

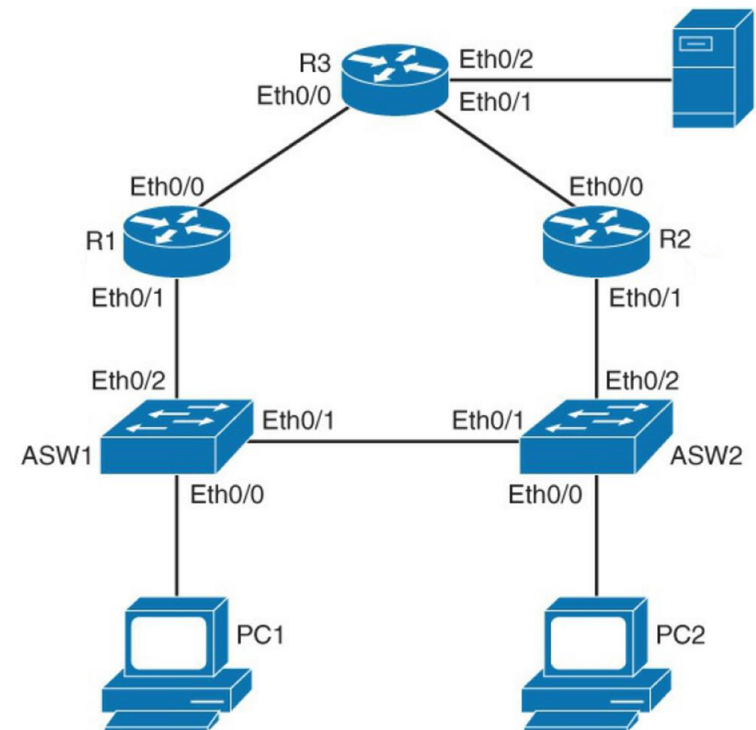
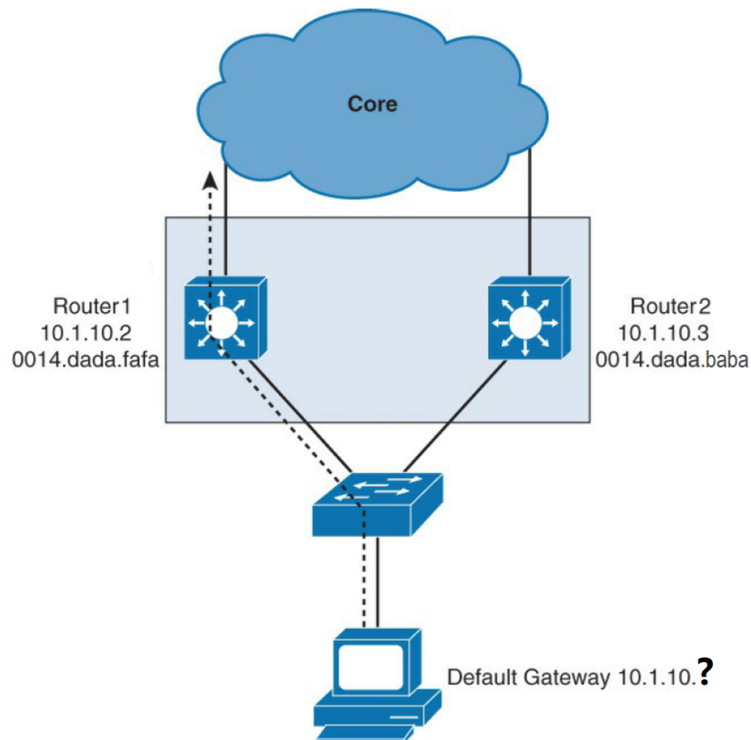
First Hop Redundancy Protocols

