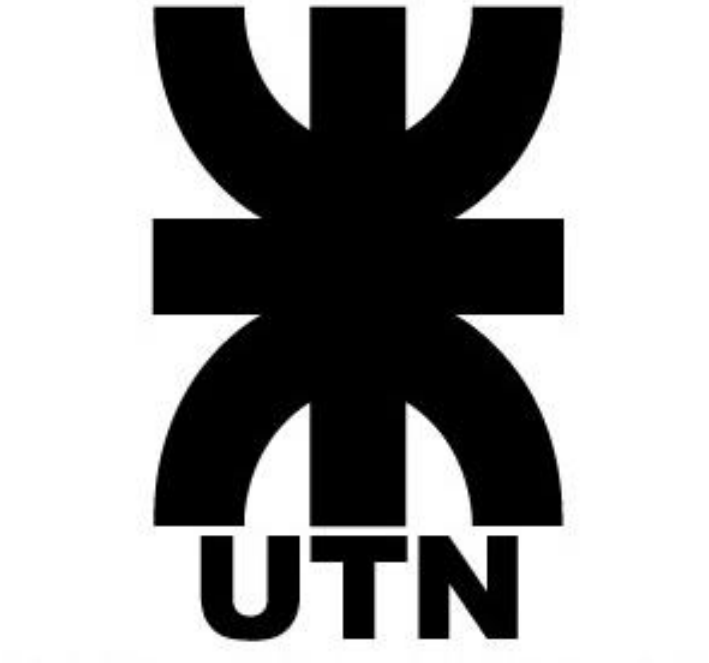
Universidad Tecnológica Nacional



Facultad Regional Delta

Redes de información

2024

Trabajo Práctico N°11 | Frame Relay

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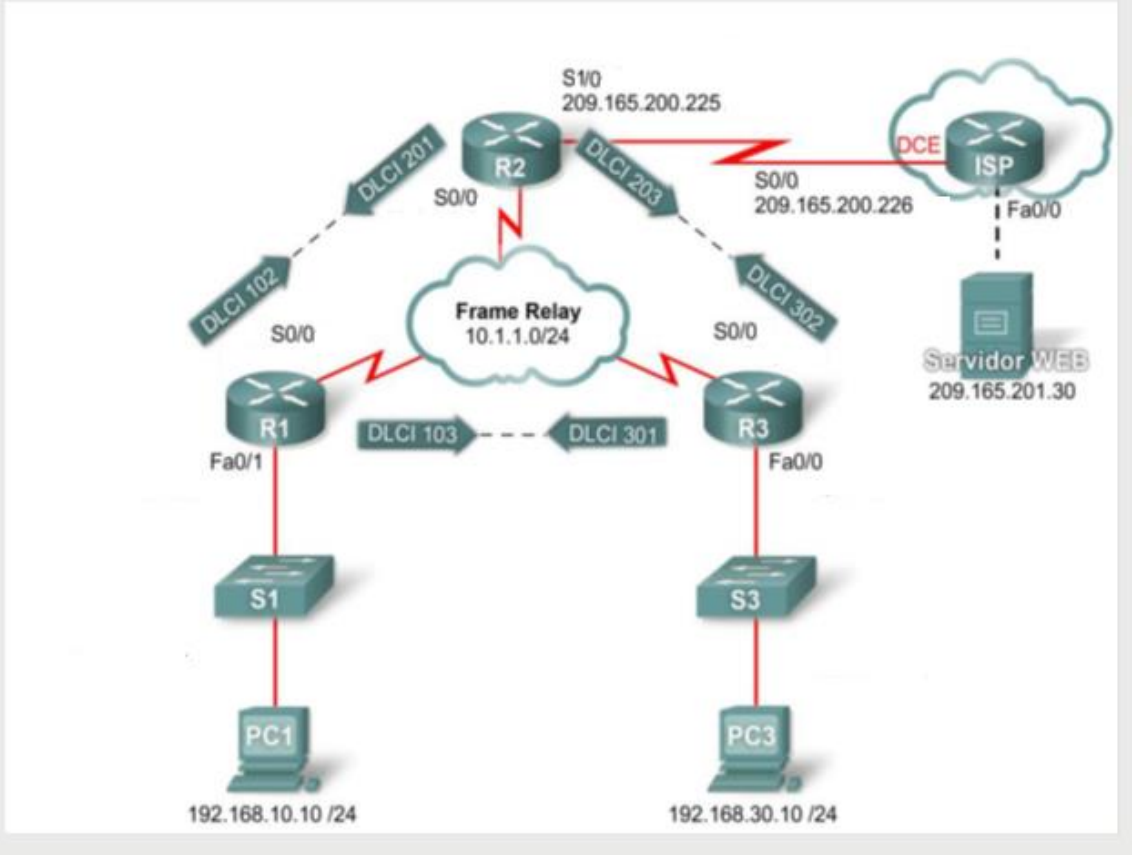
[UNIVERSIDAD TECNOLOGICA NACIONAL]
[FACULTAD REGIONAL DELTA]

Redes de información– Trabajo Practico N°11 | Frame Relay

Gonzalez Tomas	4to año	Ingeniería en Sistemas de información
		2024

Consignas

Dado el siguiente diagrama de red:



Y los siguientes datos:

Dispositivo	Interfaz	Dirección IP	Máscara de Subred
R1	Fa1/0	192.168.10.1	255.255.255.0
	S0/0	10.10.10.1	255.0.0.0
R2	S0/0	10.10.10.2	255.0.0.0
	S1/0	209.165.200.225	**255.255.255.0**
R3	Fa1/0	192.168.30.1	255.255.255.0
	S0/0	10.10.10.3	**255.0.0.0**
ISP	S0/0	209.165.200.226	255.255.255.0
	Fa1/0	**209.165.201.1**	**255.255.255.0**

1)

· Configure las direcciones IPs de todos los equipos y la encapsulación Frame Relay.

