

# TP - OSPF

## Rapport

### I - Élaboration de l'espace d'adressage

#### A - Espace d'adressage IPv4

Zone	Nom	Sous réseau	Adresse n°1	Adresse n°2
Area 0	R2-R5	10.10.10.0/30	<b>Fe0/1:</b> 10.10.10.1	<b>Fe0/1:</b> 10.10.10.2
Area 1	R1-R4	10.10.10.4/30	<b>Fe0/1:</b> 10.10.10.5	<b>Fe0/1:</b> 10.10.10.6
	R4-PC1	10.10.10.8/30	<b>Fe0/0:</b> 10.10.10.9	<b>E0/0:</b> 10.10.10.10
	R1-R2	10.10.10.12/30	<b>Fe1/0:</b> 10.10.10.13	<b>Fe1/0:</b> 10.10.10.14
	R4-R5	10.10.10.16/30	<b>Fe1/0:</b> 10.10.10.17	<b>Fe1/0:</b> 10.10.10.18
Area 2	R2-R3	10.10.10.20/30	<b>Fe0/0:</b> 10.10.10.21	<b>Fe1/0:</b> 10.10.10.22
	R5-R6	10.10.10.24/30	<b>Fe0/0:</b> 10.10.10.25	<b>Fe1/0:</b> 10.10.10.26
	R3-R6	10.10.10.28/30	<b>Fe0/1:</b> 10.10.10.29	<b>Fe0/1:</b> 10.10.10.30
	R3-PC2	10.10.10.32/30	<b>Fe0/0:</b> 10.10.10.33	<b>E0/0:</b> 10.10.10.34

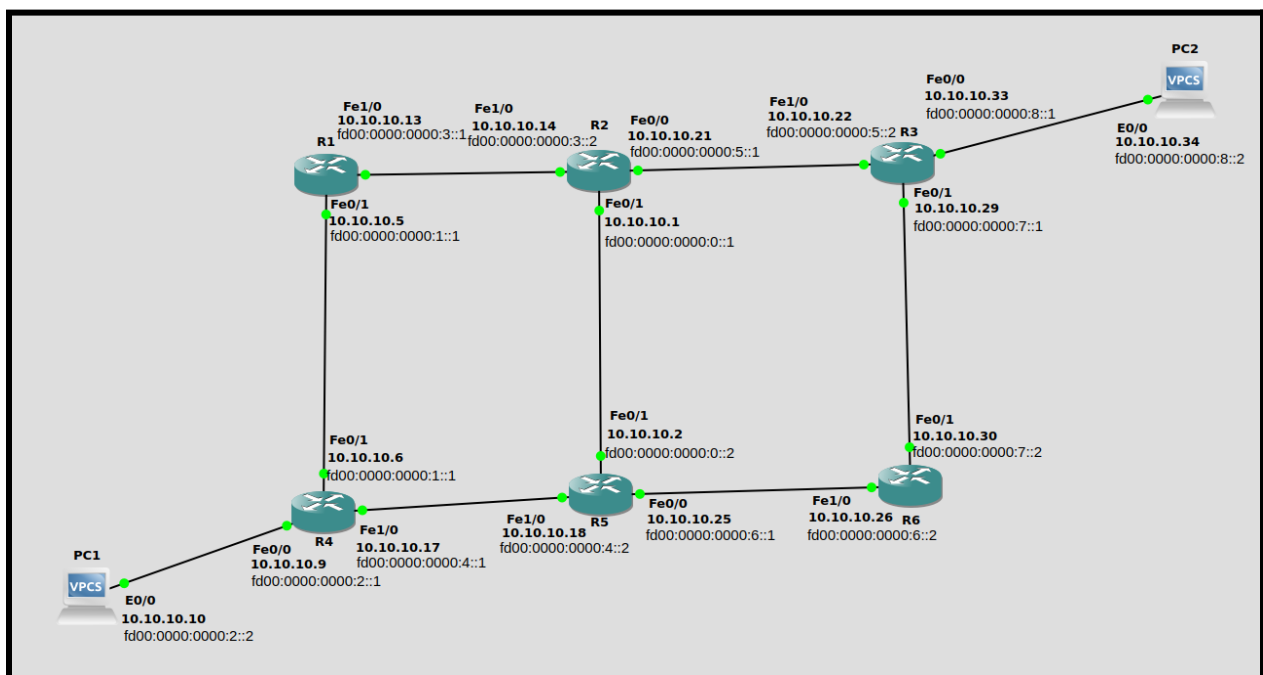
Tous les réseaux sont donc contenus dans le réseau : 10.10.10.0/26. Il nous reste donc 9 sous réseau de taille 2 que l'on peut adresser.

#### B - Espace d'adressage IPv6

Zone	Nom	Sous réseau	Adresse n°1	Adresse n°2
Area 0	R2-R5	fd00:0000:0000:0::/64	<b>Fe0/1:</b> fd00:0000:0000:0::1	<b>Fe0/1:</b> fd00:0000:0000:0::2
Area 1	R1-R4	fd00:0000:0000:1::/64	<b>Fe0/1:</b> fd00:0000:0000:1::1	<b>Fe0/1:</b> fd00:0000:0000:1::2
	R4-PC1	fd00:0000:0000:2::/64	<b>Fe0/0:</b> fd00:0000:0000:2::1	<b>E0/0:</b> fd00:0000:0000:2::2
	R1-R2	fd00:0000:0000:3::/64	<b>Fe1/0:</b> fd00:0000:0000:3::1	<b>Fe1/0:</b> fd00:0000:0000:3::2
	R4-R5	fd00:0000:0000:4::/64	<b>Fe1/0:</b> fd00:0000:0000:4::1	<b>Fe1/0:</b> fd00:0000:0000:4::2