Réseaux d'entreprise

Marouane SEBGUI

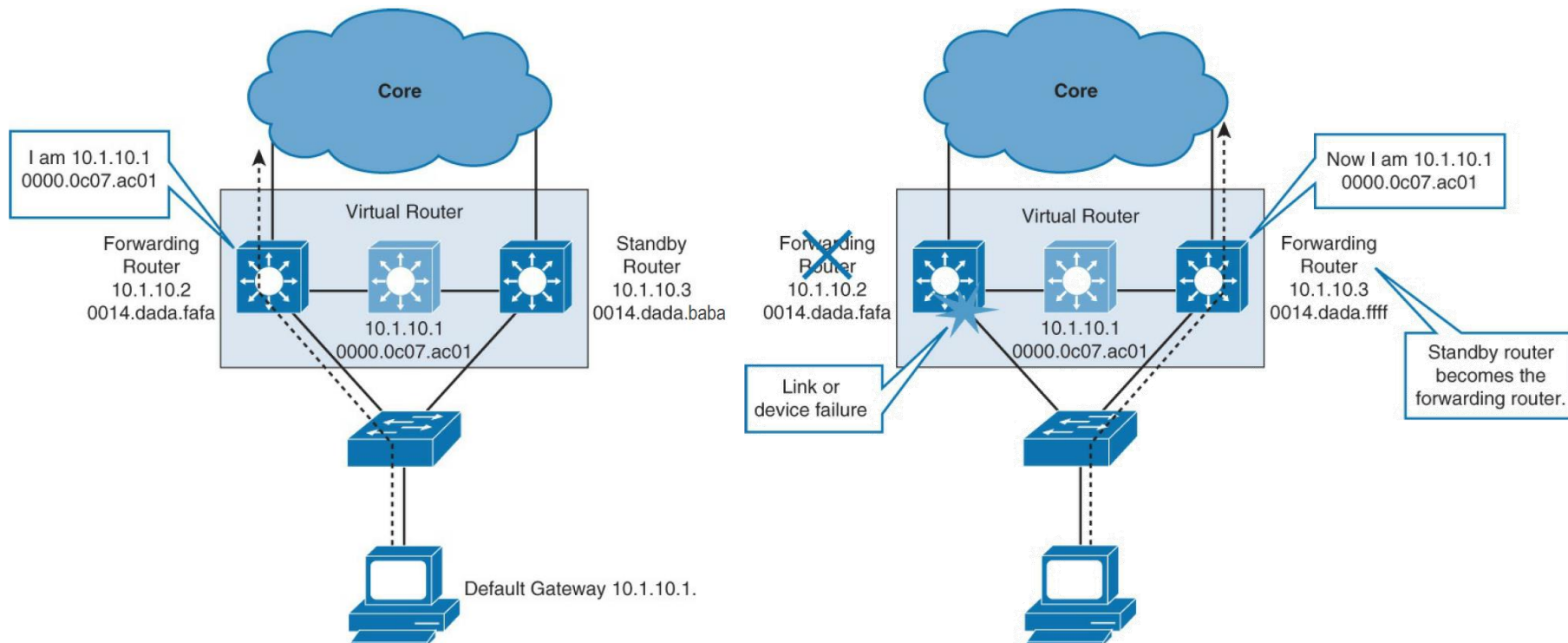
Redondance de la gateway

- En cas d'indisponibilité d'une gateway ??
- Quelle adresse de gateway pour les PCs ??



Solution

- La création d'un routeur virtuel avec une 3^{ème} adresse (virtuelle) qui sera utilisée comme gateway par les PCs



