



Instituto Politécnico Nacional

Escuela Superior de Cómputo

Ingeniería en Sistemas Computacionales



Administración de Servicios en Red

Práctica 1

VLANs, VTP Server/Client, Spanning Tree, Ruteo Estático

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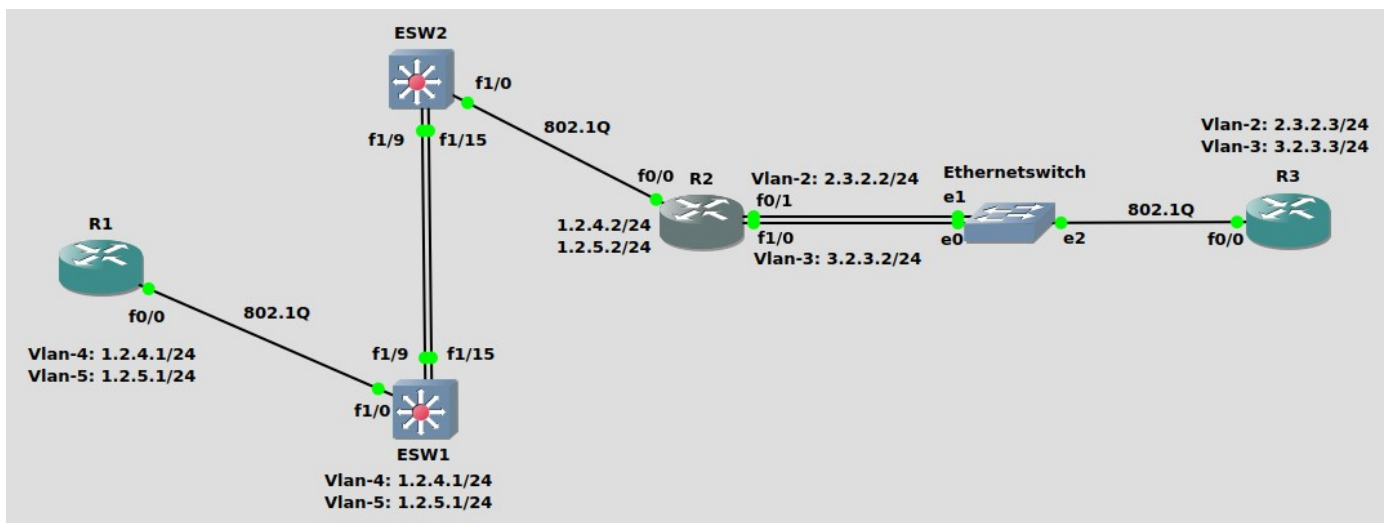
06 de Septiembre de 2019

1. Desarrollo

El objetivo de esta práctica es implementar switches de capa 3 y convertirlos a Servidor y Cliente VTP , utilizando el ISO del Router 3745. Configurar los Routers en diferentes VLANs. Además, configurar que los paquetes de ciertas VLANs se transmitan por interfaces específicas.

2. Topología

A continuación, creamos la topología con los elementos que necesitamos para el desarrollo de nuestra práctica.

