



# Instituto Politécnico Nacional



Escuela Superior de Cómputo

**PRACTICE\_ROUTING\_MULTILAYER\_SWITCHING**

Materia:

Administración de servicios en red

Grupo:

4CV13

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Arévalo Andrade Miguel Ángel  
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Pedroza García Rodolfo

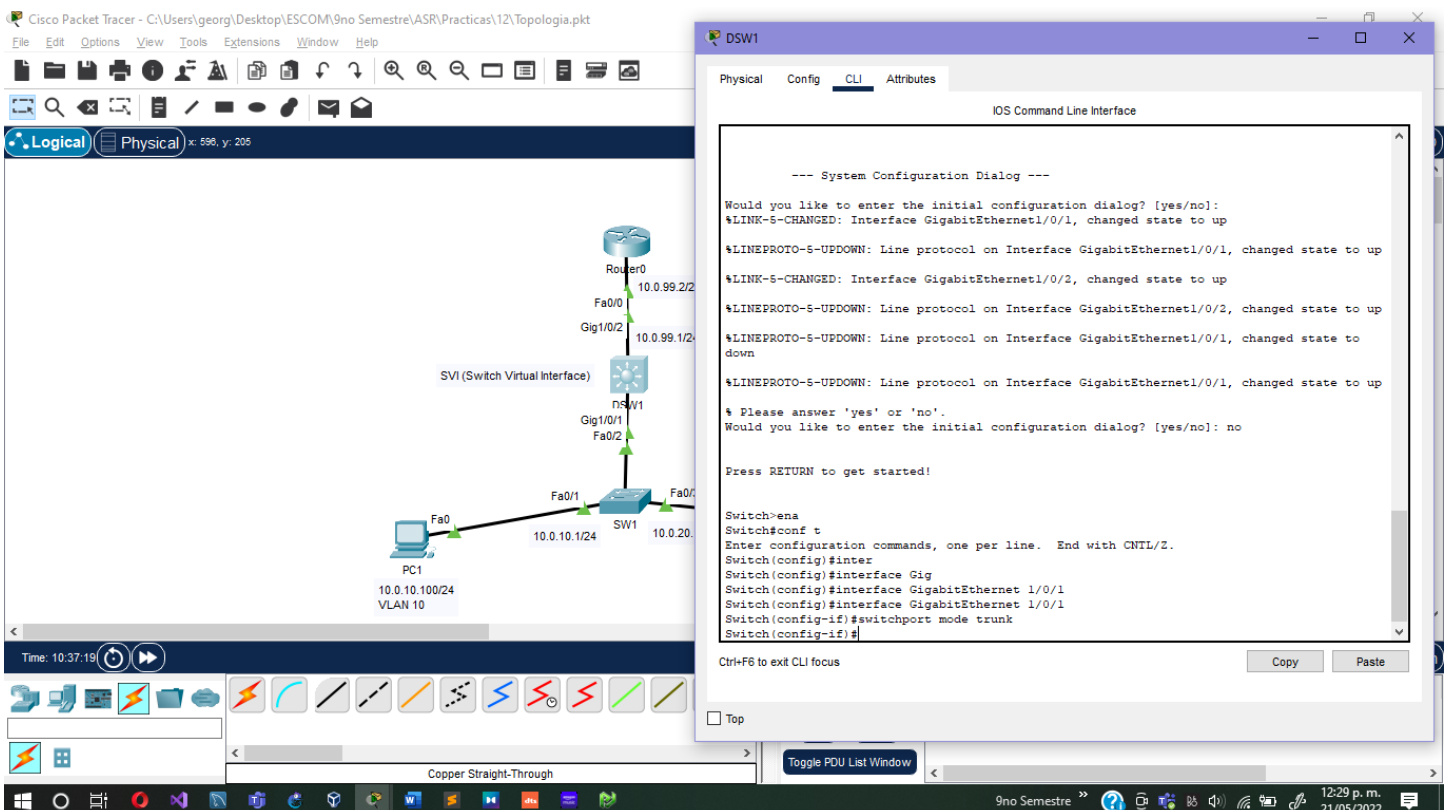
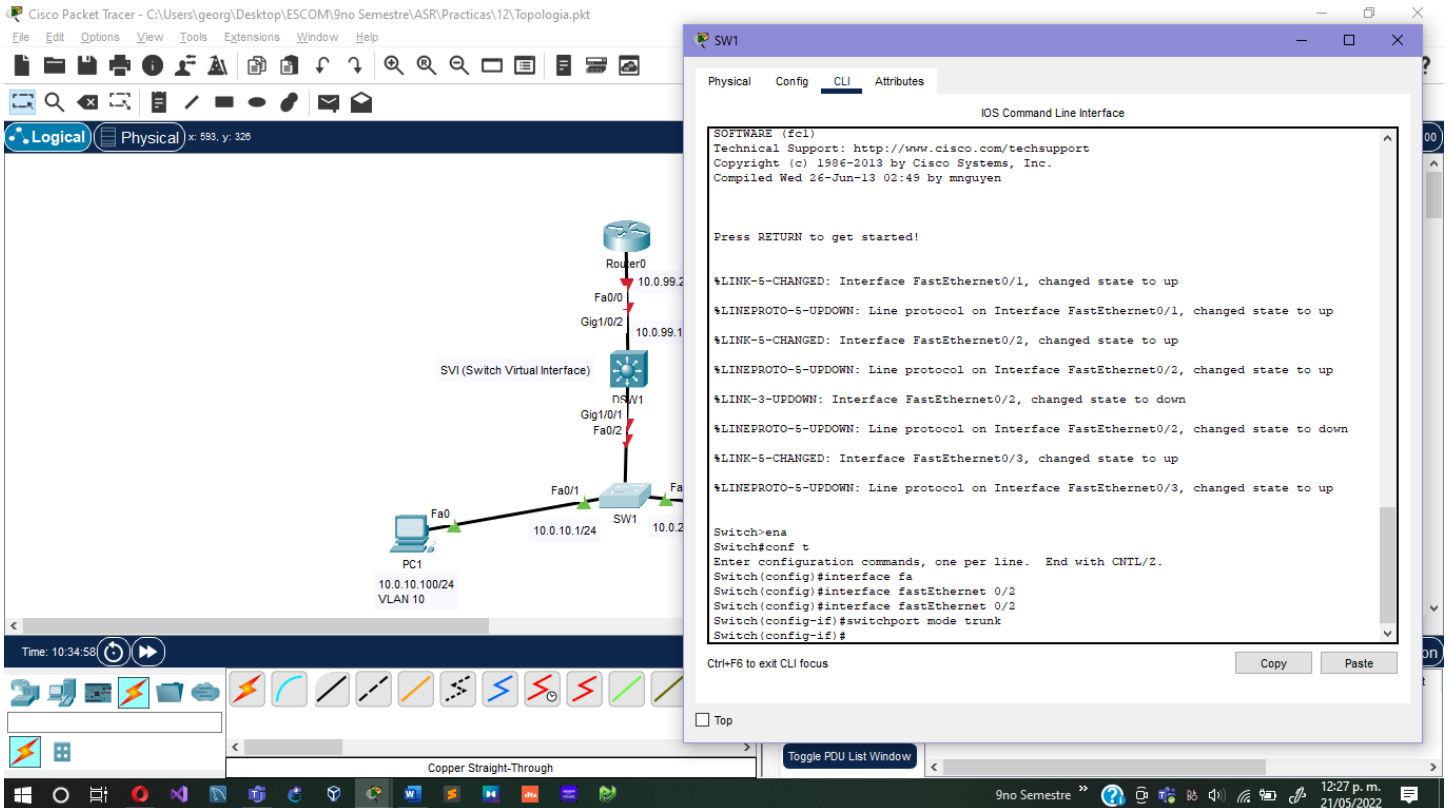
Fecha:

