UNIVERSITE DE FIANARANTSOA

ECOLE NATIONAL D'INFORMATQUE

RAPPORT DE PROJET

EN DEUXIEME ANNEE DE LICENCE PROFESSIONNELLE
Mention : Informatique
Parcours : Informatique Générale

Routing Information Protocol (RIPv2) and Open Shortest Path First (OSPF)

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Parcours : L2 Informatique Générale

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Table de matière :

PARTIE I : Présentation des outils

Outils utilisés :

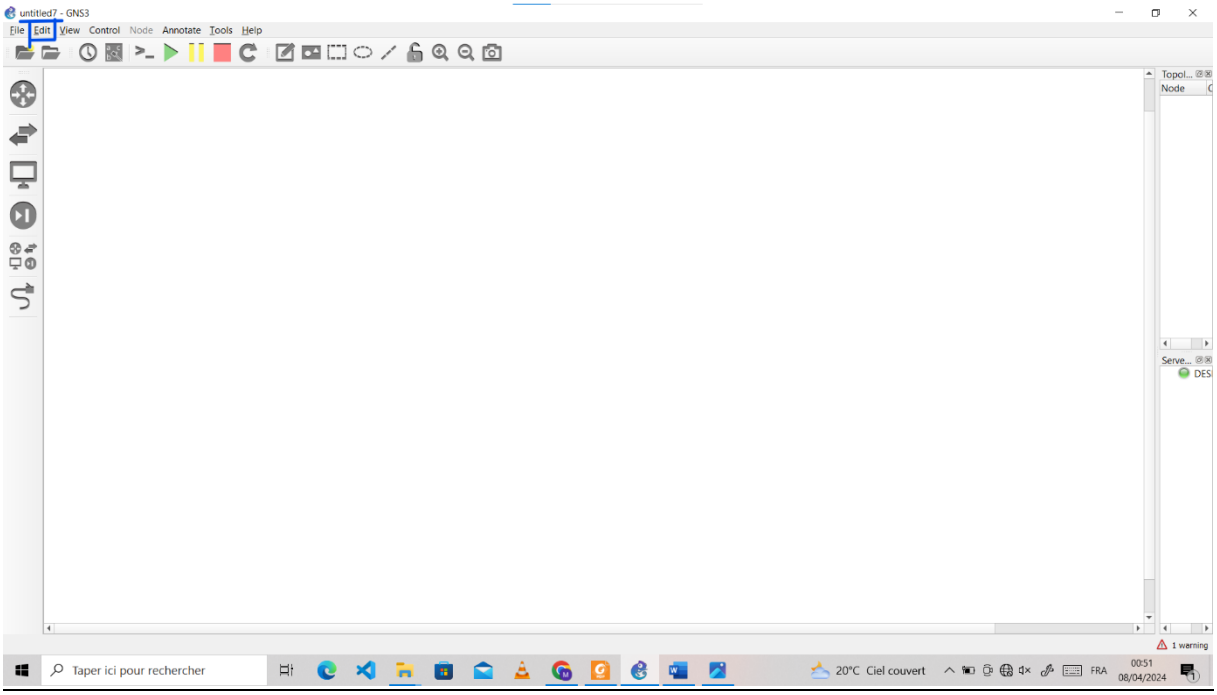
- **GNS3** :
  GNS3 est un outil de simulation et d'émulation de réseau gratuit qui permet aux utilisateurs de créer des réseaux virtuels réaliste.

- **Wireshark** :
  Wireshark est un outil gratuit permettant d'analyser les réseaux.

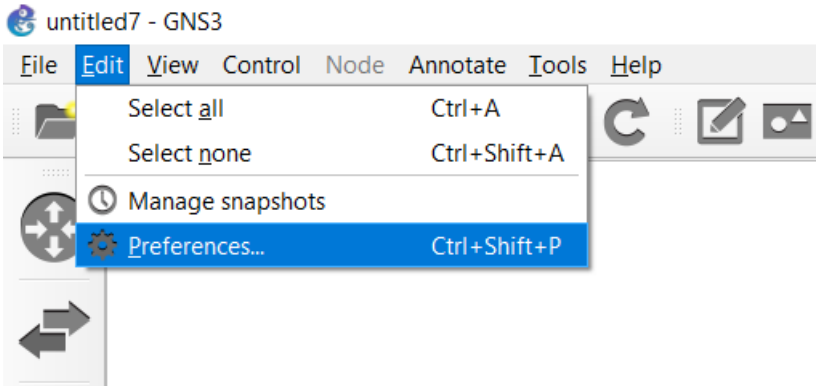
PARTIE II : Routage avec Rip version 2

1) Création d'un modèle de routeur Cisco 7200 :

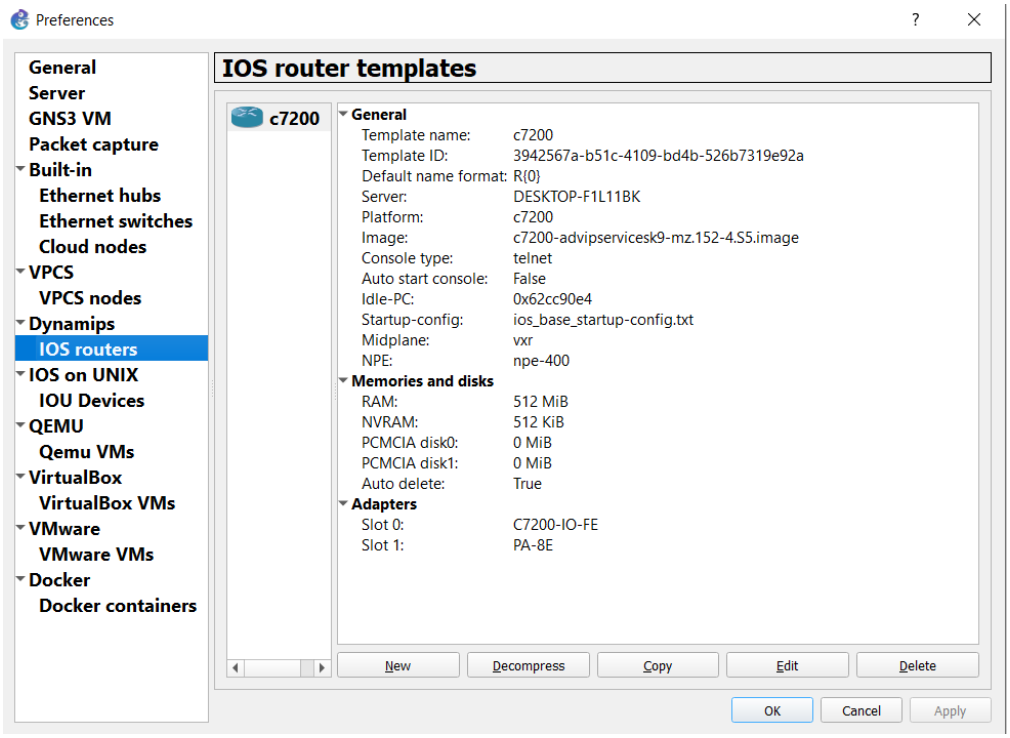
- Etape 1 :



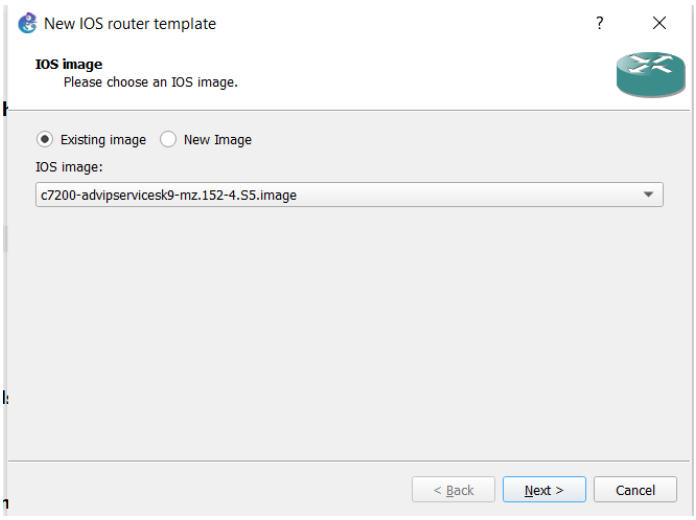
- Etape 2 :