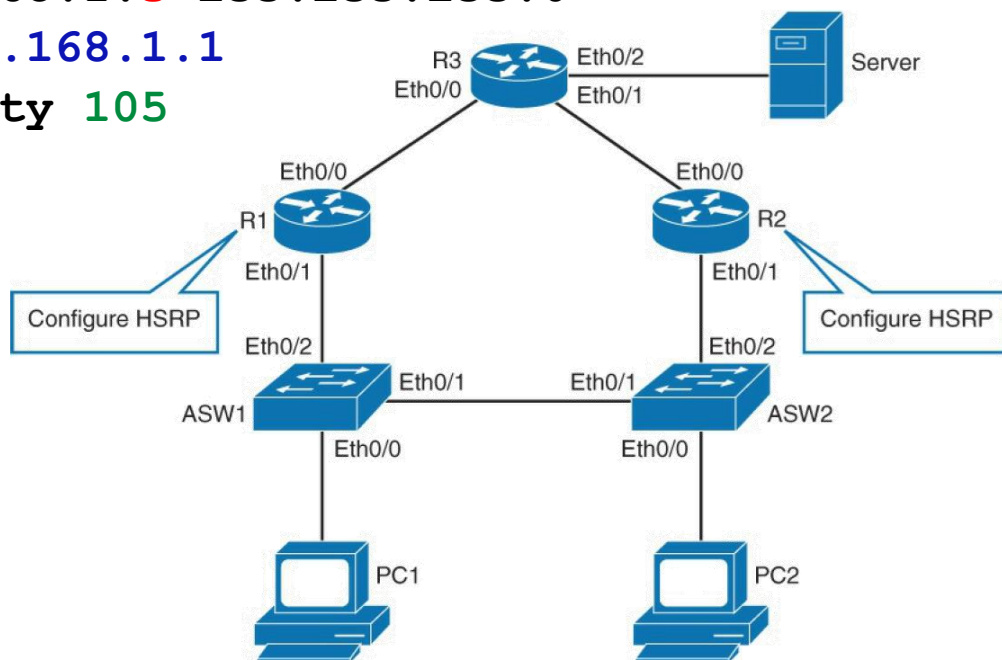
Protocoles

- Il s'agit de créer une adresse IP couplée à une adresse MAC virtuelles. Que les équipements vont considérer comme gateway. A chaque moment un des deux routeurs joue le rôle de Forwarding et l'autre joue le rôle de Standby. Cette négociation se fait par un protocole FHRP (First Hop Redundancy Protocole) :
 - HSRP : protocole propriétaire Cisco (Active-Passive)
 - VRRP : protocole de l'IETF – RFC 5798 (Active-Passive)
 - GLBP : protocole propriétaire Cisco (Active-Active)

HSRP - Configuration

```
R1(config)# interface ethernet 0/1
R1(config-if)# ip address 192.168.1.3 255.255.255.0
R1(config-if)# standby 1 ip 192.168.1.1
R1(config-if)# standby 1 priority 105
```

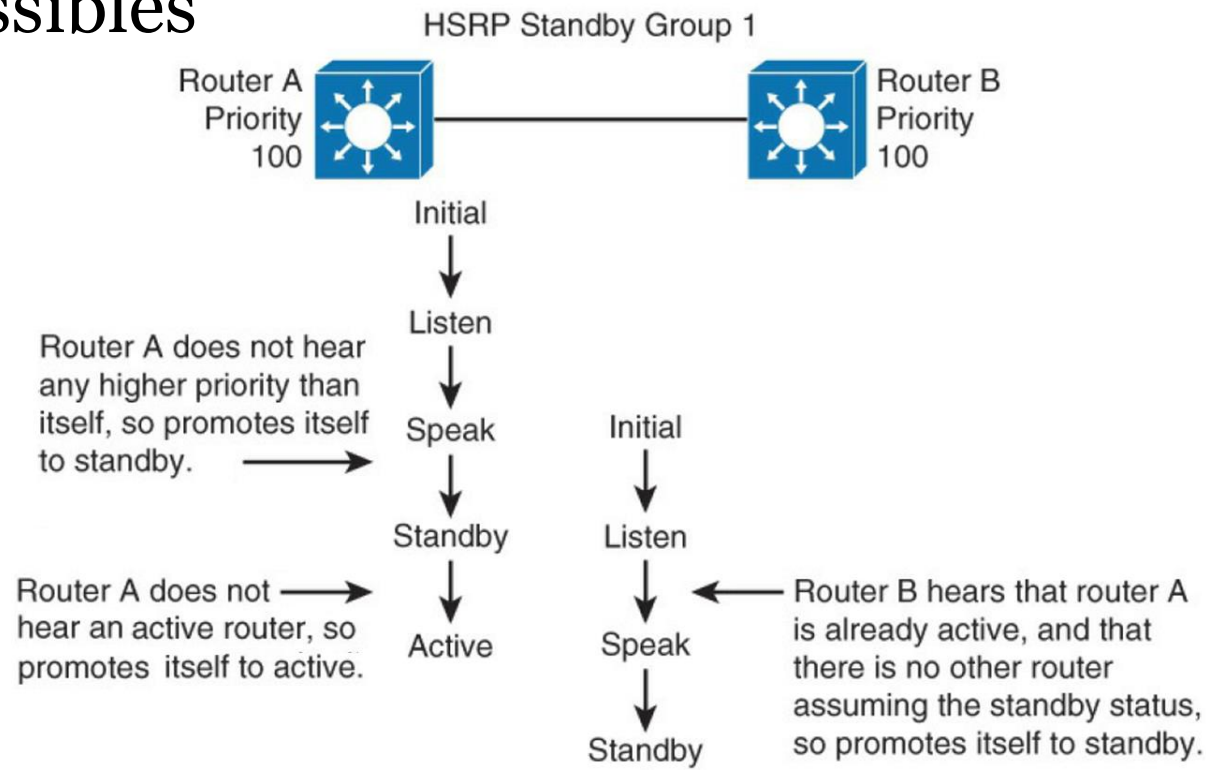
```
//default priority is 100
// value in range 0 to 255
```



```
R2(config)# interface ethernet 0/1
R2(config-if)# ip address 192.168.1.2 255.255.255.0
R2(config-if)# standby 1 ip 192.168.1.1
```