lunes, 23 de mayo de 2022

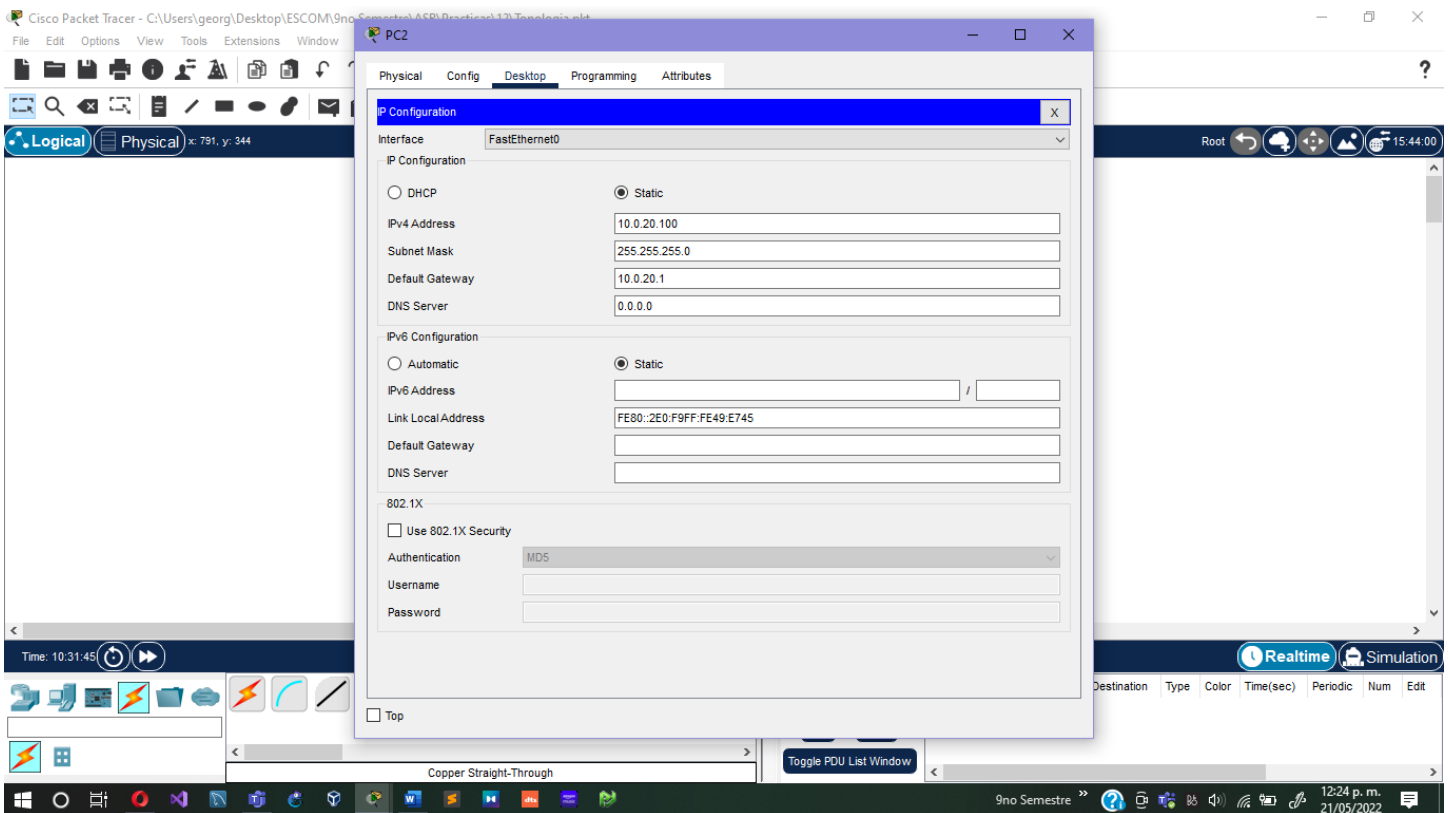
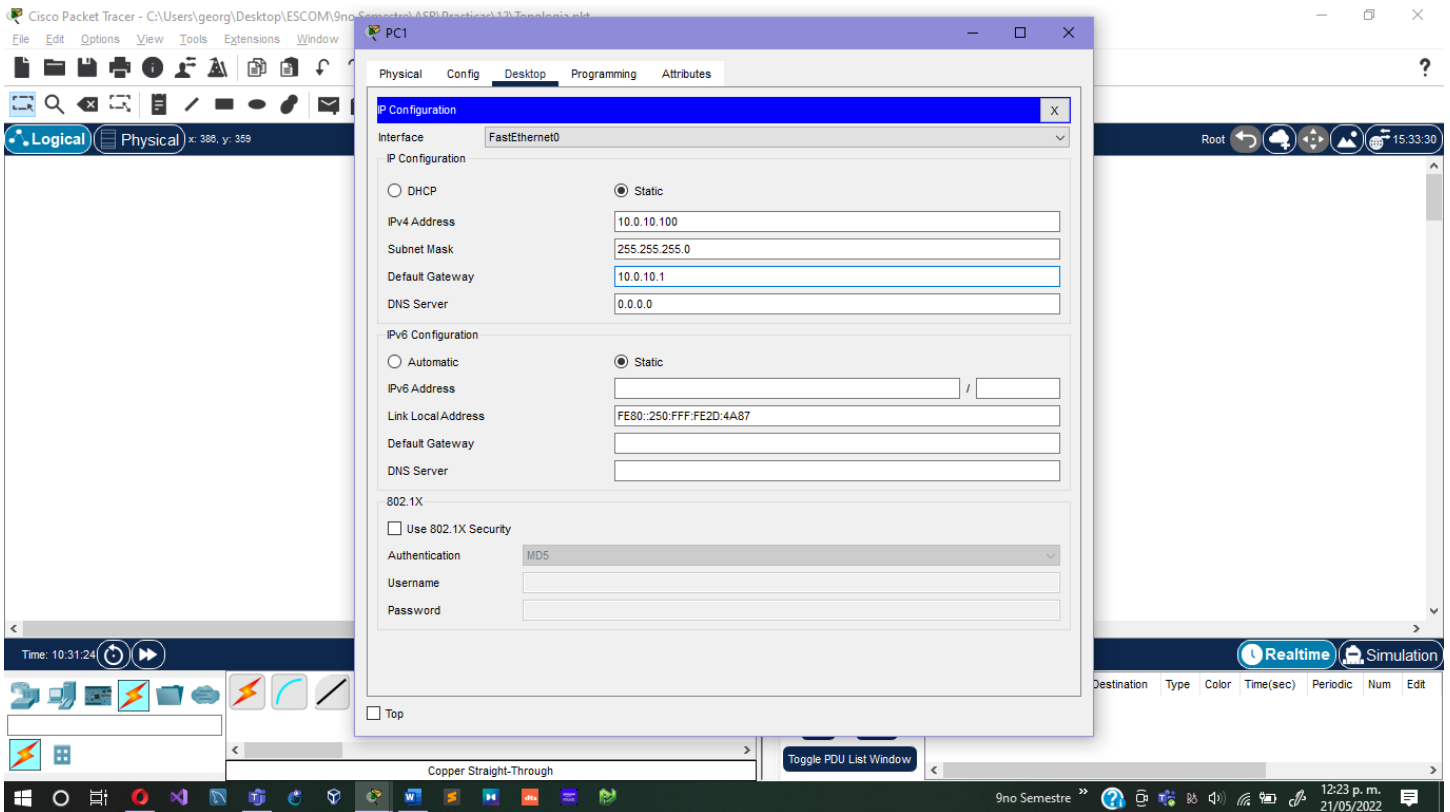
# PRÁCTICA: ENRUTAMIENTO EN UN INTERRUPTOR MULTICAPA

En esta práctica, aprenderá a configurar una SVI (interfaz virtual de conmutador), puertos enrutados y enrutamiento en un conmutador multicapa.

- Los puertos en SW1 deben configurarse para tener PC1 en VLAN 10 y PC2 en VLAN 20.
- El enlace entre SW1 y DSW1 está configurado como enlace troncal.



- PC1 y PC2 están configurados con direcciones.



- R1 está configurado con direcciones IP y EIGRP.

Router0

Physical Config CLI Attributes

IOS Command Line Interface

```
191K bytes of NVRAM.
63488K bytes of ATA CompactFlash (Read/Write)
Cisco IOS Software, 1841 Software (C1841-ADVIPSERVICESK9-M), Version 12.4(15)T1, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 18-Jul-07 04:52 by pt_team

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>ena
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#inter
Router(config)#interface fa
Router(config)#interface fastEthernet 0
Router(config)#interface fastEthernet 0/0
Router(config)#interface fastEthernet 0/0
Router(config-if)#ip add
Router(config-if)#ip address 10.0.99.2 255.255.255.0
Router(config-if)#no shut

Router(config-if)#
%LINK-S-CHANGED: Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#router eigrp 1
Router(config-router)#network 10.0.0.0
Router(config-router)#no auto
Router(config-router)#no auto-summary
Router(config-router)#exit
Router(config)#
```

