



## Práctica No. 3

Protocolo HSRP

### Montaje del Router C3640

Para instalar el Router C3640 debemos descargar la imagen de la siguiente URL:

► [Descarga Cisco IOS: Imagenes para GNS3 \[Direct Link Download\]](#)

#### 2.4. Serie C3640

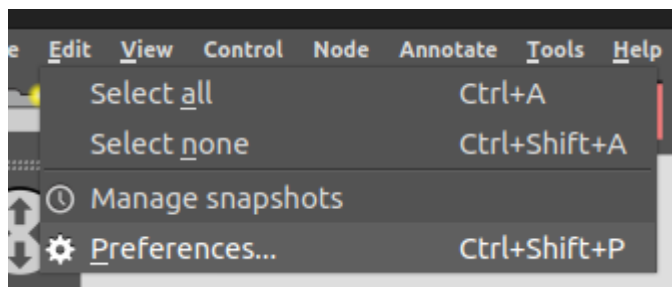
El c3640 admite hasta 4 módulos de red (máximo de 16 puertos Ethernet, 32 puertos FastEthernet o 16 puertos serie).

##### 2.4.1. IOS versión 12.4.25d (línea principal)

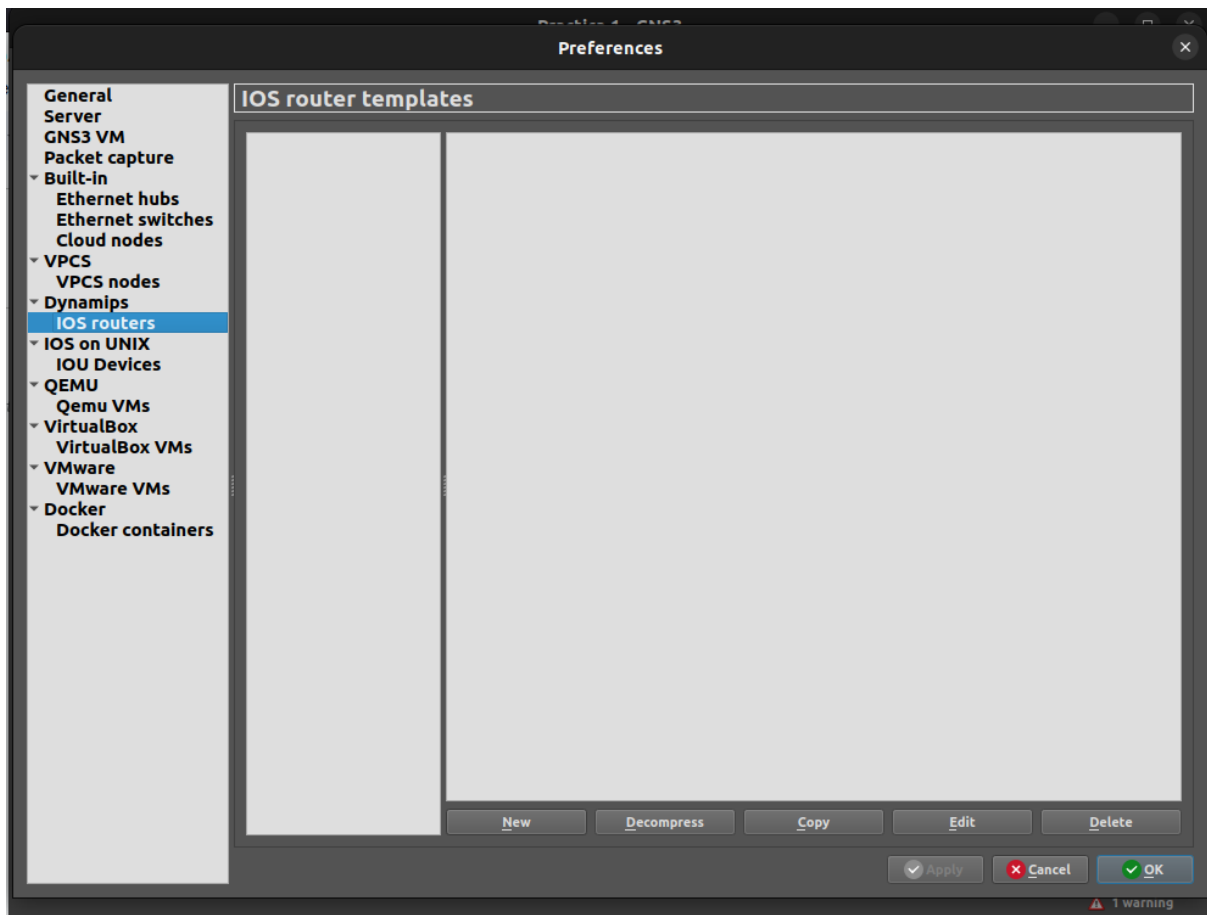
- Nombre de archivo: c3640-a3js-mz.124-25d.bin
- MD5: db9f63ca1b46d18fb835496bffffe608a
- RAM mínima: 128MB
- Valor de PC inactivo propuesto: 0x6050b114

**Descarga c3640-a3js-mz.124-25d.bin**

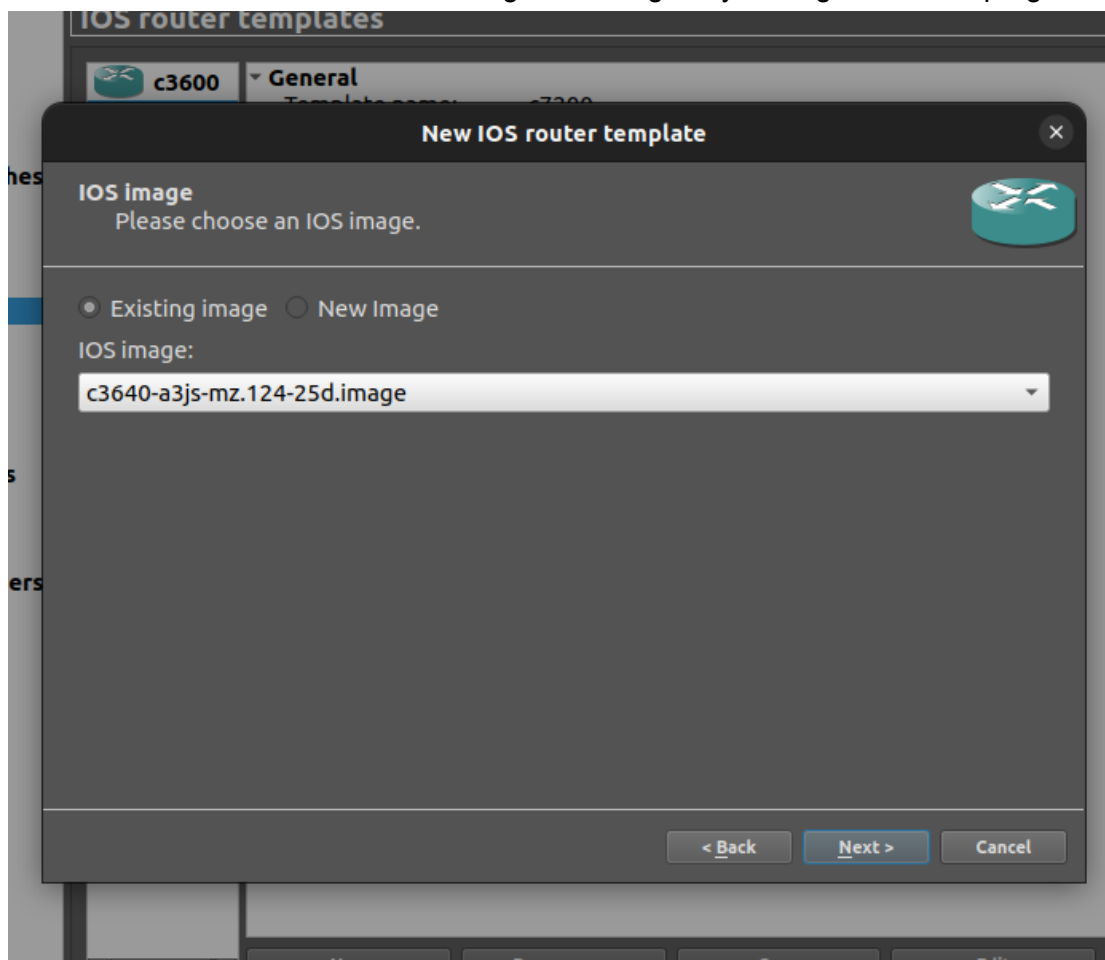
Damos click en Edit y luego en Preferences.