HSRP - élection

- Il s'agit d'un protocole Cisco pour une redondance de gateway en mode Active-Passive.
- Cinq états sont possibles
- Des paquets hello sont envoyés pour vérifier l'existence d'un autre voisin dans le même HSRP groupe



HSRP - Etats

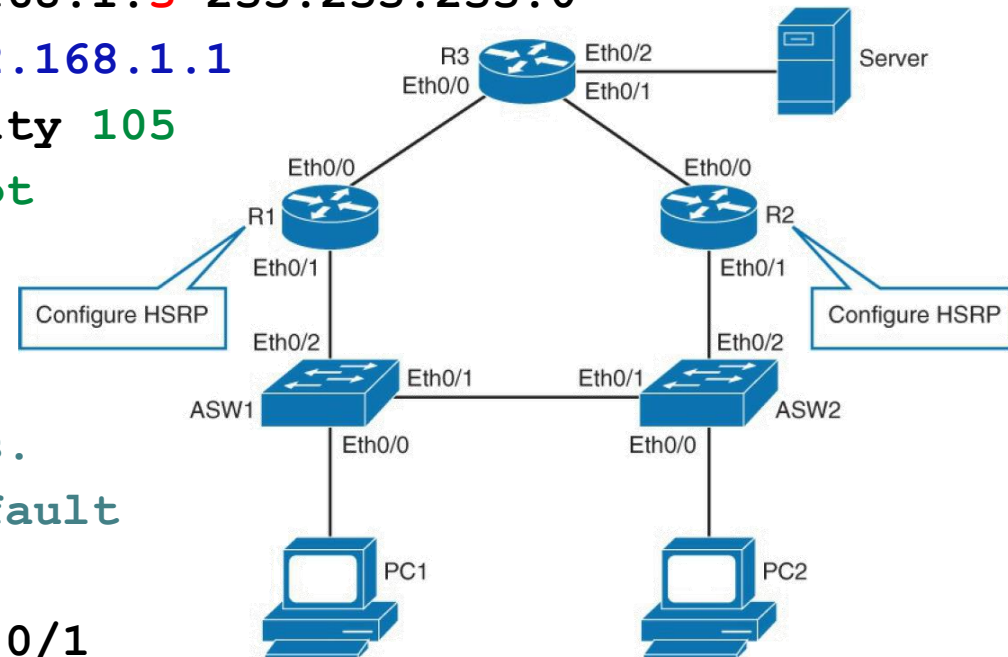
State	Definition
Initial	The beginning state. The initial state indicates that HSRP does not run. This state is entered via a configuration change or when an interface first comes up.
Listen	The router knows the virtual IP address, but the router is neither the active router nor the standby router. It listens for hello messages from those routers.
Speak	The router sends periodic hello messages and actively participates in the election of the active or standby router. A router cannot enter speak state unless the router has the virtual IP address.
Standby	The router is a candidate to become the next active router and sends periodic hello messages. With the exclusion of transient conditions, there is, at most, one router in the group in standby state.
Active	The router currently forwards packets that are sent to the group virtual MAC address. The router sends periodic hello messages. With the exclusion of transient conditions, there must be, at the most, one router in the active state in the group.