Ctrl+F6 to exit CLI focus

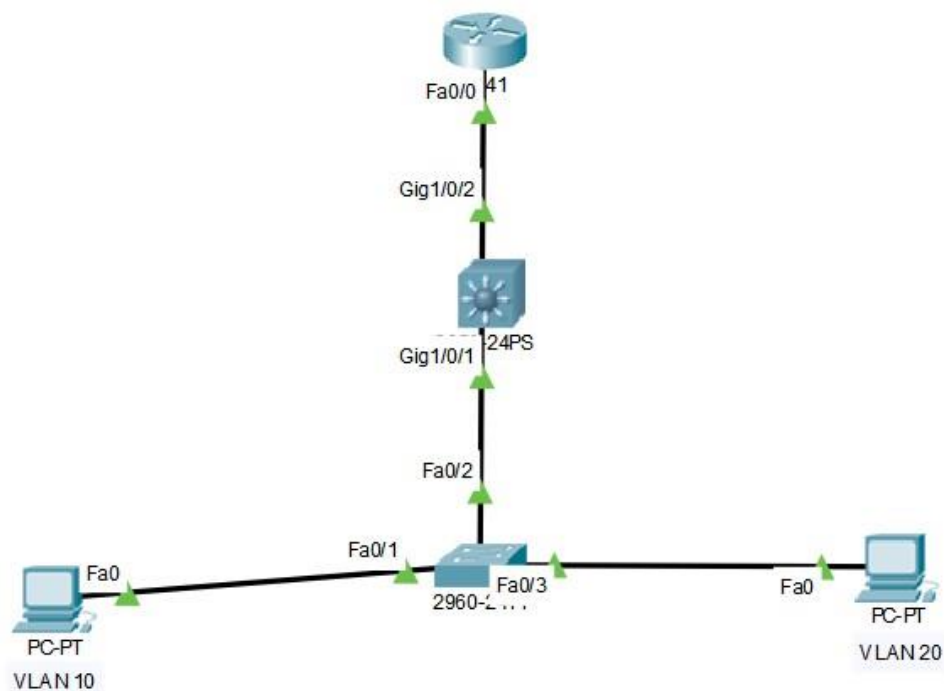
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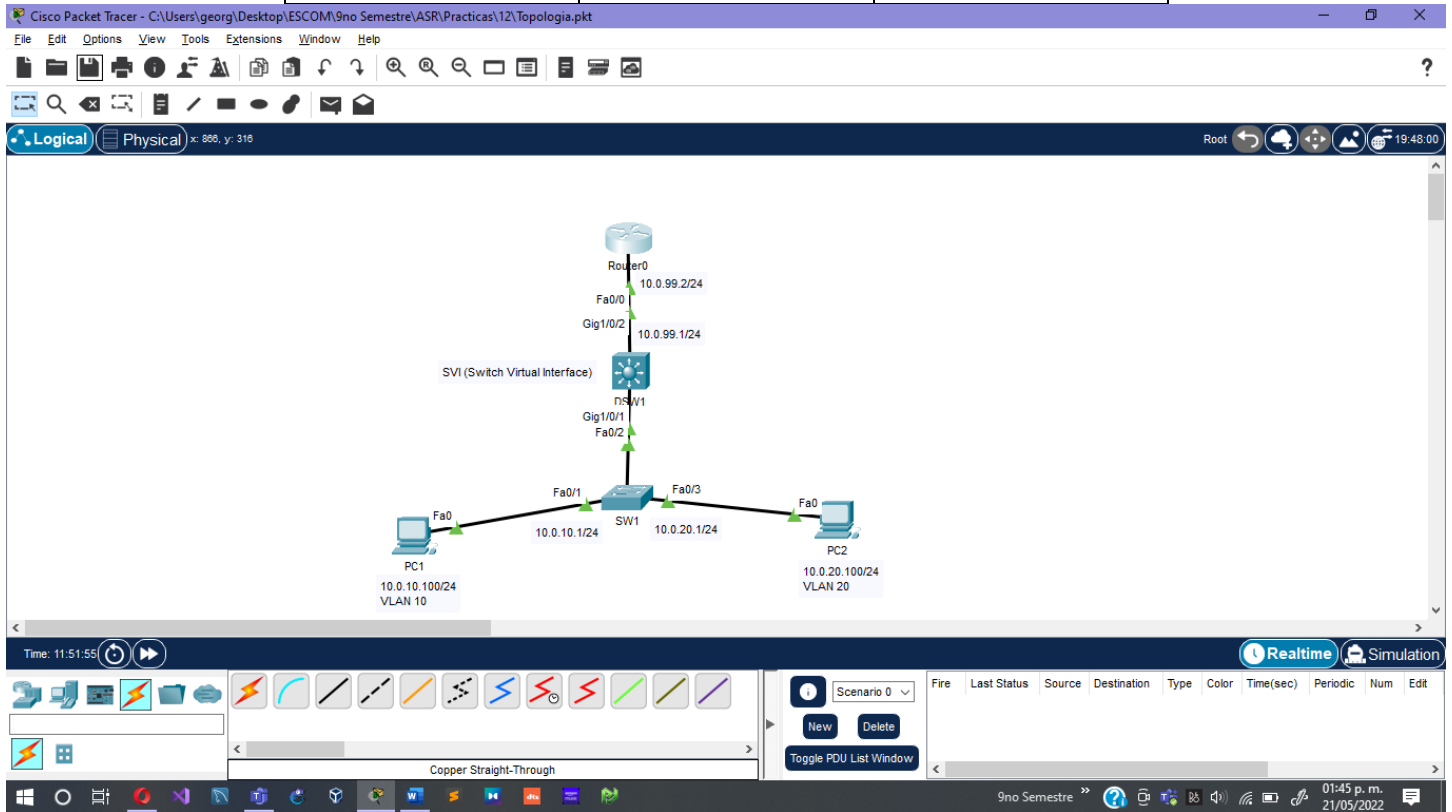
- Configure DSW1 para enrutar entre PC1 y PC2.