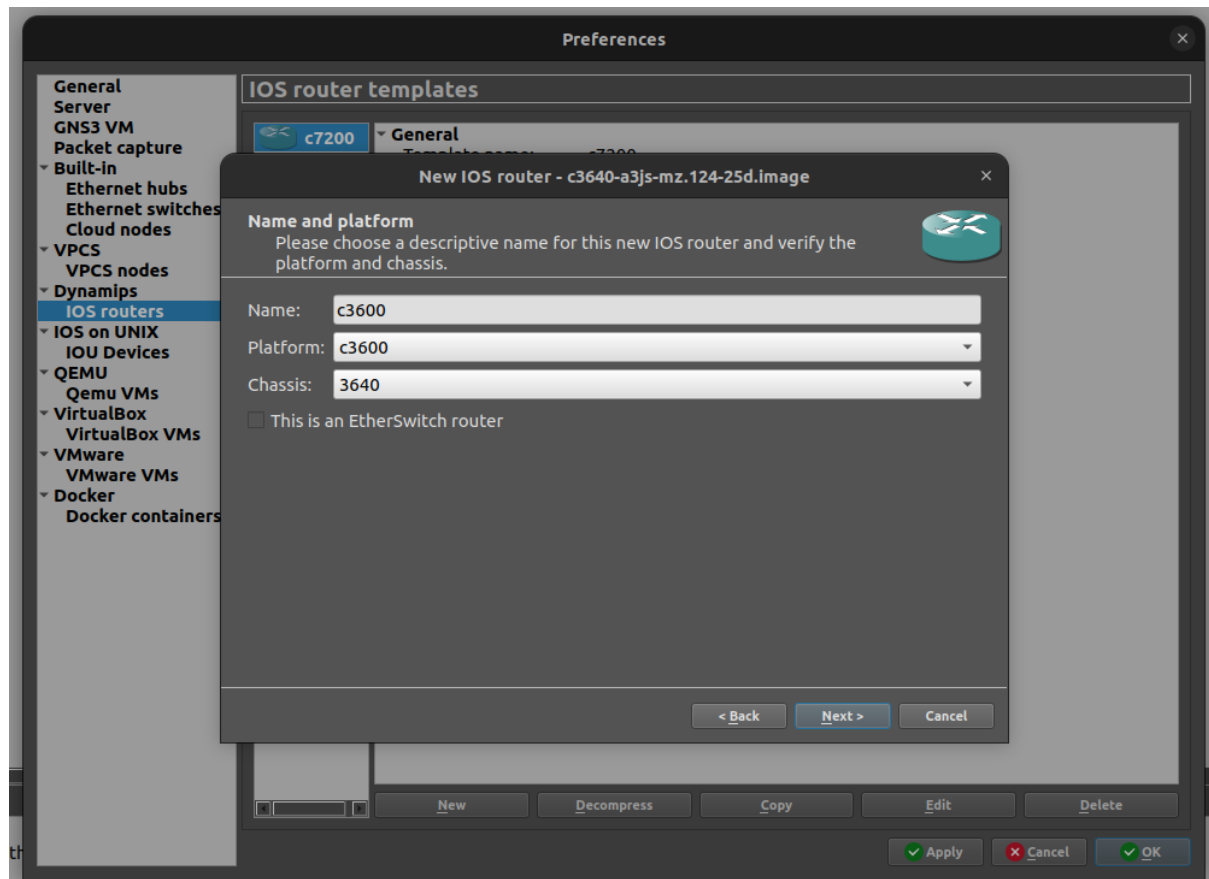
En la sección de "Dynamips" y "IOS Routers", seleccionamos la opción "New".



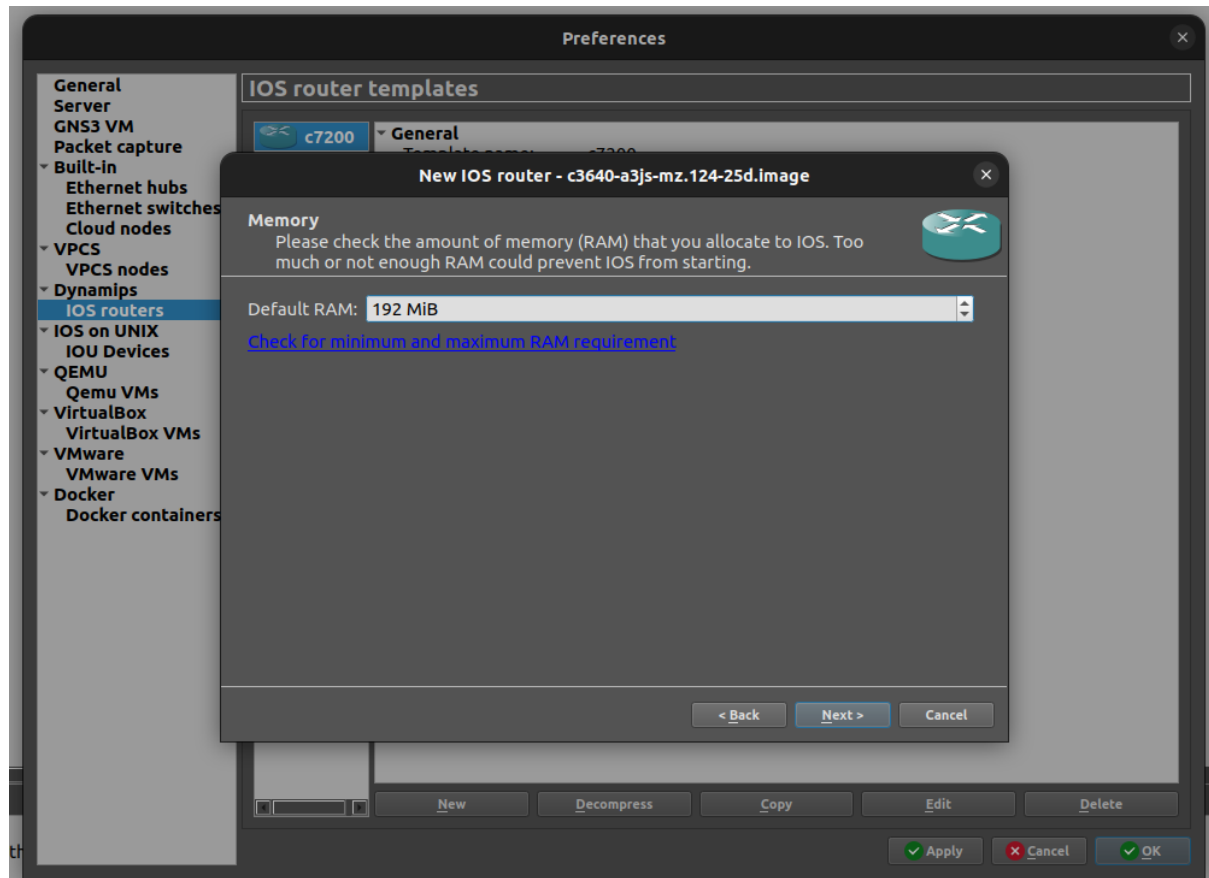
Buscamos en nuestro directorio la imagen descargada y la cargamos en el programa.