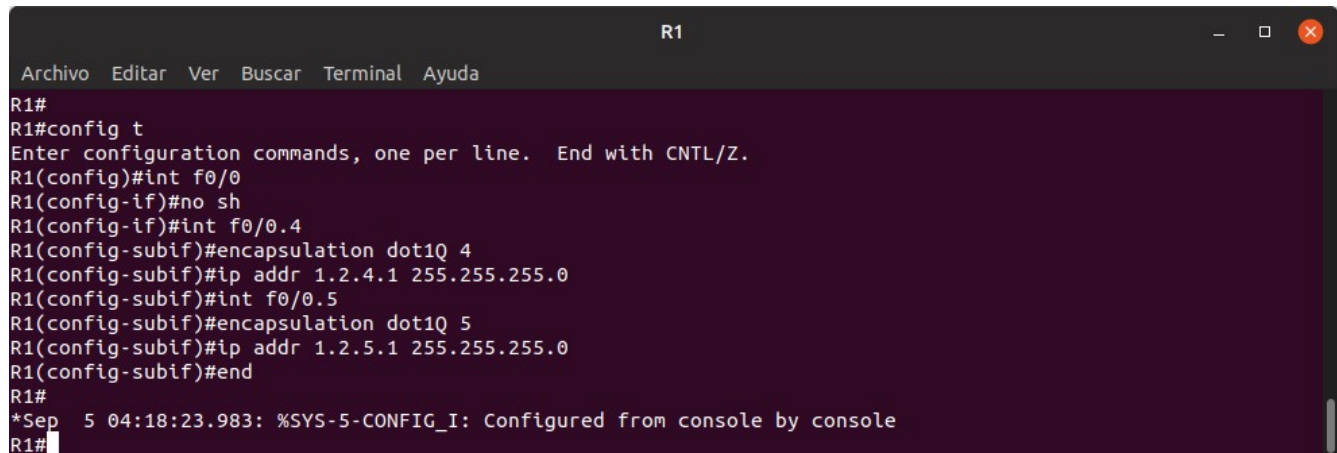


3. Configuración

1. Routers

Procedemos a hacer la configuración de los Routers, asignando las direcciones de las VLANs y haciendo el ruteo estático entre ellos.

Router1.



```
R1#
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int f0/0
R1(config-if)#no sh
R1(config-if)#int f0/0.4
R1(config-subif)#encapsulation dot1q 4
R1(config-subif)#ip addr 1.2.4.1 255.255.255.0
R1(config-subif)#int f0/0.5
R1(config-subif)#encapsulation dot1q 5
R1(config-subif)#ip addr 1.2.5.1 255.255.255.0
R1(config-subif)#end
R1#
*Sep 5 04:18:23.983: %SYS-5-CONFIG_I: Configured from console by console
R1#
```

Comandos:

```
> conf t
> int f0/0
> no sh
> int f0/0.4
> encapsulation dot1q 4
> ip addr 1.2.4.1 255.255.255.0
> int f0/0.5
> encapsulation dot1q 5
> ip addr 1.2.5.1 255.255.255.0
> end
```

Ahora para corroborar la asignación de las direcciones a las VLANs correctas, tecleamos:

```
> sh ip int br
```

Lo cual nos mostrará todas las interfaces y su información.

```
R1
Archivo  Editar  Ver  Buscar  Terminal  Ayuda
R1#sh ip int br
Interface                IP-Address      OK? Method Status        Protocol
FastEthernet0/0          unassigned      YES unset  up            up
FastEthernet0/0.4        1.2.4.1         YES manual  up            up
FastEthernet0/0.5        1.2.5.1         YES manual  up            up
FastEthernet0/1          unassigned      YES unset  administratively down down
FastEthernet1/0          unassigned      YES unset  administratively down down
FastEthernet2/0          unassigned      YES unset  administratively down down
FastEthernet3/0          unassigned      YES unset  administratively down down
FastEthernet4/0          unassigned      YES unset  administratively down down
FastEthernet5/0          unassigned      YES unset  administratively down down
Serial6/0                unassigned      YES unset  administratively down down
Serial6/1                unassigned      YES unset  administratively down down
--More--
```

Podemos observar, que a través de la interfaz f0/0 están correctamente agregadas las VLAN 4 y 5.

Router 2.

```
R2
Archivo  Editar  Ver  Buscar  Terminal  Ayuda
R2#
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int f0/0
R2(config-if)#int f0/0.4
R2(config-subif)#encapsulation dot1q 4
R2(config-subif)#ip addr 1.2.4.2 255.255.255.0
R2(config-subif)#int f0/0.5
R2(config-subif)#encapsulation dot1q 5
R2(config-subif)#ip addr 1.2.5.2 255.255.255.0
R2(config-subif)#int f0/0
R2(config-if)#no sh
R2(config-if)#
*Sep  5 04:26:13.695: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Sep  5 04:26:14.695: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#end
R2#
*Sep  5 04:26:27.319: %SYS-5-CONFIG_I: Configured from console by console
R2#
```

En el Router 2, haremos la configuración para las VLAN 4 y 5 con los mismos comandos del Router 1, cambiando solamente las direcciones IP.

```
R2
Archivo  Editar  Ver  Buscar  Terminal  Ayuda
R2#
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int f0/1
R2(config-if)#ip addr 2.3.2.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Sep  5 09:09:08.811: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Sep  5 09:09:09.811: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R2(config-if)#exit
R2(config)#int f1/0
R2(config-if)#ip addr 3.2.3.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Sep  5 09:09:48.167: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Sep  5 09:09:49.167: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#
```

En el mismo Router 2 configuramos las VLAN 2 y 3, en este caso no haremos una división del enlace, pues tenemos dos enlaces así que utilizaremos uno para cada uno.