## TOPOLOGY



DEVICE	INTERFACE	IP ADDRESS
PC1	FA0/0	10.0.10.100/24
PC2	FA0/0	10.0.20.100/24

SW1	VLAN 10	10.0.10.1/24
SW1	VLAN 20	10.0.20.1/24
DSW1	G1/0/2	10.0.99.1/24
R1	FA0/0	10.0.99.2/24



## Task 1: Routing on a Multilayer Switch

### Activity

#### Step 1

On DSW1, create VLANs 10 and 20.

```
DSW1(config)# vlan 10
DSW1(config-vlan)# vlan 20
```

If a VLAN that is to be routed by an SVI does not exist on the multilayer switch, you must create it.

In this example, VLANs 10 and 20 were already preconfigured on DSW1 and you could have verified that with the **show vlan** command. However, these VLANs will not be present on a new device and if you forget to configure them, the switch will not be able to perform inter-VLAN routing.

The screenshot displays the Cisco Packet Tracer interface. On the left, a network topology is visible, featuring a router (Router0) connected to a switch (DSW1) via a GigabitEthernet interface. A PC (PC1) is connected to the switch. The switch is configured with VLAN 10, and the PC is assigned the IP address 10.0.10.100/24. The switch is also connected to a server (SVI) via a GigabitEthernet interface.

On the right, the CLI window for DSW1 is open, showing the configuration process. The configuration commands entered are:

```
Switch>ena
Switch#conf t
Switch(config)#interface Gig
Switch(config)#interface GigabitEthernet 1/0/1
Switch(config)#interface GigabitEthernet 1/0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#vlan 10
Switch(config-vlan)#vlan 20
Switch(config-vlan)#
```

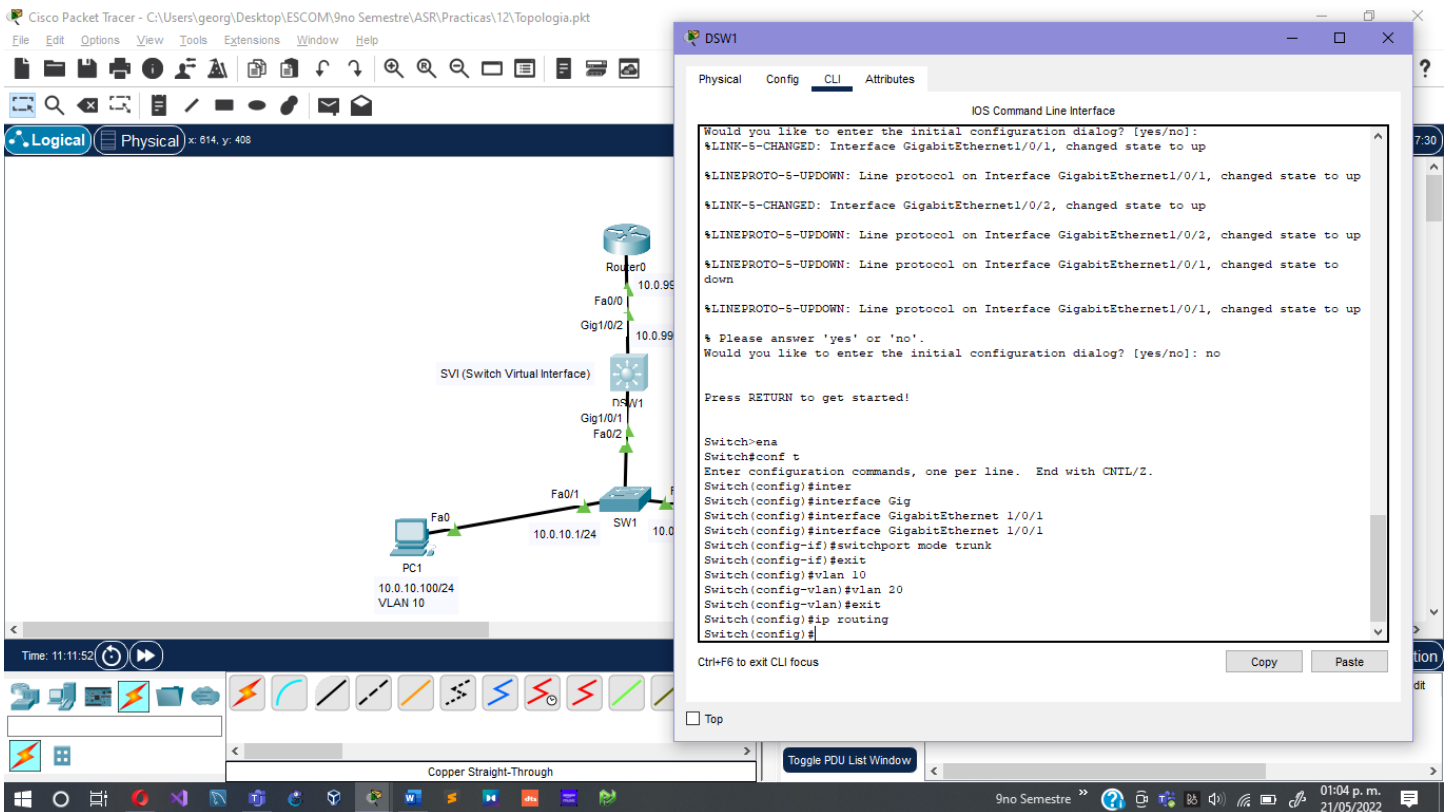
The CLI window also displays the system configuration dialog, which prompts the user to enter the initial configuration dialog. The user has responded with 'no'.