HSRP - Préemption

```
R1(config)# interface ethernet 0/1
R1(config-if)# ip address 192.168.1.3 255.255.255.0
R1(config-if)# standby 1 ip 192.168.1.1
R1(config-if)# standby 1 priority 105
R1(config-if)# standby 1 preempt
```

//Preemption is the ability of
an HSRP-enabled device to
trigger the re-election process.
//preemption is disabled by default

```
R2(config)# interface ethernet 0/1
R2(config-if)# ip address 192.168.1.2 255.255.255.0
R2(config-if)# standby 1 ip 192.168.1.1
R1(config-if)# standby 1 preempt
```



Vérification de configuration

```
R1#sho standby
```

```
GigabitEthernet0/1 - Group 1
```

```
State is Active
```

```
4 state changes, last state change 03:13:50
```

```
Virtual IP address is 192.168.1.1
```

```
Active virtual MAC address is 0000.0C07.AC01
```

```
Local virtual MAC address is 0000.0C07.AC01  
(v1 default)
```

```
Hello time 3 sec, hold time 10 sec
```

```
Next hello sent in 1.914 secs
```

```
Preemption disabled
```

```
Active router is local
```

```
Standby router is 192.168.1.2
```

```
Priority 100 (default 100)
```

```
Group name is hsrp-Gig0/1-1 (default)
```

```
R2#sho standby
```

```
GigabitEthernet0/1 - Group 1
```

```
State is Standby
```

```
3 state changes, last state change 03:16:02
```

```
Virtual IP address is 192.168.1.1
```

```
Active virtual MAC address is 0000.0C07.AC01
```

```
Local virtual MAC address is 0000.0C07.AC01  
(v1 default)
```

```
Hello time 3 sec, hold time 10 sec
```

```
Next hello sent in 2.679 secs
```

```
Preemption disabled
```

```
Active router is 192.168.1.3
```

```
Standby router is local
```

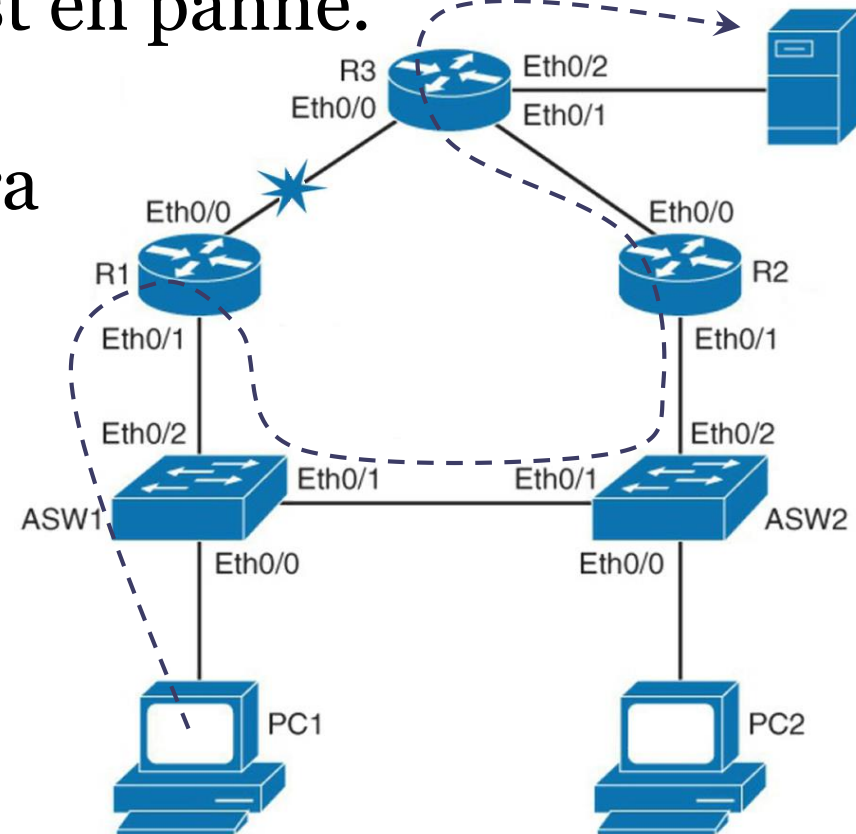
```
Priority 100 (default 100)
```

```
Group name is hsrp-Gig0/1-1 (default)
```

```
//in 0000.0c07.acXX, where XX is the group identifier. and  
0000.0C07.AC is dedicated to HSRP
```