Comandos:

```
> conf t
> int f0/1
> ip addr 2.3.2.2 255.255.255.0
> no sh
> int f1/0
> ip addr 3.2.3.2 255.255.255.0
> no sh
> end
```

Ahora, mostramos las interfaces ya asignadas en nuestro Router, podemos observar que están las VLAN 2, 3, 4 y 5.

```
R2
R2#sh ip int br
Interface                IP-Address    OK? Method Status        Protocol
FastEthernet0/0          unassigned    YES NVRAM    up            up
FastEthernet0/0.4        1.2.4.2       YES NVRAM    up            up
FastEthernet0/0.5        1.2.5.2       YES NVRAM    up            up
FastEthernet0/1          2.3.2.2       YES manual  up            up
FastEthernet1/0          3.2.3.2       YES manual  up            up
FastEthernet2/0          unassigned    YES NVRAM    administratively down down
FastEthernet3/0          unassigned    YES NVRAM    administratively down down
FastEthernet4/0          unassigned    YES NVRAM    administratively down down
FastEthernet5/0          unassigned    YES NVRAM    administratively down down
Serial6/0                unassigned    YES NVRAM    administratively down down
Serial6/1                unassigned    YES NVRAM    administratively down down
--More--
```

Para poder tener comunicación entre nuestros Routers, R2 y R3, hacemos uso del enrutamiento estático.

```
R2
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 2.3.2.0 255.255.255.0 f0/1
R2(config)#ip route 3.2.3.0 255.255.255.0 f1/0
R2(config)#ip route 1.2.4.0 255.255.255.0 f0/0.4
R2(config)#ip route 1.2.5.0 255.255.255.0 f0/0.5
R2(config)#end
R2#
```

Comandos:

```
> conf t
> ip route 2.3.2.0 255.255.255.0 f0/1
> ip route 3.2.3.0 255.255.255.0 f1/0
> ip route 1.2.4.0 255.255.255.0 f0/0.4
> ip route 1.2.5.0 255.255.255.0 f0/0.5
> end
```

Router 3.

Así como en nuestros Router 1 y 2, haremos la configuración de nuestras VLANs.

```
R3#
R3#config t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#int f0/0
R3(config-if)#no sh
R3(config-if)#
*Sep  5 09:16:55.227: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R3(config-if)#
*Sep  5 09:16:56.227: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#int f0/0.2
R3(config-subif)#encapsulation dot1Q 2
R3(config-subif)#ip addr 2.3.2.3 255.255.255.0
R3(config-subif)#int f0/0.3
R3(config-subif)#encapsulation dot1Q 3
R3(config-subif)#ip addr 3.2.3.3 255.255.255.0
R3(config-subif)#end
R3#
*Sep  5 09:18:26.395: %SYS-5-CONFIG_I: Configured from console by console
R3#
```

Mostramos la información.

```
R3#
R3#sh ip int br
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          unassigned      YES unset    up          up
FastEthernet0/0.2        2.3.2.3         YES manual    up          up
FastEthernet0/0.3        3.2.3.3         YES manual    up          up
FastEthernet0/1          unassigned      YES unset    administratively down down
FastEthernet1/0          unassigned      YES unset    administratively down down
FastEthernet2/0          unassigned      YES unset    administratively down down
FastEthernet3/0          unassigned      YES unset    administratively down down
FastEthernet4/0          unassigned      YES unset    administratively down down
FastEthernet5/0          unassigned      YES unset    administratively down down
Serial6/0                unassigned      YES unset    administratively down down
Serial6/1                unassigned      YES unset    administratively down down
--More--
```


Ingresamos las demás rutas por enrutamiento estático.

```
R3#
R3#config t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#ip route 2.3.2.0 255.255.255.0 f0/0.2
R3(config)#ip route 3.2.3.0 255.255.255.0 f0/0.3
R3(config)#end
R3#
*Sep  5 09:19:59.963: %SYS-5-CONFIG_I: Configured from console by console
R3#
```

2. Switch Capa 2

Por medio de la interfaz gráfica del Switch, agregamos las VLAN.