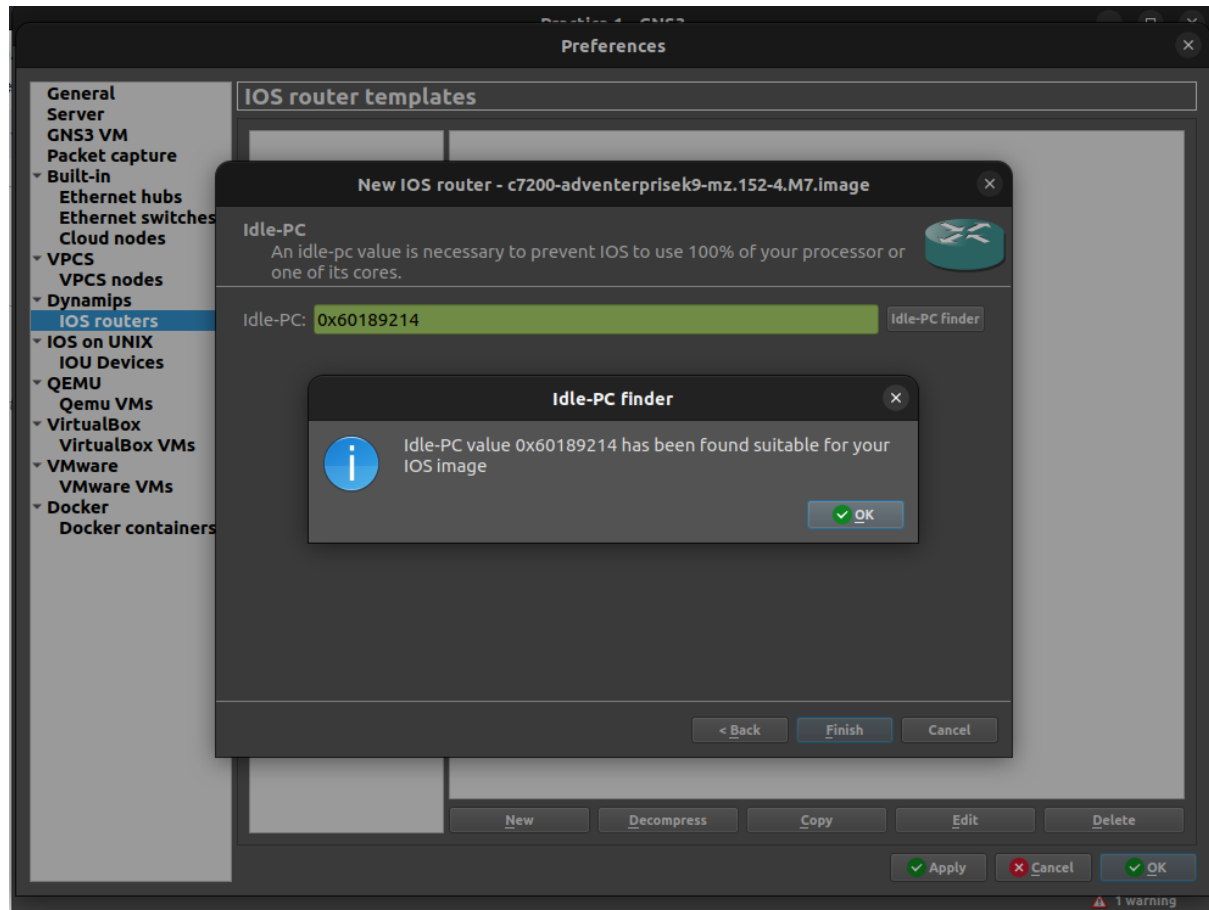
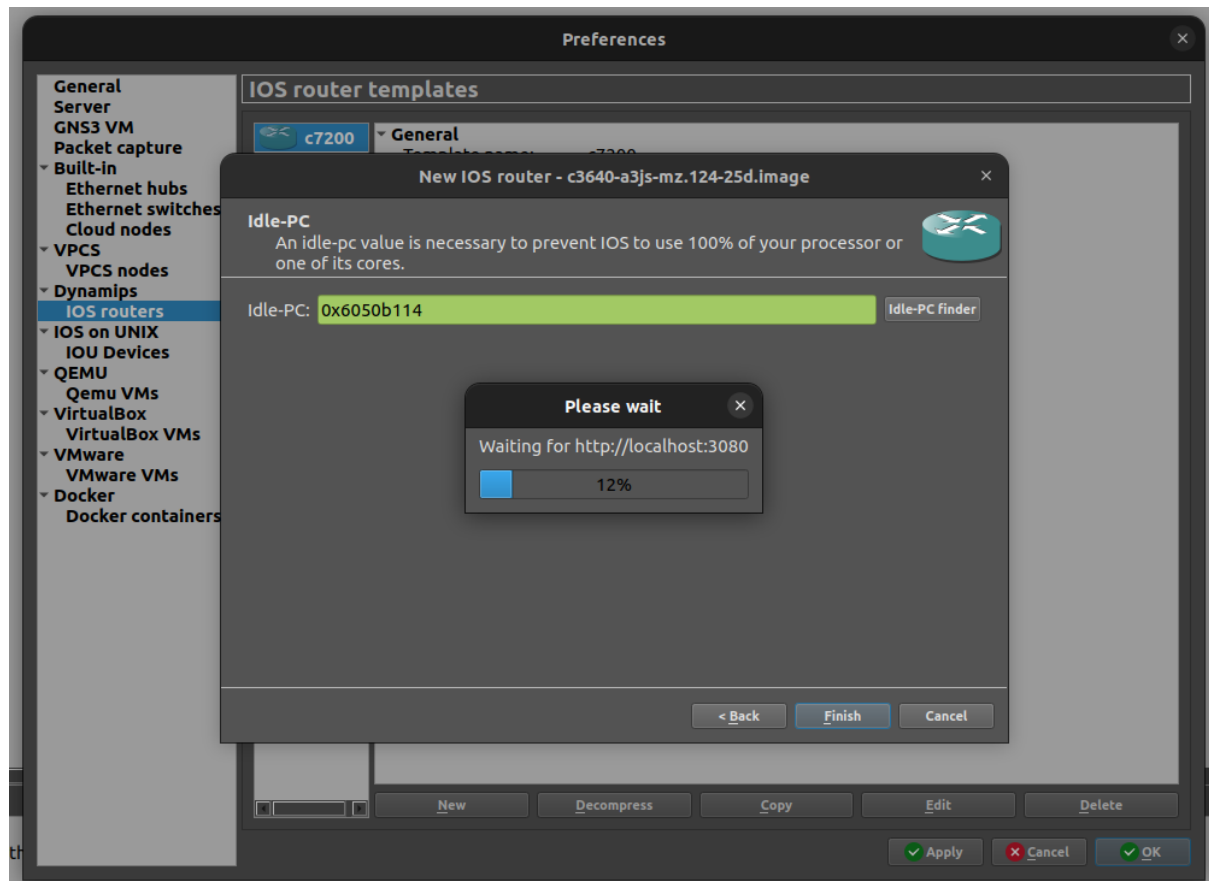
Mantenemos la configuración por default del nombre y plataforma.