HSRP - track

- Si l'interface Eth0/0 de R1 est en panne.
Si R1 est élu active, le trafic en destination du serveur sera bloqué au niveau de R2.
 - Configurer le routage
 - Configure Tracking



```
R1(config)#interface Eth0/1
```

```
R1(config-if)#standby 1 track Eth0/0 [decrement 15]
```

```
Local virtual MAC address is 0000.0C07.AC01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 2.342 secs
Preemption enabled
Active router is 192.168.1.253, priority 105 (expires in 8 sec)
MAC address is 0000.0C07.AC01
Standby router is local
Priority 101 (configured 101)
Group name is hsrp-Gig0/0-1 (default)
GigabitEthernet0/1 - Group 2
State is Standby
15 state changes, last state change 00:25:37
Virtual IP address is 192.168.2.1
Active virtual MAC address is 0000.0C07.AC02
Local virtual MAC address is 0000.0C07.AC02 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.475 secs
Preemption enabled
Active router is 192.168.2.253, priority 101 (expires in 8 sec)
MAC address is 0000.0C07.AC02
Standby router is local
Priority 95 (configured 105)
Track interface GigabitEthernet0/2 state Down decrement 10
```

VRRP configuration

```

R1(config)# interface ethernet 0/1
R1(config-if)# ip address 192.168.1.3 255.255.255.0
R1(config-if)# vrrp 1 ip 192.168.1.1
R1(config-if)# vrrp 1 priority 110
R1(config-if)# vrrp 1 preempt

```

```

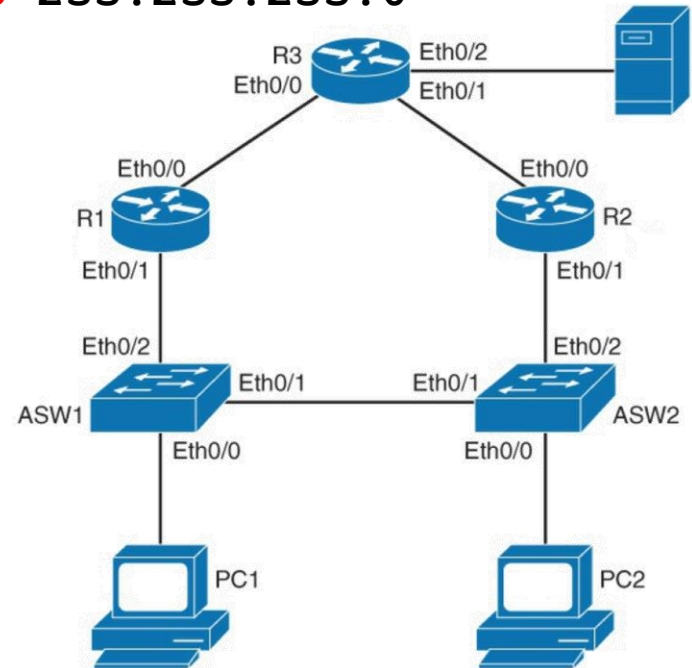
//the virtual MAC for group XX
// is 00:00:5E:00:01:XX

```

```

R2(config)# interface ethernet 0/1
R2(config-if)# ip address 192.168.1.2 255.255.255.0
R2(config-if)# vrrp 1 ip 192.168.1.1
R1(config-if)# vrrp 1 preempt