Area 2	R2-R3	fd00:0000:0000:5::/64	<b>Fe0/0:</b> fd00:0000:0000:5::1	<b>Fe1/0:</b> fd00:0000:0000:5::2
	R5-R6	fd00:0000:0000:6::/64	<b>Fe0/0:</b> fd00:0000:0000:6::1	<b>Fe1/0:</b> fd00:0000:0000:6::2
	R3-R6	fd00:0000:0000:7::/64	<b>Fe0/1:</b> fd00:0000:0000:7::1	<b>Fe0/1:</b> fd00:0000:0000:7::2
	R3-PC2	fd00:0000:0000:8::/64	<b>Fe0/0:</b> fd00:0000:0000:8::1	<b>E0/0:</b> fd00:0000:0000:8::2

## II - Modélisation de la topologie



## III - Configuration des machines et des routeurs

### A - Les machines

On exécute les commandes suivantes sur PC1 :

```
PC1> ip 10.10.10.10/30 10.10.10.9
PC1> ip fd00:0000:0000:2::2/64 fd00:0000:0000:2::1
PC1> save
```

Ainsi, PC1 aura comme adresse IP 10.10.10.10, comme masque de sous-réseau 255.255.255.252, et comme passerelle par défaut 10.10.10.9. De même pour ipv6.

On fait de même sur PC2 :

```
PC2> ip 10.10.10.34/30 10.10.10.33
PC2> ip fd00:0000:0000:8::2/64 fd00:0000:0000:8::1
PC2> save
```

## B - Les routeurs

On exécute les commandes suivantes sur R1:

```
R1# configure
R1(config)# interface fastEthernet0/1
R1(config-if)# ip address 10.10.10.5 255.255.255.252
R1(config-if)# ipv6 address fd00:0000:0000:1::1/64
R1(config-if)# no shut
R1(config-if)# interface fastEthernet1/0
R1(config-if)# ip address 10.10.10.13 255.255.255.252
R1(config-if)# ipv6 address fd00:0000:0000:3::1/64
R1(config-if)# no shut
R1(config-if)# exit
R1# write memory
```

Ainsi R1 possède les adresses prévues dans le plan d'adressage pour ses deux interfaces.

De même pour R2:

```
R2# configure
R2(config)# interface fastEthernet0/1
R2(config-if)# ip address 10.10.10.1 255.255.255.252
R2(config-if)# ipv6 address fd00:0000:0000:0::1/64
R2(config-if)# no shut
R2(config-if)# interface fastEthernet1/0
R2(config-if)# ip address 10.10.10.14 255.255.255.252
R2(config-if)# ipv6 address fd00:0000:0000:3::2/64
R2(config-if)# no shut
R2(config-if)# interface fastEthernet0/0
R2(config-if)# ip address 10.10.10.21 255.255.255.252
R2(config-if)# ipv6 address fd00:0000:0000:5::1/64
R2(config-if)# no shut
R2(config-if)# exit
R2# write memory
```

Pour R3:

```
R3# configure
R3(config)# interface fastEthernet0/1
R3(config-if)# ip address 10.10.10.29 255.255.255.252
R3(config-if)# ipv6 address fd00:0000:0000:7::1/64
R3(config-if)# no shut
R3(config-if)# interface fastEthernet1/0
R3(config-if)# ip address 10.10.10.22 255.255.255.252
```

```
R3(config-if)# ipv6 address fd00:0000:0000:5::2/64
R3(config-if)# no shut
R3(config-if)# interface fastEthernet0/0
R3(config-if)# ip address 10.10.10.33 255.255.255.252
R3(config-if)# ipv6 address fd00:0000:0000:8::1/64
R3(config-if)# no shut
R3(config-if)# exit
R3# write memory
```

Pour R4:

```
R4# configure
R4(config)# interface fastEthernet0/1
R4(config-if)# ip address 10.10.10.6 255.255.255.252
R4(config-if)# ipv6 address fd00:0000:0000:1::2/64
R4(config-if)# no shut
R4(config-if)# interface fastEthernet1/0
R4(config-if)# ip address 10.10.10.17 255.255.255.252
R4(config-if)# ipv6 address fd00:0000:0000:4::1/64
R4(config-if)# no shut
R4(config-if)# interface fastEthernet0/0
R4(config-if)# ip address 10.10.10.9 255.255.255.252
R4(config-if)# ipv6 address fd00:0000:0000:2::1/64
R4(config-if)# no shut
R4(config-if)# exit
R4# write memory
```

Pour R5:

```
R5# configure
R5(config)# interface fastEthernet0/1
R5(config-if)# ip address 10.10.10.2 255.255.255.252
R5(config-if)# ipv6 address fd00:0000:0000:0::2/64
R5(config-if)# no shut
R5(config-if)# interface fastEthernet1/0
R5(config-if)# ip address 10.10.10.18 255.255.255.252
R5(config-if)# ipv6 address fd00:0000:0000:4::2/64
R5(config-if)# no shut
R5(config-if)# interface fastEthernet0/0
R5(config-if)# ip address 10.10.10.25 255.255.255.252
R5(config-if)# ipv6 address fd00:0000:0000:6::1/64
R5(config-if)# no shut
R5(config-if)# exit
R5# write memory
```

Pour R6:

```
R6# configure
R6(config)# interface fastEthernet0/1
R6(config-if)# ip address 10.10.10.30 255.255.255.252
R6(config-if)# ipv6 address fd00:0000:0000:7::2/64
R6(config-if)# no shut
R6(config-if)# interface fastEthernet1/0
R6(config-if)# ip address 10.10.10.26 255.255.255.252
R6(config-if)# ipv6 address fd00:0000:0000:6::2/64
R6(config-if)# no shut
R6(config-if)# exit
R6# write memory
```

Les fichiers de configuration de cette étape sont disponibles dans l'annexe 1.

