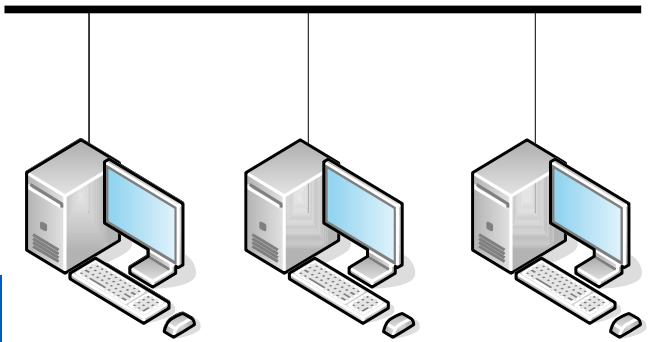
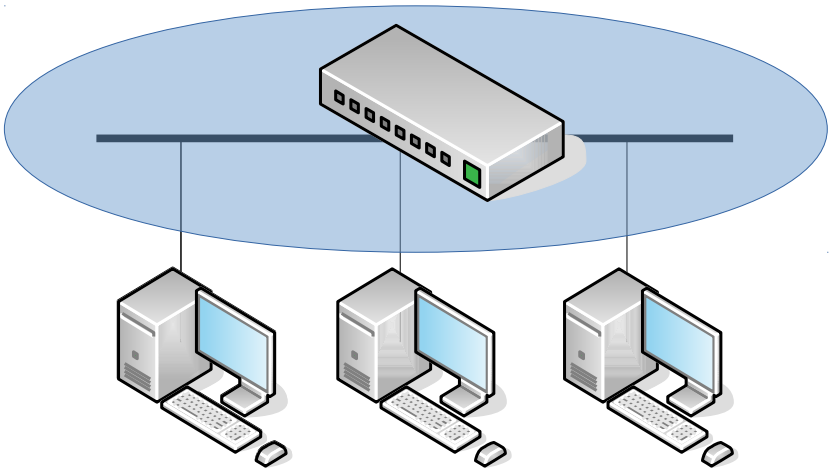
Ethernet

- Estandarizada por IEEE802.3
- Originalmente, topología de bus
  - Implementada sobre coaxil
  - 10Base5, 10Base2 (1982-1985)

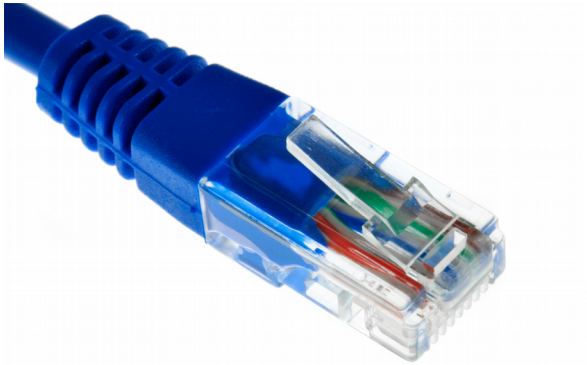


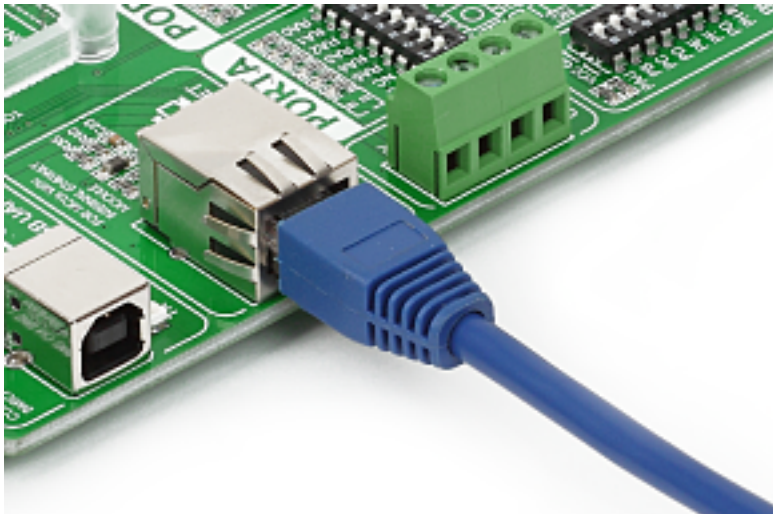
Ethernet

- 10Base-T (1990)
- 100Base-F
- 100Base-TX, 100Base-T4, 100Base-FX
- 1000Base-T (1999)
- 10GBase-T (2003-2006)
- Topología en estrella
- Cableado UTP, RJ45



Ethernet





Interfaces

```
oso@betsyrc ~ $ lspci
00:00.0 Host bridge: Intel Corporation 3rd Gen Core processor
DRAM Controller (rev 09)
00:01.0 PCI bridge: Intel Corporation Xeon E3-1200 v2/3rd Gen
Core processor PCI Express Root Port (rev 09)
00:02.0 VGA compatible controller: Intel Corporation 3rd Gen
Core processor Graphics Controller (rev 09)
00:14.0 USB controller: Intel Corporation 7 Series/C210 Series
Chipset Family USB xHCI Host Controller (rev 04)

...


03:00.0 Ethernet controller: Realtek Semiconductor Co., Ltd.
RTL8111/8168/8411 PCI Express Gigabit Ethernet Controller (rev
06)
```