```



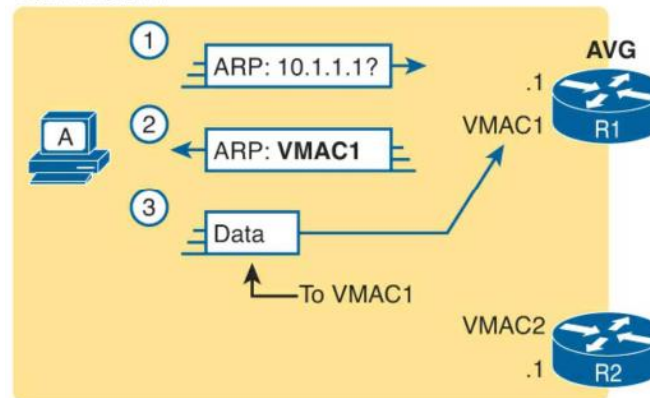
GLBP

- Gateway Load Balancing Protocole : GLBP
- Les deux routeurs du groupe sont Active aucun routeur n'est Passive.
- Les deux routeurs ont chacun une MAC Virtuelle : VMAC
- Un des deux routeur est élu AVG Active Virtual Gateway. Il est responsable de :
 - Faire l'équilibrage de charge
 - Répondre aux requêtes ARP

GLBP

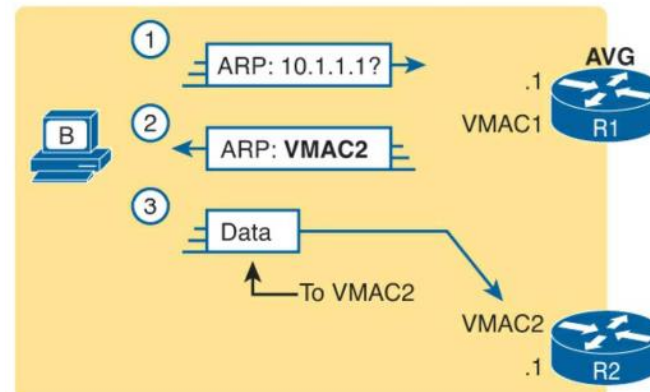
- Le routeur AVG répond aux requêtes ARP de façon équilibrée. Il donne à chaque fois une des deux VMAC en réponse
- En cas de panne d'une gateway l'autre routeur doit devenir forwarder pour l'autre VMAC

10.1.1.0/24



GLBP Table

Role	Router	Address
AVG	R1	10.1.1.1
Forwarder	R1	VMAC1
Forwarder	R2	VMAC2

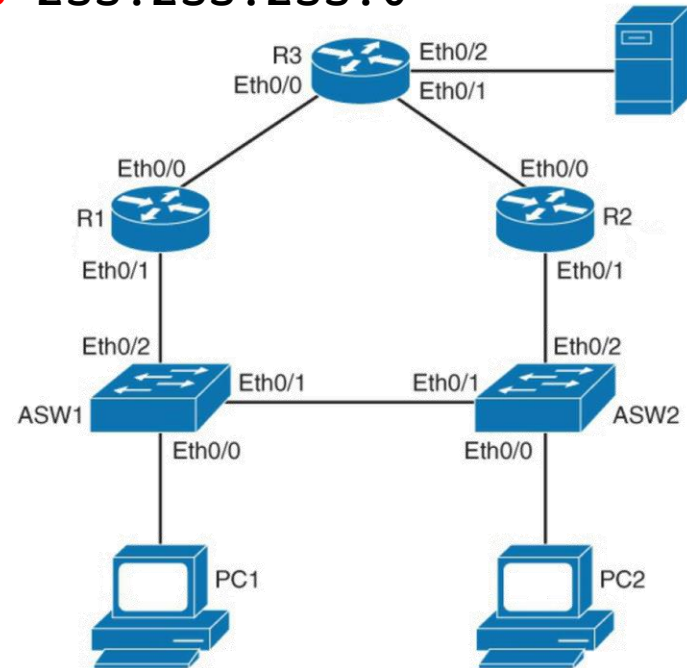


GLBP Table

Role	Router	Address
AVG	R1	10.1.1.1
Forwarder	R1	VMAC1
Forwarder	R2	VMAC2

GLBP configuration

```
R1(config)# interface ethernet 0/1
R1(config-if)# ip address 192.168.1.3 255.255.255.0
R1(config-if)# glbp 1 ip 192.168.1.1
R1(config-if)# glbp 1 priority 110
R1(config-if)# glbp 1 preempt
```



```
R2(config)# interface ethernet 0/1
R2(config-if)# ip address 192.168.1.2 255.255.255.0
R2(config-if)# glbp 1 ip 192.168.1.1
R1(config-if)# glbp 1 preempt
```