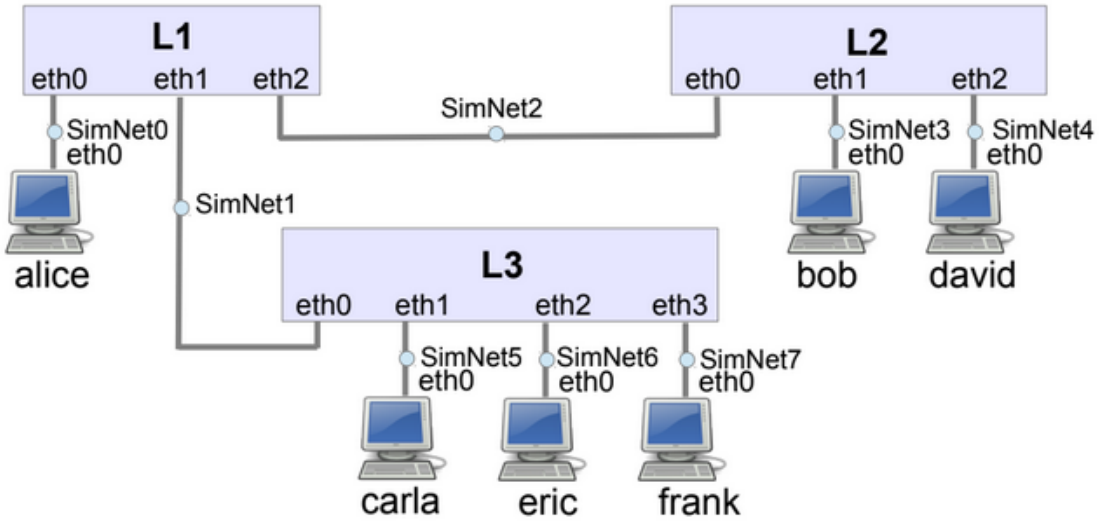


Figure 1.1: Scenario for testing Switching

EXERCISE 1.1

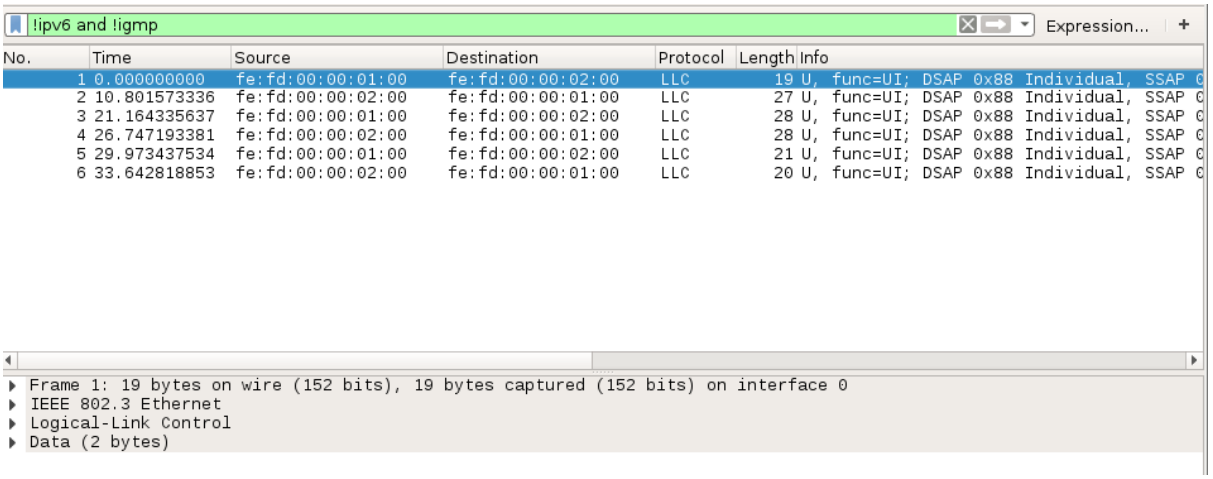
```
telem@phyhost:~$ simctl switching-vlan start
......
Total time elapsed: 294 seconds
```