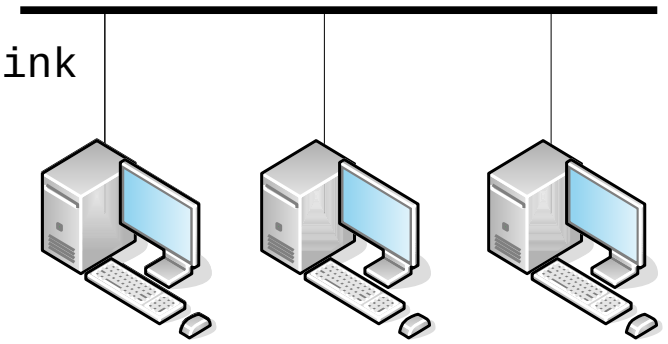
Interfaces

```
oso@betsyrc ~ $ lspci
00:00.0 Host bridge: I                                  cessor
DRAM Controller (rev 0
00:01.0 PCI bridge: In                                  rd Gen
Core processor PCI Exp
00:02.0 VGA compatible                                  d Gen
Core processor Graphic
00:14.0 USB controlle                                    Series
Chipset Family USB xHC

...


03:00.0 Ethernet cont                                    Ltd.
RTL8111/8168/8411 PCI                                   er (rev
06)
```

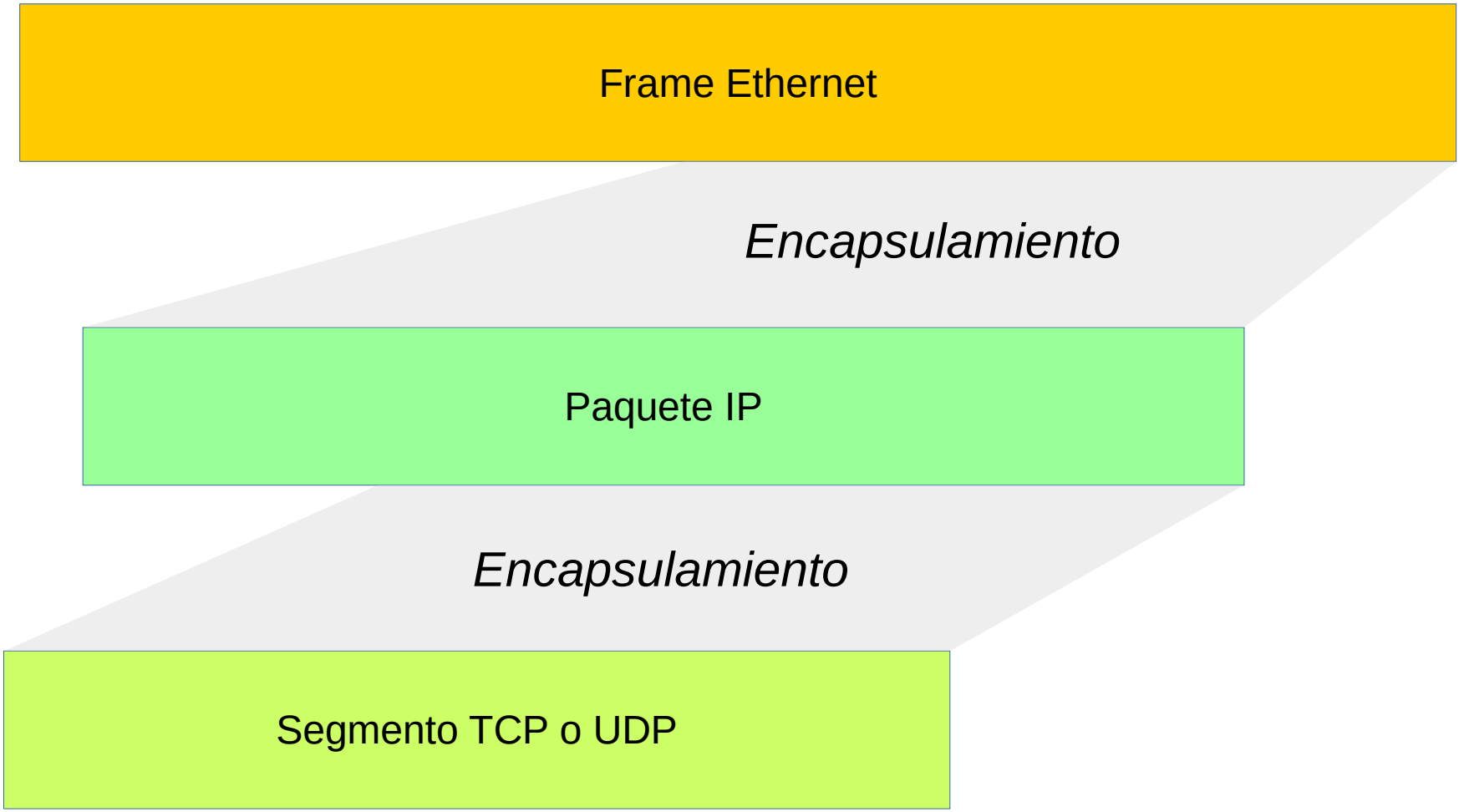
```
oso@betsyrc ~ $ lspci -n
00:00.0 0600: 8086:0154 (rev 09)
00:01.0 0604: 8086:0151 (rev 09)
00:02.0 0300: 8086:0166 (rev 09)
00:14.0 0c03: 8086:1e31 (rev 04)
00:16.0 0780: 8086:1e3a (rev 04)
00:1a.0 0c03: 8086:1e2d (rev 04)
00:1b.0 0403: 8086:1e20 (rev 04)
00:1c.0 0604: 8086:1e10 (rev c4)
00:1c.3 0604: 8086:1e16 (rev c4)
00:1d.0 0c03: 8086:1e26 (rev 04)
00:1f.0 0601: 8086:1e59 (rev 04)
00:1f.2 0106: 8086:1e03 (rev 04)
00:1f.3 0c05: 8086:1e22 (rev 04)
01:00.0 0300: 10de:0de9 (rev ff)
02:00.0 0280: 8086:088e (rev 24)
03:00.0 0200: 10ec:8168 (rev 06)
```