Node properties

Ethernetswitch configuration

General

Name: Ethernetswitch

Settings

Port: 3

VLAN: 3

Type: access

QinQ EtherType: 0x8100

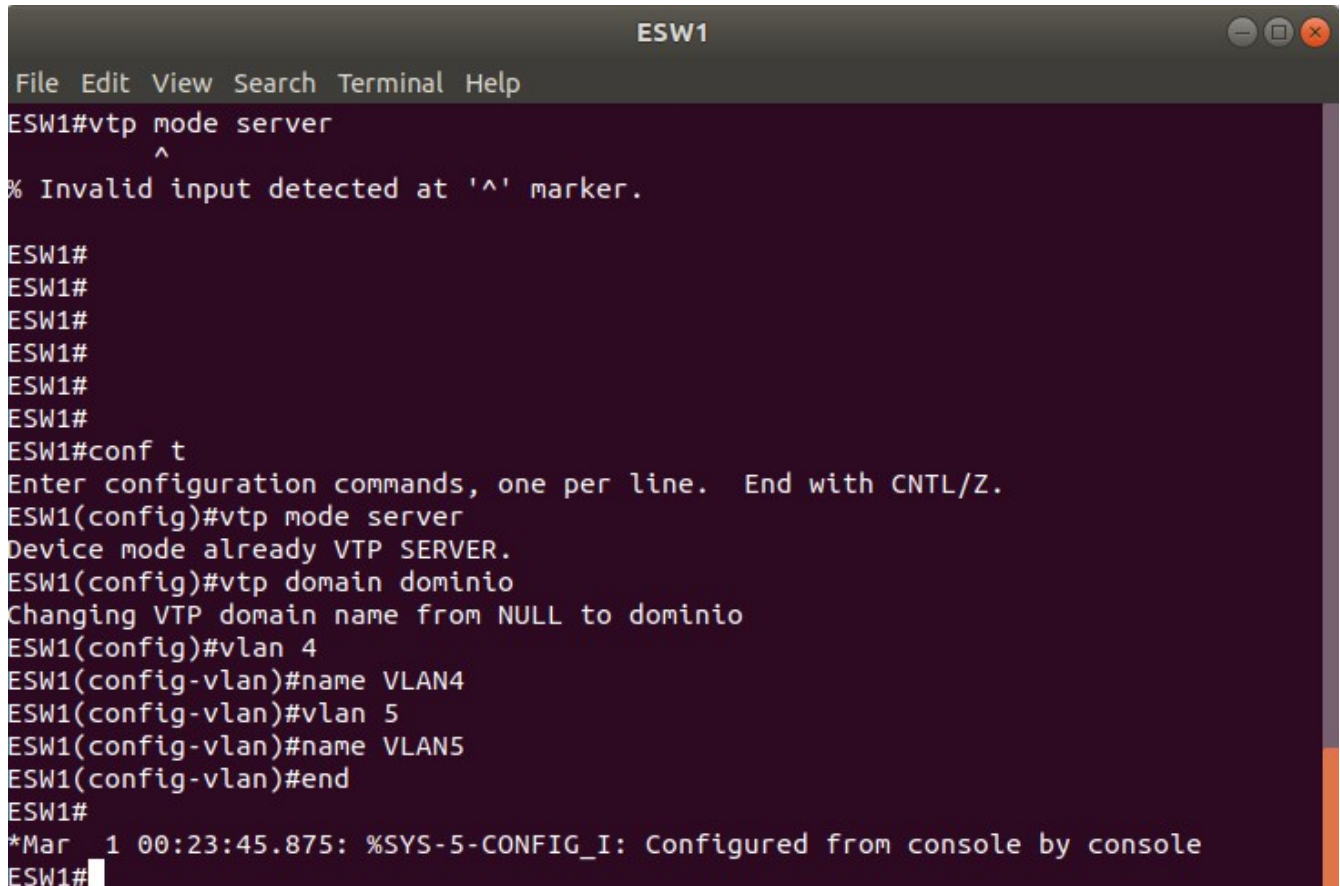
Ports

Port	VLAN	Type	EtherType
0	2	access	
1	3	access	
2	1	dot1q	

Buttons: Add, Delete, Reset, Apply, Cancel, OK

3. Switch Capa 3 VTP Servidor y Cliente

A continuación crearemos un Servidor VTP en un Switch de Capa 3 y le configuraremos las VLAN que le pertenecen.



```
ESW1
File Edit View Search Terminal Help
ESW1#vtp mode server
^
% Invalid input detected at '^' marker.

ESW1#
ESW1#
ESW1#
ESW1#
ESW1#
ESW1#
ESW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ESW1(config)#vtp mode server
Device mode already VTP SERVER.
ESW1(config)#vtp domain dominio
Changing VTP domain name from NULL to dominio
ESW1(config)#vlan 4
ESW1(config-vlan)#name VLAN4
ESW1(config-vlan)#vlan 5
ESW1(config-vlan)#name VLAN5
ESW1(config-vlan)#end
ESW1#
*Mar  1 00:23:45.875: %SYS-5-CONFIG_I: Configured from console by console
ESW1#
```

