSPF?

### Distance Administrative & Cout

- Distance Administrative = 110.
- Le cout est calculer avec la bandwidth (capacité de transfert de données) des cables avec la formule suivant :

$$\sum_{i=1}^m \text{round} \left( \frac{\text{Reference Bandwidth}}{\text{interface}_i \text{ Bandwidth}} \right)$$

$$\text{round}(n) = \begin{cases} \text{if } n < 1 & : 1 \\ \text{if } n \in \mathbb{N} & : n \\ \text{if } n \in \mathbb{R} & : \text{Integer Part} + 1 \end{cases}$$

- $m$  est le nombre d'interfaces emetteur pour atteindre la switch du reseau recepteur.
- Par default la reference bandwidth est de 100Mbps donc  $100 \times 10^6 \text{ bps} = 10^8 \text{ bps}$ .

## 6. changer le cout des interface g 0/0 des deux routeurs , afficher la table de routage expliquer le nouveau cout :

### Changer Le Cout

Pour changer le cout on doit etre au niveau 4 (conf interface) et on utilise la commande :  
**ip ospf cost <nouveau\_cout>**

```

Router1
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, EX - OSPF external, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, NI - 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

O 192.168.10.0/24 [110/6] via 200.100.12.1, 00:00:14, GigabitEthernet0/1
C 192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.20.0/24 is directly connected, GigabitEthernet0/0
L 192.168.20.0/24 is directly connected, GigabitEthernet0/0
C 200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.12.0/24 is directly connected, GigabitEthernet0/1
L 200.100.12.0/24 is directly connected, GigabitEthernet0/1

Router(config)#show ip ospf cost
Router(config)#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, EX - OSPF external, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, NI - 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

O 192.168.10.0/24 [110/6] via 200.100.12.1, 00:06:10, GigabitEthernet0/1
C 192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.20.0/24 is directly connected, GigabitEthernet0/0
L 192.168.20.0/24 is directly connected, GigabitEthernet0/0
C 200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.12.0/24 is directly connected, GigabitEthernet0/1
L 200.100.12.0/24 is directly connected, GigabitEthernet0/1

Router(config)#
  
```

```

Router0
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, EX - OSPF external, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, NI - 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

O 192.168.10.0/24 [110/6] via 200.100.12.1, 00:06:10, GigabitEthernet0/1
C 192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.20.0/24 is directly connected, GigabitEthernet0/0
L 192.168.20.0/24 is directly connected, GigabitEthernet0/0
C 200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.12.0/24 is directly connected, GigabitEthernet0/1
L 200.100.12.0/24 is directly connected, GigabitEthernet0/1

Router(config)#
  
```

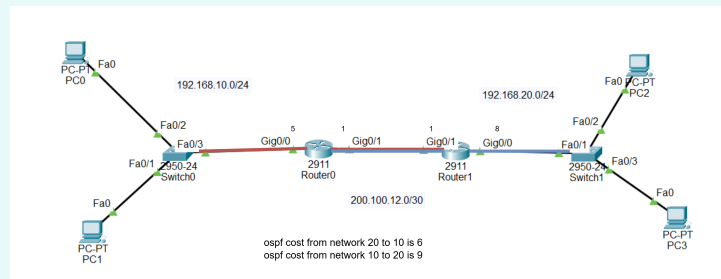
## Nouveau Cout

- cout de la route vers 192.168.10.0 est :