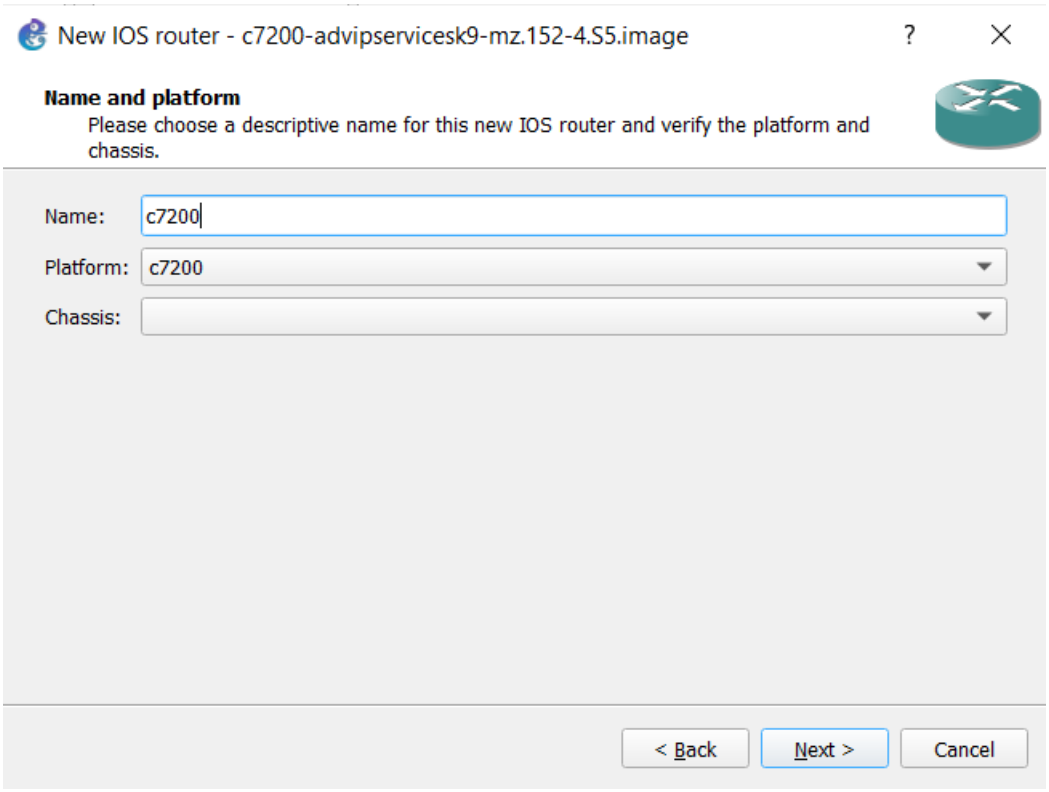
- Etape 3 :



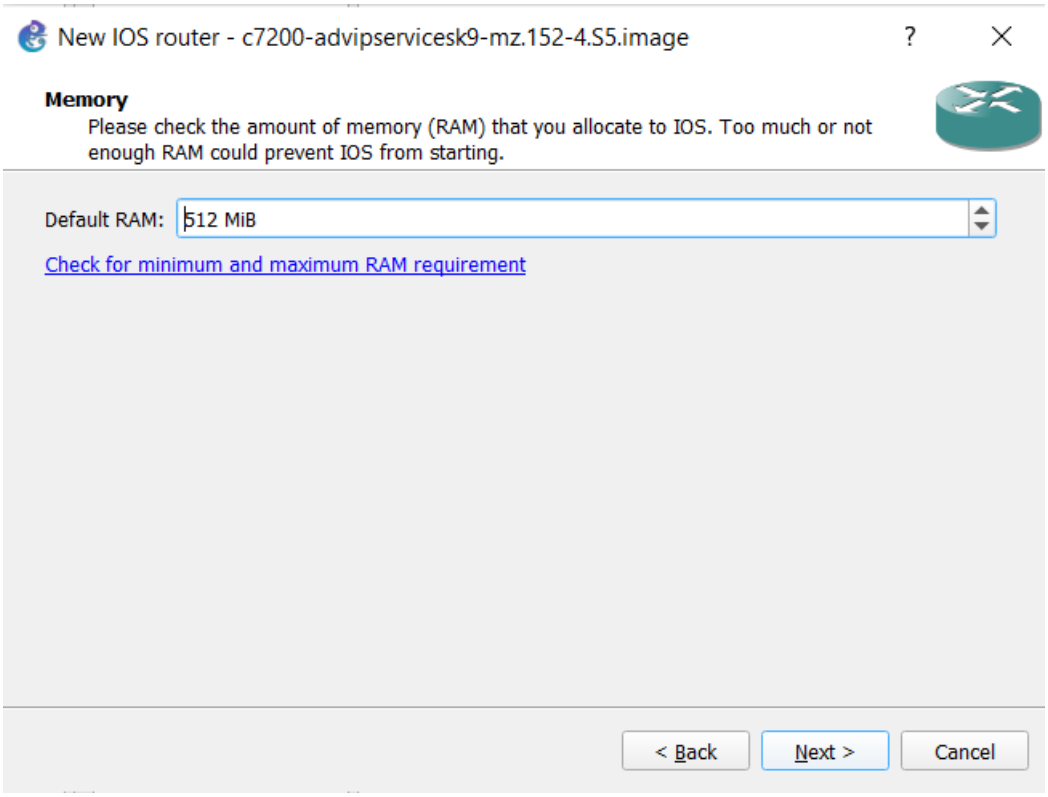
- Etape 4 :



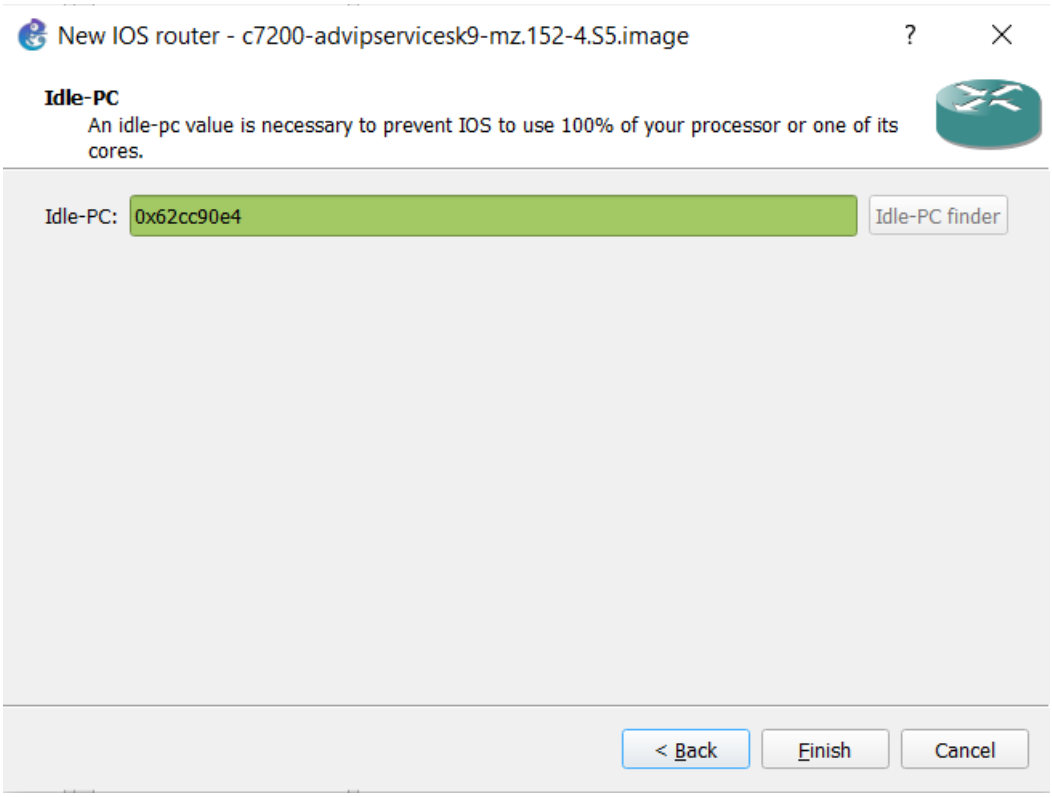
- Etape 5 :



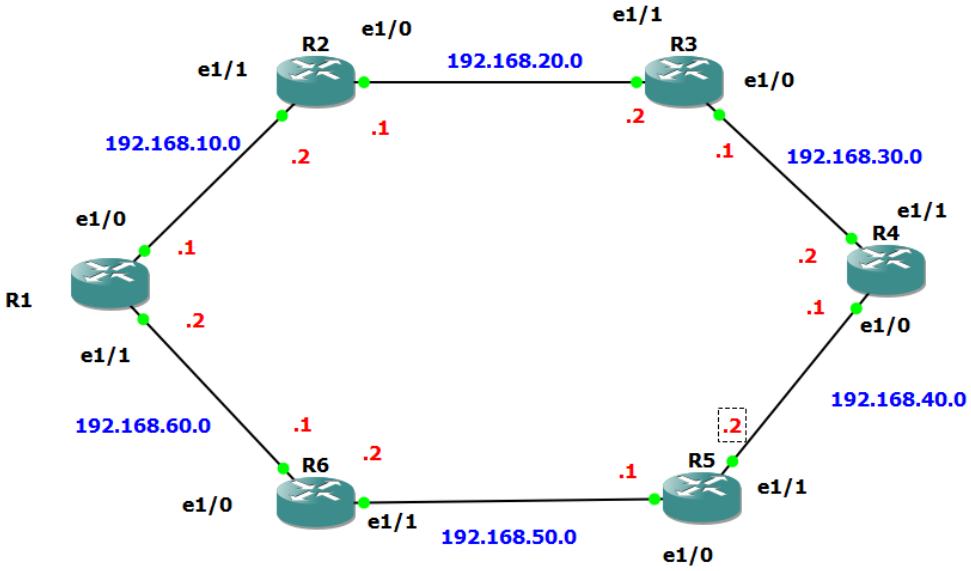
- Etape 6



- Etape 7 :


New IOS router - c7200-advipservicesk9-mz.152-4.S5.image
?
Idle-PC
An idle-pc value is necessary to prevent IOS to use 100% of your processor or one of its cores.
Idle-PC:
0x62cc90e4
Idle-PC finder
< Back
Finish
Cancel

2) Réalisation de la topologie :



3) Configuration de routeur :

- Configuration de R1 :

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#
R1(config)#int e1/0
R1(config-if)#ip addr 192.168.10.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Mar 28 08:44:31.811: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 28 08:44:32.811: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R1(config-if)#exit
R1(config)#int e1/1
R1(config-if)#op addr 192.168.60.2 255.255.255.0
               ^
% Invalid input detected at '^' marker.