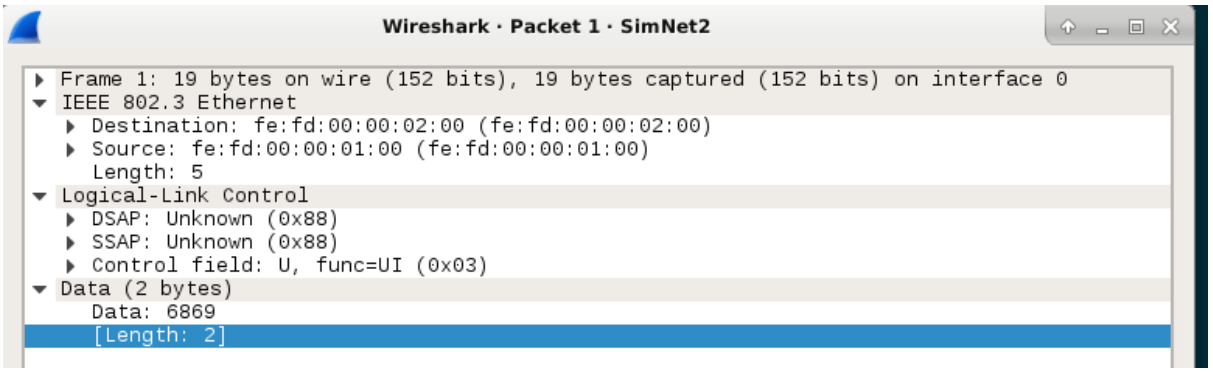
```
root@alice:~# client-chat-LLC1.py -d fe:fd:00:00:02:00
root@bob:~# server-chat-LLC1.py
```

Chat btween alis & bob

```
root@alice:~# client-chat-LLC1.py -d fe:fd:00:00:02:00
Type Text: hi
.Waiting for the server...
Remote Text: hello alis
Type Text: how r u bob
.Waiting for the server...
Remote Text: so good bby
Type Text: cool
.Waiting for the server...
Remote Text: bye
```

Wireshark en SimNet2





802.2 Frame Format (LLC)

6 bytes	6 bytes	2 bytes	1 bytes	1 bytes	1 bytes	Up to 1497 bytes
Destination Address	Source Address	Length	DSAP	SSAP	Control (0x3)	Network Packet

SSAP: bit menos significativo: 0: peticiones
1:

DSAP:

0: unicast
1: multicast

EXERCISE 1.2

```
root@phyhost:~# client-chat-LLC1.py -d 00:23:ae:1c:51:29 --ssap 0x54 --dsap 0x64
Type Text: hello server!
.Waiting for the server...
```

Servidor en alis-> host 0 SAP: 0x88 (por defecto)

```
root@alice:~# server-chat-LLC1.py
Listening on interface:  eth0
Listening on LLC1 and SAP:  0x88
Waiting for the client...
Remote Text: hello im bob sending from defect sap
Type Text: hello im alis from 0x88
```

host 1 SAP: 0x64

slides 01.01-01.03, 02.01-02.05
https://drive.google.com/drive/folders/1ugbAayGfGTtjjVX0rLdREecVnr-qNXcN?usp=sharing

```
root@alice:~# server-chat-LLC1.py --sap 0x64
Listening on interface:  eth0
Listening on LLC1 and SAP:  0x64
Waiting for the client...
Remote Text: helo im carla, sending from dsap 0x64
Type Text: hello im alis from 0x64
```

* No hace falta especificar el DSAP porq este lo detecta al recibir la trama del otro host. Asi q solo especificamos el SSAP (SAP)

CLiente en bob-> DSAP: 0x88 (por defecto)

```
root@bob:~# client-chat-LLC1.py -d fe:fd:00:00:01:00
Type Text: hello im bob sending from defect sap
.Waiting for the server...
Remote Text: hello im alis from 0x88
```

CLiente en carla-> DSAP: 0x64

```
root@carla:~# client-chat-LLC1.py -d fe:fd:00:00:01:00 --dsap 0x64
Type Text: helo im carla, sending from dsap 0x64
.Waiting for the server...
Remote Text: hello im alis from 0x64
```