Direcciones

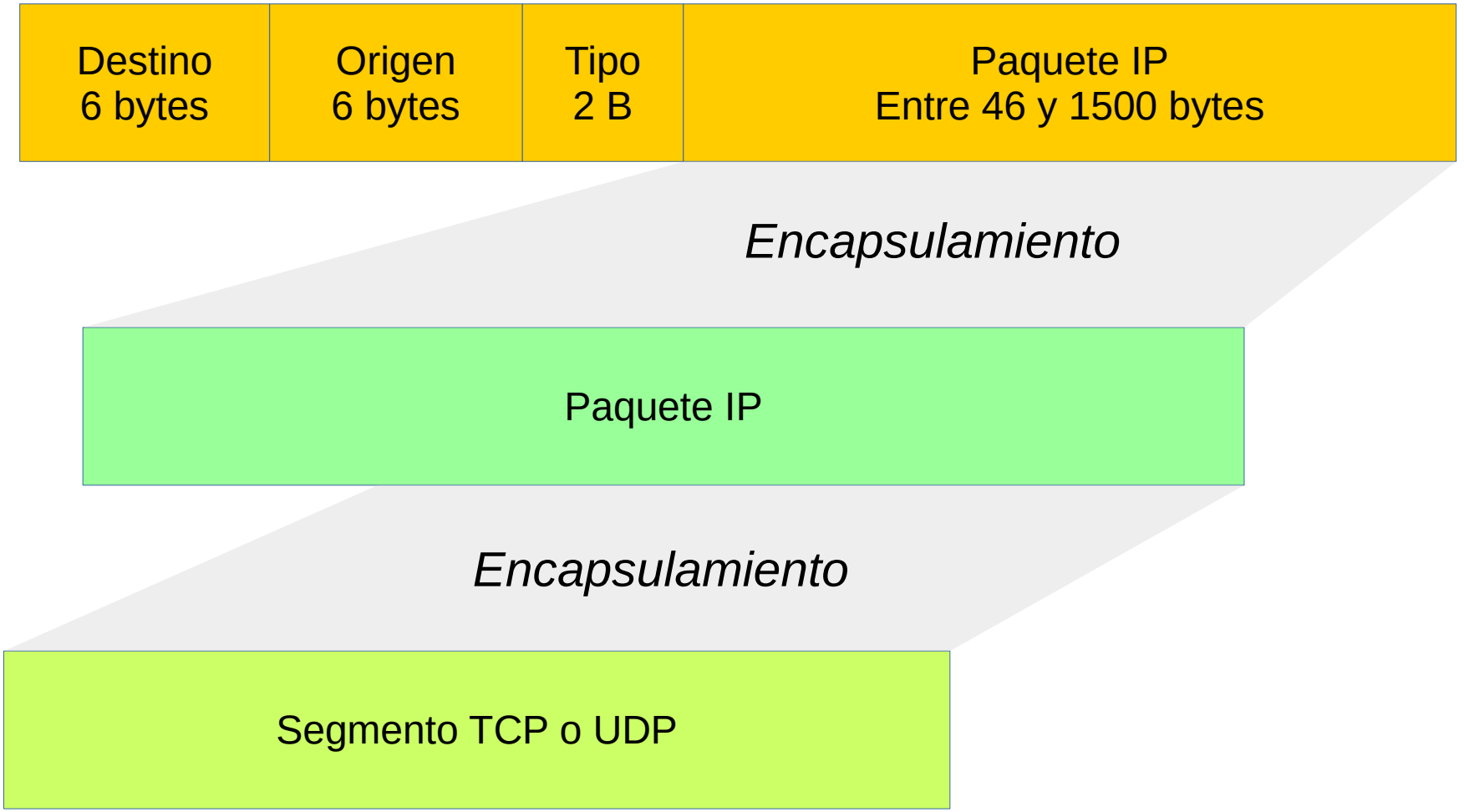
```
betsyrc ~ # ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 50:b7:c3:04:5d:06
          inet addr:10.0.2.226  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::52b7:c3ff:fe04:5d06/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:402483 errors:0 dropped:0 overruns:0 frame:0
          TX packets:168545 errors:0 dropped:1 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:95016681 (90.6 MiB)  TX bytes:155432538 (148.2 MiB)

betsyrc ~ # ip addr show dev eth0
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
state UP group default qlen 1000
    link/ether 50:b7:c3:04:5d:06 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.226/24 brd 10.0.2.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::52b7:c3ff:fe04:5d06/64 scope link
       valid_lft forever preferred_lft forever
```