## IV - Tests des connexions de bout en bout (ping, traceroute...)

### A - OSPF pour ipv4

On active OSPF sur R1:

```
R1# configure
R1(config)# network 10.10.10.4 0.0.0.3 area 1
R1(config)# network 10.10.10.12 0.0.0.3 area 1
R1(config)# exit
R1# write memory
```

Ainsi, on dit à R1 de gérer ospf pour le réseau 10.10.10.4/24 et le réseau 10.10.10.12/24. Ces deux réseaux seront en zone 1.

On fait de même pour R2 :

```
R2# configure
R2(config)# router ospf 1
R2(config)# network 10.10.10.0 0.0.0.3 area 0
R2(config)# network 10.10.10.12 0.0.0.3 area 1
R2(config)# network 10.10.10.20 0.0.0.3 area 2
R2(config)# exit
R2# write memory
```

Pour R3:

```
R3# configure
R3(config)# router ospf 1
R3(config)# network 10.10.10.20 0.0.0.3 area 2
R3(config)# network 10.10.10.28 0.0.0.3 area 2
R3(config)# network 10.10.10.32 0.0.0.3 area 2
R3(config)# exit
```

```
R3# write memory
```

Pour R4:

```
R4# configure
R4(config)# router ospf 1
R4(config)# network 10.10.10.4 0.0.0.3 area 1
R4(config)# network 10.10.10.8 0.0.0.3 area 1
R4(config)# network 10.10.10.16 0.0.0.3 area 1
R4(config)# exit
R4# write memory
```

Pour R5:

```
R5# configure
R5(config)# router ospf 1
R5(config)# network 10.10.10.0 0.0.0.3 area 0
R5(config)# network 10.10.10.16 0.0.0.3 area 1
R5(config)# network 10.10.10.24 0.0.0.3 area 2
R5(config)# exit
R5# write memory
```

Pour R6:

```
R6# configure
R6(config)# router ospf 1
R6(config)# network 10.10.10.24 0.0.0.3 area 2
R6(config)# network 10.10.10.28 0.0.0.3 area 2
R6(config)# exit
R6# write memory
```

Les configurations des routeurs sont disponibles dans l'annexe 2

## B - Connexions et échanges

Pour tester, nous avons fait des traceroute vers tous les routeurs possibles. Par exemple pour R4 à R3 :

```
R4#traceroute 10.10.10.29

Type escape sequence to abort.
Tracing the route to 10.10.10.29

 1 10.10.10.18 20 msec 32 msec 20 msec
 2 10.10.10.26 40 msec 44 msec 40 msec
 3 10.10.10.29 64 msec 60 msec 60 msec
```

Voici les tables de routage pour R1 :

```
R1#sh ip route ospf
    10.0.0.0/30 is subnetted, 9 subnets
O    10.10.10.8 [110/2] via 10.10.10.6, 00:01:12, FastEthernet0/1
O IA 10.10.10.0 [110/2] via 10.10.10.14, 00:01:12, FastEthernet1/0
O IA 10.10.10.24 [110/3] via 10.10.10.6, 00:01:12, FastEthernet0/1
O IA 10.10.10.28 [110/3] via 10.10.10.14, 00:01:12, FastEthernet1/0
O    10.10.10.16 [110/2] via 10.10.10.6, 00:01:12, FastEthernet0/1
O IA 10.10.10.20 [110/2] via 10.10.10.14, 00:01:12, FastEthernet1/0
O IA 10.10.10.32 [110/3] via 10.10.10.14, 00:01:12, FastEthernet1/0
```

#### Pour R2 :

```
R2#sh ip route ospf
    10.0.0.0/30 is subnetted, 9 subnets
O    10.10.10.8 [110/3] via 10.10.10.13, 00:01:42, FastEthernet1/0
O    10.10.10.4 [110/2] via 10.10.10.13, 00:01:42, FastEthernet1/0
O    10.10.10.24 [110/3] via 10.10.10.22, 00:01:42, FastEthernet0/0
O    10.10.10.28 [110/2] via 10.10.10.22, 00:01:42, FastEthernet0/0
O    10.10.10.16 [110/3] via 10.10.10.13, 00:01:42, FastEthernet1/0
O    10.10.10.32 [110/2] via 10.10.10.22, 00:01:42, FastEthernet0/0
```

#### Pour R3 :

```
R3#sh ip route ospf
    10.0.0.0/30 is subnetted, 9 subnets
O IA 10.10.10.8 [110/4] via 10.10.10.30, 00:02:13, FastEthernet0/1
    [110/4] via 10.10.10.21, 00:02:13, FastEthernet1/0
O IA 10.10.10.12 [110/2] via 10.10.10.21, 00:02:13, FastEthernet1/0
O IA 10.10.10.0 [110/2] via 10.10.10.21, 00:02:13, FastEthernet1/0
O IA 10.10.10.4 [110/3] via 10.10.10.21, 00:02:13, FastEthernet1/0
O    10.10.10.24 [110/2] via 10.10.10.30, 00:02:13, FastEthernet0/1
O IA 10.10.10.16 [110/3] via 10.10.10.30, 00:02:08, FastEthernet0/1
```

#### Pour R4 :

```
R4#sh ip route ospf
    10.0.0.0/30 is subnetted, 9 subnets
O    10.10.10.12 [110/2] via 10.10.10.5, 00:03:09, FastEthernet0/1
O IA 10.10.10.0 [110/2] via 10.10.10.18, 00:03:09, FastEthernet1/0
O IA 10.10.10.24 [110/2] via 10.10.10.18, 00:03:09, FastEthernet1/0
O IA 10.10.10.28 [110/3] via 10.10.10.18, 00:03:09, FastEthernet1/0
O IA 10.10.10.20 [110/3] via 10.10.10.5, 00:03:09, FastEthernet0/1
O IA 10.10.10.32 [110/4] via 10.10.10.18, 00:03:09, FastEthernet1/0
    [110/4] via 10.10.10.5, 00:03:09, FastEthernet0/1
```