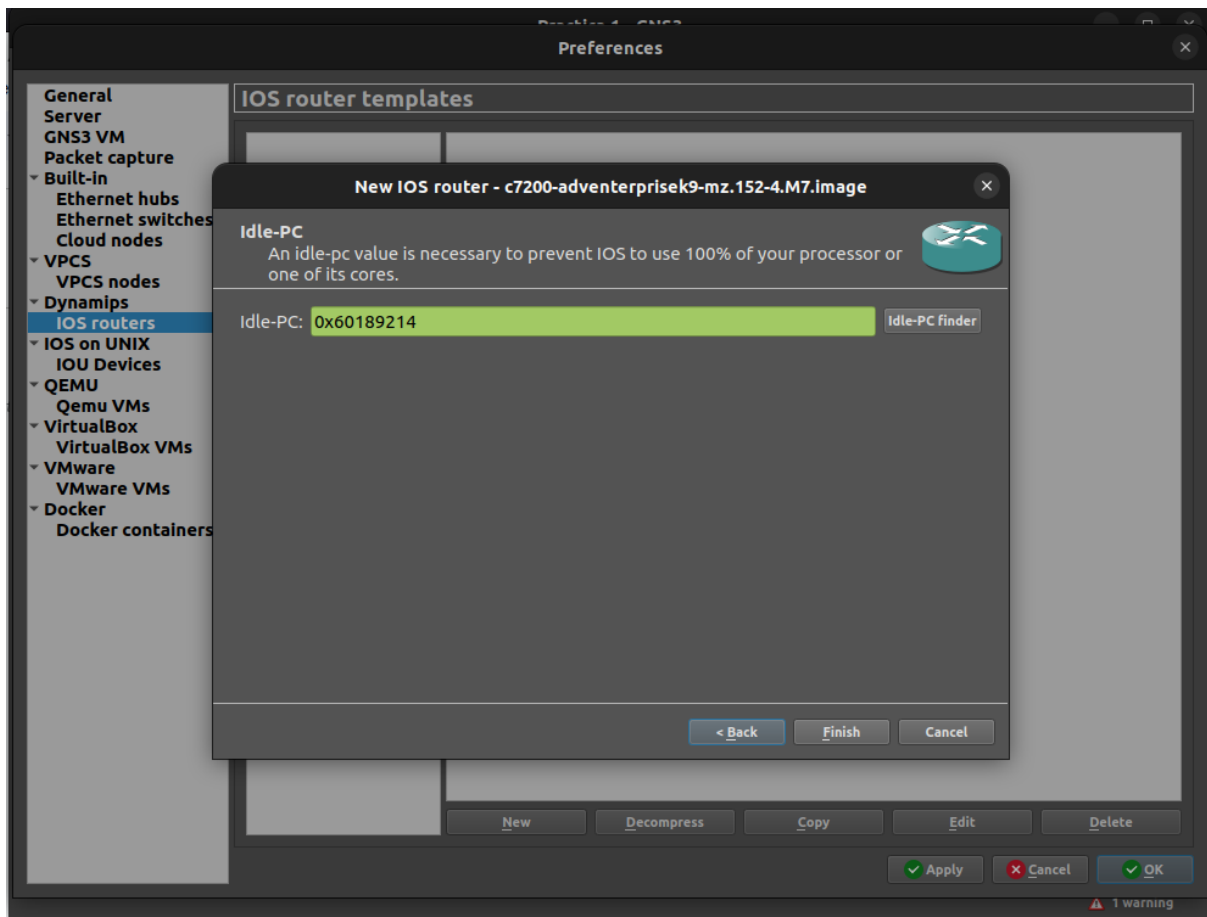
Mantenemos la configuración por defecto de la RAM.



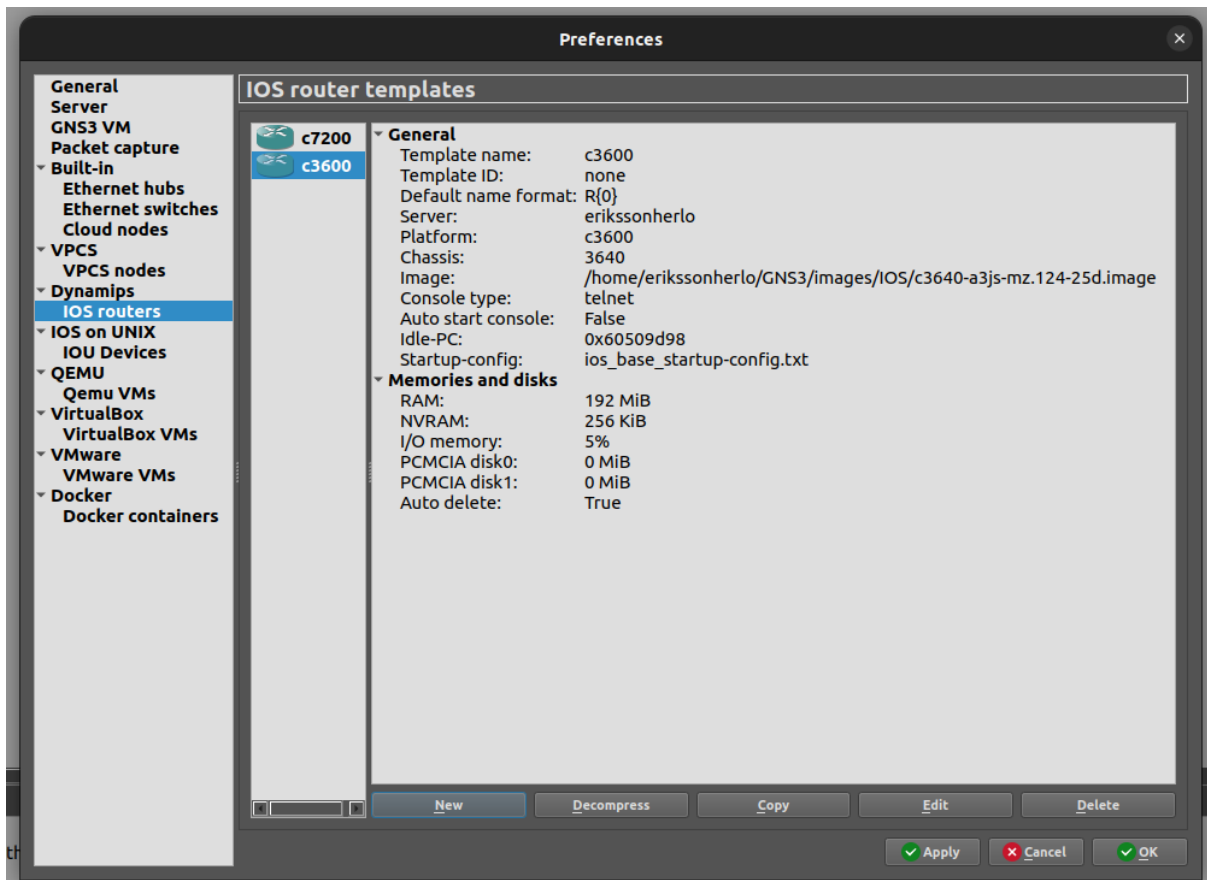
Luego debemos cargar el servicio de “Idle-PC”, el cual se estará ejecutando en el localhost:3080.



Al cargar el servicio, podremos aplicar y aceptar la configuración del router.