EXERCISE 2.1

```
root@L1:~# brctl
Usage: brctl [commands]
commands:
        addbr           <bridge>                add bridge
        delbr           <bridge>                delete bridge
        addif           <bridge> <device>       add interface to bridge
        delif           <bridge> <device>       delete interface from bridge
        setageing       <bridge> <time>         set ageing time
        setbridgeprio   <bridge> <prio>         set bridge priority
        setfd           <bridge> <time>         set bridge forward delay
        sethello        <bridge> <time>         set hello time
        setmaxage       <bridge> <time>         set max message age
        setpathcost     <bridge> <port> <cost>  set path cost
        setportprio     <bridge> <port> <prio>  set port priority
        show                                    show a list of bridges
        showmacs        <bridge>                show a list of mac addrs
        showstp         <bridge>                show bridge stp info
        stp             <bridge> {on|off}       turn stp on/off
root@L1:~# brctl show
bridge name     bridge id               STP enabled     interfaces
br1             8000.fefd00000700       no              eth0
                                                        eth1
                                                        eth2

root@L1:~# brctl showmacs br1
port no mac addr                is local?       ageing timer
  1     fe:fd:00:00:07:00       yes                0.00
  2     fe:fd:00:00:07:01       yes                0.00
  3     fe:fd:00:00:07:02       yes                0.00
root@L1:~#
```

EXERCISE 2.2 & 2.3
SImNet1:

slides 01.01-01.03, 02.01-02.05
https://drive.google.com/drive/folders/1ugbAayGfGTtjjVX0rLdREecVnr-qNXcN?usp=sharing

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	30	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
2	6.210831858	fe80::3c15:89ff:fed…	ff02::2	ICMPv6	70	Router Solicitation from 3e:15:89:d3:12:bd
3	65.250628426	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	30	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command

SImNet2:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	30	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
2	6.211360102	fe80::3c15:89ff:fed…	ff02::2	ICMPv6	70	Router Solicitation from 3e:15:89:d3:12:bd
3	65.250802497	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	30	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
4	119.371746116	fe:fd:00:00:02:00	fe:fd:00:00:01:00	LLC	37	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command

L1 MAC table evolution:

port no	mac addr	is local?	ageing timer
2	3e:15:89:d3:12:bd	no	40.65
1	fe:fd:00:00:01:00	no	46.86
1	fe:fd:00:00:07:00	yes	0.00
2	fe:fd:00:00:07:01	yes	0.00
3	fe:fd:00:00:07:02	yes	0.00

port no	mac addr	is local?	ageing timer
1	fe:fd:00:00:01:00	no	32.17
1	fe:fd:00:00:07:00	yes	0.00
2	fe:fd:00:00:07:01	yes	0.00
3	fe:fd:00:00:07:02	yes	0.00

port no	mac addr	is local?	ageing timer
3	fe:fd:00:00:02:00	no	13.40
1	fe:fd:00:00:07:00	yes	0.00
2	fe:fd:00:00:07:01	yes	0.00
3	fe:fd:00:00:07:02	yes	0.00

EXERCISE 2.4

SImNet1:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80::5c3c:ceff:fea…	ff02::2	ICMPv6	70	Router Solicitation from 5e:3c:ce:a2:60:41
2	75.354246149	fe:fd:00:00:02:00	fe:fd:00:00:01:00	LLC	29	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
3	150.381036549	fe:fd:00:00:03:00	fe:fd:00:00:01:00	LLC	22	U, func=UI; DSAP 0x64 Individual, SSAP 0x88 Command
4	153.687473941	fe:fd:00:00:01:00	fe:fd:00:00:03:00	LLC	19	U, func=UI; DSAP 0x88 Individual, SSAP 0x64 Command
5	157.438055714	fe:fd:00:00:03:00	fe:fd:00:00:01:00	LLC	26	U, func=UI; DSAP 0x64 Individual, SSAP 0x88 Command
6	164.091541401	fe:fd:00:00:01:00	fe:fd:00:00:03:00	LLC	34	U, func=UI; DSAP 0x88 Individual, SSAP 0x64 Command
7	179.557181612	fe:fd:00:00:03:00	fe:fd:00:00:01:00	LLC	30	U, func=UI; DSAP 0x64 Individual, SSAP 0x88 Command
8	186.529650374	fe:fd:00:00:01:00	fe:fd:00:00:03:00	LLC	21	U, func=UI; DSAP 0x88 Individual, SSAP 0x64 Command