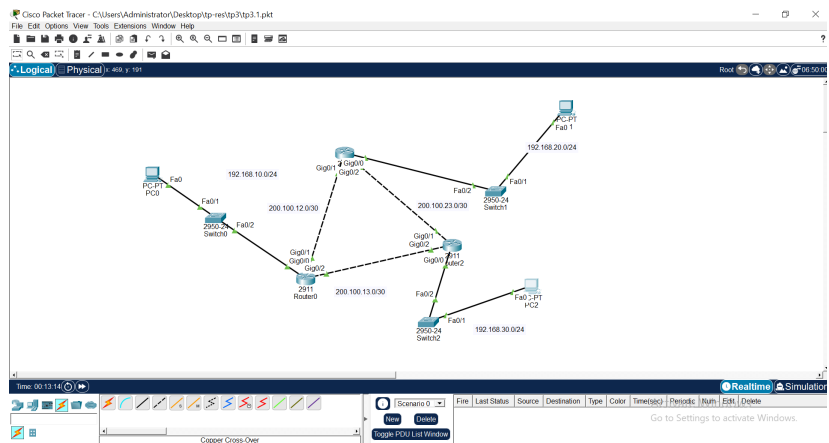
$$\begin{aligned}\text{cout}_{192.168.10.0} &= \text{cout}(g0/1_{\text{router } 1}) + \text{cout}(g0/0_{\text{router } 0}) \\ &= \text{round}\left(\frac{10^8 \text{bps}}{1 \text{Gbps}}\right) + 5 \\ &= \text{round}\left(\frac{10^8 \text{bps}}{10^9 \text{bps}}\right) + 5 \\ &= \text{round}(0.1) + 5 \\ &= 1 + 5 \\ &= \boxed{6}\end{aligned}$$

- cout de la route vers 192.168.20.0 est :

$$\begin{aligned}\text{cout}_{192.168.20.0} &= \text{cout}(g0/1_{\text{router } 0}) + \text{cout}(g0/0_{\text{router } 1}) \\ &= \text{round}\left(\frac{10^8 \text{bps}}{1 \text{Gbps}}\right) + 8 \\ &= \text{round}\left(\frac{10^8 \text{bps}}{10^9 \text{bps}}\right) + 8 \\ &= \text{round}(0.1) + 8 \\ &= 1 + 8 \\ &= \boxed{9}\end{aligned}$$



7. Faite la topologie suivante et configurer les adresses et les gateway :



PC0

Physical Config Desktop Programming Attributes

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

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80:2E0:BF31:B980

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication

Username

Password

PC1

Physical Config Desktop Programming Attributes

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

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80:208:BEFF:FECD:AAB

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication

Username

Password

PC2

Physical Config Desktop Programming Attributes

Configuration

Interface (FastEthernet0)

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.30.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.30.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80:2E0:BF31:FE80:AAB

Default Gateway

DNS Server

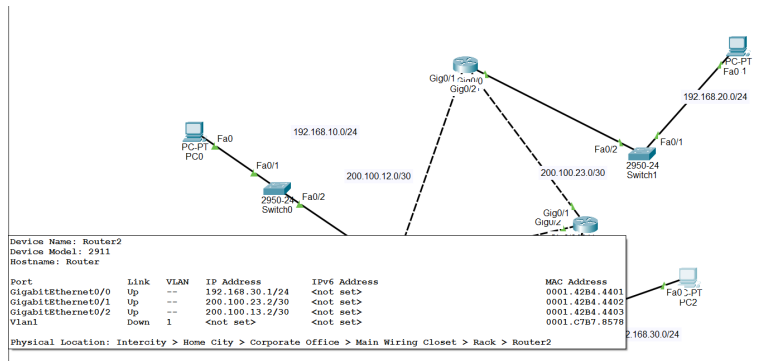
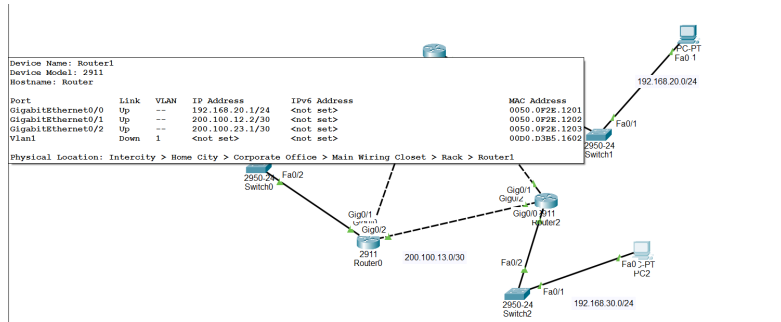
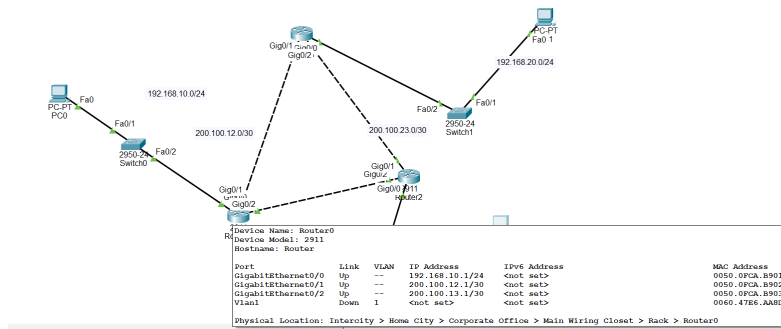
802.1X