#### Pour R5 :

```
R5#sh ip route ospf
```

```

10.0.0.0/30 is subnetted, 9 subnets
O 10.10.10.8 [110/2] via 10.10.10.17, 00:03:39, FastEthernet1/0
O 10.10.10.12 [110/3] via 10.10.10.17, 00:03:39, FastEthernet1/0
O 10.10.10.4 [110/2] via 10.10.10.17, 00:03:39, FastEthernet1/0
O 10.10.10.28 [110/2] via 10.10.10.26, 00:03:39, FastEthernet0/0
O 10.10.10.20 [110/3] via 10.10.10.26, 00:03:39, FastEthernet0/0
O 10.10.10.32 [110/3] via 10.10.10.26, 00:03:39, FastEthernet0/0

```

Pour R6 :

```

R6#sh ip route ospf
10.0.0.0/30 is subnetted, 9 subnets
O IA 10.10.10.8 [110/3] via 10.10.10.25, 00:04:14, FastEthernet1/0
O IA 10.10.10.12 [110/3] via 10.10.10.29, 00:04:14, FastEthernet0/1
O IA 10.10.10.0 [110/2] via 10.10.10.25, 00:04:14, FastEthernet1/0
O IA 10.10.10.4 [110/3] via 10.10.10.25, 00:04:14, FastEthernet1/0
O IA 10.10.10.16 [110/2] via 10.10.10.25, 00:04:10, FastEthernet1/0
O 10.10.10.20 [110/2] via 10.10.10.29, 00:04:14, FastEthernet0/1
O 10.10.10.32 [110/2] via 10.10.10.29, 00:04:14, FastEthernet0/1

```

Pour observer un événement de convergence, on a coupé les liens R1-R2 et R4-R5 afin de couper les routeurs R1/R4 du reste du réseau. En écoutant le lien R1-R4 et en réactivant, d'abord R4-R5, puis R1-R2, nous avons pu observer deux événements de convergence.

Nous avons pu observer trois types de messages OSPF. Le message **Hello**, envoyé à intervalle régulier pour indiquer aux voisins que le routeur est en ligne et prêt à échanger d'autres paquets OSPF. Nous avons pu voir des messages **LSU** (Link State Update) permettant d'envoyer aux voisins des mise à jour dans la table de routage. En réponse à ces LSU, nous avons aussi pu observer des **LSAck** (Link State Acknowledgment), pour confirmer la réception et vérifier l'intégrité des mises à jour de la table de routage des messages LSU.

En revanche, nous n'avons pas vu passer de message **DBD** (Database Description) servant à échanger l'entière de la base de données, ni de message **LSR** (Link State Request) permettant à un routeur de demander les informations de routage à un voisin. Cela s'explique par le fait que nous avons commencé la capture après l'établissement du réseau. Les seuls messages pertinents étaient donc les LSU, pour échanger uniquement les changements dans la table de routage.

10	18.158466	10.10.10.6	224.0.0.5	OSPF	94 Hello Packet
13	28.051216	10.10.10.5	224.0.0.5	OSPF	94 Hello Packet
14	28.151722	10.10.10.6	224.0.0.5	OSPF	94 Hello Packet
15	29.334840	10.10.10.6	224.0.0.5	OSPF	122 LS Update
16	31.839635	10.10.10.5	224.0.0.5	OSPF	78 LS Acknowledge
19	38.051829	10.10.10.5	224.0.0.5	OSPF	94 Hello Packet
20	38.151747	10.10.10.6	224.0.0.5	OSPF	94 Hello Packet
23	48.043700	10.10.10.5	224.0.0.5	OSPF	94 Hello Packet
24	48.154508	10.10.10.6	224.0.0.5	OSPF	94 Hello Packet



On rappelle que les liens R1/R2 et R4/R5 sont coupés, et que l'on observe le lien R1/R4.

Sur cette capture d'écran, on peut constater que les routeurs R1/R4 s'envoient à intervalle régulier des Hello Packet, pour indiquer qu'ils sont encore fonctionnels. On rebranche le lien R4-R5. R4 sait que R5 est reconnecté car il reçoit des Hello packet de sa part. Il met à jour sa table de routage. Il met au courant R1 avec le paquet n°15 le LSU.

```

  LS Update Packet
    Number of LSAs: 1
  LSA-type 1 (Router-LSA), len 60
    .000 0000 0000 0001 = LS Age (seconds): 1
    0... .... = Do Not Age Flag: 0
  > Options: 0x22, (DC) Demand Circuits, (E) External Routing
    LS Type: Router-LSA (1)
    Link State ID: 10.10.10.17
    Advertising Router: 10.10.10.17
    Sequence Number: 0x80000004
    Checksum: 0x8395
    Length: 60
  > Flags: 0x00
    Number of Links: 3
  > Type: Stub      ID: 10.10.10.16      Data: 255.255.255.252 Metric: 1
  > Type: Stub      ID: 10.10.10.8       Data: 255.255.255.252 Metric: 1
  > Type: Transit   ID: 10.10.10.6       Data: 10.10.10.6      Metric: 1

```

Sur la capture ci-contre, on peut voir le contenu du paquet LSU (n°15). On peut voir qu'il met au courant R1 que le réseau 10.10.10.16 est joignable en 1 saut à partir de R4 (10.10.10.16 correspond au réseau R4-R5). De même pour 10.10.10.8, qui est le réseau R4-PC1.

Il indique aussi que pour cela il faut passer par l'appareil disponible en 10.10.10.6, soit lui même : R4.

R1 répond avec le paquet n°16, avec un LSAck.