SImNet2:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80::5c3c:ceff:fea…	ff02::2	ICMPv6	70	Router Solicitation from 5e:3c:ce:a2:60:41
2	75.354329865	fe:fd:00:00:02:00	fe:fd:00:00:01:00	LLC	29	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
3	92.385605160	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	29	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
4	100.378673555	fe:fd:00:00:02:00	fe:fd:00:00:01:00	LLC	21	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
5	108.611748644	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	25	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
6	113.762381309	fe:fd:00:00:02:00	fe:fd:00:00:01:00	LLC	21	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
7	118.996581643	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	29	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
8	121.824825984	fe:fd:00:00:02:00	fe:fd:00:00:01:00	LLC	19	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command
9	138.383277326	fe:fd:00:00:01:00	fe:fd:00:00:02:00	LLC	20	U, func=UI; DSAP 0x88 Individual, SSAP 0x88 Command

La primera trama de alice a bob es enviada por L1 a todos los demás puertos porq no sabe donde esta, pero las siguientes tramas intercambiadas ya solo se ven en SImNet 2 (entre alis y bob), ya que L2 y L1 saben donde se encuentran alis y bob.

slides 01.01-01.03, 02.01-02.05

https://drive.google.com/drive/folders/1ugbAayGfGTtjjVX0rLdREecVnr-qNXcN?usp=sharing

Para el segundo chat iniciado entre alice y carla se ven mensajes entre carla y alice directamente porq L3 enviara a L1, q ya sabe donde esta alis, y al revés.

EXERCISE 3.1
Modificar L3 para crear 2 VLAN (eth0/2 i eth1/3)
L3:~# ifconfig br3 down; brctl delbr br3 ->eliminar bridge br3
L3:~# brctl addbr brA // brB -> crear bridge brA
L3:~# brctl addif brA eth1 eth3-> add interfaces a brA
L3:~# brctl addif brB eth0 eth2 -> add interfaces a brB
L3:~# ifconfig brA 10.0.0.12 -> assignar IP
L3:~# ifconfig brB 10.0.0.11

```
root@L3:~# brctl show
bridge name     bridge id               STP enabled     interfaces
brA             8000.fefd00000901       no              eth1
                                                        eth3
brB             8000.fefd00000900       no              eth0
                                                        eth2
```

2 VLAN (brA i brB)

Para probar nuestra configuración capturamos con wireshark las SlimNet 1 y 2 y, enviamos tramas (send-frame-LLC1.py) entre Alice (fe:fd:00:00:01:00) y Eric (fe:fd:00:00:05:00). Al recibir una respuesta de un host el switch establece esa ruta en la tabla y vemos como pueden intercambiar mensajes. En cambio, si probamos de enviar tramas desde ALice a Carla, el mensaje nunca llega porq los br no estan connectados y, por consiguiente, los sw no reciben respuesta. Asi q enviaran mensajes de broadcast todo el rato ya que no reachean el host.

EXERCISE 3.2
Config de switches:
L1:~# ifconfig br1 down ; brctl delbr br1
L1:~# brctl addbr VLAN10 // VLAN20
L1:~# vconfig add eth1 10
L1:~# ifconfig eth1.10 up
L1:~# brctl addif VLAN10 eth0 eth1.10 -> Alice i Carla
L1:~# ifconfig VLAN10 10.0.0.3
L1:~# vconfig add eth1 20 ; ifconfig eth1.20 up-> eth1 compartido por 2 VLAN's
L1:~# vconfig add eth2 20 ; ifconfig eth2.20 up
L1:~# brctl addif VLAN20 eth1.20 eth2.20 -> Bob, David, Eric, Frank
L1:~# ifconfig VLAN20 10.0.0.2