Ej:

R1 (config)#interface Serial0/0

R1 (config-if)#ip address 10.10.10.1 255.0.0.0

R1(config-if)# encapsulation frame-relay cisco (viene por defecto en router cisco)

R1(config-if)# no shutdown

a) Documente el status de las interfaces de cada router.

Ej:

R1#show interface s0/0

2)

· Desde la línea de comandos de la PC1, verifique la conectividad al host de la PC3, ubicado en 192.168.30.10, mediante el comando ping.

a) Documente y explique el resultado.

3)

· Configure las rutas en la nube frame relay basado en el esquema.

· Cada router necesita dos mapas estáticos para poder alcanzar a los demás routers. Los DLCI para alcanzar a estos routers son los siguientes:

Router R1:

o Para alcanzar al router R2, utilice DLCI 102 ubicado en la dirección IP 10.10.10.2.

o Para alcanzar al router R3, utilice DLCI 103 ubicado en la dirección IP 10.10.10.3.

Router R2:

o Para alcanzar al router R1, utilice DLCI 201 ubicado en la dirección IP 10.10.10.1.

o Para alcanzar al router R3, utilice DLCI 203 ubicado en la dirección IP 10.10.10.3.

Router R3:

o Para alcanzar al router R1, utilice DLCI 301 ubicado en la dirección IP 10.10.10.1.

o Para alcanzar al router R3, utilice DLCI 302 ubicado en la dirección IP 10.10.10.2.

a) Documente la configuración de la nube Frame Relay.

4)

· Establezca una comunicación RIP entre los distintos routers.

a) Documente la tabla de ruteo de cada router.

Ej: R1#show ip route

· Verifique el estado de PVC de Frame Relay para cada router.

b) Documente el estado de PVC

Ej: R1# show frame pvc

5)

· Verifique la conectividad correcta entre las PCs.

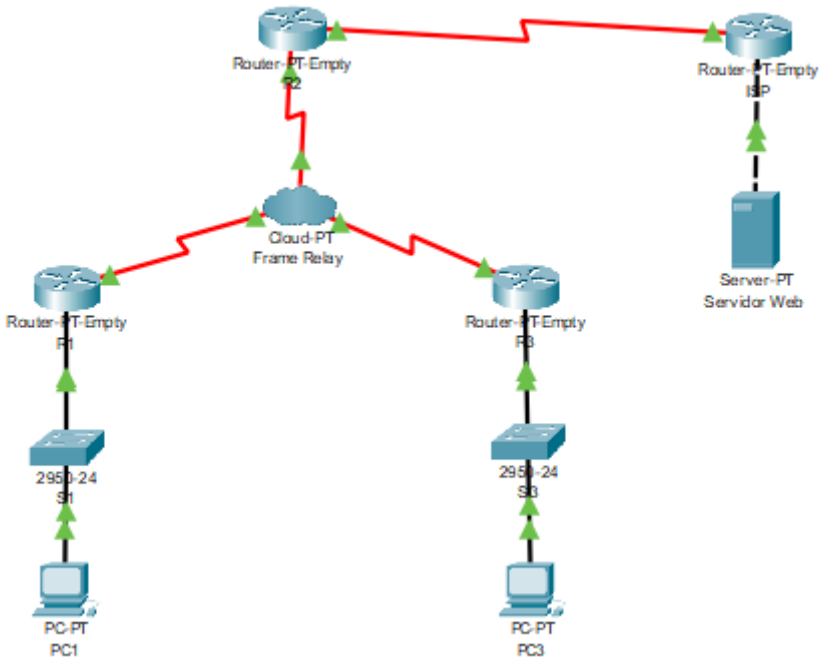
· Verifique el acceso al servidor WEB desde una de las PCs

a) Documente el resultado de la verificación de la conexión entre las PC.

Adjunte el archivo .pkg de la red.

Resolución

Formo la topología en packet tracer:



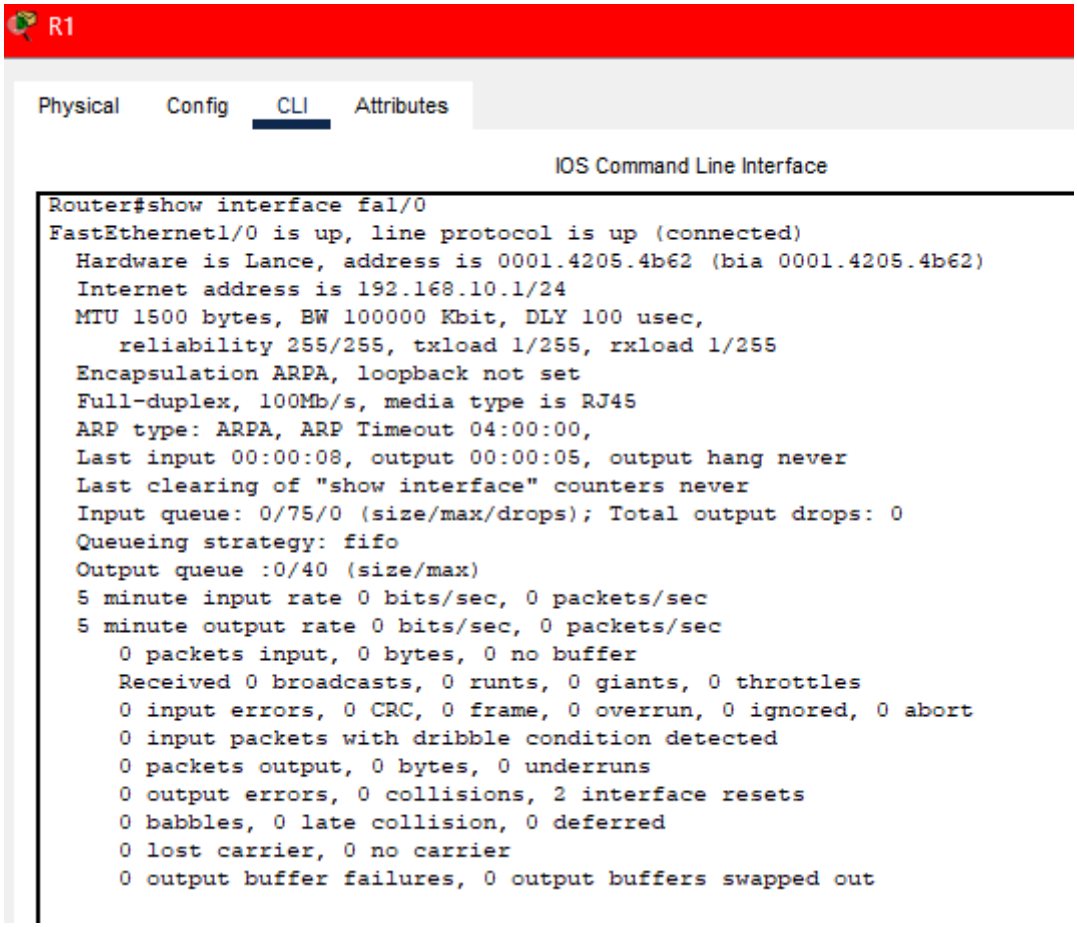
Luego de configurar los routers, tengo las siguientes interfaces, para el router 1:

R1

Physical Config CLI Attributes

IOS Command Line Interface

```
Router# show interface s0/0
Serial0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 10.10.10.1/8
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation Frame Relay, loopback not set, keepalive set (10 sec)
  LMI enq sent  118, LMI stat recvd 117, LMI upd recvd 0, DTE LMI up
  LMI enq recvd 0, LMI stat sent  0, LMI upd sent  0
  LMI DLCI 1023  LMI type is CISCO  frame relay DTE
  Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadca
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 96 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```



Para el router 2:

R2

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show interface s0/0
Serial0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 10.10.10.2/8
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation Frame Relay, loopback not set, keepalive set (10 sec)
  LMI enq sent  79, LMI stat recvd 79, LMI upd recvd 0, DTE LMI up
  LMI enq recvd 0, LMI stat sent  0, LMI upd sent  0
  LMI DLCI 1023  LMI type is CISCO  frame relay DTE
  Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadcasts 0
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 96 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

R2

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show interface s1/0
Serial1/0 is up, line protocol is down (disabled)
  Hardware is HD64570
  Internet address is 209.165.200.225/24
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation Frame Relay, loopback not set, keepalive set (10 sec)
  LMI enq sent  78, LMI stat recvd 0, LMI upd recvd 0, DTE LMI up
  LMI enq recvd 0, LMI stat sent  0, LMI upd sent  0
  LMI DLCI 1023  LMI type is CISCO  frame relay DTE
  Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadcasts 0
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 96 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

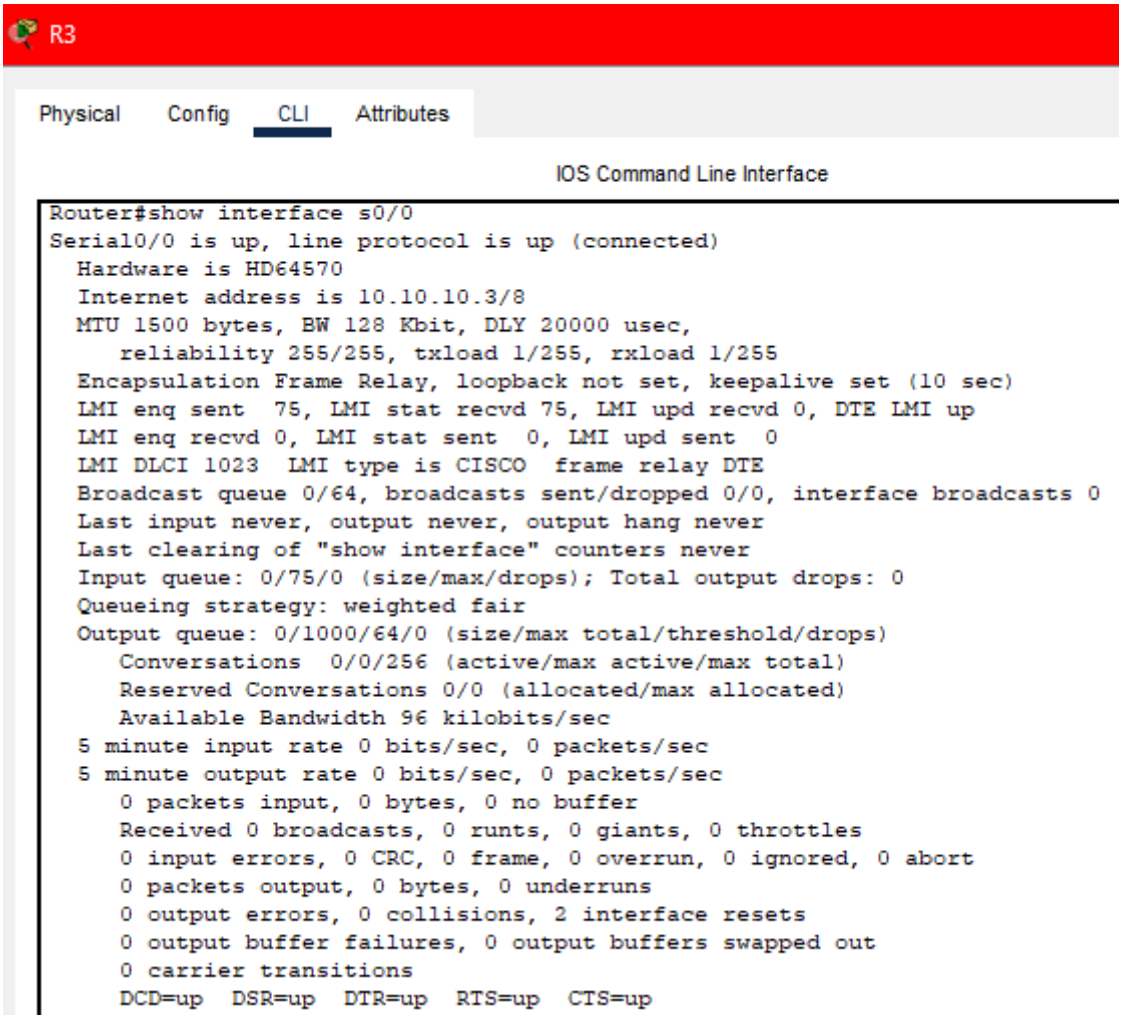
Para el router 3:

R3

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show interface fa1/0
FastEthernet1/0 is up, line protocol is up (connected)
  Hardware is Lance, address is 00e0.f9db.572a (bia 00e0.f9db.572a)