☐ Use 802.1X Security

Authentication

Username

Password



## 8. configurer L'OSPF sur chaque routeur avec la deuxieme methode :

```
Router0
Physical Config CLI Attributes
IOS Command Line Interface

Router>en
Router>conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g0/2
Router(config-if)#ip ospf 1 area 0
```

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

*****
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wf/public/crypto/tool/atqg.html
If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISC02811/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX12400R8
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
256K bytes of non-volatile configuration memory.
149356K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up

Router>en
Router>conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g0/2
Router(config-if)#ip ospf 1 area 0
Router(config-if)#
12:04:06: VOSPP-5-ADJCHG: Process 1, Hbr 200.100.13.1 on GigabitEthernet0/1 from LOADING to FULL, Loading Done
Router(config-if)#
```

```
Router2
Physical Config CLI Attributes
IOS Command Line Interface

*****
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wf/public/crypto/tool/atqg.html
If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISC02811/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX12400R8
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
256K bytes of non-volatile configuration memory.
149356K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

Router>en
Router>conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int g0/2
Router(config-if)#ip ospf 1 area 0
Router(config-if)#
12:05:09: VOSPP-5-ADJCHG: Process 1, Hbr 200.100.12.2 on GigabitEthernet0/1 from LOADING to FULL, Loading Done
12:05:10: VOSPP-5-ADJCHG: Process 1, Hbr 200.100.13.1 on GigabitEthernet0/2 from LOADING to FULL, Loading Done
```

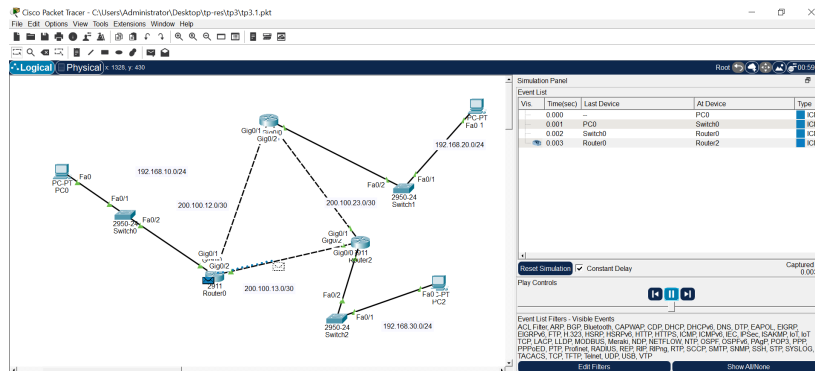
## 9. Afficher la table de routage de tout les routeurs :