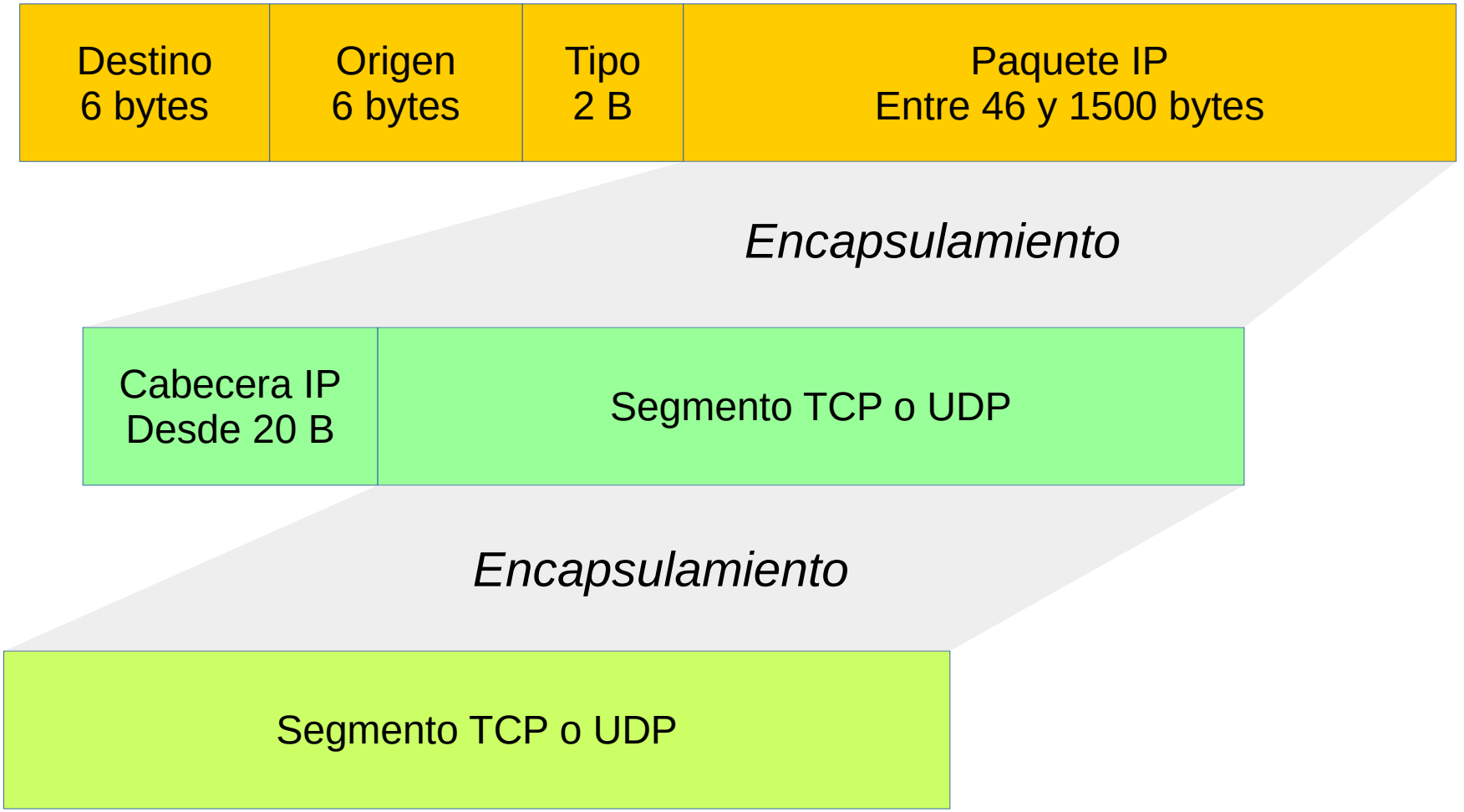
Frames, paquetes, segmentos



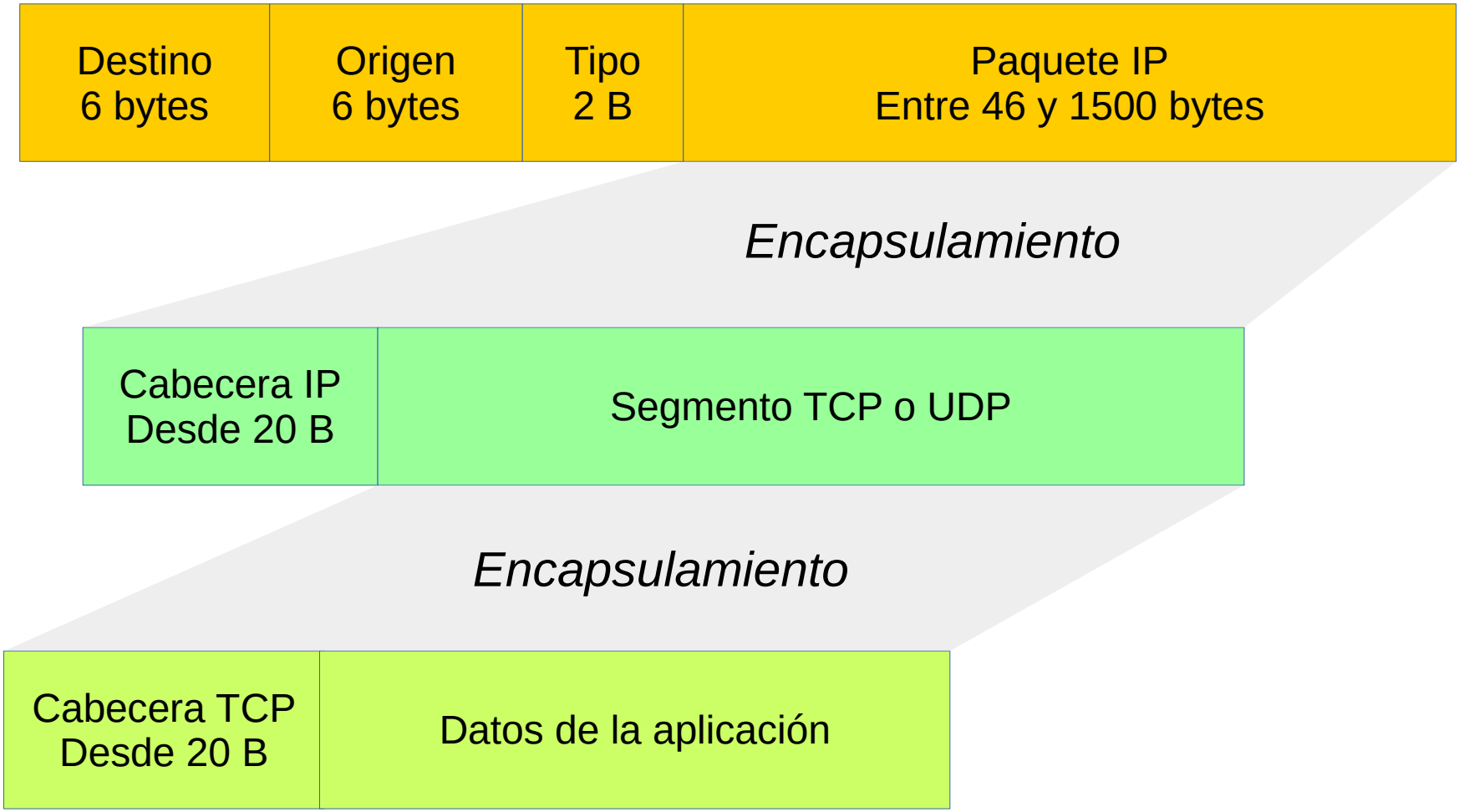
Frames, paquetes, segmentos