  Internet address is 192.168.30.1/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Full-duplex, 100Mb/s, media type is RJ45
  ARP type: ARPA, ARP Timeout 04:00:00,
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```


R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router#show interface s0/0
Serial0/0 is up, line protocol is up (connected)
Hardware is HD64570
Internet address is 10.10.10.3/8
MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation Frame Relay, loopback not set, keepalive set (10 sec)
LMI enq sent 75, LMI stat recvd 75, LMI upd recvd 0, DTE LMI up
LMI enq recvd 0, LMI stat sent 0, LMI upd sent 0
LMI DLCI 1023 LMI type is CISCO frame relay DTE
Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadcasts 0
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
Conversations 0/0/256 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
Available Bandwidth 96 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
0 packets input, 0 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
0 packets output, 0 bytes, 0 underruns
0 output errors, 0 collisions, 2 interface resets
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up

Para el ISP:

ISP

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show interface s0/0
Serial0/0 is up, line protocol is down (disabled)
  Hardware is HD64570
  Internet address is 209.165.200.226/24
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 96 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

ISP

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show interface s1/0
%Invalid interface type and number

Router#show interface fa1/0
FastEthernet1/0 is up, line protocol is up (connected)
  Hardware is Lance, address is 0001.96d1.c88a (bia 0001.96d1.c88a)
  Internet address is 209.165.201.1/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Full-duplex, 100Mb/s, media type is RJ45
  ARP type: ARPA, ARP Timeout 04:00:00,
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Pruebo la comunicación entre las dos PCS:

PC1

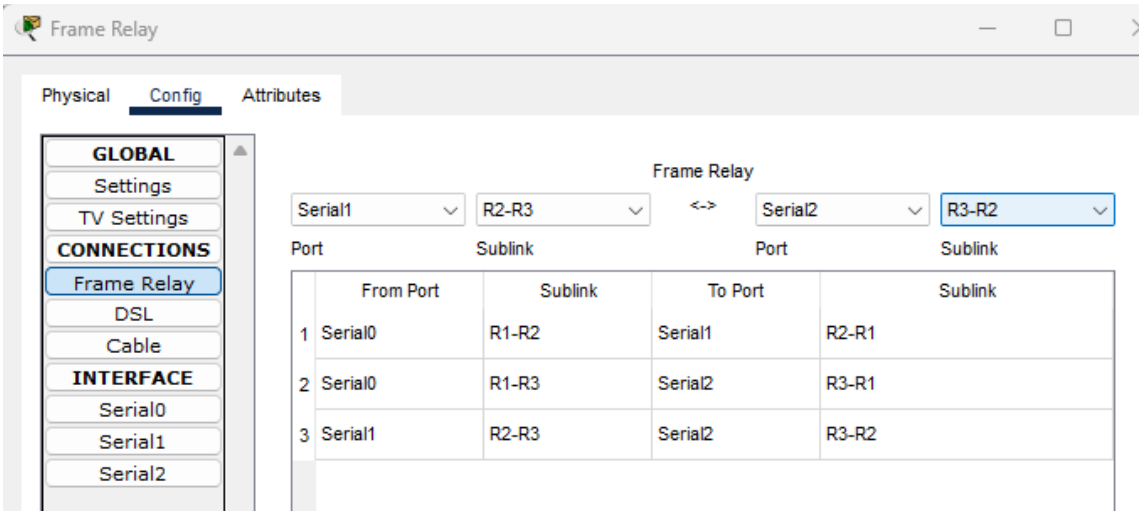
Physical Config Desktop Programming Attributes

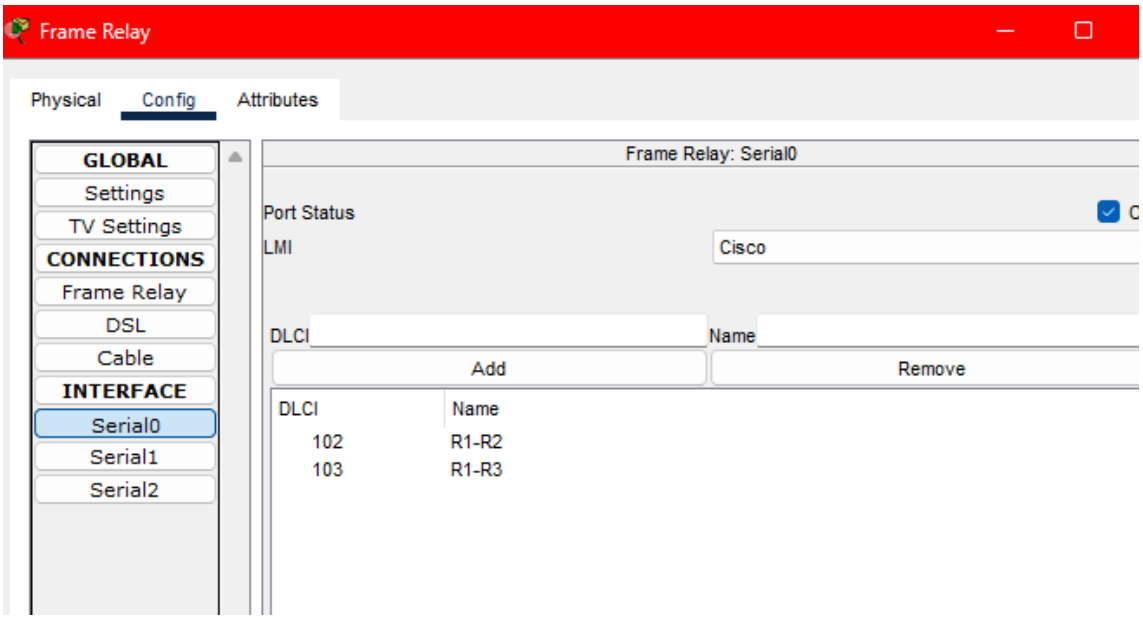
Command Prompt

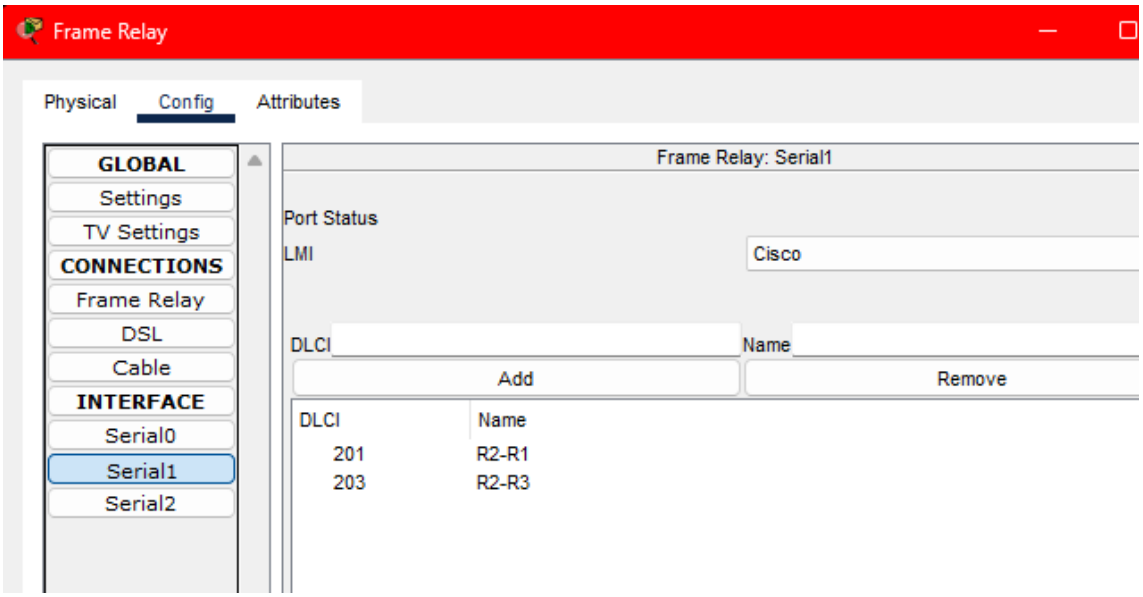
```
C:\>ping 192.168.30.10