R1(config-if)#ip addr 192.168.60.2 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Mar 28 08:45:38.523: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 28 08:45:39.523: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R1(config-if)#end
R1#
*Mar 28 08:45:43.827: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R1#
```

- Configuration de R2 :

```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int e1/1
R2(config-if)#ip addr 192.168.10.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar 28 08:48:09.879: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 28 08:48:10.879: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R2(config-if)#exit
R2(config)#int e1/0
R2(config-if)#ip addr 192.168.20.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#end
*Mar 28 08:49:02.327: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 28 08:49:03.327: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R2(config-if)#end
R2#w
*Mar 28 08:49:06.295: %SYS-5-CONFIG_I: Configured from console by console
R2#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2#
```

- Configuration de R3 :

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int e1/1
R3(config-if)#ip addr 192.168.20.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar 28 08:51:28.663: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 28 08:51:29.663: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R3(config-if)#exit
R3(config)#int e1/0
R3(config-if)#ip addr 192.168.30.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar 28 08:52:36.059: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 28 08:52:37.059: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R3(config-if)#
```

- Configuration de R4 :

```
R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#int e1/1
R4(config-if)#ip addr 192.168.30.2 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Mar 28 08:55:31.807: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 28 08:55:32.807: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R4(config-if)#exit
R4(config)#int e1/0
R4(config-if)#ip addr 192.168.40.1 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Mar 28 08:57:05.091: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 28 08:57:06.091: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R4(config-if)#end
R4#
*Mar 28 08:57:21.391: %SYS-5-CONFIG_I: Configured from console by console
R4#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R4#
```

- Configuration de R5 :

```
R5#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R5(config)#int e1/1
R5(config-if)#ip addr 192.168.40.2 255.255.255.0
R5(config-if)#no sh
R5(config-if)#
*Mar 28 08:58:42.019: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 28 08:58:43.019: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R5(config-if)#exit
R5(config)#int e1/0
R5(config-if)#ip addr 192.168.50.1 255.255.255.0
R5(config-if)#no sh
R5(config-if)#
*Mar 28 08:59:44.831: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 28 08:59:45.831: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R5(config-if)#end
R5#
*Mar 28 08:59:50.343: %SYS-5-CONFIG_I: Configured from console by console
R5#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R5#
```

- Configuration de R6

```
R6#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R6(config)#int e1/1
R6(config-if)#ip addr 192.168.50.2 255.255.255.0
R6(config-if)#no sh
R6(config-if)#
*Mar 28 09:04:18.171: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 28 09:04:19.171: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R6(config-if)#exit
R6(config)#int e1/0
R6(config-if)#ip addr 192.168.60.1 255.255.255.0
R6(config-if)#no sh
R6(config-if)#
*Mar 28 09:05:06.907: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 28 09:05:07.907: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R6(config-if)#end
R6#
*Mar 28 09:05:12.939: %SYS-5-CONFIG_I: Configured from console by console
R6#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R6#
```

4) Activation de Rip version 2

- Pour R1 :

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 192.168.10.0
R1(config-router)#network 192.168.60.0
R1(config-router)#end
R1#w
*Mar 28 09:07:41.203: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#
```

- Pour R2 :

```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 192.168.10.0
R2(config-router)#network 192.168.20.0
R2(config-router)#end
R2#w
*Mar 28 09:09:24.267: %SYS-5-CONFIG_I: Configured from console by console
R2#wr
Building configuration...
[OK]
R2#
```

- Pour R3 :

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#network 192.168.20.0
R3(config-router)#network 192.168.30.0
R3(config-router)#end
R3#wr
*Mar 28 09:11:52.303: %SYS-5-CONFIG_I: Configured from console by console
R3#wr
Building configuration...
[OK]
R3#
```

- Pour R4 :

```
R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router rip
R4(config-router)#version 2
R4(config-router)#network 192.168.30
% Incomplete command.

R4(config-router)#network 192.168.30.0
R4(config-router)#network 192.168.40.0
R4(config-router)#end
R4#w
*Mar 28 09:14:52.263: %SYS-5-CONFIG_I: Configured from console by console
R4#wr
Building configuration...
[OK]
R4#
```

- Pour R5 :

```
R5#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R5(config)#router rip
R5(config-router)#version 2
R5(config-router)#network 192.168.40.0
R5(config-router)#network 192.168.50.0
R5(config-router)#end
R5#
*Mar 28 09:22:15.047: %SYS-5-CONFIG_I: Configured from console by console
R5#wr
Building configuration...
[OK]
R5#
```

- Pour R6 :

```
R6#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R6(config)#router rip
R6(config-router)#version 2
R6(config-router)#network 192.168.50.0
R6(config-router)#network 192.168.60.0
R6(config-router)#end
R6#
*Mar 28 09:20:20.795: %SYS-5-CONFIG_I: Configured from console by console
R6#wr
Building configuration...
[OK]
R6#
```

5) La table de routage de R1 et la vérification de la connectivité par le ping :

- La table de routage de R1 :

```
R1#sh 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

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, Ethernet1/0
L        192.168.10.1/32 is directly connected, Ethernet1/0
R     192.168.20.0/24 [120/1] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.30.0/24 [120/2] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.40.0/24 [120/2] via 192.168.60.1, 00:00:08, Ethernet1/1
R     192.168.50.0/24 [120/1] via 192.168.60.1, 00:00:08, Ethernet1/1
      192.168.60.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.60.0/24 is directly connected, Ethernet1/1
L        192.168.60.2/32 is directly connected, Ethernet1/1
R1#
```

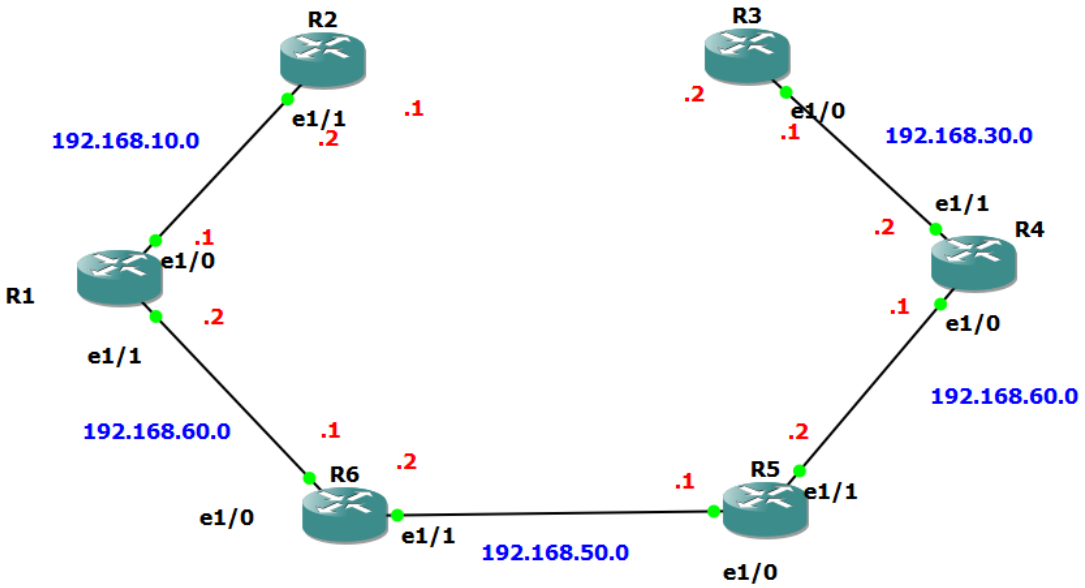
- Vérification de la connectivité de R1 :

```
R1#ping 192.168.10.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/90/120 ms
R1#ping 192.168.20.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.20.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 108/163/260 ms
R1#ping 192.168.30.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.30.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 192/227/268 ms
R1#ping 192.168.40.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.40.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 140/155/188 ms
R1#ping 192.168.50.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/79/108 ms
R1#ping 192.168.60.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.60.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R1#
```

Tous les pings effectués par R1 ont eu des succès.