#### Step 2

On DSW1, enable IPv4 routing.

```
DSW1(config)# ip routing
```

Multilayer switches might or might not have IP routing that is enabled by default. In order for the switch to route between SVIs, you will need to enable IPv4 routing.



### Step 3

On DSW1, configure an SVI for VLAN 10 with the IP address 10.0.10.1/24.

PC1 is in VLAN 10 and is already configured with a default gateway of 10.0.10.1. You can now configure this IP address on DSW1.

```
DSW1(config)# interface vlan 10
DSW1(config-if)# ip address 10.0.10.1 255.255.255.0
DSW1(config-if)# no shutdown
```

You need to create an SVI for each VLAN that is to be routed within the multilayer switch.

SVI needs to be enabled with the **no shutdown** command. Otherwise it will stay in the "administratively shutdown" state.

Cisco Packet Tracer - C:\Users\georg\Desktop\ESCOM\9no Semestre\ASR\Praticas\12\Topologia.pkt

File Edit Options View Tools Extensions Window Help

Logical Physical x: 614, y: 408

Time: 11:17:03

Copper Straight-Through

DSW1

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to up
% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Switch>ena
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#inter
Switch(config)#interface Gig
Switch(config)#interface GigabitEthernet 1/0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#vlan 10
Switch(config-vlan)#vlan 20
Switch(config-vlan)#exit
Switch(config)#ip routing
Switch(config)#inter
Switch(config)#interface vl
Switch(config)#interface vlan 10
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up

Switch(config-if)#ip add
Switch(config-if)#ip address 10.0.10.1 255.255.255.0
Switch(config-if)#no shut
Switch(config-if)#no shutdown
Switch(config-if)#
```

Ctrl+F6 to exit CLI focus

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Toggle PDU List Window

9no Semestre 01:09 p.m. 21/05/2022

#### Step 4

On DSW1, configure an SVI for VLAN 20 with the IP address 10.0.20.1/24.

PC2 is in VLAN 20 and is already configured with the default gateway of 10.0.20.1. You can now configure this IP address on DSW1.

```
DSW1(config)# interface vlan 20
DSW1(config-if)# ip address 10.0.20.1 255.255.255.0
DSW1(config-if)# no shutdown
```

Cisco Packet Tracer - C:\Users\georg\Desktop\ESCOM\9no Semestre\ASR\Praticas\12\Topologia.pkt

File Edit Options View Tools Extensions Window Help

Logical Physical x: 614, y: 408

Time: 11:18:13

Copper Straight-Through

DSW1

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch(config)#interface Gig
Switch(config)#interface GigabitEthernet 1/0/1
Switch(config)#interface GigabitEthernet 1/0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#vlan 10
Switch(config-vlan)#vlan 20
Switch(config-vlan)#exit
Switch(config)#ip routing
Switch(config)#inter
Switch(config)#interface vl
Switch(config)#interface vlan 10
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up

Switch(config-if)#ip add
Switch(config-if)#ip address 10.0.10.1 255.255.255.0
Switch(config-if)#no shut
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#inter
Switch(config)#interface vl
Switch(config)#interface vlan 20
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan20, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan20, changed state to up

Switch(config-if)#ip add
Switch(config-if)#ip address 10.0.20.1 255.255.255.0
Switch(config-if)#no shut
Switch(config-if)#no shutdown
Switch(config-if)#
```

Ctrl+F6 to exit CLI focus

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Toggle PDU List Window

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### Step 5

On DSW1, verify the IP interface configuration for VLANs 10 and 20.

```
DSW1# show ip interface brief
<... output omitted ...>
Vlan10      10.0.10.1      YES manual up
Vlan20      10.0.20.1      YES manual up
```

In order for the SVIs to be fully operational, they need to have the correct IP address configured and in the "up/up" state.

The screenshot shows the DSW1 CLI interface with the 'show ip interface brief' command executed. The output lists all interfaces and their status. The relevant lines for VLANs 10 and 20 are highlighted in yellow.

```
Switch(config)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#show ip interface brief
Interface      IP-Address      OK? Method Status      Protocol
GigabitEthernet1/0/1  unassigned     YES unset  up          up
GigabitEthernet1/0/2  unassigned     YES unset  up          up
GigabitEthernet1/0/3  unassigned     YES unset  down        down
GigabitEthernet1/0/4  unassigned     YES unset  down        down
GigabitEthernet1/0/5  unassigned     YES unset  down        down
GigabitEthernet1/0/6  unassigned     YES unset  down        down
GigabitEthernet1/0/7  unassigned     YES unset  down        down
GigabitEthernet1/0/8  unassigned     YES unset  down        down
GigabitEthernet1/0/9  unassigned     YES unset  down        down
GigabitEthernet1/0/10 unassigned     YES unset  down        down
GigabitEthernet1/0/11 unassigned     YES unset  down        down
GigabitEthernet1/0/12 unassigned     YES unset  down        down
GigabitEthernet1/0/13 unassigned     YES unset  down        down
GigabitEthernet1/0/14 unassigned     YES unset  down        down
GigabitEthernet1/0/15 unassigned     YES unset  down        down
GigabitEthernet1/0/16 unassigned     YES unset  down        down
GigabitEthernet1/0/17 unassigned     YES unset  down        down
GigabitEthernet1/0/18 unassigned     YES unset  down        down
GigabitEthernet1/0/19 unassigned     YES unset  down        down
GigabitEthernet1/0/20 unassigned     YES unset  down        down
GigabitEthernet1/0/21 unassigned     YES unset  down        down
GigabitEthernet1/0/22 unassigned     YES unset  down        down
GigabitEthernet1/0/23 unassigned     YES unset  down        down
GigabitEthernet1/0/24 unassigned     YES unset  down        down
GigabitEthernet1/1/1  unassigned     YES unset  down        down
GigabitEthernet1/1/2  unassigned     YES unset  down        down
GigabitEthernet1/1/3  unassigned     YES unset  down        down
GigabitEthernet1/1/4  unassigned     YES unset  down        down
Vlan1          unassigned     YES unset  administratively down down
Vlan10         10.0.10.1      YES manual up          up
Vlan20         10.0.20.1      YES manual up          up
Switch#
Switch#
```