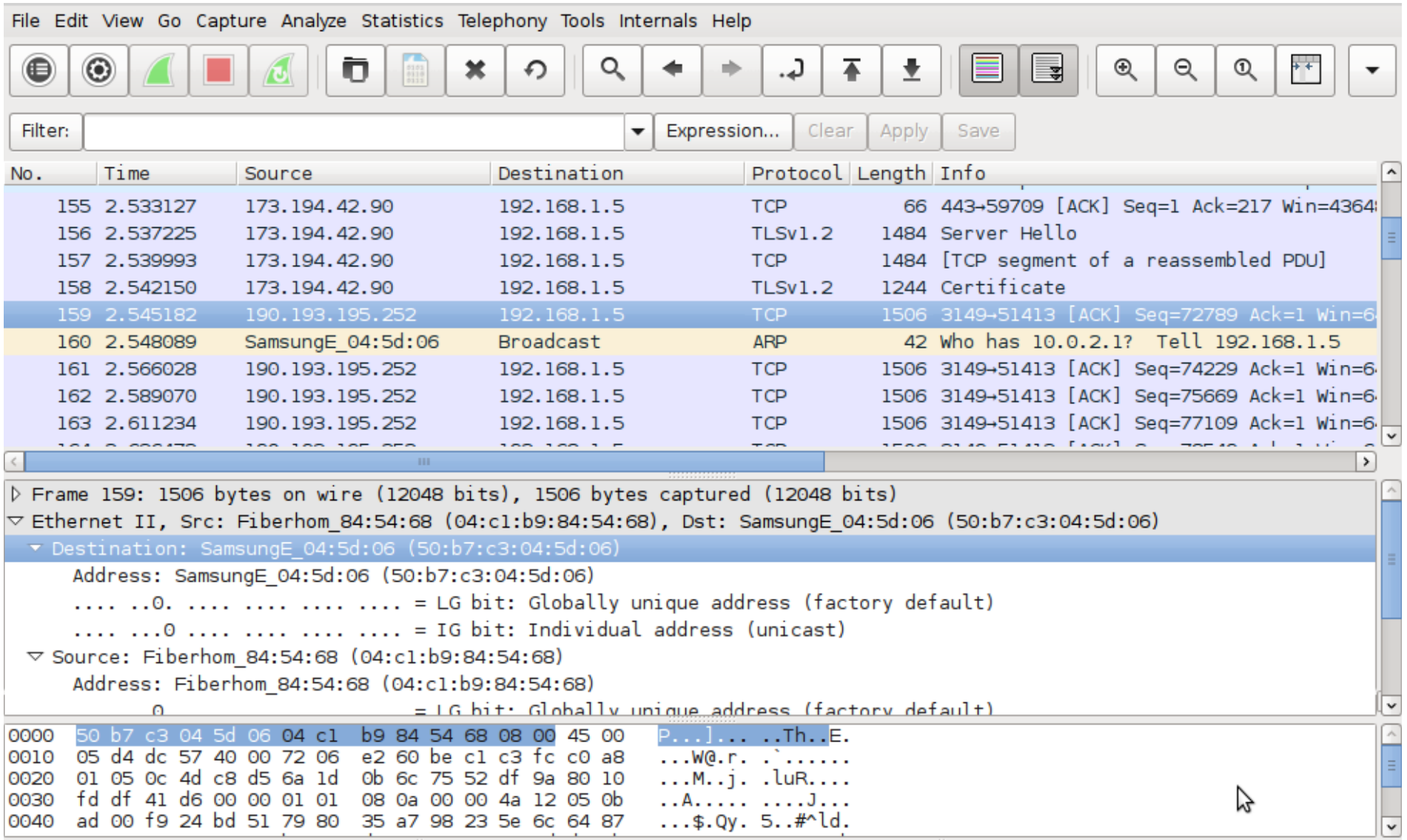
Frames, paquetes, segmentos



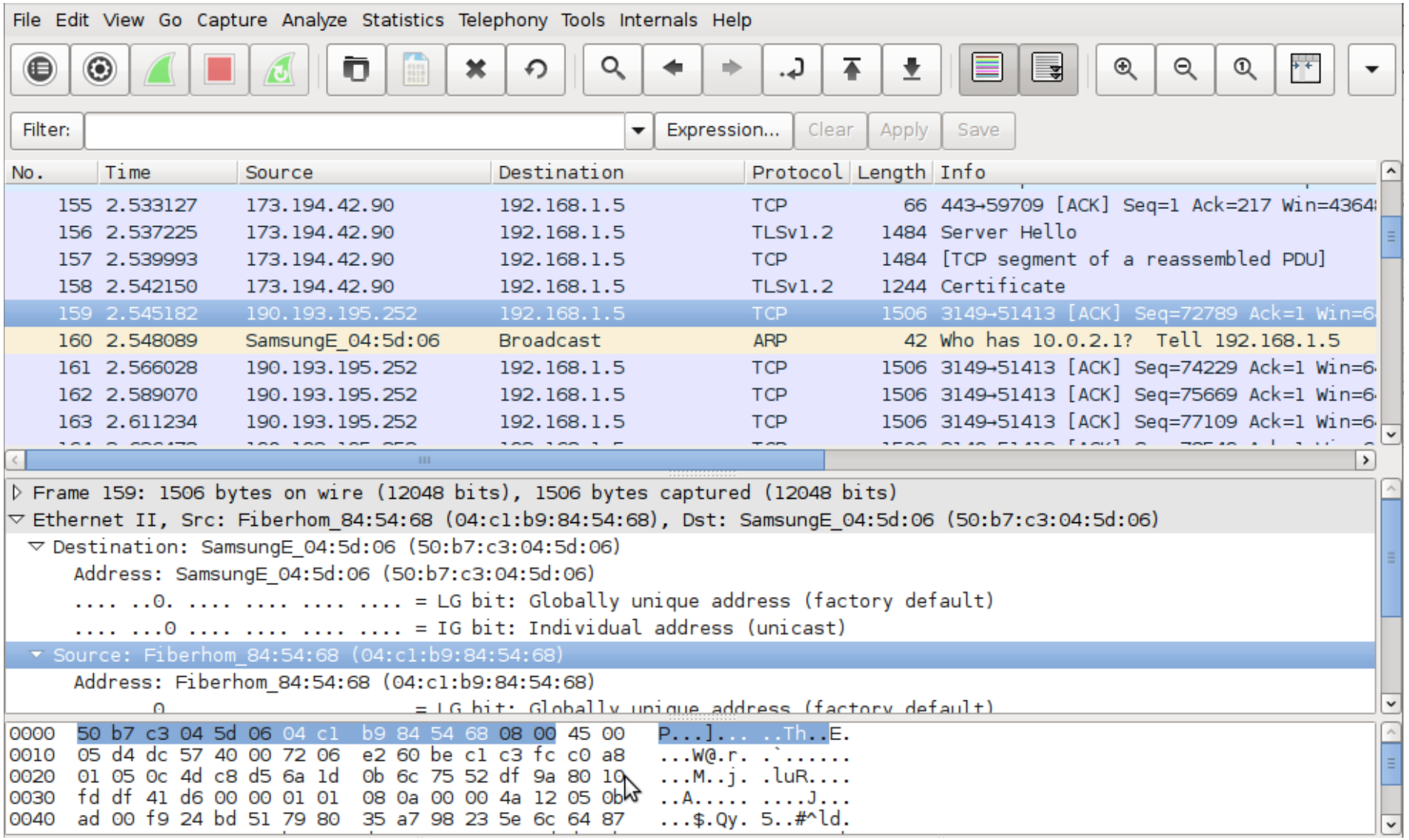
Frames, paquetes, segmentos



Dirección destino