```
Router0
Physical Config CLI Attributes
IOS Command Line Interface
Router(config-if)#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
O - OSPF, EX - OSPF 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 - BGP
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
0 192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.10.0/24 is directly connected, GigabitEthernet0/0
O 192.168.20.0/24 [110/2] via 200.100.12.2, 00:05:38, GigabitEthernet0/1
O 192.168.30.0/24 [110/2] via 200.100.12.2, 00:04:32, GigabitEthernet0/2
L 200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
O 200.100.12.0/30 is directly connected, GigabitEthernet0/1
L 200.100.12.0/30 is directly connected, GigabitEthernet0/1
O 200.100.13.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.13.0/30 is directly connected, GigabitEthernet0/2
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
O 200.100.23.0/24 is variably subnetted, 1 subnets
L 200.100.23.0/24 [110/2] via 200.100.12.2, 00:04:32, GigabitEthernet0/2
O 200.100.23.0/30 is directly connected, GigabitEthernet0/2
L 200.100.23.0/30 is directly connected, GigabitEthernet0/2
```

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
Router(config-if)#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
O - OSPF, EX - OSPF 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 - BGP
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
O 192.168.10.0/24 [110/2] via 200.100.12.1, 00:04:09, GigabitEthernet0/1
O 192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.20.0/24 is directly connected, GigabitEthernet0/0
L 192.168.20.0/24 is directly connected, GigabitEthernet0/0
O 192.168.30.0/24 [110/2] via 200.100.23.2, 00:05:06, GigabitEthernet0/2
O 200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.12.0/30 is directly connected, GigabitEthernet0/1
L 200.100.12.0/30 is directly connected, GigabitEthernet0/1
O 200.100.13.0/24 is variably subnetted, 1 subnets
O 200.100.13.0/30 [110/2] via 200.100.12.1, 00:05:06, GigabitEthernet0/2
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
O 200.100.23.0/24 is variably subnetted, 1 subnets, 2 masks
C 200.100.23.0/30 is directly connected, GigabitEthernet0/2
L 200.100.23.0/30 is directly connected, GigabitEthernet0/2
```

```
Router2
Physical Config CLI Attributes
IOS Command Line Interface
Router(config-if)#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
O - OSPF, EX - OSPF 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 - BGP
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
O 192.168.10.0/24 [110/2] via 200.100.13.1, 00:09:32, GigabitEthernet0/2
O 192.168.20.0/24 [110/2] via 200.100.23.1, 00:09:32, GigabitEthernet0/1
O 192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.30.0/24 is directly connected, GigabitEthernet0/0
L 192.168.30.0/24 is directly connected, GigabitEthernet0/0
O 200.100.12.0/30 is variably subnetted, 1 subnets
O 200.100.12.0/30 [110/2] via 200.100.23.1, 00:09:32, GigabitEthernet0/1
L 200.100.12.0/30 is directly connected, GigabitEthernet0/1
O 200.100.13.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.13.0/30 is directly connected, GigabitEthernet0/2
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
O 200.100.23.0/24 is variably subnetted, 1 subnets, 2 masks
C 200.100.23.0/30 is directly connected, GigabitEthernet0/1
L 200.100.23.0/30 is directly connected, GigabitEthernet0/1
```

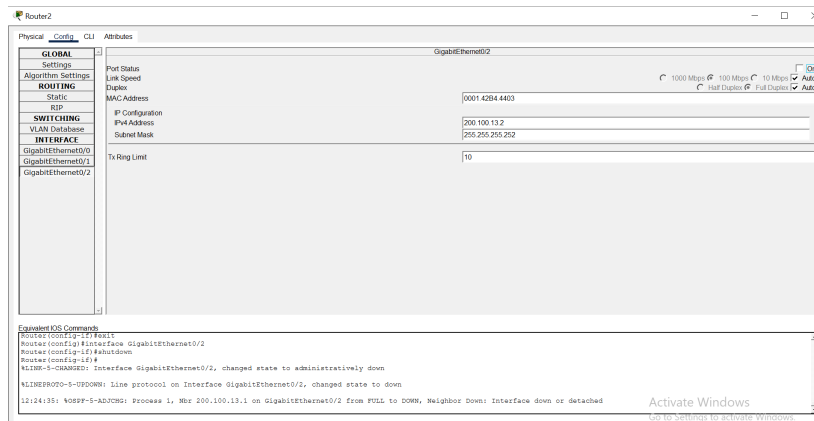
## 10. Faire un ping en simulation depuis le PC0 au PC1:



## Remarque

On remarque que le routeur prefere passe directement par le routeur 2 (cout **OSPF** = 2) au lieu de passe par le routeur 1 puis le routeur 2 (cout **OSPF** = 3).