6) Suppression du lien entre R1 et R2 et désactivation de l'interface :

- Suppression du lien entre R1 et R2 :



- Désactivation de l'interface :
  - R3 :

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int e1/1
R3(config-if)#shutdown
R3(config-if)#
*Mar 28 09:36:03.883: %LINK-5-CHANGED: Interface Ethernet1/1, changed state to administratively
down
*Mar 28 09:36:04.883: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state
 to down
```

  - R2 :

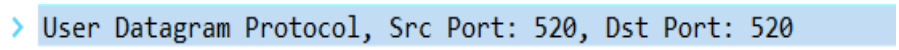
```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int e1/0
R2(config-if)#shutdown
R2(config-if)#
*Mar 28 09:35:07.779: %LINK-5-CHANGED: Interface Ethernet1/0, changed state to
administratively down
*Mar 28 09:35:08.779: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet
0, changed state to down
R2(config-if)#end
R2#
```

R1 peut atteindre R3 au bout de 120secondes

Ces 120 secondes correspondent au temporisateur (ou timeout) par défaut, le temps pour que R1 et R3 détectent la panne du lien entre R2 et R3, puis ils vont envoyer des messages RIP v2 pour

informer les autres routeurs de la panne du lien, pour enfin mettre à jour leurs tables de routage. R1 pourra après retrouver un autre chemin pour accéder au routeur R3. Or que les mises à jour s'effectuent périodiquement, toutes les 30 secondes.

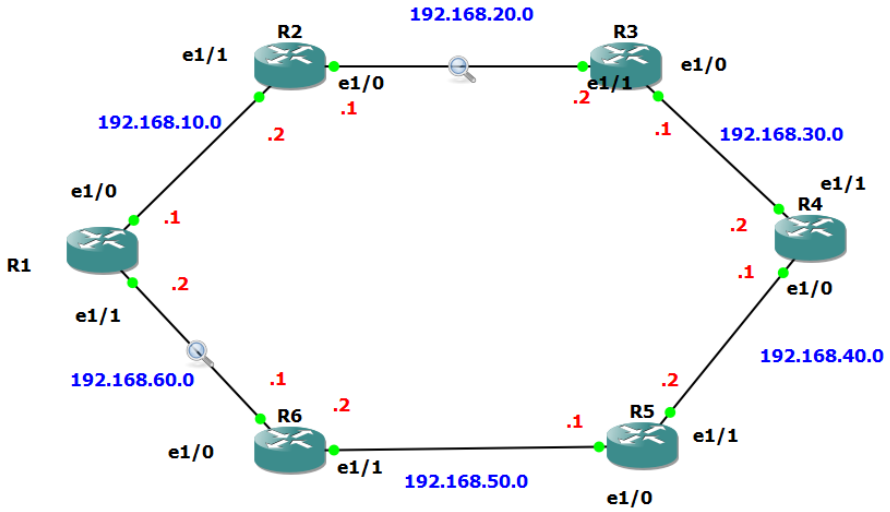
7) Encapsulation de RIP :



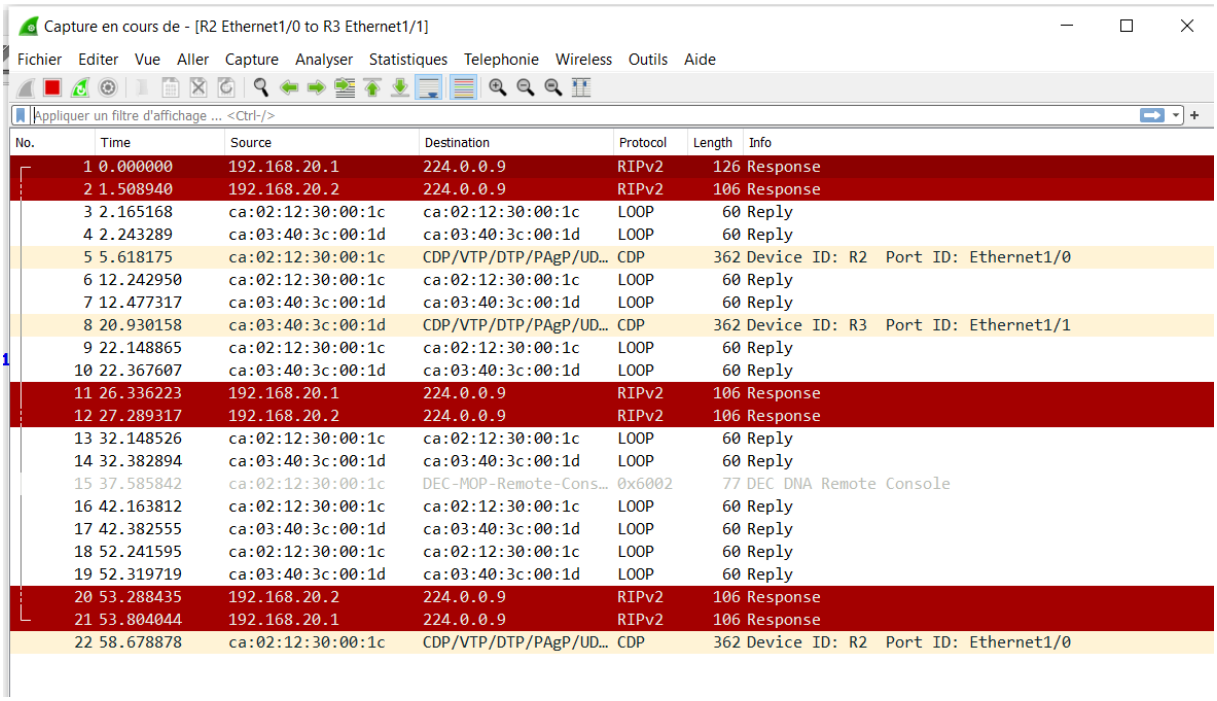
D'après cet image les paquets RIP sont encapsulé dans les protocoles **UDP** (**U**ser **D**atagram **P**rotocol) sur le Port :520 et encapsulé dans le protocole **IPX** (**I**nternetwork **P**acket **E**xchange) sur le Port 2048

8) L'échange entre R2 et R3 lorsque on remet le lien R2-R3 :

✓ R2-R3 :



✓ L'échange entre R2 et R3 avec *Wireshark*:



Types de paquets :

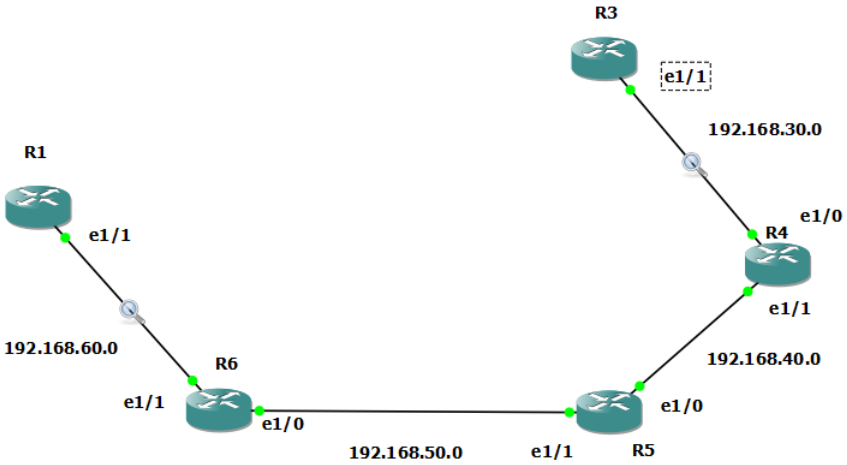
- Paquets RIPv2 : pour échanger des informations de routage.

- Paquets CDP : propre aux routeurs CISCO pour la découverte de voisins et d'annonces de présence.

-Paquets Loop : pour faire une boucle afin de mettre à jour la table de routage.

9) Suppression du routeur R2 et les messages échangés en sortie de R1 et de R3 :

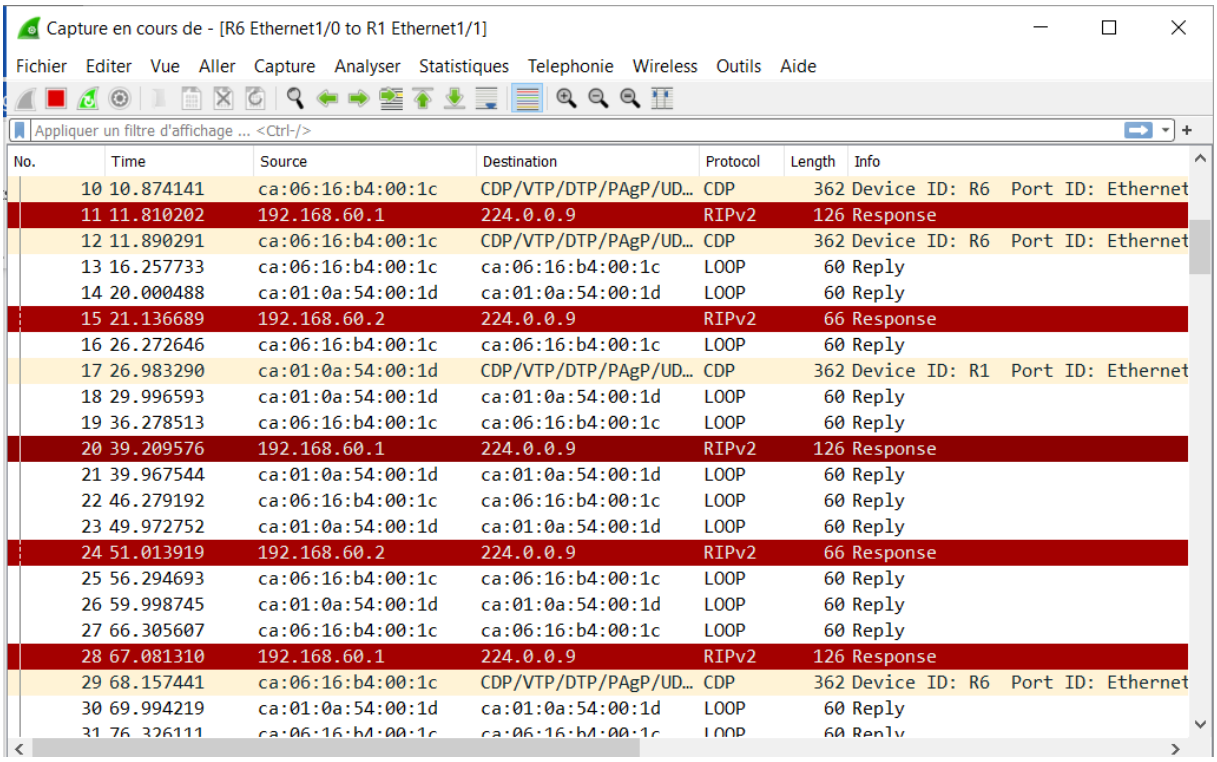
✓ Suppression du routeur R2



✓ Les messages échangés en sortie de R1 et de R3 :

Après avoir supprimer la routeur R2 la capture de R1 à R2 ne marche plus car R2 n'existe plus alors par conséquent on prend la sortie de R1 vers R6

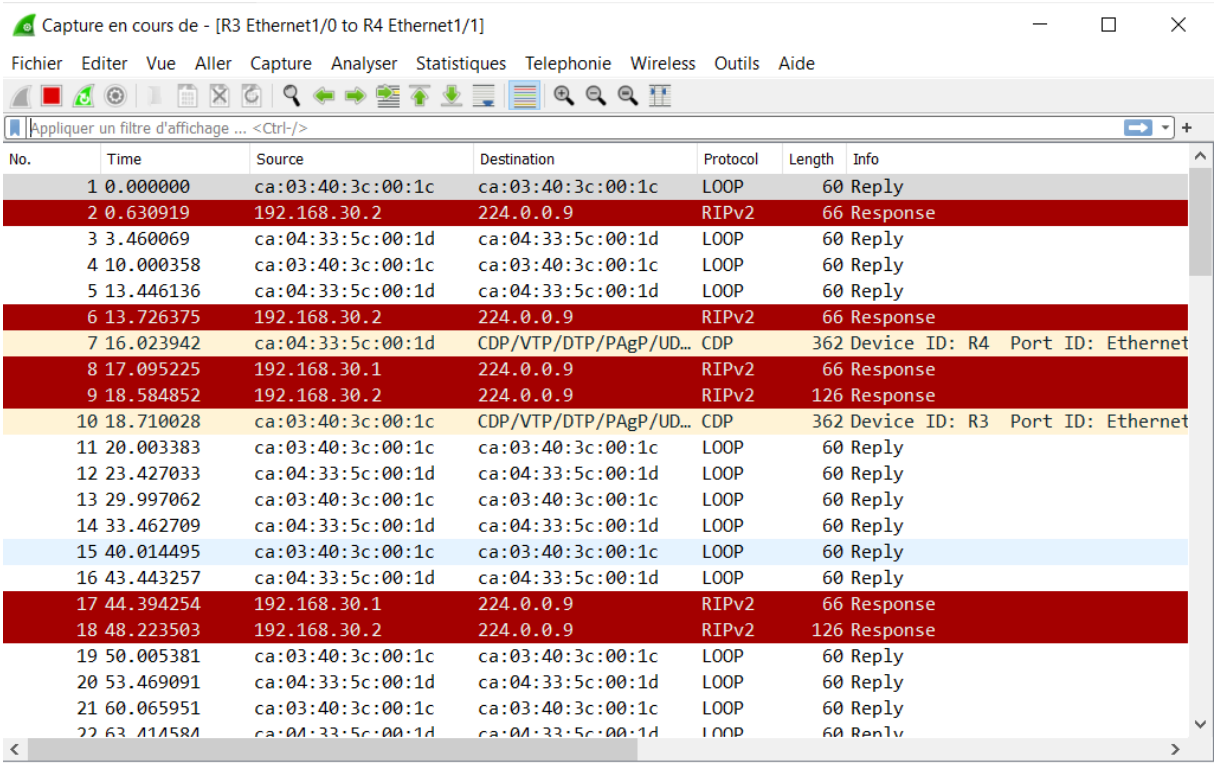
Sortie de R1 à R6 :



Par cette image nous remarquons que lorsque le routeur R2 est supprimé, les messages échangés à la sortie de R1 vers R6 avec Wireshark sont « Response » qui signifie la réponse de la routeur R1 et R6. Le message « Reply » qui signifie la réponse des autres routeurs.

Après avoir supprimer la routeur R2 la capture de R3 à R2 ne marche plus car R2 n'existe plus alors par conséquent on prend la sortie de R3 vers R4

Sortie de R3 a R4 :



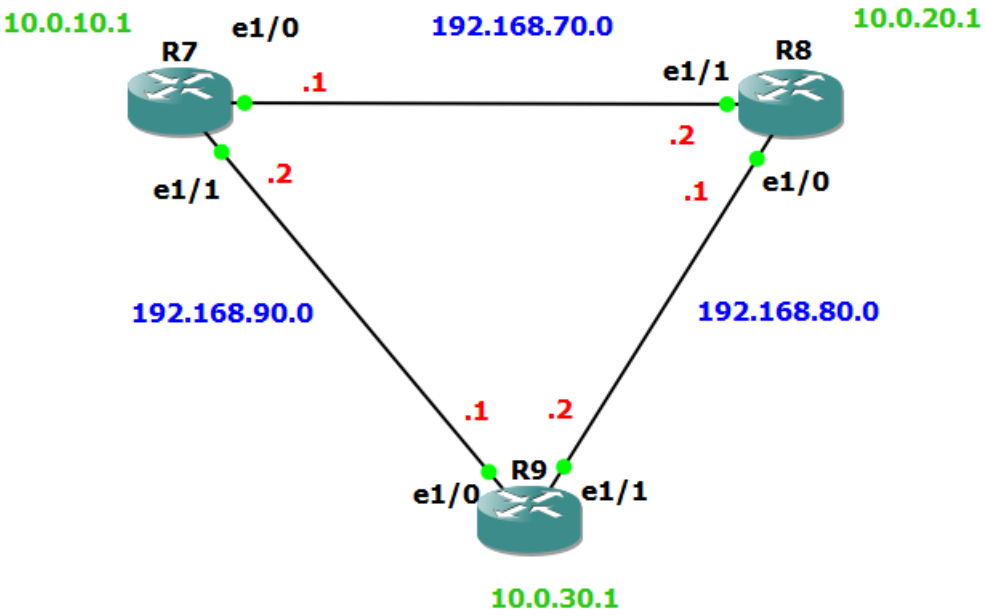
Par cette image nous remarquons que lorsque le routeur R2 est supprimé, les messages échangés à la sortie de R3 vers R4 avec Wireshark sont Response qui signifie la réponse de la routeur R1 et R4 et le message Reply qui signifie la réponse des autres routeurs

.

A l'entour de 30 secondes que la convergence prend d' après les deux captures de Wireshark.

PARTIE III: Open Shortest Path First (OSPF)

- La topologie :



1) Ajout d'une interface loopback a chaque interface :
   a) Pour R7 :