Ctrl+F6 to exit CLI focus

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### Step 6

Use the **traceroute** command to test connectivity between PC1 and PC2.

```
PC1# traceroute 10.0.20.100
Type escape sequence to abort.
Tracing the route to 10.0.20.100
VRF info: (vrf in name/id, vrf out name/id)
 0 10.0.10.1 1001 msec 1 msec 0 msec
 1 *
 2 10.0.20.100 1 msec
```

You should be able to ping from PC1 to PC2. The traffic from PC1 goes through SW1 to the SVI for VLAN 10 on DSW1, gets routed to the SVI for VLAN 20 on DSW1, and then goes through SW1 to PC2. The reverse path is the same.

### Step 7

On DSW1, change the interface that connects to R1 (Ethernet 0/2) into a routed interface. Configure it with the IP address 10.0.99.1/24.

The link between DSW1 and R1 should be a Layer 3 link. The R1 interface is already configured with an IP address.

```
DSW1(config)# interface ethernet 0/2
DSW1(config-if)# no switchport
*Nov 28 15:03:55.138: %LINK-3-UPDOWN: Interface Ethernet0/2, changed state to up
*Nov 28 15:03:56.142: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/2, changed state to up
DSW1(config-if)# ip address 10.0.99.1 255.255.255.0
```

When you enter the **no switchport** command for an interface, it changes it from a Layer 2 interface to a Layer 3 interface.

When you issue the **no switchport** command, the interface will be shut down and then brought back up. When you put the interface into Layer 3 mode, you delete all Layer 2 configuration on the interface.

The screenshot shows the Cisco Packet Tracer interface with a network topology. A router (R1) is connected to a switch (DSW1) via GigabitEthernet1/0/2. DSW1 is connected to a PC (PC1) via Ethernet0/24. The PC is in VLAN 10. The CLI window for DSW1 shows the following configuration:

```
Switch(config-if)#exit
Switch(config)#interface GigabitEthernet1/0/2
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface GigabitEthernet1/0/2
Switch(config-if)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#inter
Switch(config)#interface eth
Switch(config)#interface ether
Switch(config)#interface ethernet 0/2
Switch(config)#interface ethernet 0/2
^
% Invalid input detected at '^' marker.

Switch(config)#inter gig
Switch(config)#inter gigabitEthernet 1/0/2
Switch(config-if)#no s
Switch(config-if)#no swi
Switch(config-if)#no switchport
Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to up

Switch(config-if)#ip add
Switch(config-if)#ip address 10.0.99.1 255.255.255.0
Switch(config-if)#exit
Switch(config)#
```