Si el br es d paso, tiene q entrar y salir con el mismo tag.
Los hosts q envian y reciben no tienen tag.
SI s envia una trama a un host VLAN diferente solo s ev la trama al SN d la interficie d salida.
El br no deja pasar la trama porq no ve el host dest.

```
root@L1:~# brctl show
bridge name     bridge id               STP enabled     interfaces
VLAN10          8000.fefd00000700       no              eth0
                                                        eth1.10
VLAN20          8000.fefd00000701       no              eth1.20
                                                        eth2.20
```

L3:~# ifconfig brA down ; brctl delbr brA
L3:~# ifconfig brB down ; brctl delbr brB -> eliminar config d ex 1
L3:~# brctl addbr VLAN10 ; brctl addbr VLAN20
L3:~# vconfig add eth0 10 ; ifconfig eth0.10 up
L3:~# brctl addif VLAN10 eth0.10 eth1
L3:~# vconfig add eth0 20 ; ifconfig eth0.20 up
L3:~# brctl addif VLAN20 eth0.20 eth2 eth3
L3:~# ifconfig VLAN10 10.0.0.4 ; ifconfig VLAN20 10.0.0.5

```
root@L3:~# brctl show
bridge name     bridge id               STP enabled     interfaces
VLAN10          8000.fefd00000900       no              eth0.10
                                                        eth1
VLAN20          8000.fefd00000900       no              eth0.20
                                                        eth2
                                                        eth3
```

L2:~# ifconfig br2 down ; brctl delbr br2
L2:~# brctl addbr VLAN20
L2:~# vconfig add eth0 20 ; ifconfig eth0.20 up
L2:~# brctl addif VLAN20 eth0.20 eth1 eth2
L2:~# ifconfig VLAN20 10.0.0.6

```
root@L2:~# brctl show
bridge name     bridge id               STP enabled     interfaces
VLAN20          8000.fefd00000800       no              eth0.20
                                                        eth1
                                                        eth2
```

Probamos a enviar tramas entre alis y carla y entre bob y eric:
SimNet0:

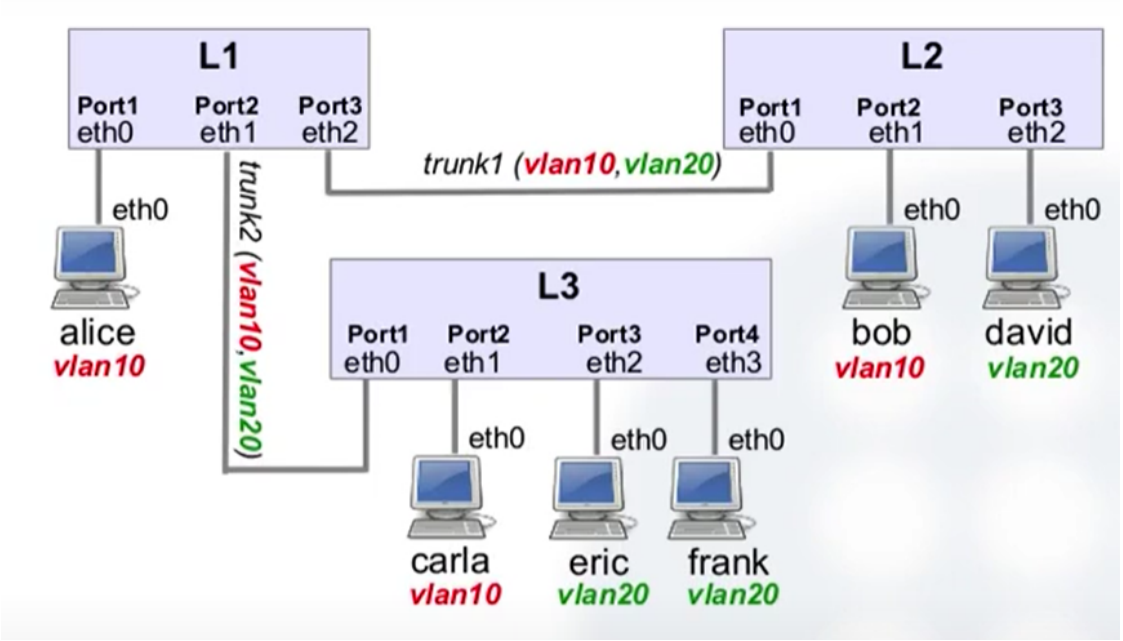
```
▼ Frame 3: 19 bytes on wire (152 bits), 19 bytes captured (152 bits) on interface 0
  ▶ Interface id: 0 (SimNet0)
    Encapsulation type: Ethernet (1)
    Arrival Time: Feb 26, 2021 13:33:35.376200019 CET
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1614342815.376200019 seconds
    [Time delta from previous captured frame: 85.902908075 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 102.192807049 seconds]
    Frame Number: 3
    Frame Length: 19 bytes (152 bits)
    Capture Length: 19 bytes (152 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:llc:data]
▼ IEEE 802.3 Ethernet
  ▶ Destination: fe:fd:00:00:03:00 (fe:fd:00:00:03:00)
  ▶ Source: fe:fd:00:00:01:00 (fe:fd:00:00:01:00)
    Length: 5
▶ Logical-Link Control
▶ Data (2 bytes)
```