```
R7#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R7(config)#int lo0
R7(config-if)#ip
*Apr  8 04:10:40.643: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
R7(config-if)#ip addr 10.0.10.1 255.255.255.0
R7(config-if)#end
R7#
*Apr  8 04:11:00.243: %SYS-5-CONFIG_I: Configured from console by console
R7#
```

   b) Pour R8 :

```
R8#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R8(config)#int lo0
R8(config-if)#ip a
*Apr  8 04:12:13.687: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
R8(config-if)#ip addr 10.0.20.1 255.255.255.0
R8(config-if)#end
R8#
*Apr  8 04:12:35.251: %SYS-5-CONFIG_I: Configured from console by console
R8#
```

c) Pour R9 :

```
Enter configuration commands, one per line.  End with CNTL/Z.
R9(config)#int lo0
R9(config-if)#no ip addr
R9(config-if)#ip addr 10.0.30.1 255.255.255.0
R9(config-if)#exit
```

2) Un plan d'adressage pertinent pour le réseau :

i. Pour R7 :

```
R7#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R7(config)#int e1/0
R7(config-if)#ip address 192.168.70.1 255.255.255.0
R7(config-if)#no sh
R7(config-if)#
*Mar 26 08:28:21.255: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 26 08:28:22.255: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R7(config-if)#xit
               ^
% Invalid input detected at '^' marker.

R7(config-if)#exit
R7(config)#int e1/1
R7(config-if)#ip add
R7(config-if)#ip address 192.168.90.2 255.255.255.0
R7(config-if)#no sh
R7(config-if)#
*Mar 26 08:29:23.091: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 26 08:29:24.091: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R7(config-if)#end
R7#
```

ii. Pour R8 :

```
R8#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R8(config)#int e1/0
R8(config-if)#ip add 192.68.70.2 255.255.255.0
R8(config-if)#no sh
R8(config-if)#
*Mar 26 08:53:40.211: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 26 08:53:41.211: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R8(config-if)#exit
R8(config)#int e1/1
R8(config-if)#ip add 192.168.80.1 255.255.255.0
R8(config-if)#no sh
R8(config-if)#e
*Mar 26 08:54:20.995: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 26 08:54:21.995: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R8(config-if)#exit
R8(config)#end
R8#
*Mar 26 08:54:37.755: %SYS-5-CONFIG_I: Configured from console by console
R8#wr
Building configuration...
[OK]
R8#
R8#
```

iii. Pour R9 :