33	68.051882	10.10.10.5	224.0.0.5	OSPF	94	Hello Packet
34	68.152630	10.10.10.6	224.0.0.5	OSPF	94	Hello Packet
35	68.890004	10.10.10.6	224.0.0.5	OSPF	98	LS Update
36	68.920202	10.10.10.6	224.0.0.5	OSPF	178	LS Update
37	69.333029	10.10.10.6	224.0.0.5	OSPF	122	LS Update
38	71.400918	10.10.10.5	224.0.0.5	OSPF	178	LS Acknowledge
39	73.888706	10.10.10.6	224.0.0.5	OSPF	94	LS Update
40	73.969243	10.10.10.6	224.0.0.5	OSPF	98	LS Update
41	76.397966	10.10.10.5	224.0.0.5	OSPF	98	LS Acknowledge
44	78.051216	10.10.10.5	224.0.0.5	OSPF	94	Hello Packet

Quelques secondes plus tard, d'autres LSU de R4 arrivent. Il mettent au courant R1 que les autres routeurs sont joignable en passant par R4 (on rappelle que R1/R2 est coupé).

```

  LS Update Packet
    Number of LSAs: 1
  LSA-type 1 (Router-LSA), len 36
    .000 0000 0000 0110 = LS Age (seconds): 6
    0... .... = Do Not Age Flag: 0
  > Options: 0x22, (DC) Demand Circuits, (E) External Routing
    LS Type: Router-LSA (1)
    Link State ID: 10.10.10.25
    Advertising Router: 10.10.10.25
    Sequence Number: 0x80000004
    Checksum: 0x0957
    Length: 36
  > Flags: 0x01, (B) Area border router
    Number of Links: 1
  > Type: Transit   ID: 10.10.10.18      Data: 10.10.10.18      Metric: 1
    Link ID: 10.10.10.18 - IP address of Designated Router
    Link Data: 10.10.10.18
    Link Type: 2 - Connection to a transit network

```

Par exemple, nous avons ci-contre le détail du paquet n°40, ou R4 met au courant R1 que 10.10.10.25 (R5 dans le réseau R5-R6) est joignable à travers R4.

## C- Aires OSPF

Les messages échangés pour annoncer les ressources des autres aires sont des LSA (Link State Advertisement) LSU dont on a déjà parlé plus haut sont des LSA.

Les routeurs d'une même aire ont une vue complète du réseau et partagent toutes les informations de routage entre eux. Cela signifie que chaque routeur de l'aire a une table de routage similaire contenant des routes vers toutes les destinations de l'aire.

Les routeurs de différentes aires n'ont pas une vue complète du réseau et ne partagent pas toutes les informations de routage. Ils ne sont donc pas au courant de toutes les routes disponibles dans le réseau. Pour permettre aux routeurs de différentes aires de communiquer entre eux, ils doivent utiliser des routeurs ABR (Area Border Router) qui ont une vue complète du réseau et qui peuvent transmettre des informations de routage entre les aires.

Les tables de routage des routeurs de différentes aires peuvent différer en fonction de l'aire à laquelle ils appartiennent et des informations de routage qu'ils ont reçues des routeurs en bordures.

## D-OSPF pour IPv6

On active OSPF IPv6 sur R1:

```
R1# configure
R1(config)# ipv6 unicast-routing
R1(config)# ipv6 router ospf 2
R1(config)# interface fastEthernet0/1
R1(config-if)# ipv6 ospf 2 area 1
R1(config-if)# interface fastEthernet1/0
R1(config-if)# ipv6 ospf 2 area 1
R1(config)# exit
R1# write memory
```

Ainsi, on dit à R1 de gérer ospf pour le réseau 10.10.10.4/24 et le réseau 10.10.10.12/24. Ces deux réseaux seront en zone 1.

On fait de même pour R2 :

```
R2# configure
R2(config)# ipv6 unicast-routing
R2(config)# ipv6 router ospf 2
R2(config)# interface fastEthernet0/1
R2(config-if)# ipv6 ospf 2 area 0
R2(config-if)# interface fastEthernet1/0
R2(config-if)# ipv6 ospf 2 area 1
R2(config-if)# interface fastEthernet0/0
R2(config-if)# ipv6 ospf 2 area 2
R2(config)# exit
R2# write memory
```

Pour R3:

```
R3# configure
R3(config)# ipv6 unicast-routing
R3(config)# ipv6 router ospf 2
R3(config)# interface fastEthernet0/1
R3(config-if)# ipv6 ospf 2 area 2
R3(config-if)# interface fastEthernet1/0
R3(config-if)# ipv6 ospf 2 area 2
R3(config-if)# interface fastEthernet0/0
R3(config-if)# ipv6 ospf 2 area 2
R3(config)# exit
R3# write memory
```

Pour R4:

```
R4# configure
R4(config)# ipv6 unicast-routing
R4(config)# ipv6 router ospf 2
R4(config)# interface fastEthernet0/1
R4(config-if)# ipv6 ospf 2 area 1
R4(config-if)# interface fastEthernet1/0
R4(config-if)# ipv6 ospf 2 area 1
R4(config-if)# interface fastEthernet0/0
R4(config-if)# ipv6 ospf 2 area 1
R4(config)# exit
R4# write memory
```

Pour R5:

```
R5# configure
R5(config)# ipv6 unicast-routing
R5(config)# ipv6 router ospf 2
R5(config)# interface fastEthernet0/1
R5(config-if)# ipv6 ospf 2 area 0
```

```

R5(config-if)# interface fastEthernet1/0
R5(config-if)# ipv6 ospf 2 area 1
R5(config-if)# interface fastEthernet0/0
R5(config-if)# ipv6 ospf 2 area 2
R5(config)# exit
R5# write memory

```

Pour R6:

```

R6# configure
R6(config)# ipv6 unicast-routing
R6(config)# ipv6 router ospf 2
R6(config)# interface fastEthernet0/1
R6(config-if)# ipv6 ospf 2 area 2
R6(config-if)# interface fastEthernet1/0
R6(config-if)# ipv6 ospf 2 area 2
R6(config)# exit
R6# write memory

```

Les configurations des routeurs sont disponibles dans l'annexe 3.