Comandos:

```
> conf t
> vtp mode server
> vtp domain dominio
> vlan 4
> name VLAN4
> vlan 5
> name VLAN5
```

Ahora, configuraremos el protocolo Trunk para que puedan comunicarse entre Switches, en este caso, entre Servidor y Cliente VTP.

```
ESW1
File Edit View Search Terminal Help
ESW1#wr
Building configuration...
[OK]
ESW1#
ESW1#
ESW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ESW1(config)#int f1/0
ESW1(config-if)#switchport trunk encapsulation dot1q
ESW1(config-if)#switchport mode trunk
ESW1(config-if)#exit
*Mar  1 00:33:15.331: %DTP-5-TRUNKPORTON: Port Fa1/0 has become dot1q trunk
ESW1(config-if)#exit
ESW1(config)#int f1/9
ESW1(config-if)#switchport mode trunk
ESW1(config-if)#exit
*Mar  1 00:33:29.107: %DTP-5-TRUNKPORTON: Port Fa1/9 has become dot1q trunk
ESW1(config-if)#exit
ESW1(config)#int f1/15
ESW1(config-if)#switchport mode trunk
ESW1(config-if)#
*Mar  1 00:33:43.327: %DTP-5-TRUNKPORTON: Port Fa1/15 has become dot1q trunk
ESW1(config-if)#exit
ESW1(config)#
```

Comandos:

```
> conf t
> int f1/0
> switchport trunk encapsulation dot1q
> switchport mode trunk
> exit
-----
> int f1/9
> switchport mode trunk
> exit
-----
> int f1/15
> switchport mode trunk
> exit
```

Verificamos que estén activadas las VLAN, tecleando:

> sh vlan-switch br

```
*Mar  1 00:23:45.875: %SYS-5-CONFIG_I: Configured from console by console
ESW1#sh vlan-switch br
```

VLAN	Name	Status	Ports
1	default	active	Fa1/0, Fa1/1, Fa1/2, Fa1/3 Fa1/4, Fa1/5, Fa1/6, Fa1/7 Fa1/8, Fa1/9, Fa1/10, Fa1/11 Fa1/12, Fa1/13, Fa1/14, Fa1/15
4	VLAN4	active	
5	VLAN5	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
ESW1#
```

Procedemos a configurar el Switch 2, es decir, nuestro Cliente VTP.

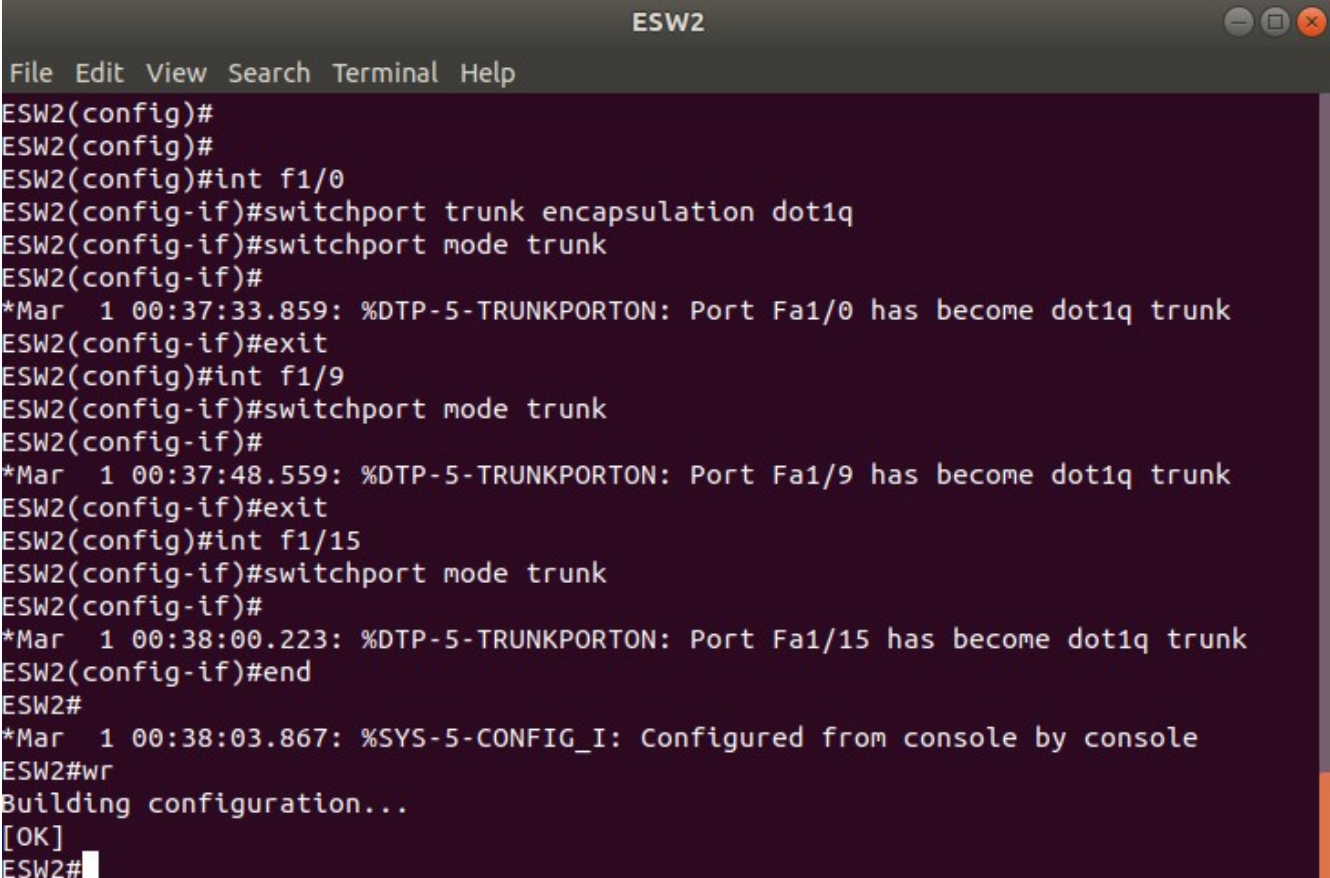
```
ESW2
ESW2#
ESW2#vtp mode client
^
% Invalid input detected at '^' marker.