```
R9#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R9(config)#int e1/0
R9(config-if)#ip addr 192.168.80.2 255.255.255.0
R9(config-if)#no sh
R9(config-if)#
*Mar 26 09:00:02.639: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Mar 26 09:00:03.639: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R9(config-if)#exit
R9(config)#int e1/1
R9(config-if)#ip add 192.168.90.1 255.255.255.0
R9(config-if)#no sh
R9(config-if)#
*Mar 26 09:01:28.611: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Mar 26 09:01:29.611: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
1, changed state to up
R9(config-if)#end
R9#
*Mar 26 09:01:33.035: %SYS-5-CONFIG_I: Configured from console by console
R9#wr
Building configuration...
[OK]
R9#
```

3) Activation d'ospf sur chaque routeur :

i. Pour R7 :

```
R7#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R7(config)#router ospf 1
R7(config-router)#network 192.168.70.0 0.0.0.255 area 0
R7(config-router)#network 192.168.90.0 0.0.0.255 area 0
R7(config-router)#network 10.0.10.0 0.0.0.255 area 0
R7(config-router)#end
R7#w
*Apr  8 04:17:53.087: %SYS-5-CONFIG_I: Configured from console by console
R7#wr
Building configuration...
[OK]
R7#
```

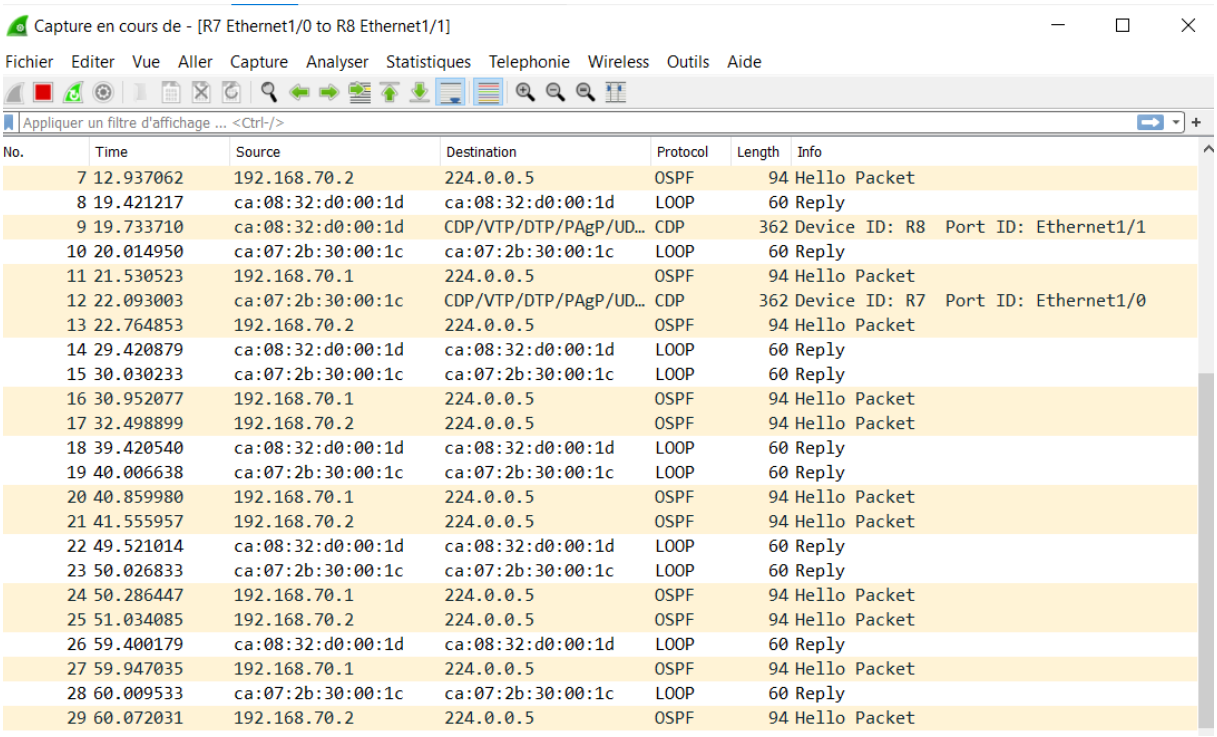
ii. Pour R8 :

```
R8#
*Apr  8 04:12:35.251: %SYS-5-CONFIG_I: Configured from console by console
R8#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R8(config)#router ospf 1
R8(config-router)#network 192.168.70.0 0.0.0.255 area 0
R8(config-router)#network 192.168.80.0 0.0.0.255 area 0
R8(config-router)#network 10.0.20.0 0.0.0.255 area 0
R8(config-router)#end
R8#
*Apr  8 04:19:55.567: %SYS-5-CONFIG_I: Configured from console by console
R8#
```

iii. Pour R9 :

```
R9#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R9(config)#no router ospf 1
R9(config)#router ospf 1
R9(config-router)#network 192.168.80.0 0.0.0.255 area 0
R9(config-router)#network 192.168.90.0 0.0.0.255 area 0
R9(config-router)#network 10.0.30.0 0.0.0.255 area 0
R9(config-router)#end
R9#
```

4) Les messages échanger entre R7 et R8 et Wireshark :
   a) Les messages échanges entre les routeurs sont : hello, DBD, LSR, LSU, LSA
   b) La capture d' écran de Hello avec Wireshark :



No.	Time	Source	Destination	Protocol	Length	Info
7	12.937062	192.168.70.2	224.0.0.5	OSPF	94	Hello Packet
8	19.421217	ca:08:32:d0:00:1d	ca:08:32:d0:00:1d	LOOP	60	Reply
9	19.733710	ca:08:32:d0:00:1d	CDP/VTP/DTP/PAgP/UD…	CDP	362	Device ID: R8 Port ID: Ethernet1/1
10	20.014950	ca:07:2b:30:00:1c	ca:07:2b:30:00:1c	LOOP	60	Reply
11	21.530523	192.168.70.1	224.0.0.5	OSPF	94	Hello Packet
12	22.093003	ca:07:2b:30:00:1c	CDP/VTP/DTP/PAgP/UD…	CDP	362	Device ID: R7 Port ID: Ethernet1/0
13	22.764853	192.168.70.2	224.0.0.5	OSPF	94	Hello Packet
14	29.420879	ca:08:32:d0:00:1d	ca:08:32:d0:00:1d	LOOP	60	Reply
15	30.030233	ca:07:2b:30:00:1c	ca:07:2b:30:00:1c	LOOP	60	Reply
16	30.952077	192.168.70.1	224.0.0.5	OSPF	94	Hello Packet
17	32.498899	192.168.70.2	224.0.0.5	OSPF	94	Hello Packet
18	39.420540	ca:08:32:d0:00:1d	ca:08:32:d0:00:1d	LOOP	60	Reply
19	40.006638	ca:07:2b:30:00:1c	ca:07:2b:30:00:1c	LOOP	60	Reply
20	40.859980	192.168.70.1	224.0.0.5	OSPF	94	Hello Packet
21	41.555957	192.168.70.2	224.0.0.5	OSPF	94	Hello Packet
22	49.521014	ca:08:32:d0:00:1d	ca:08:32:d0:00:1d	LOOP	60	Reply
23	50.026833	ca:07:2b:30:00:1c	ca:07:2b:30:00:1c	LOOP	60	Reply
24	50.286447	192.168.70.1	224.0.0.5	OSPF	94	Hello Packet
25	51.034085	192.168.70.2	224.0.0.5	OSPF	94	Hello Packet
26	59.400179	ca:08:32:d0:00:1d	ca:08:32:d0:00:1d	LOOP	60	Reply
27	59.947035	192.168.70.1	224.0.0.5	OSPF	94	Hello Packet
28	60.009533	ca:07:2b:30:00:1c	ca:07:2b:30:00:1c	LOOP	60	Reply
29	60.072031	192.168.70.2	224.0.0.5	OSPF	94	Hello Packet

5) Les identifiants RID pris par chaque routeur :

Les identifiants RID pris par chaque routeur sont leur propres adresse IpV4 de l'interface loopback car

On n'a pas encore configuré leur RID

Il est simple et cohérent :

- L'adresse loopback est toujours accessible et unique sur chaque routeur, ce qui facilite la configuration et l'identification des routeurs dans le domaine OSPF.
- Elle offre une solution standardisée et cohérente pour l'identification des routeurs, quelle que soit leur configuration réseau.

Stable et fiable :

- L'adresse loopback n'est pas sujette à changement contrairement aux adresses IP physiques qui peuvent varier en cas de panne ou de reconfiguration du réseau.
- Cela garantit une identification stable et fiable des routeurs, contribuant à la robustesse du routage OSPF.

a) RID pour routeur R7 :

```
R7#sh ip ospf
 Routing Process "ospf 1" with ID 10.0.10.1
```

b) RID pour routeur R8 :

```
R8#sh ip ospf
Routing Process "ospf 1" with ID 10.0.20.1
```

c) RID pour routeur R9 :