Les tests avec traceroute nous montrent que tous nos appareils communiquent entre eux avec IPv6.

Voici la table de routage pour R1:

```

R1#sh ipv6 route ospf
IPv6 Routing Table - 13 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
OI  FD00::/64 [110/2]
    via FE80::C802:19FF:FEE0:1C, FastEthernet1/0
O   FD00:0:0:2::/64 [110/2]
    via FE80::C804:1AFF:FE13:6, FastEthernet0/1
O   FD00:0:0:4::/64 [110/2]
    via FE80::C804:1AFF:FE13:6, FastEthernet0/1
OI  FD00:0:0:5::/64 [110/2]
    via FE80::C802:19FF:FEE0:1C, FastEthernet1/0
OI  FD00:0:0:6::/64 [110/3]
    via FE80::C804:1AFF:FE13:6, FastEthernet0/1
    via FE80::C802:19FF:FEE0:1C, FastEthernet1/0

```

```

OI  FD00:0:0:7::/64 [110/4]
    via FE80::C804:1AFF:FE13:6, FastEthernet0/1
    via FE80::C802:19FF:FEE0:1C, FastEthernet1/0
OI  FD00:0:0:8::/64 [110/3]
    via FE80::C802:19FF:FEE0:1C, FastEthernet1/0

```

Pour R2:

```

R2#sh ipv6 route ospf
IPv6 Routing Table - 14 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
O  FD00:0:0:1::/64 [110/2]
    via FE80::C801:19FF:FECE:1C, FastEthernet1/0
O  FD00:0:0:2::/64 [110/3]
    via FE80::C801:19FF:FECE:1C, FastEthernet1/0
O  FD00:0:0:4::/64 [110/3]
    via FE80::C801:19FF:FECE:1C, FastEthernet1/0
OI  FD00:0:0:6::/64 [110/2]
    via FE80::C805:1AFF:FE24:6, FastEthernet0/1
OI  FD00:0:0:7::/64 [110/3]
    via FE80::C805:1AFF:FE24:6, FastEthernet0/1
O  FD00:0:0:8::/64 [110/2]
    via FE80::C803:1AFF:FE02:1C, FastEthernet0/0

```

Pour R3:

```

R3#sh ipv6 route ospf
IPv6 Routing Table - 14 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
OI  FD00::/64 [110/2]
    via FE80::C802:19FF:FEE0:8, FastEthernet1/0
OI  FD00:0:0:1::/64 [110/3]
    via FE80::C802:19FF:FEE0:8, FastEthernet1/0

```

```

OI  FD00:0:0:2::/64 [110/4]
    via FE80::C802:19FF:FEE0:8, FastEthernet1/0
OI  FD00:0:0:3::/64 [110/2]
    via FE80::C802:19FF:FEE0:8, FastEthernet1/0
OI  FD00:0:0:4::/64 [110/4]
    via FE80::C802:19FF:FEE0:8, FastEthernet1/0
OI  FD00:0:0:6::/64 [110/3]
    via FE80::C802:19FF:FEE0:8, FastEthernet1/0

```

Pour R4:

```

R4#sh ipv6 route ospf
IPv6 Routing Table - 14 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
OI  FD00::/64 [110/2]
    via FE80::C805:1AFF:FE24:1C, FastEthernet1/0
O   FD00:0:0:3::/64 [110/2]
    via FE80::C801:19FF:FECE:6, FastEthernet0/1
OI  FD00:0:0:5::/64 [110/3]
    via FE80::C801:19FF:FECE:6, FastEthernet0/1
    via FE80::C805:1AFF:FE24:1C, FastEthernet1/0
OI  FD00:0:0:6::/64 [110/2]
    via FE80::C805:1AFF:FE24:1C, FastEthernet1/0
OI  FD00:0:0:7::/64 [110/3]
    via FE80::C805:1AFF:FE24:1C, FastEthernet1/0
OI  FD00:0:0:8::/64 [110/4]
    via FE80::C801:19FF:FECE:6, FastEthernet0/1
    via FE80::C805:1AFF:FE24:1C, FastEthernet1/0

```

Pour R5:

```

R5#sh ipv6 route ospf
IPv6 Routing Table - 14 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

```

```

    D - EIGRP, EX - EIGRP external
O   FD00:0:0:1::/64 [110/2]
    via FE80::C804:1AFF:FE13:1C, FastEthernet1/0
O   FD00:0:0:2::/64 [110/2]
    via FE80::C804:1AFF:FE13:1C, FastEthernet1/0
O   FD00:0:0:3::/64 [110/3]
    via FE80::C804:1AFF:FE13:1C, FastEthernet1/0
OI  FD00:0:0:5::/64 [110/2]
    via FE80::C802:19FF:FEE0:6, FastEthernet0/1
O   FD00:0:0:7::/64 [110/2]
    via FE80::C806:1AFF:FE34:1C, FastEthernet0/0
OI  FD00:0:0:8::/64 [110/3]
    via FE80::C802:19FF:FEE0:6, FastEthernet0/1

```

Pour R6:

```

R6#sh ipv6 route ospf
IPv6 Routing Table - 13 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
OI  FD00::/64 [110/2]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0
OI  FD00:0:0:1::/64 [110/3]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0
OI  FD00:0:0:2::/64 [110/3]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0
OI  FD00:0:0:3::/64 [110/4]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0
OI  FD00:0:0:4::/64 [110/2]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0
OI  FD00:0:0:5::/64 [110/3]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0
OI  FD00:0:0:8::/64 [110/4]
    via FE80::C805:1AFF:FE24:8, FastEthernet1/0