Pinging 192.168.30.10 with 32 bytes of data:

Reply from 192.168.10.1: Destination host unreachable.
Reply from 192.168.10.1: Destination host unreachable.
Request timed out.
Reply from 192.168.10.1: Destination host unreachable.

Ping statistics for 192.168.30.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

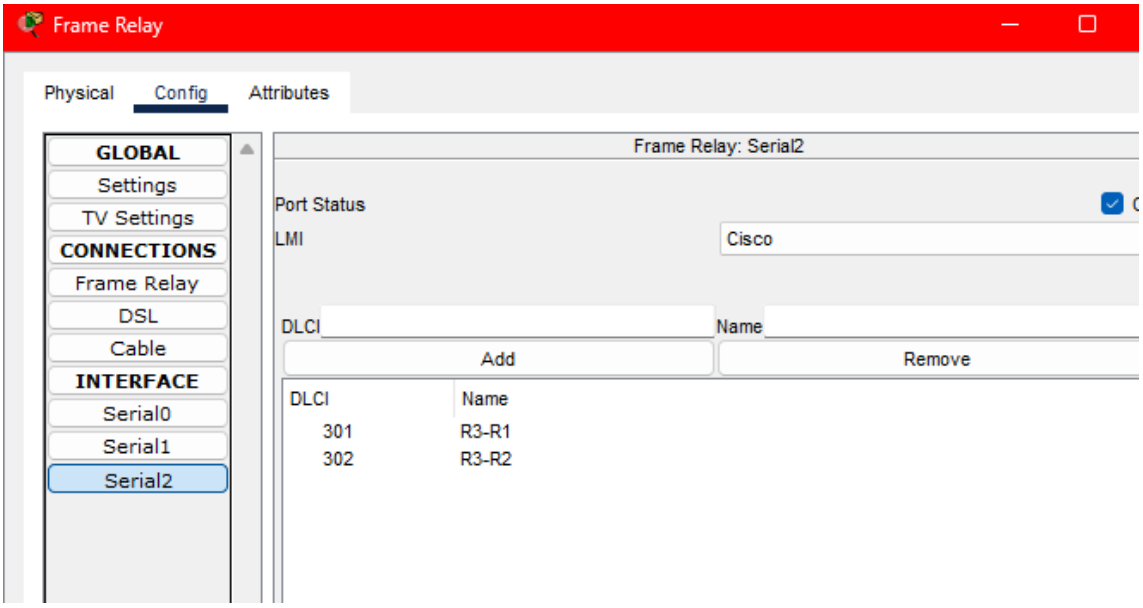
Luego se observa que no se puede llegar a la PC3 desde PC1, esto se debe ya que no se identifica la ruta que lleva hasta esa PC, producto de que no se “mapeo” el Frame Relay, por lo tanto, el router no sabe hacia donde enrutar dicho paquete.

Luego configuro la nube frame relay y obtengo:

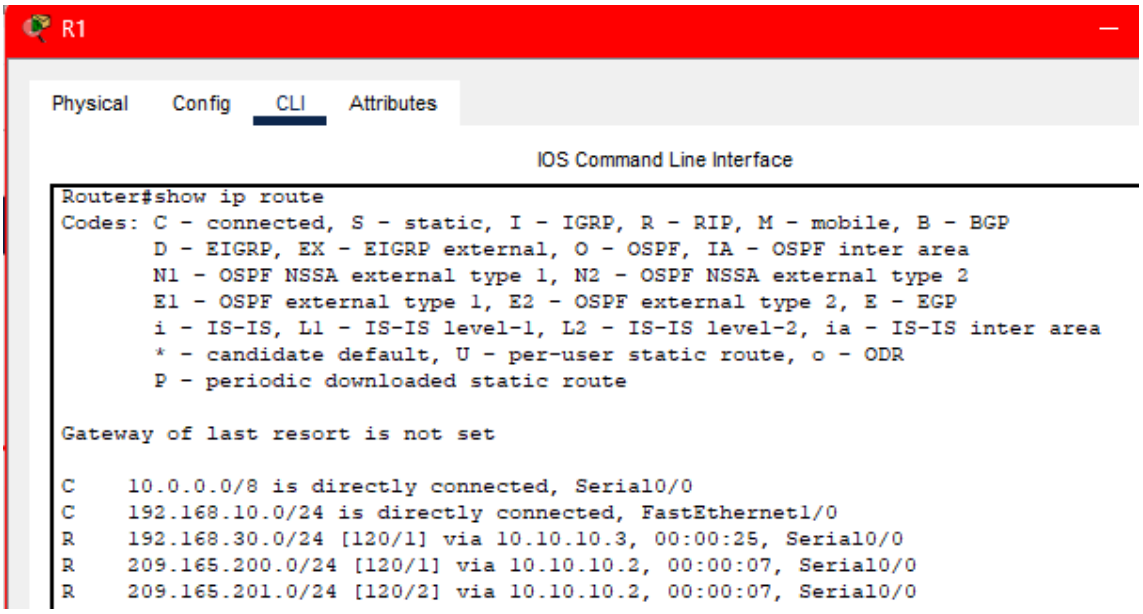








Luego documento la tabla de enrutamiento de cada router:



R2

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#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

C    10.0.0.0/8 is directly connected, Serial0/0
R    192.168.10.0/24 [120/1] via 10.10.10.1, 00:00:20, Serial0/0
R    192.168.30.0/24 [120/1] via 10.10.10.3, 00:00:18, Serial0/0
C    209.165.200.0/24 is directly connected, Serial1/0
R    209.165.201.0/24 [120/1] via 209.165.200.226, 00:00:27, Serial1/0
```

R3

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#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

C    10.0.0.0/8 is directly connected, Serial0/0
R    192.168.10.0/24 [120/1] via 10.10.10.1, 00:00:24, Serial0/0
C    192.168.30.0/24 is directly connected, FastEthernet1/0
R    209.165.200.0/24 [120/1] via 10.10.10.2, 00:00:04, Serial0/0
R    209.165.201.0/24 [120/2] via 10.10.10.2, 00:00:04, Serial0/0
```

ISP

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#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

R    10.0.0.0/8 [120/1] via 209.165.200.225, 00:00:27, Serial0/0
R    192.168.10.0/24 [120/2] via 209.165.200.225, 00:00:27, Serial0/0
R    192.168.30.0/24 [120/2] via 209.165.200.225, 00:00:27, Serial0/0
C    209.165.200.0/24 is directly connected, Serial0/0
C    209.165.201.0/24 is directly connected, FastEthernet1/0
```

Documento el estado de PVC de frame relay para cada router:

R1

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show frame pvc

PVC Statistics for interface Serial0/0 (Frame Relay DTE)
DLCI = 102, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0

input pkts 14055        output pkts 32795        in bytes 1096228
out bytes 6216155       dropped pkts 0           in FECN pkts 0
in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
in DE pkts 0            out DE pkts 0
out bcast pkts 32795    out bcast bytes 6216155

DLCI = 103, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0

input pkts 14055        output pkts 32795        in bytes 1096228
out bytes 6216155       dropped pkts 0           in FECN pkts 0
in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
in DE pkts 0            out DE pkts 0
out bcast pkts 32795    out bcast bytes 6216155
```

R2

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#show frame pvc

PVC Statistics for interface Serial0/0 (Frame Relay DTE)
DLCI = 201, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0

input pkts 14055        output pkts 32795        in bytes 1096228
out bytes 6216155       dropped pkts 0           in FECN pkts 0
in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
in DE pkts 0            out DE pkts 0
out bcast pkts 32795    out bcast bytes 6216155