```
R9#sh ip ospf 1
 Routing Process "ospf 1" with ID 10.0.30.1
```

On a donc,
RID de R7 : 10.0.10.1

RID de R8 : 10.0.20.1

RID de R9 :10.0.30.1

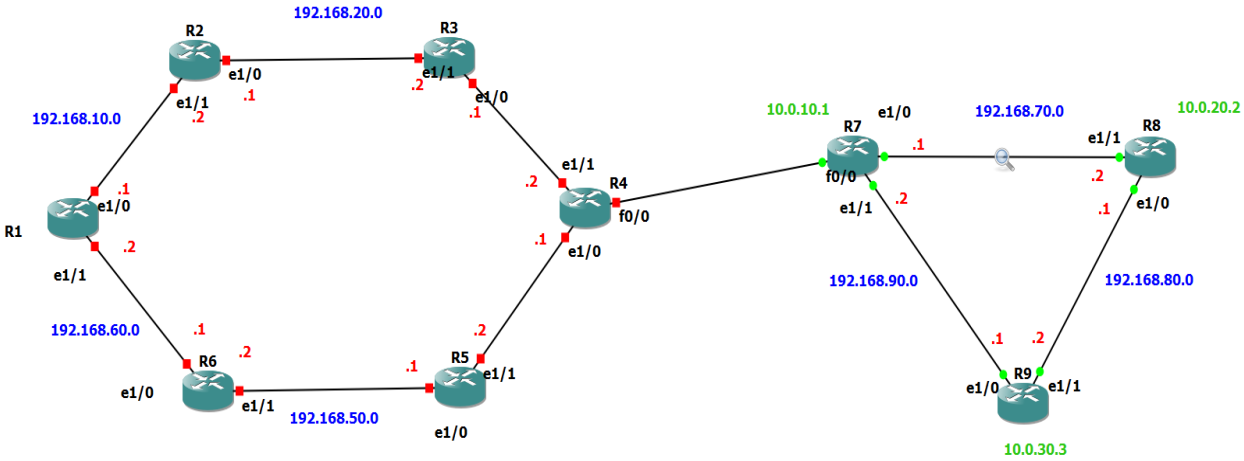
6) Teste connectivite :

```
R7#ping 192.168.70.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.70.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/40 ms
R7#ping 192.168.80.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.80.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/43/52 ms
R7#ping 192.168.80.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.80.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/36/48 ms
R7#ping 192.168.90.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.90.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/25/36 ms
R7#ping 192.168.90.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.90.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R7#
```

Dans cette image nous pouvons voir que tous les tests de connectivite de R7 ont tous réussi.

Redistribution entre route RIP et OSPF

7) Relions R4 et R7 :



8) Vérification de la table de routage pour assurer que la configuration soit correcte :

```
R1#sh 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

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, Ethernet1/0
L        192.168.10.1/32 is directly connected, Ethernet1/0
R     192.168.20.0/24 [120/1] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.30.0/24 [120/2] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.40.0/24 [120/2] via 192.168.60.1, 00:00:08, Ethernet1/1
R     192.168.50.0/24 [120/1] via 192.168.60.1, 00:00:08, Ethernet1/1
      192.168.60.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.60.0/24 is directly connected, Ethernet1/1
L        192.168.60.2/32 is directly connected, Ethernet1/1
R1#
```

Par cette image nous pouvons affirmer que la configuration est correcte.

9) Activation des nouvelles interfaces entre R4 et R7 et attribution de leur une adresse IP et un masque.

- Activation de R4

```
R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#int f0/0
R4(config-if)#ip addr 192.168.100.1 255.255.255.0
R4(config-if)#no sh
R4(config-if)#end
R4#
R4#
*Apr  8 06:19:55.743: %SYS-5-CONFIG_I: Configured from console by console
R4#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R4#
```

- Activation de R7 :

```
R7#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R7(config)#int f0/0
R7(config-if)#ip addr 192.168.100.2 255.255.255.0
R7(config-if)#no sh
R7(config-if)#end
R7#w
*Apr  8 06:19:48.119: %SYS-5-CONFIG_I: Configured from console by console
R7#wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R7#
```

10) Activation OSPF sur ces deux nouvelles interfaces (R4 et R7) :

Pour R4 :

```
R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router ospf 1
R4(config-router)#network 192.168.100.0 0.0.0.255 area 0
R4(config-router)#end
R4#
*Apr  8 06:29:01.035: %SYS-5-CONFIG_I: Configured from console by console
R4#
```

Pour R7 :

```
R7#
R7#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R7(config)# router ospf 1
R7(config-router)#network 192.168.100.0 0.0.0.255 area 0
R7(config-router)#end
R7#
*Apr  8 06:31:06.843: %SYS-5-CONFIG_I: Configured from console by console
R7#wr
Building configuration...
[OK]
R7#
```

11) Oui, R4 peut pinger l'interface loop de R8 car R4 se trouve maintenant dans la même zone configurée dynamiquement sous OSPF.

Voici l'image :

```
R4#ping 10.0.20.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.20.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 80/135/196 ms
R4#
```

12) Ping de R4 qui est connecte à R3 par R8 :

```
R8#ping 192.168.30.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.30.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R8#
```

Dans cette image on trouve que le ping de R4 par R8 n' a pas fonctionné car l' interface dans laquelle R4 est connectée à R3 n' est pas configurer en ospf.

13) Ping de l'interface R8 par R1 et inversement :

```
R1#ping 192.168.70.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.70.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#
```

Ping de l'interface R8 par R1

```
R8#ping 192.168.10.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R8#
```

Ping de l'interface R1 par R8

Ces images affirment que le ping de R1 à l'interface R8 et l'inverse ne marche pas car R4 n'est pas encore configurer pour redistribuer les Ospf et les Rip entre eux, et de plus l'adresse IP de R1 peut être pas encore dans la table de routage de R8

14) Tables de routages de R4, R8, R1 :

- Table de routage de R4 :

```
R4#sh ip rout
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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/32 is subnetted, 3 subnets
O        10.0.10.1 [110/2] via 192.168.100.2, 00:53:26, FastEthernet0/0
O        10.0.20.1 [110/12] via 192.168.100.2, 00:53:26, FastEthernet0/0
O        10.0.30.1 [110/12] via 192.168.100.2, 00:53:26, FastEthernet0/0
R     192.168.10.0/24 [120/2] via 192.168.30.1, 00:00:10, Ethernet1/1
R     192.168.20.0/24 [120/1] via 192.168.30.1, 00:00:10, Ethernet1/1
      192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.30.0/24 is directly connected, Ethernet1/1
L        192.168.30.2/32 is directly connected, Ethernet1/1
      192.168.40.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.40.0/24 is directly connected, Ethernet1/0
L        192.168.40.1/32 is directly connected, Ethernet1/0
R     192.168.50.0/24 [120/1] via 192.168.40.2, 00:00:17, Ethernet1/0
R     192.168.60.0/24 [120/2] via 192.168.40.2, 00:00:17, Ethernet1/0
O     192.168.70.0/24 [110/11] via 192.168.100.2, 00:53:26, FastEthernet0/0
O     192.168.80.0/24 [110/21] via 192.168.100.2, 00:53:26, FastEthernet0/0
O     192.168.90.0/24 [110/11] via 192.168.100.2, 00:53:26, FastEthernet0/0
      192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.100.0/24 is directly connected, FastEthernet0/0
L        192.168.100.1/32 is directly connected, FastEthernet0/0
R4#
```

- Table R8 :

```
R8#sh ip rout
Codes: 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
       i - IS-IS, su - IS-IS summary, 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    192.168.90.0/24 [110/20] via 192.168.70.1, 00:15:06, Ethernet1/1
C    192.168.80.0/24 is directly connected, Ethernet1/0
     10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
O       10.0.10.1/32 [110/11] via 192.168.70.1, 00:15:06, Ethernet1/1
O       10.0.30.1/32 [110/21] via 192.168.70.1, 00:06:52, Ethernet1/1
C       10.0.20.0/24 is directly connected, Loopback0
C    192.168.70.0/24 is directly connected, Ethernet1/1
O    192.168.100.0/24 [110/11] via 192.168.70.1, 00:00:32, Ethernet1/1
R8#
```

- Table de R1 :

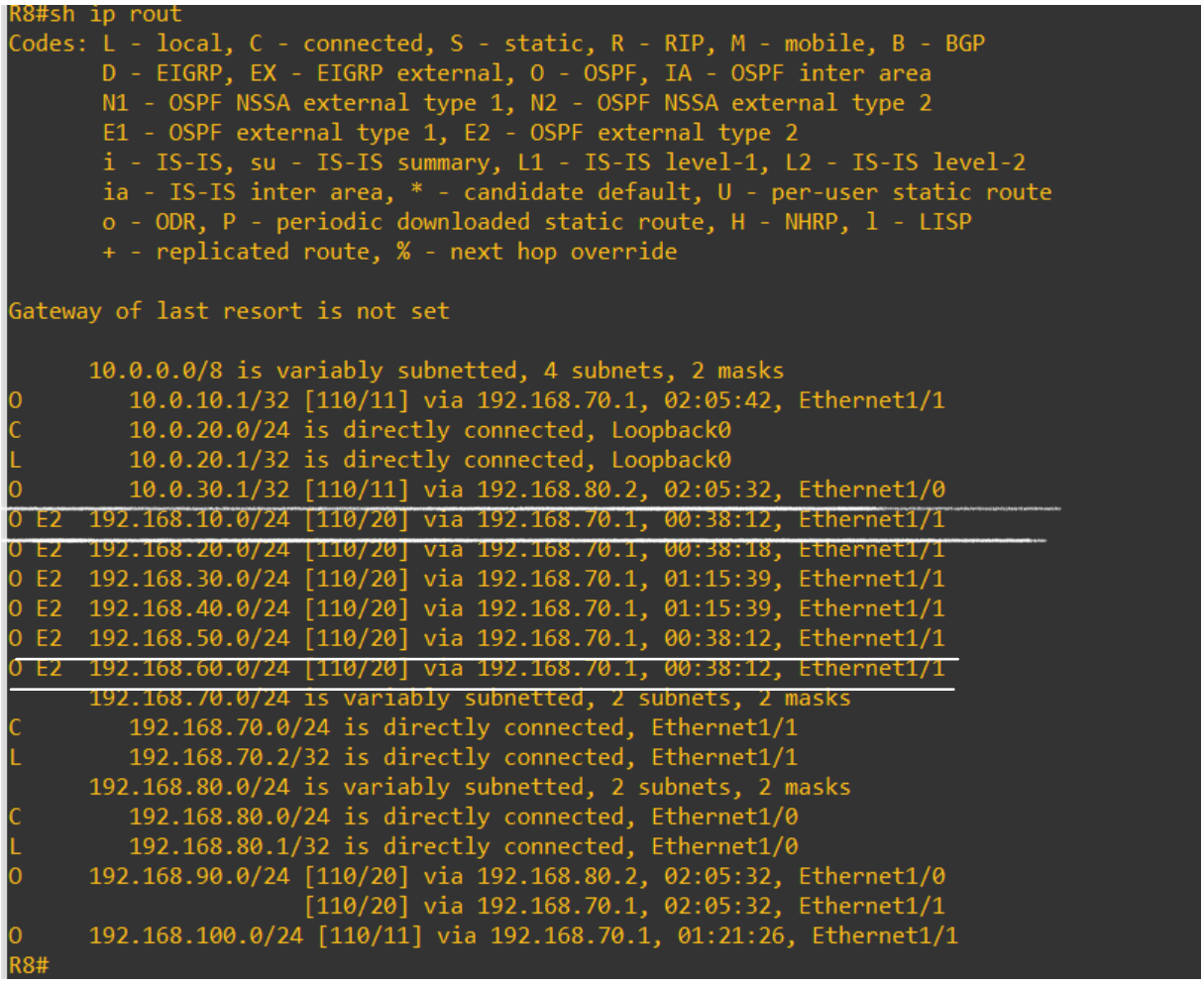
```
R1#sh ip rout
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