```

## V - Annexes

### Annexe 1 - Configuration de base

#### PC1

```
set pcname PC1
ip 10.10.10.10 10.10.10.9 30
ip fd00:0:0:2::2/64
```

#### PC2

```
set pcname PC2
ip 10.10.10.34 10.10.10.33 30
ip fd00:0:0:8::2/64
```

#### R1

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R1
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface FastEthernet0/1
  ip address 10.10.10.5 255.255.255.252
  duplex auto
  speed auto
  ipv6 address FD00:0:0:1::1/64
!
interface FastEthernet1/0
  ip address 10.10.10.13 255.255.255.252
  duplex half
```



```
    ipv6 address FD00:0:0:3::1/64
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
    shutdown
line con 0
    exec-timeout 0 0
    privilege level 15
    logging synchronous
    stopbits 1
line aux 0
    exec-timeout 0 0
    privilege level 15
    logging synchronous
    stopbits 1
line vty 0 4
    login
end
```

## R2

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R2
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
    ip address 10.10.10.21 255.255.255.252
    duplex auto
    speed auto
    ipv6 address FD00:0:0:5::1/64
!
interface FastEthernet0/1
    ip address 10.10.10.1 255.255.255.252
```

```

duplex auto
speed auto
ipv6 address FD00::1/64
!
interface FastEthernet1/0
ip address 10.10.10.14 255.255.255.252
duplex half
ipv6 address FD00:0:0:3::2/64
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end

```

### R3

```

version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R3
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0

```

```

ip address 10.10.10.33 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:8::1/64
!
interface FastEthernet0/1
ip address 10.10.10.29 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:7::1/64
!
interface FastEthernet1/0
ip address 10.10.10.22 255.255.255.252
duplex half
ipv6 address FD00:0:0:5::2/64
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end

```

## R4

```

version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R4
boot-start-marker
boot-end-marker
no aaa new-model

```

```
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
 ip address 10.10.10.9 255.255.255.252
 duplex auto
 speed auto
 ipv6 address FD00:0:0:2::1/64
!
interface FastEthernet0/1
 ip address 10.10.10.6 255.255.255.252
 duplex auto
 speed auto
 ipv6 address FD00:0:0:1::2/64
!
interface FastEthernet1/0
 ip address 10.10.10.17 255.255.255.252
 duplex half
 ipv6 address FD00:0:0:4::1/64
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
 shutdown
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
end
```

## R5

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R5
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
 ip address 10.10.10.25 255.255.255.252
 duplex auto
 speed auto
 ipv6 address FD00:0:0:6::1/64
!
interface FastEthernet0/1
 ip address 10.10.10.2 255.255.255.252
 duplex auto
 speed auto
 ipv6 address FD00::2/64
!
interface FastEthernet1/0
 ip address 10.10.10.18 255.255.255.252
 duplex half
 ipv6 address FD00:0:0:4::2/64
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
 shutdown
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
```

```
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R6

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R6
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
no ip address
shutdown
duplex auto
speed auto
!
interface FastEthernet0/1
ip address 10.10.10.30 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:7::2/64
!
interface FastEthernet1/0
ip address 10.10.10.26 255.255.255.252
duplex half
ipv6 address FD00:0:0:6::2/64
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
```