ESW2#
ESW2#
ESW2#
ESW2#
ESW2#
ESW2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
ESW2(config)#vtp mode client
Setting device to VTP CLIENT mode.
ESW2(config)#
*Mar  1 00:24:40.843: %SYS-3-CPUHOG: Task is running for (2028)msecs, more than
(2000)msecs (1/1),process = Exec.
-Traceback= 0x60AA55BC 0x60A9A6A8 0x60A9AA80 0x60A9AAF8 0x60A9AB24 0x60BA74AC 0x
614D5078 0x614F8E3C 0x62B1AED8 0x62B1AEBC
ESW2(config)#vtp domain dominio
Changing VTP domain name from NULL to dominio
ESW2(config)#
```

Comandos:

```
> conf t
> vtp mode client
> vtp domain dominio
```

De igual forma como en el Servidor, configuraremos el protocolo Trunk en nuestro Cliente.



```
ESW2
File Edit View Search Terminal Help
ESW2(config)#
ESW2(config)#
ESW2(config)#int f1/0
ESW2(config-if)#switchport trunk encapsulation dot1q
ESW2(config-if)#switchport mode trunk
ESW2(config-if)#
*Mar  1 00:37:33.859: %DTP-5-TRUNKPORTON: Port Fa1/0 has become dot1q trunk
ESW2(config-if)#exit
ESW2(config)#int f1/9
ESW2(config-if)#switchport mode trunk
ESW2(config-if)#
*Mar  1 00:37:48.559: %DTP-5-TRUNKPORTON: Port Fa1/9 has become dot1q trunk
ESW2(config-if)#exit
ESW2(config)#int f1/15
ESW2(config-if)#switchport mode trunk
ESW2(config-if)#
*Mar  1 00:38:00.223: %DTP-5-TRUNKPORTON: Port Fa1/15 has become dot1q trunk
ESW2(config-if)#end
ESW2#
*Mar  1 00:38:03.867: %SYS-5-CONFIG_I: Configured from console by console
ESW2#wr
Building configuration...
[OK]
ESW2#
```

4. Pruebas

Podemos observar que hacemos ping entre todos los Routers y los paquetes llegan completamente.

```
R1
Archivo  Editar  Ver  Buscar  Terminal  Ayuda
R1#ping 1.2.4.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.2.4.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms
R1#ping 1.2.5.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.2.5.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/16 ms
R1#ping 2.3.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.3.2.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 8/10/12 ms
R1#ping 3.2.3.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.2.3.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 8/14/20 ms
R1#ping 2.3.2.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.3.2.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/40 ms
R1#ping 3.2.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.2.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/30/40 ms
R1#
```