SimNet1:

```
▼ Frame 6: 23 bytes on wire (184 bits), 23 bytes captured (184 bits) on interface 0
  ▶ Interface id: 0 (SimNet1)
    Encapsulation type: Ethernet (1)
    Arrival Time: Feb 26, 2021 13:33:35.376269126 CET
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1614342815.376269126 seconds
    [Time delta from previous captured frame: 33.705360078 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 102.192950702 seconds]
    Frame Number: 6
    Frame Length: 23 bytes (184 bits)
    Capture Length: 23 bytes (184 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:vlan:llc:data]
▼ Ethernet II, Src: fe:fd:00:00:01:00 (fe:fd:00:00:01:00), Dst: fe:fd:00:00:03:00 (fe:fd:00
  ▶ Destination: fe:fd:00:00:03:00 (fe:fd:00:00:03:00)
  ▶ Source: fe:fd:00:00:01:00 (fe:fd:00:00:01:00)
    Type: 802.1Q Virtual LAN (0x8100)
▼ 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 10
    000. .... .... .... = Priority: Best Effort (default) (0)
    ...0 .... .... .... = DEI: Ineligible
    .... 0000 0000 1010 = ID: 10
    Length: 5
▶ Logical-Link Control
▶ Data (2 bytes)
```

La diferencia entre tramas son los protocolos utilizados. Cuando se utilizan los VLAN id (eth1.10 y eth1.20), las tramas utilizan los protocols ethII y 802.1Q Virtual LAN, q es el q lleva el id (+LLC), cuando para las otras en cambio de estos se utiliza 802.3 eth.

EXERCICI 3.3



Pasar a Bob de la VLAN20 a la VLAN10.
L2:~# brctl addbr VLAN10
L2:~# vconfig add eth0 10 ; ifconfig eth0.10 up
L2:~# brctl delif VLAN20 eth1
L2:~# brctl addif VLAN10 eth0.10 eth1
L2:~# ifconfig VLAN10 10.0.0.7

```
root@L2:~# brctl show
bridge name     bridge id               STP enabled     interfaces
VLAN10          8000.fefd00000800       no              eth0.10
                                                        eth1
VLAN20          8000.fefd00000800       no              eth0.20
                                                        eth2
```

L1:~# vconfig add eth2 10 ; ifconfig eth2.10 up
L1:~# brctl addif VLAN10 eth2.10

```
root@L1:~# brctl show
bridge name     bridge id               STP enabled     interfaces
VLAN10          8000.fefd00000700       no              eth0
                                                        eth1.10
                                                        eth2.10
VLAN20          8000.fefd00000701       no              eth1.20
                                                        eth2.20
```

Si capturamos el trafico en las nets 1 y 2 vemos que las tramas recibidas seran como las anteriores que utilizaban los dos protcolos EthII y 802.1Q VLAN.
En el caso de la net 3, como pasaba antes en la net 0, solo recibimos tramas con el protocolo 802.3 eth porq no s utilizan los id entre eth1 y bob.