```
line con 0
  exec-timeout 0 0
  privilege level 15
  logging synchronous
  stopbits 1
line aux 0
  exec-timeout 0 0
  privilege level 15
  logging synchronous
  stopbits 1
line vty 0 4
  login
end
```

## Annexe 2 - Activation OSPF en ipv4

### R1

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R1
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
no ip address
shutdown
duplex auto
speed auto
!
interface FastEthernet0/1
ip address 10.10.10.5 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:1::1/64
!
interface FastEthernet1/0
ip address 10.10.10.13 255.255.255.252
duplex half
```

```
ipv6 address FD00:0:0:3::1/64
!
router ospf 1
log-adjacency-changes
network 10.10.10.4 0.0.0.3 area 1
network 10.10.10.12 0.0.0.3 area 1
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R2

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R2
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
```



```
ip address 10.10.10.21 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:5::1/64
!
interface FastEthernet0/1
ip address 10.10.10.1 255.255.255.252
duplex auto
speed auto
ipv6 address FD00::1/64
!
interface FastEthernet1/0
ip address 10.10.10.14 255.255.255.252
duplex half
ipv6 address FD00:0:0:3::2/64
!
router ospf 1
log-adjacency-changes
network 10.10.10.0 0.0.0.3 area 0
network 10.10.10.12 0.0.0.3 area 1
network 10.10.10.20 0.0.0.3 area 2
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

### R3

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R3
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
ip address 10.10.10.33 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:8::1/64
!
interface FastEthernet0/1
ip address 10.10.10.29 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:7::1/64
!
interface FastEthernet1/0
ip address 10.10.10.22 255.255.255.252
duplex half
ipv6 address FD00:0:0:5::2/64
!
router ospf 1
log-adjacency-changes
network 10.10.10.20 0.0.0.3 area 2
network 10.10.10.28 0.0.0.3 area 2
network 10.10.10.32 0.0.0.3 area 2
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
```

```
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R4

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R4
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
ip address 10.10.10.9 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:2::1/64
!
interface FastEthernet0/1
ip address 10.10.10.6 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:1::2/64
!
interface FastEthernet1/0
ip address 10.10.10.17 255.255.255.252
duplex half
```

```
ipv6 address FD00:0:0:4::1/64
!
router ospf 1
log-adjacency-changes
network 10.10.10.4 0.0.0.3 area 1
network 10.10.10.8 0.0.0.3 area 1
network 10.10.10.16 0.0.0.3 area 1
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R5

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R5
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
```

```
interface FastEthernet0/0
ip address 10.10.10.25 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:6::1/64
!
interface FastEthernet0/1
ip address 10.10.10.2 255.255.255.252
duplex auto
speed auto
ipv6 address FD00::2/64
!
interface FastEthernet1/0
ip address 10.10.10.18 255.255.255.252
duplex half
ipv6 address FD00:0:0:4::2/64
!
router ospf 1
log-adjacency-changes
network 10.10.10.0 0.0.0.3 area 0
network 10.10.10.16 0.0.0.3 area 1
network 10.10.10.24 0.0.0.3 area 2
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R6

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R6
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
!
interface FastEthernet0/0
no ip address
shutdown
duplex auto
speed auto
!
interface FastEthernet0/1
ip address 10.10.10.30 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:7::2/64
!
interface FastEthernet1/0
ip address 10.10.10.26 255.255.255.252
duplex half
ipv6 address FD00:0:0:6::2/64
!
router ospf 1
log-adjacency-changes
network 10.10.10.24 0.0.0.3 area 2
network 10.10.10.28 0.0.0.3 area 2
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
control-plane
gatekeeper
shutdown
```

```
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## Annexe 3 - Activation OSPF en ipv6

### R1

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R1
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
ipv6 unicast-routing
!
interface FastEthernet0/0
no ip address
shutdown
duplex auto
speed auto
interface FastEthernet0/1
ip address 10.10.10.5 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:1::1/64
ipv6 ospf 2 area 1
!
```

```
interface FastEthernet1/0
ip address 10.10.10.13 255.255.255.252
duplex half
ipv6 address FD00:0:0:3::1/64
ipv6 ospf 2 area 1
router ospf 1
log-adjacency-changes
network 10.10.10.4 0.0.0.3 area 1
network 10.10.10.12 0.0.0.3 area 1
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
ipv6 router ospf 2
log-adjacency-changes
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R2

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R2
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
```



```
ip tcp synwait-time 5
no ip domain lookup
ipv6 unicast-routing
!
interface FastEthernet0/0
ip address 10.10.10.21 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:5::1/64
ipv6 ospf 2 area 2
!
interface FastEthernet0/1
ip address 10.10.10.1 255.255.255.252
duplex auto
speed auto
ipv6 address FD00::1/64
ipv6 ospf 2 area 0
!
interface FastEthernet1/0
ip address 10.10.10.14 255.255.255.252
duplex half
ipv6 address FD00:0:0:3::2/64
ipv6 ospf 2 area 1
!
router ospf 1
log-adjacency-changes
network 10.10.10.0 0.0.0.3 area 0
network 10.10.10.12 0.0.0.3 area 1
network 10.10.10.20 0.0.0.3 area 2
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
ipv6 router ospf 2
log-adjacency-changes
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
```

```
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

### R3

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R3
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
ipv6 unicast-routing
!
interface FastEthernet0/0
ip address 10.10.10.33 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:8::1/64
ipv6 ospf 2 area 2
!
interface FastEthernet0/1
ip address 10.10.10.29 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:7::1/64
!
interface FastEthernet1/0
ip address 10.10.10.22 255.255.255.252
duplex half
ipv6 address FD00:0:0:5::2/64
ipv6 ospf 2 area 2
!
router ospf 1
```

```
log-adjacency-changes
network 10.10.10.20 0.0.0.3 area 2
network 10.10.10.28 0.0.0.3 area 2
network 10.10.10.32 0.0.0.3 area 2
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
ipv6 router ospf 2
log-adjacency-changes
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R4

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R4
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
ipv6 unicast-routing
!
```

```
interface FastEthernet0/0
ip address 10.10.10.9 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:2::1/64
ipv6 ospf 2 area 1
!
interface FastEthernet0/1
ip address 10.10.10.6 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:1::2/64
ipv6 ospf 2 area 1
!
interface FastEthernet1/0
ip address 10.10.10.17 255.255.255.252
duplex half
ipv6 address FD00:0:0:4::1/64
ipv6 ospf 2 area 1
!
router ospf 1
log-adjacency-changes
network 10.10.10.4 0.0.0.3 area 1
network 10.10.10.8 0.0.0.3 area 1
network 10.10.10.16 0.0.0.3 area 1
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
ipv6 router ospf 2
log-adjacency-changes
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
```

```
line vty 0 4
login
end
```

## R5

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R5
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
!
no ip domain lookup
ipv6 unicast-routing
!
interface FastEthernet0/0
ip address 10.10.10.25 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:6::1/64
ipv6 ospf 2 area 2
!
interface FastEthernet0/1
ip address 10.10.10.2 255.255.255.252
duplex auto
speed auto
ipv6 address FD00::2/64
ipv6 ospf 2 area 0
!
interface FastEthernet1/0
ip address 10.10.10.18 255.255.255.252
duplex half
ipv6 address FD00:0:0:4::2/64
ipv6 ospf 2 area 1
!
router ospf 1
log-adjacency-changes
network 10.10.10.0 0.0.0.3 area 0
```

```
network 10.10.10.16 0.0.0.3 area 1
network 10.10.10.24 0.0.0.3 area 2
!
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
ipv6 router ospf 2
log-adjacency-changes
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```

## R6

```
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
hostname R6
boot-start-marker
boot-end-marker
no aaa new-model
resource policy
no ip icmp rate-limit unreachable
ip cef
ip tcp synwait-time 5
no ip domain lookup
ipv6 unicast-routing
!
interface FastEthernet0/0
no ip address
```

```
shutdown
duplex auto
speed auto
interface FastEthernet0/1
ip address 10.10.10.30 255.255.255.252
duplex auto
speed auto
ipv6 address FD00:0:0:7::2/64
ipv6 ospf 2 area 2
interface FastEthernet1/0
ip address 10.10.10.26 255.255.255.252
duplex half
ipv6 address FD00:0:0:6::2/64
ipv6 ospf 2 area 2
router ospf 1
log-adjacency-changes
network 10.10.10.24 0.0.0.3 area 2
network 10.10.10.28 0.0.0.3 area 2
no ip http server
no ip http secure-server
logging alarm informational
no cdp log mismatch duplex
ipv6 router ospf 2
log-adjacency-changes
control-plane
gatekeeper
shutdown
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
end
```