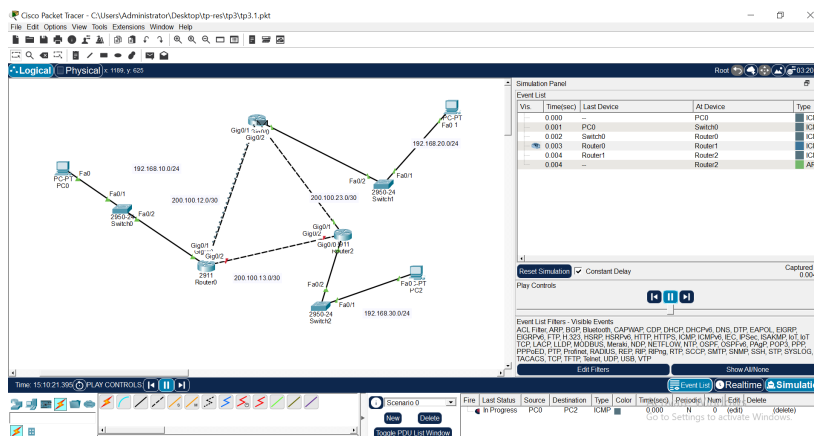
11. Desactiver l'interface g0/2 du routeur 2 pour simuler une panne puis affiche la table de routage du routeur 1:



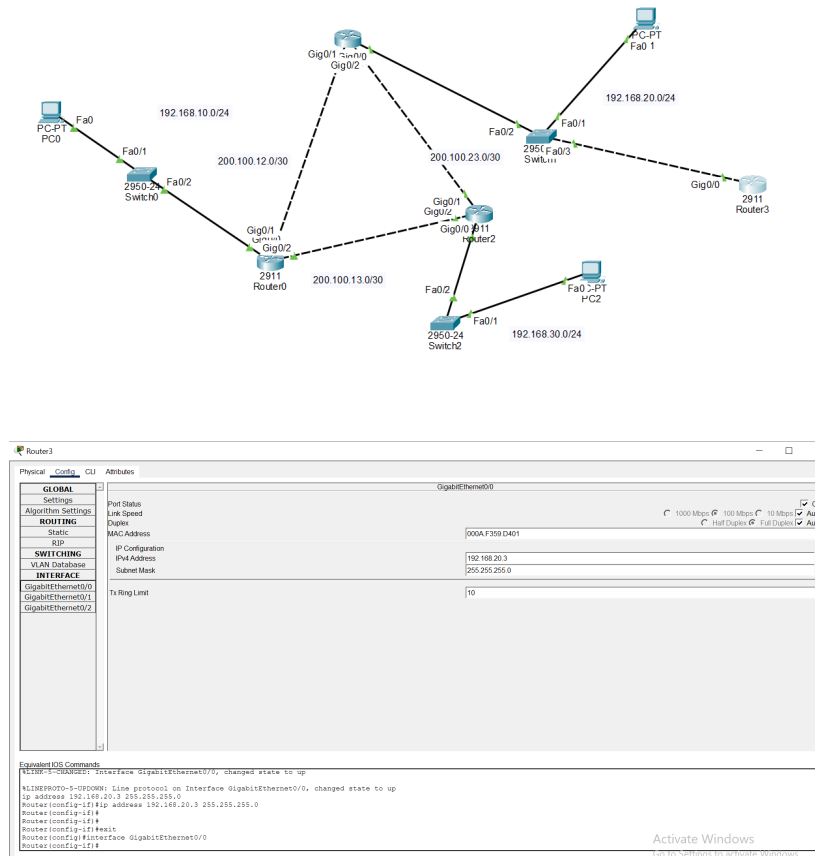
## Remarque

Puisque l'interface reliant le routeur 2 au 0 n'est plus fonctionnelle, **OSPF** a dynamiquement mis à jour la route vers 192.168.30.0 du routeur 0 pour qu'il passe par le routeur 1 et le cout deviendra 3.

12. Refaire le ping en simulation :



### 13. Ajouter un routeur et configurer son adresse :

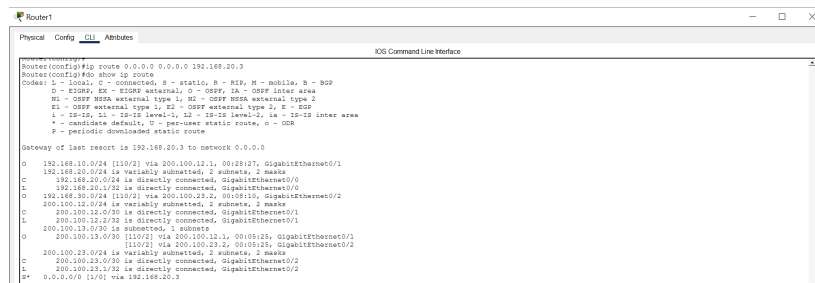


### 14. Le routeur 3 qu'on a ajouter est un routeur provider donc il ya des possibilite et combinaison infini d'adresse ip venant depuis ce routeur comment alors on va configurer cette route ?