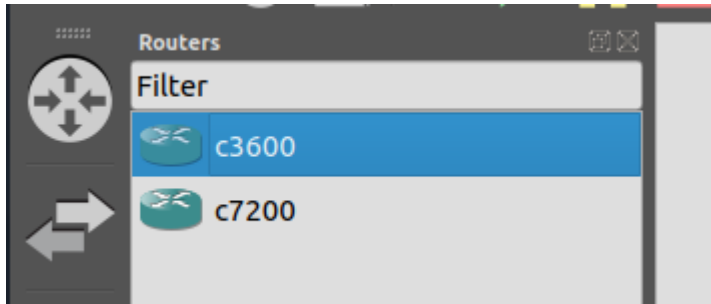


Quedando nuestra configuración de la siguiente manera:

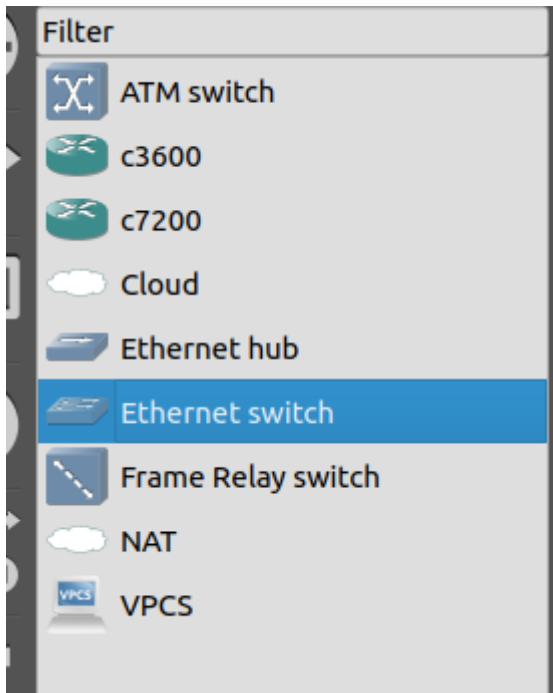


# Estructura de la Red

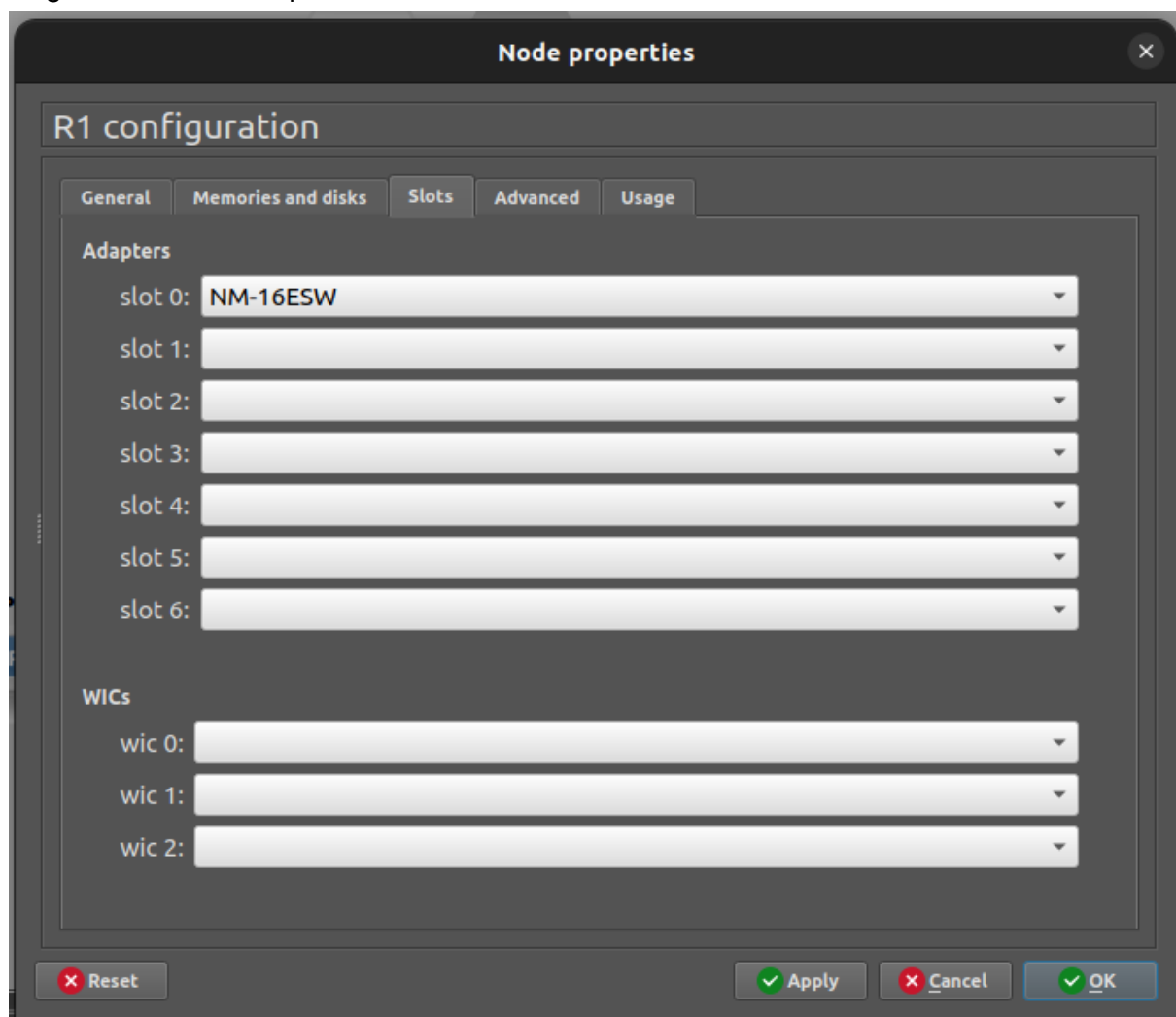
Elegimos 4 routers modelo C3600.



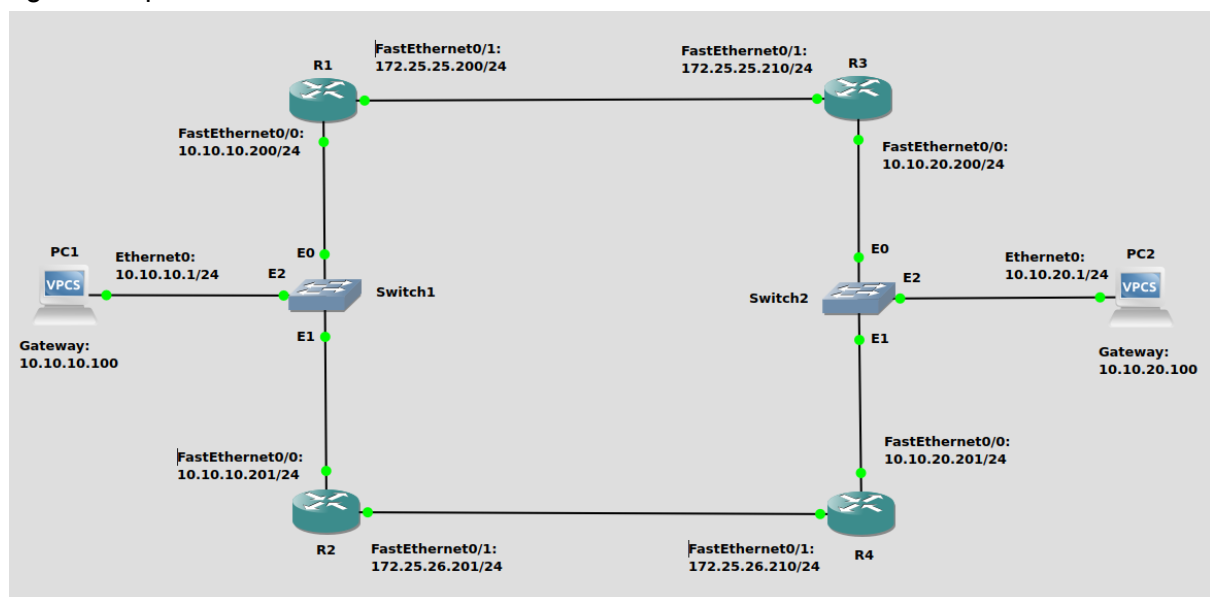
Elegimos 2 switches.