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, Ethernet1/0
L        192.168.10.1/32 is directly connected, Ethernet1/0
R     192.168.20.0/24 [120/1] via 192.168.10.2, 00:00:01, Ethernet1/0
R     192.168.30.0/24 [120/2] via 192.168.10.2, 00:00:01, Ethernet1/0
R     192.168.40.0/24 [120/2] via 192.168.60.1, 00:00:23, Ethernet1/1
R     192.168.50.0/24 [120/1] via 192.168.60.1, 00:00:23, Ethernet1/1
      192.168.60.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.60.0/24 is directly connected, Ethernet1/1
L        192.168.60.2/32 is directly connected, Ethernet1/1
R1#
```

15) Configuration de R4 pour distribuer des routes rip sur ospf :

```
R4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router ospf 1
R4(config-router)#redistribute rip subnets
R4(config-router)#end
R4#wr
*Apr  8 07:22:04.367: %SYS-5-CONFIG_I: Configured from console by console
R4#wr
```

16) Route vers R1 dans la table de routage de R8 :

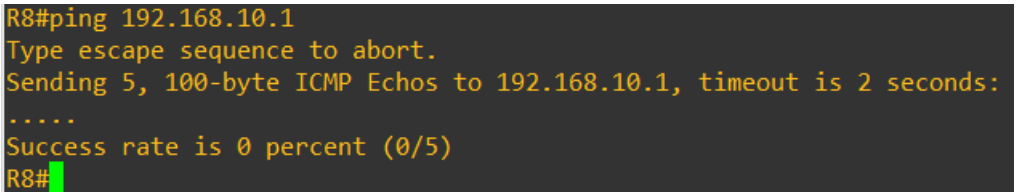
La table de routage de R8 :



```
R8#sh ip rout
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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
O        10.0.10.1/32 [110/11] via 192.168.70.1, 02:05:42, Ethernet1/1
C        10.0.20.0/24 is directly connected, Loopback0
L        10.0.20.1/32 is directly connected, Loopback0
O        10.0.30.1/32 [110/11] via 192.168.80.2, 02:05:32, Ethernet1/0
O E2  192.168.10.0/24 [110/20] via 192.168.70.1, 00:38:12, Ethernet1/1
O E2  192.168.20.0/24 [110/20] via 192.168.70.1, 00:38:18, Ethernet1/1
O E2  192.168.30.0/24 [110/20] via 192.168.70.1, 01:15:39, Ethernet1/1
O E2  192.168.40.0/24 [110/20] via 192.168.70.1, 01:15:39, Ethernet1/1
O E2  192.168.50.0/24 [110/20] via 192.168.70.1, 00:38:12, Ethernet1/1
O E2  192.168.60.0/24 [110/20] via 192.168.70.1, 00:38:12, Ethernet1/1
      192.168.70.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.70.0/24 is directly connected, Ethernet1/1
L        192.168.70.2/32 is directly connected, Ethernet1/1
      192.168.80.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.80.0/24 is directly connected, Ethernet1/0
L        192.168.80.1/32 is directly connected, Ethernet1/0
O     192.168.90.0/24 [110/20] via 192.168.80.2, 02:05:32, Ethernet1/0
                      [110/20] via 192.168.70.1, 02:05:32, Ethernet1/1
O     192.168.100.0/24 [110/11] via 192.168.70.1, 01:21:26, Ethernet1/1
R8#
```

Dans cette image on peut voir une route vers R1 apparaît dans la table de routage de R8.

17) Ping de R8 vers un interface R1 :



```
R8#ping 192.168.10.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R8#
```

Par cet image on peut conclure que le ping de l' interface R1 par R8 est un échec car même si la route de R1 apparaît dans la table de routage dans R8 et par conséquent le paquet ICMP n' arrive pas a R1.

18) Ping de l'interface R8 par R1 :

```
R1#ping 192.168.100.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#
```

19) Redistribution de OSPF sur RIP au niveau de R4:

```
R4(config-router)#redistribute ospf 1
R4(config-router)#end
R4#
*Apr  8 08:25:08.835: %SYS-5-CONFIG_I: Configured from console by console
R4#
```

20) Table de routage de R1 :

```
R1#sh ip rout
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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

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, Ethernet1/0
L        192.168.10.1/32 is directly connected, Ethernet1/0
R     192.168.20.0/24 [120/1] via 192.168.10.2, 00:00:22, Ethernet1/0
R     192.168.30.0/24 [120/2] via 192.168.10.2, 00:00:22, Ethernet1/0
R     192.168.40.0/24 [120/2] via 192.168.60.1, 00:00:24, Ethernet1/1
R     192.168.50.0/24 [120/1] via 192.168.60.1, 00:00:24, Ethernet1/1
      192.168.60.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.60.0/24 is directly connected, Ethernet1/1
L        192.168.60.2/32 is directly connected, Ethernet1/1
R1#
```

Par cette image on remarque que les réseau Ospf n'apparait dans la table de routage de R1 Car la métrique attribuée automatiquement à R4 pour atteindre la zone configurée sous OSPF ne convient pas aux routeurs.

Vérification :

```
R1#ping 192.168.70.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.70.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#
```

Cette image affirme bien que R1 n' arrive pas à pinger R8 .

21) Correction du problème :

Pour corriger ce problème, on va préciser manuellement la valeur de la métrique dans **R4** pour atteindre la zone OSPF grâce à

#redistribute ospf 1 metric 1

```
R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router rip
R4(config-router)#redistribute ospf 1 metric 1
R4(config-router)#end
R4#
*Apr  8 08:51:02.783: %SYS-5-CONFIG_I: Configured from console by console
R4#
```

Et voici la table de routage de R1 :

```
R1#sh ip rout
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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

R     10.0.0.0/8 [120/3] via 192.168.60.1, 00:00:04, Ethernet1/1
                 [120/3] via 192.168.10.2, 00:00:03, Ethernet1/0
      192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.10.0/24 is directly connected, Ethernet1/0
L        192.168.10.1/32 is directly connected, Ethernet1/0
R     192.168.20.0/24 [120/1] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.30.0/24 [120/2] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.40.0/24 [120/2] via 192.168.60.1, 00:00:04, Ethernet1/1
R     192.168.50.0/24 [120/1] via 192.168.60.1, 00:00:04, Ethernet1/1
      192.168.60.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.60.0/24 is directly connected, Ethernet1/1
L        192.168.60.2/32 is directly connected, Ethernet1/1
R     192.168.70.0/24 [120/3] via 192.168.60.1, 00:00:04, Ethernet1/1
                      [120/3] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.80.0/24 [120/3] via 192.168.60.1, 00:00:04, Ethernet1/1
                      [120/3] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.90.0/24 [120/3] via 192.168.60.1, 00:00:04, Ethernet1/1
                      [120/3] via 192.168.10.2, 00:00:03, Ethernet1/0
R     192.168.100.0/24 [120/3] via 192.168.60.1, 00:00:04, Ethernet1/1
                       [120/3] via 192.168.10.2, 00:00:03, Ethernet1/0
R1#
```

Teste de connectivite :

Le ping de R7 par R1 :

```
R1#
R1#ping 192.168.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 632/752/876 ms
R1#
```

Le ping de R8 par R1 :

```
R1#ping 192.168.80.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.80.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 992/1300/1412 ms
R1#
```

Le ping de R9 par R1 :

```
R1#ping 192.168.90.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.90.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 924/1216/1440 ms
R1#
```

Ces 3 trois images permettent de voir la connectivité de R1 avec R8 - R9 - R7 et de plus il tous les pings ont eu des succès ce qi veut dire que R1 peut pinger les interface des routes Ospf.