**0.0.0.0**

On va utilise un routage static et on dit que l'adresse et mask du reseau inconnu est 0.0.0.0 signifiant n'import quelle reseau qui ne figurent pas dans la table de routage du routeur, elle est appelle la **route par default** .

### 15. Configure la route static dans le routeur 1 :



16. Est-ce qu'on va configurer la **route par défaut** sur tout les autre routeurs? Ou peut on propager cette route automatiquement au routeurs?

## Propagation

- **OSPF** nous permet de propager une **route par défaut** definit sur un routeur au autre routeurs voisin.
- On doit etre au niveau 4 **OSPF** avec la commande :  
router ospf <id\_processus>
- On utilise cetter commande pour propager la **route par défaut** :  
default-information originate

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
Router(config)#router ospf 1
Router(config-router)#def
Router(config-router)#default-information o
Router(config-router)#default-information originate
```

17. Afficher la table de routage des deux autre routeur pour s'assure que la **route par défaut** c'est propage :

```
Router0
Physical Config CLI Attributes
IOS Command Line Interface
Router(config-if)#do show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, EX - OSPF external, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, O2 - 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, IS - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route
Gateway of last resort is 200.100.12.2 to network 0.0.0.0
C
O 192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
L 192.168.10.0/24 is directly connected, GigabitEthernet0/0
O 192.168.20.0/24 [110/2] via 200.100.12.2, 00:10:30, GigabitEthernet0/1
O 192.168.30.0/24 [110/2] via 200.100.12.2, 00:10:30, GigabitEthernet0/2
O 200.100.12.0/24 is variably subnetted, 2 subnets, 2 masks
C 200.100.12.0/30 is directly connected, GigabitEthernet0/1
L 200.100.12.0/30 is directly connected, GigabitEthernet0/1
O 200.100.13.0/24 is variably subnetted, 2 subnets, 2 masks
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
O 200.100.23.0/30 is variably subnetted, 2 subnets, 2 masks
C 200.100.23.0/30 is directly connected, GigabitEthernet0/1
O 200.100.23.0/30 [110/2] via 200.100.12.2, 00:10:30, GigabitEthernet0/2
* 0.0.0.0/0 [110/0] via 200.100.12.2, 00:10:30, GigabitEthernet0/2
```

```
Router2
Physical Config CLI Attributes
IOS Command Line Interface
Router#show ip route
Codes: C - local, L - connected, S - static, R - RIP, M - mobile, B - BGP
        O - OSPF, EX - OSPF external, O - OSPF, IA - OSPF inter area
        NI - OSPF NSSA external type 1, O2 - 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, IS - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route
Gateway of last resort is 200.100.23.1 to network 0.0.0.0
O 192.168.10.0/24 [110/2] via 200.100.13.1, 00:10:32, GigabitEthernet0/2
O 192.168.20.0/24 [110/2] via 200.100.23.1, 00:10:32, GigabitEthernet0/1
O 192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks
L 192.168.30.0/24 is directly connected, GigabitEthernet0/0
L 192.168.30.0/24 is directly connected, GigabitEthernet0/0
O 200.100.12.0/30 is variably subnetted, 1 subnets, 1 masks
O 200.100.12.0/30 [110/2] via 200.100.23.1, 00:10:32, GigabitEthernet0/1
O 200.100.13.0/24 is variably subnetted, 2 subnets, 2 masks
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
L 200.100.13.0/30 is directly connected, GigabitEthernet0/2
O 200.100.23.0/30 is variably subnetted, 2 subnets, 2 masks
C 200.100.23.0/30 is directly connected, GigabitEthernet0/1
L 200.100.23.0/30 is directly connected, GigabitEthernet0/1
* 0.0.0.0/0 [110/0] via 200.100.23.1, 00:10:32, GigabitEthernet0/1
```