Elegimos un Slot de Tipo NM-16ESW



Conectamos los 4 routers, y los 2 switches de la siguiente manera, a través de los siguientes puertos:



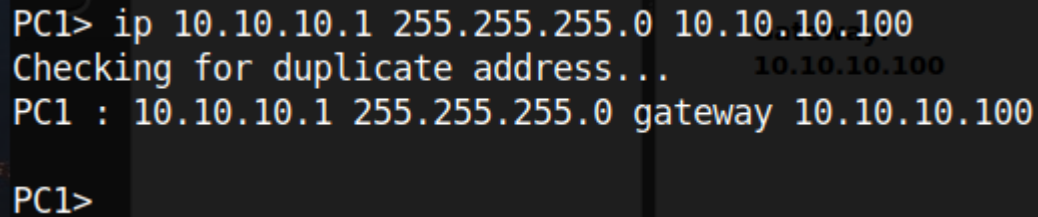
# Configuración de la Interfaz de Red

## Configuración de Dispositivos

Para configurar el dispositivo, se realiza ingresando a la terminal del dispositivo con click derecho y se asignan las IP 's que fueron designadas previamente en el diseño de la Red.

### PC1

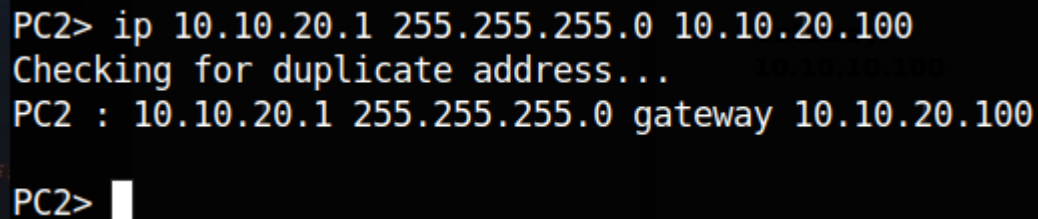
```
PC1> ip 10.10.10.1 255.255.255.0 10.10.10.100
```

A screenshot of a terminal window for PC1. The text shows the command 'ip 10.10.10.1 255.255.255.0 10.10.10.100' being entered. The system responds with 'Checking for duplicate address...' and then '10.10.10.100'. Finally, it displays 'PC1 : 10.10.10.1 255.255.255.0 gateway 10.10.10.100' and returns to the prompt 'PC1>'.

```
PC1> ip 10.10.10.1 255.255.255.0 10.10.10.100
Checking for duplicate address... 10.10.10.100
PC1 : 10.10.10.1 255.255.255.0 gateway 10.10.10.100
PC1>
```

### PC2

```
PC2> ip 10.10.20.1 255.255.255.0 10.10.20.100
```

A screenshot of a terminal window for PC2. The text shows the command 'ip 10.10.20.1 255.255.255.0 10.10.20.100' being entered. The system responds with 'Checking for duplicate address...' and then '10.10.20.100'. Finally, it displays 'PC2 : 10.10.20.1 255.255.255.0 gateway 10.10.20.100' and returns to the prompt 'PC2>'.

```
PC2> ip 10.10.20.1 255.255.255.0 10.10.20.100
Checking for duplicate address... 10.10.20.100
PC2 : 10.10.20.1 255.255.255.0 gateway 10.10.20.100
PC2>
```

## Configuración de Routers

Para configurar los routers, debemos dar click sobre el primer router y abrir la terminal y escribir los siguientes comandos, según la configuración de cada router.

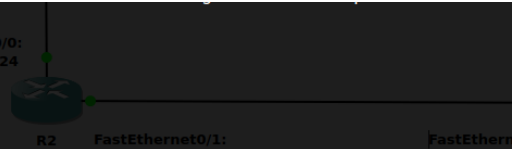
### Router 1

```
R1#conf t
R1(config)#interface FastEthernet0/0
R1(config-if)#no switchport
R1(config-if)#ip address 10.10.10.200 255.255.255.0
R1(config-if)#standby 1 ip 10.10.10.100
R1(config-if)#standby 1 preempt
R1(config-if)#exit
R1(config)#interface FastEthernet0/1
R1(config-if)#no switchport
R1(config-if)#ip address 172.25.25.200 255.255.255.0
```



```
R1(config-if)#exit
```

```
R1(config)#exit
```



```
R1#
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#no switchport
R1(config-if)#
*Mar 1 00:05:05.367: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#ip address 10.10.10.200 255.255.255.0
R1(config-if)#standby 1 ip 10.10.10.100
R1(config-if)#standby 1 preempt
R1(config-if)#exit
R1(config)#interface FastEthernet0/1
R1(config-if)#no switchport
R1(config-if)#
*Mar 1 00:05:42.671: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
R1(config-if)#
*Mar 1 00:05:44.827: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R1(config-if)#ip address 172.25.25.200 255.255.255.0
R1(config-if)#exit
R1(config)#
*Mar 1 00:05:49.951: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Speak -> Standby
*Mar 1 00:05:50.451: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Standby -> Active
R1(config)#
```

## Router 2

```
R2#conf t
```

```
R2(config)#interface FastEthernet0/0
```

```
R2(config-if)#no switchport
```

```
R2(config-if)#ip address 10.10.10.201 255.255.255.0
```

```
R2(config-if)#standby 1 ip 10.10.10.100
```

```
R2(config-if)#standby 1 priority 50
```

```
R2(config-if)#standby 1 preempt
```

```
R2(config-if)#exit
```

```
R2(config)#interface FastEthernet0/1
```

```
R2(config-if)#no switchport
```

```
R2(config-if)#ip address 172.25.26.201 2
```

```
R2(config-if)#ip address 172.25.26.201 255.255.255.0
```

```
R2(config-if)#exit
```

```
R2(config)#exit
```

```

*Mar 1 00:00:34.879: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface FastEthernet0/0
R2(config-if)#no switchport
R2(config-if)#
*Mar 1 00:07:58.755: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#ip address 10.10.10.201 255.255.255.0
R2(config-if)#standby 1 ip 10.10.10.100
R2(config-if)#standby 1 priority 50
R2(config-if)#standby 1 preempt
R2(config-if)#exit
R2(config)#interface FastEthernet0/1
R2(config-if)#no switchport
R2(config-if)#
*Mar 1 00:08:36.595: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
R2(config-if)#ip address 172.25.26.201 2
*Mar 1 00:08:38.751: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R2(config-if)#ip address 172.25.26.201 255.255.255.0
R2(config-if)#
*Mar 1 00:08:41.939: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Speak -> Standby
R2(config-if)#exit
R2(config)#

```

## Router 3

```

R3#conf t
R3(config)#interface FastEthernet0/0
R3(config-if)#no switchport
R3(config-if)#ip address 10.10.20.200 255.255.255.0
R3(config-if)#ip address 10.10.20.200 255.255.255.0
R3(config-if)#standby 1 ip 10.10.20.100
R3(config-if)#standby 1 priority 50
R3(config-if)#standby 1 preempt
R3(config-if)#exit
R3(config)#interface FastEthernet0/1
R3(config-if)#no switchport
R3(config-if)#
R3(config-if)#ip address 172.25.25.210 255.255.255.0
R3(config-if)#ip address 172.25.25.210 255.255.255.0
R3(config-if)#exit
R3(config)#exit