DLCI = 203, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0

input pkts 14055        output pkts 32795        in bytes 1096228
out bytes 6216155       dropped pkts 0           in FECN pkts 0
in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
in DE pkts 0            out DE pkts 0
out bcast pkts 32795    out bcast bytes 6216155
```

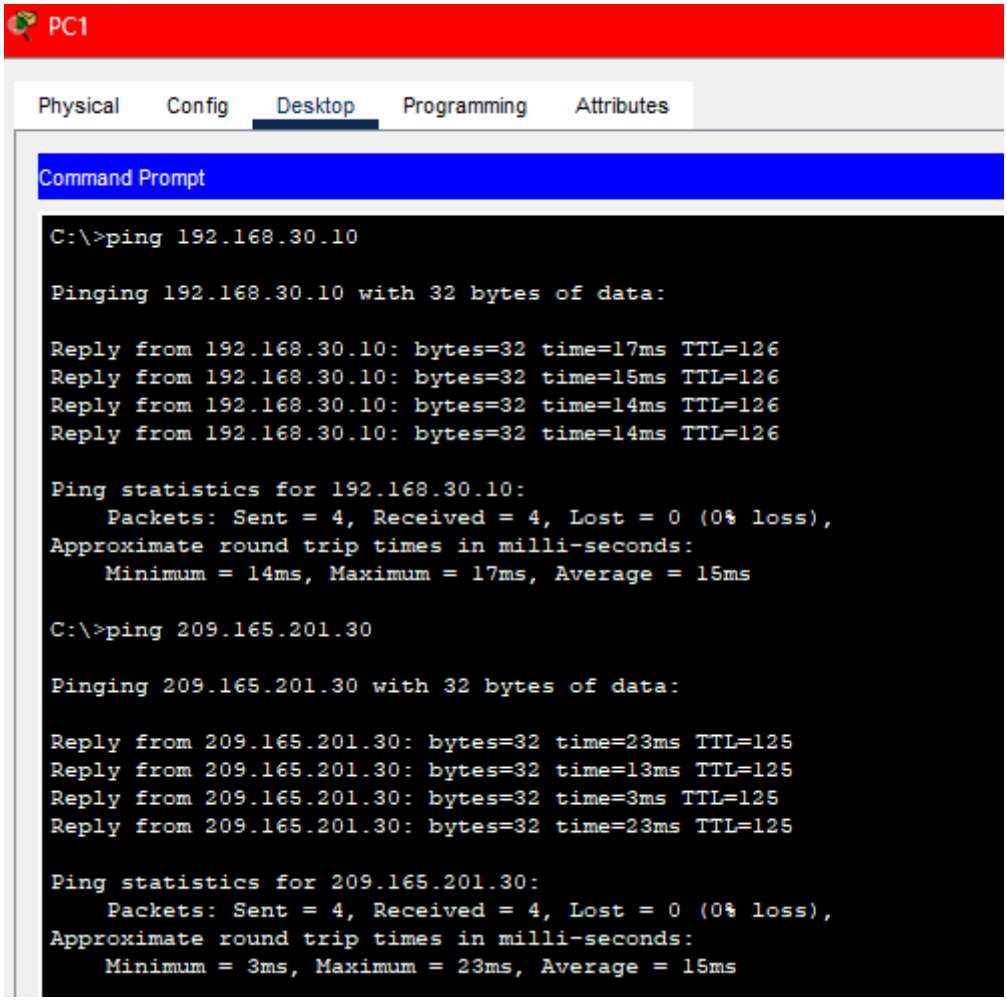
R3

Physical Config CLI Attributes

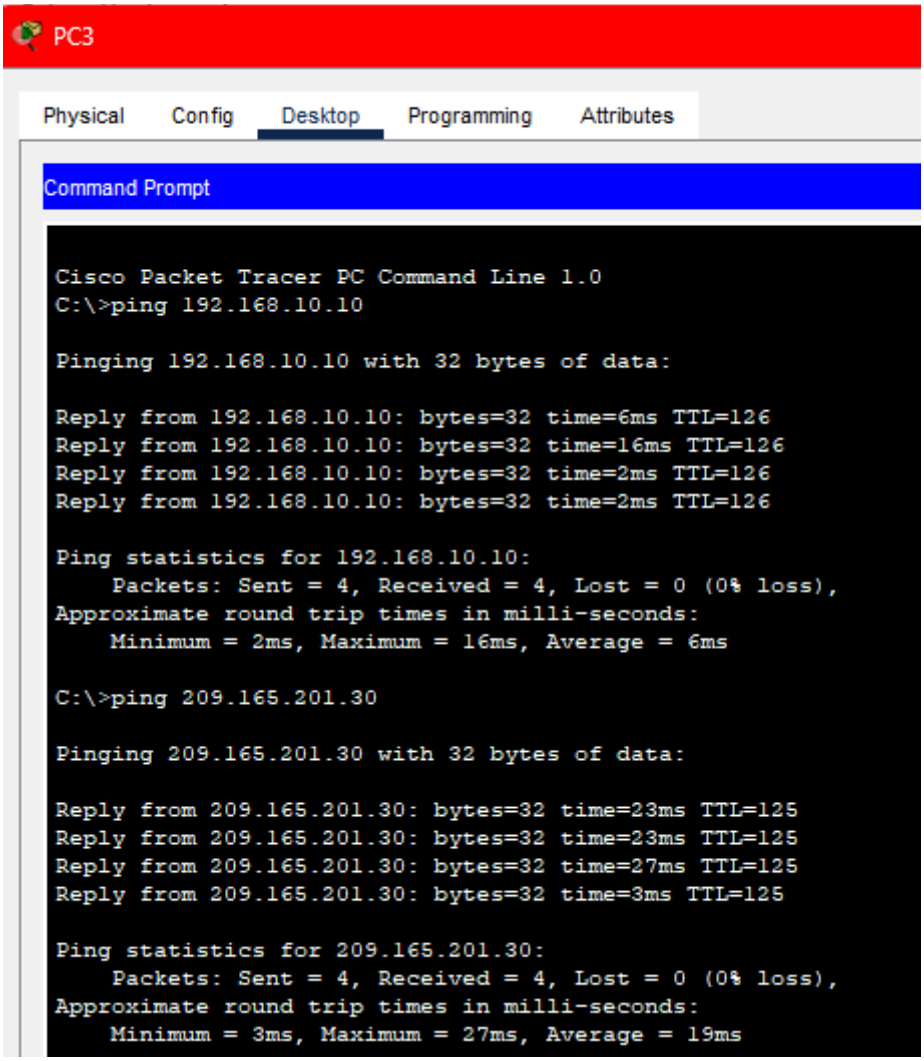
IOS Command Line Interface

```
Router#show frame pvc

PVC Statistics for interface Serial0/0 (Frame Relay DTE)
DLCI = 301, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0

input pkts 14055        output pkts 32795        in bytes 1096228
out bytes 6216155       dropped pkts 0           in FECN pkts 0
in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
in DE pkts 0            out DE pkts 0
out bcast pkts 32795    out bcast bytes 6216155

DLCI = 302, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0

input pkts 14055        output pkts 32795        in bytes 1096228
out bytes 6216155       dropped pkts 0           in FECN pkts 0
in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
in DE pkts 0            out DE pkts 0
out bcast pkts 32795    out bcast bytes 6216155
```

Por último, verificamos desde PC1 la conexión con la otra PC y con el servidor:



Y luego desde PC3:



Con lo cual se observa que existe la conexión.