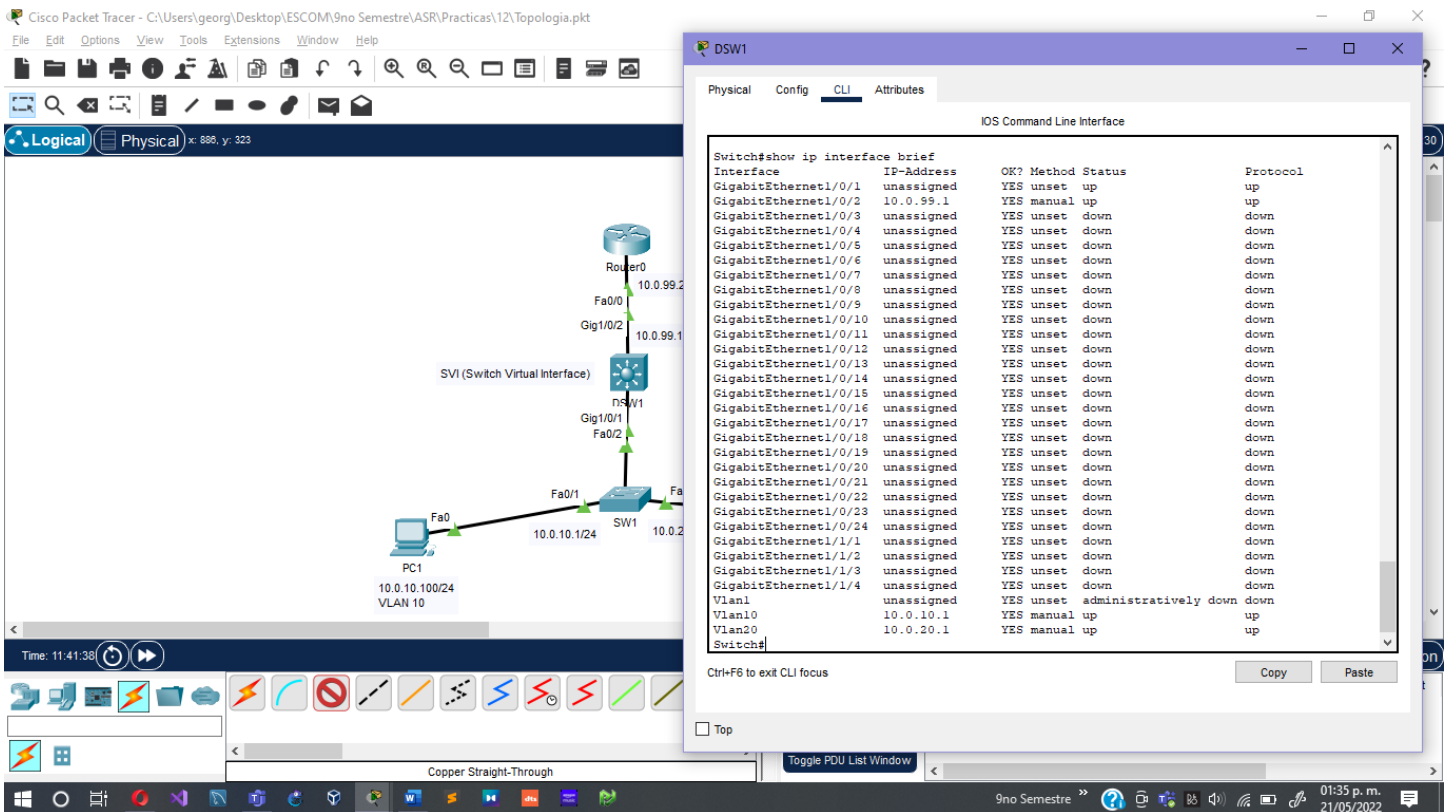
### Step 8

On DSW1, verify the configuration for the routed port IP interface.

```
DSW1# show ip interface brief
Interface      IP-Address      OK? Method Status      Protocol
Ethernet0/0    unassigned      YES unset  up          up
Ethernet0/1    unassigned      YES unset  up          up
Ethernet0/2    10.0.99.1       YES manual up          up
```

```
Ethernet0/2    10.0.99.1       YES manual up          up
<... output omitted ...>
```

The routed interface on DSW1 has an IP address that is configured and is in the "up/up" state. The interface functions like a port on a router.



## Step 9

On DSW1, configure EIGRP with [AS 1](#). Enable the VLAN 10, VLAN 20, and Ethernet 0/2 interfaces for EIGRP.

When a multilayer switch is configured with Layer 3 IP addresses, it starts behaving like a router because it has connections to different subnets. Communication between these subnets is no longer possible by using Layer 2 protocols. A major difference between a multilayer switch and a router is that the multilayer switch does not route by default. To allow routing behavior, you first need to enable routing with the **ip routing** command. Once routing is enabled, you can configure static routes or dynamic routing, or both, just like on a router.

R1 is already configured to exchange routes through EIGRP.

```
DSW1(config)# router eigrp 1
DSW1(config-router)# network 10.0.0.0
*Nov 28 15:12:22.448: %DUAL-5-NBRCHANGE: EIGRP-IPv4 1: Neighbor 10.0.99.2 (Ethernet0/2) is up: new adjacency
```

```
DSW1(config)# router eigrp 1
DSW1(config-router)# network 10.0.0.0
*Nov 28 15:12:22.448: %DUAL-5-NBRCHANGE: EIGRP-IPv4 1: Neighbor 10.0.99.2 (Ethernet0/2) is up: new adjacency
```

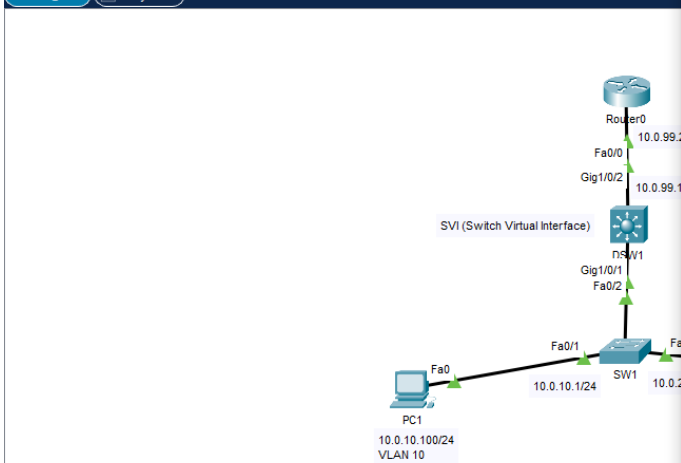
Issuing the **network 10.0.0.0** command will enable all interfaces that are configured with an IP address within the 10.0.0.0/8 subnet. The Ethernet 0/2, VLAN 10, and VLAN 20 interfaces on DSW1 will be enabled for EIGRP.

DSW1 established an EIGRP adjacency with R1.





Logical Physical x: 888, y: 323



Time: 11:49:12



Copper Straight-Through

Toggle PDU List Window

DSW1

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch#ip routing
^
% Invalid input detected at '^' marker.

Switch#ip ?
^
% Unrecognised command

Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#router eigrp 1
Switch(config-router)#network 10.0.0.0
Switch(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 10.0.99.2 (GigabitEthernet1/0/2) is up: new adjacency

Switch(config-router)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
        i - IS-IS, 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

    10.0.0.0/24 is subnetted, 3 subnets
C       10.0.10.0 is directly connected, Vlan10
C       10.0.20.0 is directly connected, Vlan20
C       10.0.99.0 is directly connected, GigabitEthernet1/0/2

Switch#
```

Ctrl+F6 to exit CLI focus

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## **Conclusiones:**

### **Arévalo Andrade Miguel Ángel:**

Se logró configurar una SVI (interfaz virtual de conmutador), puertos enrutados y enrutamiento en un conmutador multicapa.

- Los puertos en SW1 se configuraron para tener PC1 en VLAN 10 y PC2 en VLAN 20.
- El enlace entre SW1 y DSW1 se configuró como enlace troncal.

### **Castro Cruces Jorge Eduardo:**

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### **López Mares Irene Elizabeth:**

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- El enlace entre SW1 y DSW1 se configuró como enlace troncal.

### **Pedroza García Rodolfo:**

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- Los puertos en SW1 se configuraron para tener PC1 en VLAN 10 y PC2 en VLAN 20.
- El enlace entre SW1 y DSW1 se configuró como enlace troncal.