```

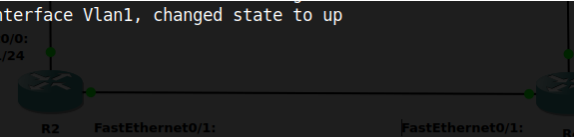
```

R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface FastEthernet0/0
R3(config-if)#no switchport
R3(config-if)#ip address 10.10.20.200 255.255.255.0
*Mar 1 00:09:44.407: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#ip address 10.10.20.200 255.255.255.0
R3(config-if)#standby 1 ip 10.10.20.100 255.255.255.0
R3(config-if)#standby 1 priority 50
R3(config-if)#standby 1 preempt
R3(config-if)#exit
R3(config)#interface FastEthernet0/1
R3(config-if)#no switchport
R3(config-if)#
*Mar 1 00:10:25.127: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
R3(config-if)#ip address 172.25.25.210 255.255.255.0
*Mar 1 00:10:27.283: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R3(config-if)#ip address 172.25.25.210 255.255.255.0
R3(config-if)#exit
*Mar 1 00:10:29.671: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Speak -> Standby
*Mar 1 00:10:30.171: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Standby -> Active
R3(config-if)#exit
*Mar 1 00:10:30.171: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Standby -> Active
R3(config)#

```

## Router 4

```
R4#conf t
R4(config)#interface FastEthernet0/0
R4(config-if)#no switchport
R4(config-if)#ip address 10.10.20.201 255.255.255.0
R4(config-if)#standby 1 ip 10.10.20.100
R4(config-if)#standby 1 preempt
R4(config-if)#exit
R4(config)#interface FastEthernet0/1
R4(config-if)#no switchport
R4(config-if)#ip address 172.25.26.210 255.255.255.0
R4(config-if)#exit
R4(config)#exit
```



```
*Mar 1 00:00:35.119: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
R4#
R4#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R4(config)#interface FastEthernet0/0
R4(config-if)#no switchport
R4(config-if)#ip address 10.10.20.201 255.255.255.0
R4(config-if)#
*Mar 1 00:11:42.007: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R4(config-if)#standby 1 ip 10.10.20.100
R4(config-if)#standby 1 preempt
R4(config-if)#exit
R4(config)#interface FastEthernet0/1
R4(config-if)#
*Mar 1 00:11:59.327: %HSRP-5-STATECHANGE: FastEthernet0/0 Grp 1 state Listen -> Active
R4(config-if)#no switchport
R4(config-if)#
*Mar 1 00:12:03.691: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
R4(config-if)#ip address 172.25.26.210 255.255.255.0
R4(config-if)#
*Mar 1 00:12:05.843: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R4(config-if)#exit
R4(config)#
```

## Enrutamiento

Debemos asignar las direcciones ip a los routers.

## Router 1

```
R1#conf t
R1(config)#interface FastEthernet0/1
R1(config-if)#ip route 10.10.20.0 255.255.255.0 172.25.25.210
R1(config)#exit
```

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/1
R1(config-if)#ip route 10.10.20.0 255.255.255.0 172.25.25.210
R1(config)#exit
R1#
*Mar 1 00:12:05.843: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
*Mar 1 00:24:22.571: %SYS-5-CONFIG_I: Configured from console by console
R1#
```

## Router 2

```
R2#conf t
R2(config)#interface FastEthernet0/1
R2(config-if)#ip route 10.10.20.0 255.255.255.0 172.25.26.210
R2(config)#exit
```

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface FastEthernet0/1
R2(config-if)#ip route 10.10.20.0 255.255.255.0 172.25.26.210
R2(config)#exit
```

## Router 3

```
R3#conf t
R3(config)#interface FastEthernet0/1
R3(config-if)#ip route 10.10.10.0 255.255.255.0 172.25.25.200
R3(config)#exit
```

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface FastEthernet0/1
R3(config-if)#ip route 10.10.10.0 255.255.255.0 172.25.25.200
R3(config)#exit
```

## Router 4

```
R4#conf t
R4(config)#interface FastEthernet0/1
R4(config-if)#ip route 10.10.10.0 255.255.255.0 172.25.26.201
R4(config)#exit
```

```
R4#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R4(config)#interface FastEthernet0/1
R4(config-if)#ip route 10.10.10.0 255.255.255.0 172.25.26.201
R4(config)#exit
```

Visualizamos las interfaces con el comando:

```
R1#show ip interface brief
```

```

R1#show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 10.10.10.200 YES manual up up
FastEthernet0/1 172.25.25.200 YES manual up up
FastEthernet0/2 unassigned YES unset up down
FastEthernet0/3 unassigned YES unset up down
FastEthernet0/4 unassigned YES unset up down
FastEthernet0/5 unassigned YES unset up down
FastEthernet0/6 unassigned YES unset up down
FastEthernet0/7 unassigned YES unset up down
FastEthernet0/8 unassigned YES unset up down
FastEthernet0/9 unassigned YES unset up down
FastEthernet0/10 unassigned YES unset up down
--More--

```

```

R2#show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 10.10.10.201 YES manual up up
FastEthernet0/1 172.25.26.201 YES manual up up
FastEthernet0/2 unassigned YES unset up down
FastEthernet0/3 unassigned YES unset up down
FastEthernet0/4 unassigned YES unset up down
FastEthernet0/5 unassigned YES unset up down
FastEthernet0/6 unassigned YES unset up down
FastEthernet0/7 unassigned YES unset up down
FastEthernet0/8 unassigned YES unset up down
FastEthernet0/9 unassigned YES unset up down
FastEthernet0/10 unassigned YES unset up down
--More--

```

```

R3#show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 10.10.20.200 YES manual up up
FastEthernet0/1 172.25.25.210 YES manual up up
FastEthernet0/2 unassigned YES unset up down
FastEthernet0/3 unassigned YES unset up down
FastEthernet0/4 unassigned YES unset up down
FastEthernet0/5 unassigned YES unset up down
FastEthernet0/6 unassigned YES unset up down
FastEthernet0/7 unassigned YES unset up down
FastEthernet0/8 unassigned YES unset up down
FastEthernet0/9 unassigned YES unset up down
FastEthernet0/10 unassigned YES unset up down
--More--

```

```

R4#show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 10.10.20.201 YES manual up up
FastEthernet0/1 172.25.26.210 YES manual up up
FastEthernet0/2 unassigned YES unset up down
FastEthernet0/3 unassigned YES unset up down
FastEthernet0/4 unassigned YES unset up down
FastEthernet0/5 unassigned YES unset up down
FastEthernet0/6 unassigned YES unset up down
FastEthernet0/7 unassigned YES unset up down
FastEthernet0/8 unassigned YES unset up down
FastEthernet0/9 unassigned YES unset up down
FastEthernet0/10 unassigned YES unset up down
--More--

```

# Pruebas de Ping

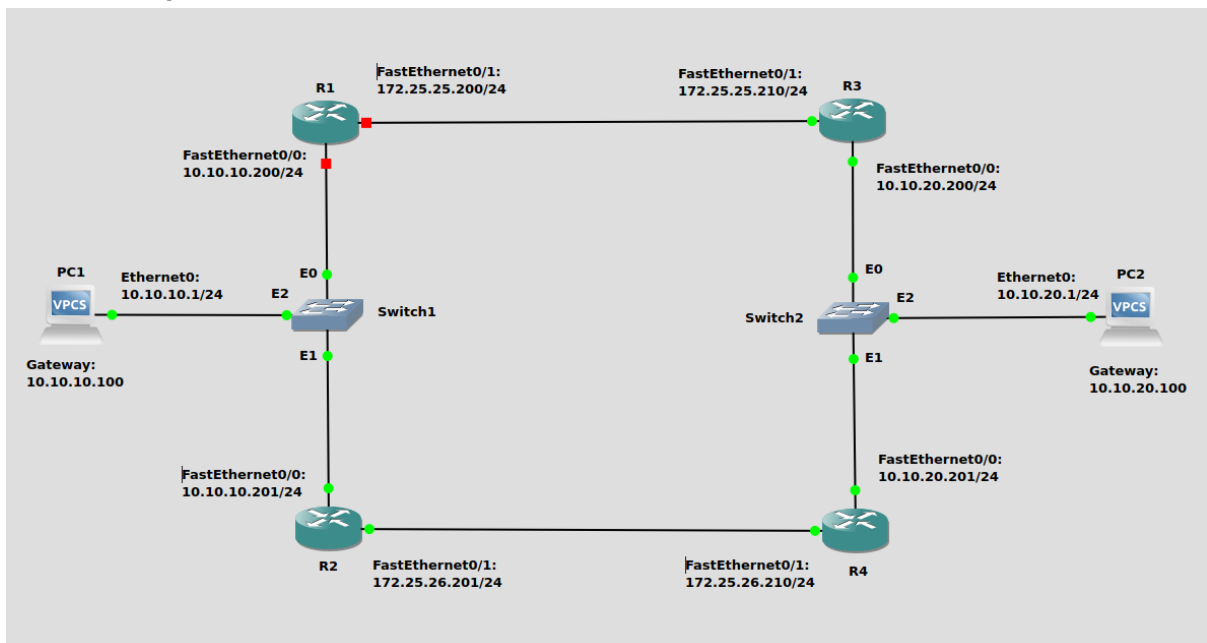
## Comunicación desde PC1 a PC2

Con Todos los Routers Activos

```
R3(config)#exit
PC1> trace 10.10.20.1
Trace to 10.10.20.1, 8 hops max, 68 bytes of buffer used
 0 10.10.10.201  0.000 ms  0.000 ms  0.000 ms
 1 172.25.25.210  30.117 ms  19.972 ms  19.582 ms
 2 172.25.25.210  30.117 ms  19.972 ms  19.582 ms
 3 10.10.20.1  30.405 ms (ICMP type:3, code:3, Destination port unreachable)
PC1>
```

## Apagando el Router Activo

Cuando apagamos el Router No. 1



Podemos observar que nos redirige a través de la ip del Router Pasivo (Router 2)

```
PC1> trace 10.10.20.1
Trace to 10.10.20.1, 8 hops max, 68 bytes of buffer used
 0 10.10.10.201  0.000 ms  0.000 ms  0.000 ms
 1 172.25.26.210  29.803 ms  20.249 ms  19.816 ms
 2 172.25.26.210  29.803 ms  20.249 ms  19.816 ms
 3 10.10.20.1  39.298 ms (ICMP type:3, code:3, Destination port unreachable)
PC1>
```



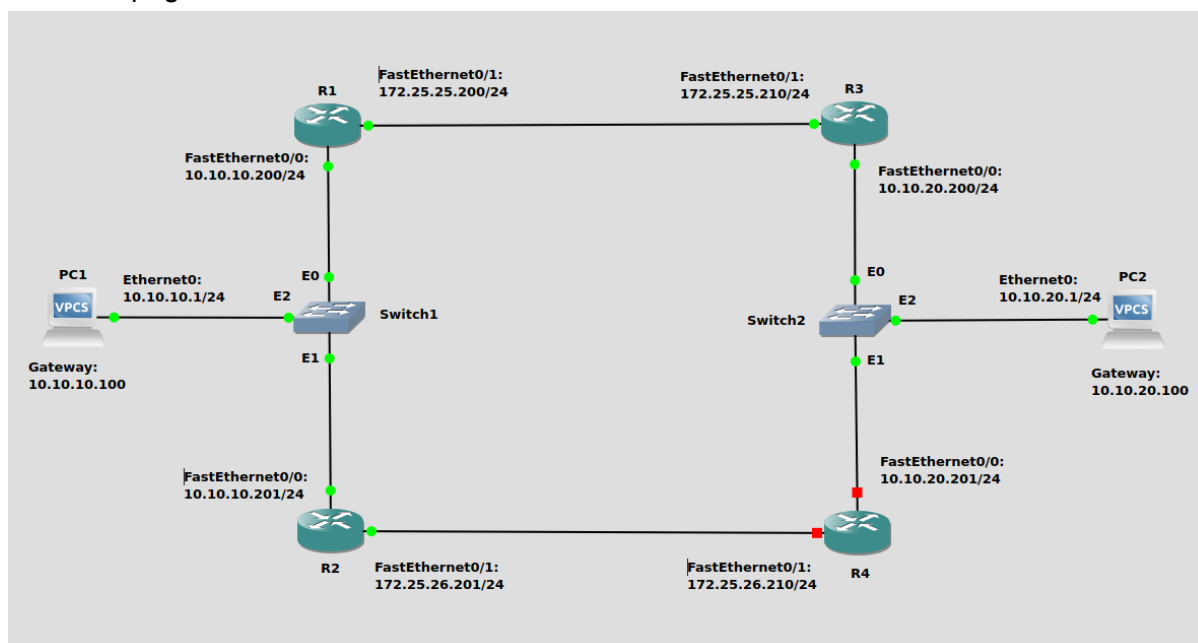
# Comunicación desde PC2 a PC1

## Con Todos los Routers Activos

```
PC2> trace 10.10.10.1
trace to 10.10.10.1, 8 hops max, press Ctrl+C to stop
R1#co10.10.20.201 11.941 ms 9.202 ms 9.494 ms
E2ter172.25.26.201 30.129 ms 30.144 ms 30.312 ms
R3(co10.10.10.1 34.894 ms (ICMP type:3, code:3, Destination port unreachable)
R3(config-if)#ip route 10.10.10.0 255.255.255.0 172.25.25.200
```

## Apagando el Router Activo

Cuando apagamos el Router No. 4



Podemos observar que nos redirige a través de la ip del Router Pasivo (Router 3)

```
PC2> trace 10.10.10.1
trace to 10.10.10.1, 8 hops max, press Ctrl+C to stop
1 10.10.20.200 6.309 ms 9.977 ms 9.441 ms
2 172.25.25.200 30.273 ms 20.018 ms 19.506 ms
3 *10.10.10.1 29.205 ms (ICMP type:3, code:3, Destination port unreachable)
```

## Conclusiones

El uso del protocolo HSRP (Hot Standby Router Protocol) en el diseño de una interfaz de red proporciona una mejora significativa en la disponibilidad y redundancia de la red. Al implementar HSRP, se establece un grupo de routers con una dirección IP virtual compartida que sirve como puerta de enlace predeterminada para los dispositivos de la red. Si uno de los routers principales (activo) falla, el router secundario (en espera) asume automáticamente el control y mantiene la conectividad sin interrupciones. Esto asegura que, en caso de fallo de hardware o de conexión en un router, los dispositivos de la red puedan seguir comunicándose a través de la dirección IP virtual. La redundancia proporcionada por HSRP minimiza los tiempos de inactividad y aumenta la confiabilidad de la red, lo que es esencial para entornos donde la continuidad operativa es crítica.