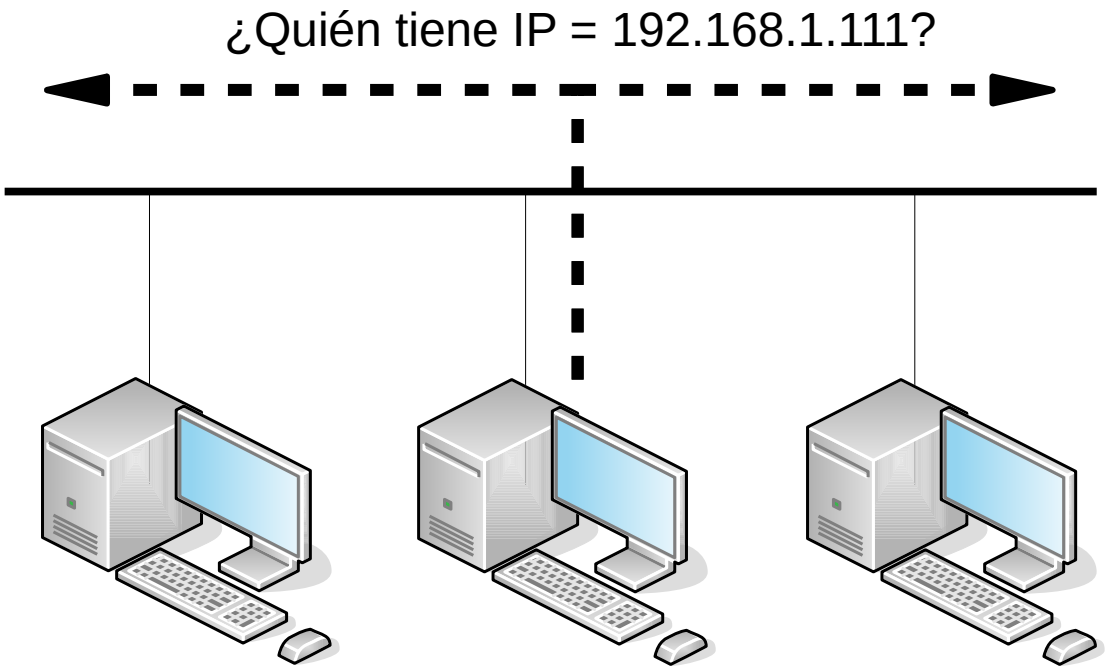


Dirección origen

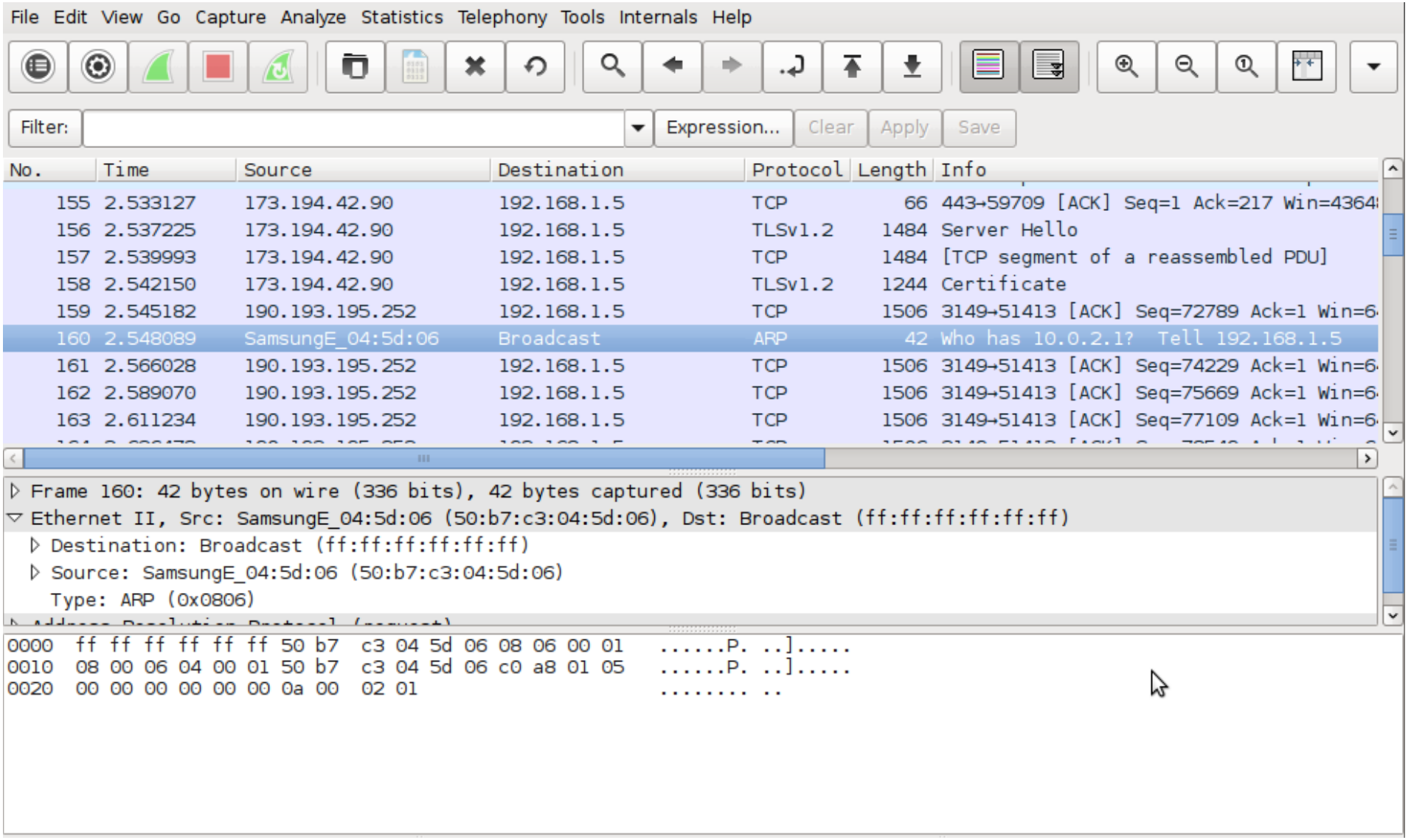


ARP

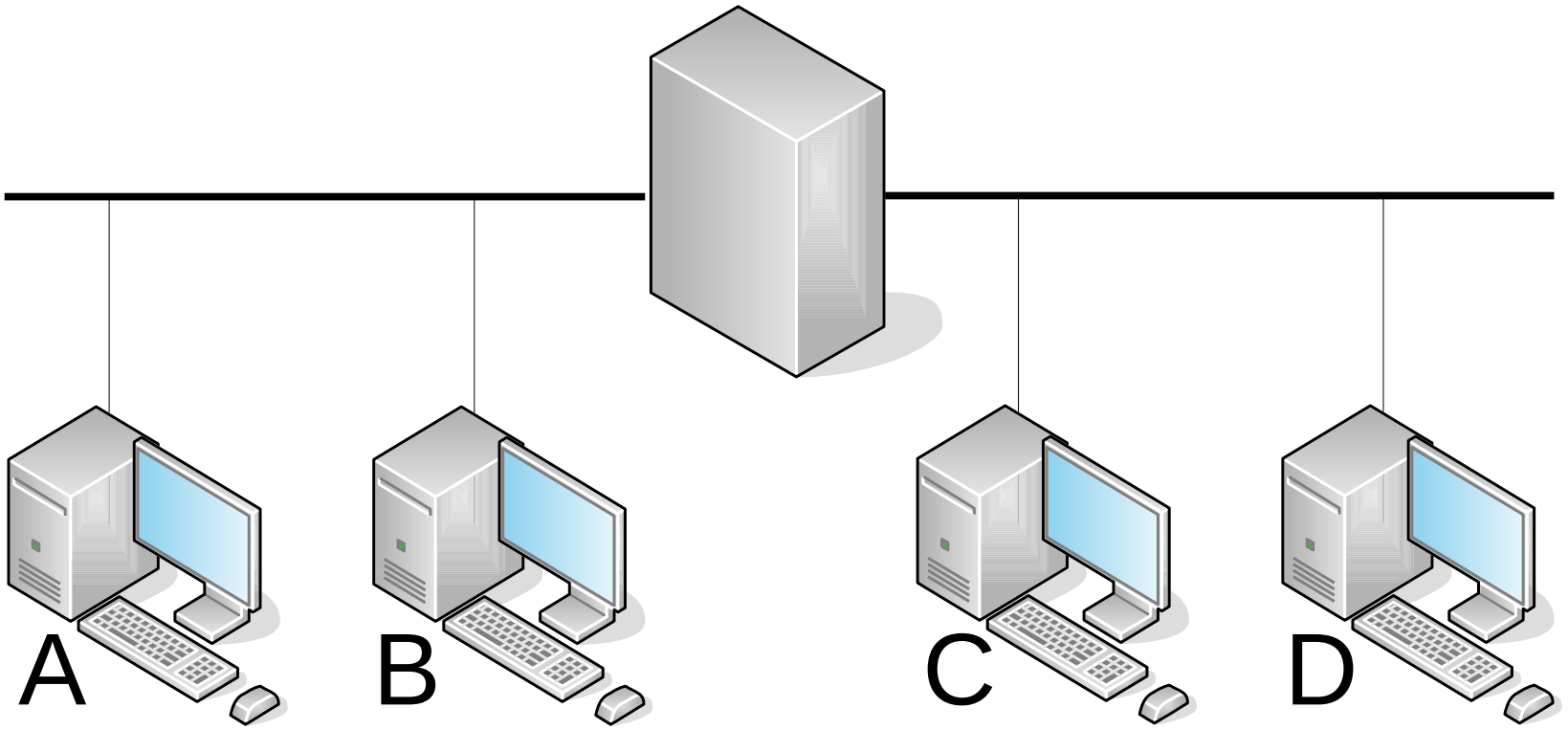
```
betsyrc ~ # ping 192.168.1.111
PING 192.168.1.111 (192.168.1.111) 56(84) bytes of data.
64 bytes from 192.168.1.111: icmp_seq=2 ttl=64 time=0.690 ms
64 bytes from 192.168.1.111: icmp_seq=3 ttl=64 time=0.642 ms
64 bytes from 192.168.1.111: icmp_seq=4 ttl=64 time=0.728 ms
```



Broadcast

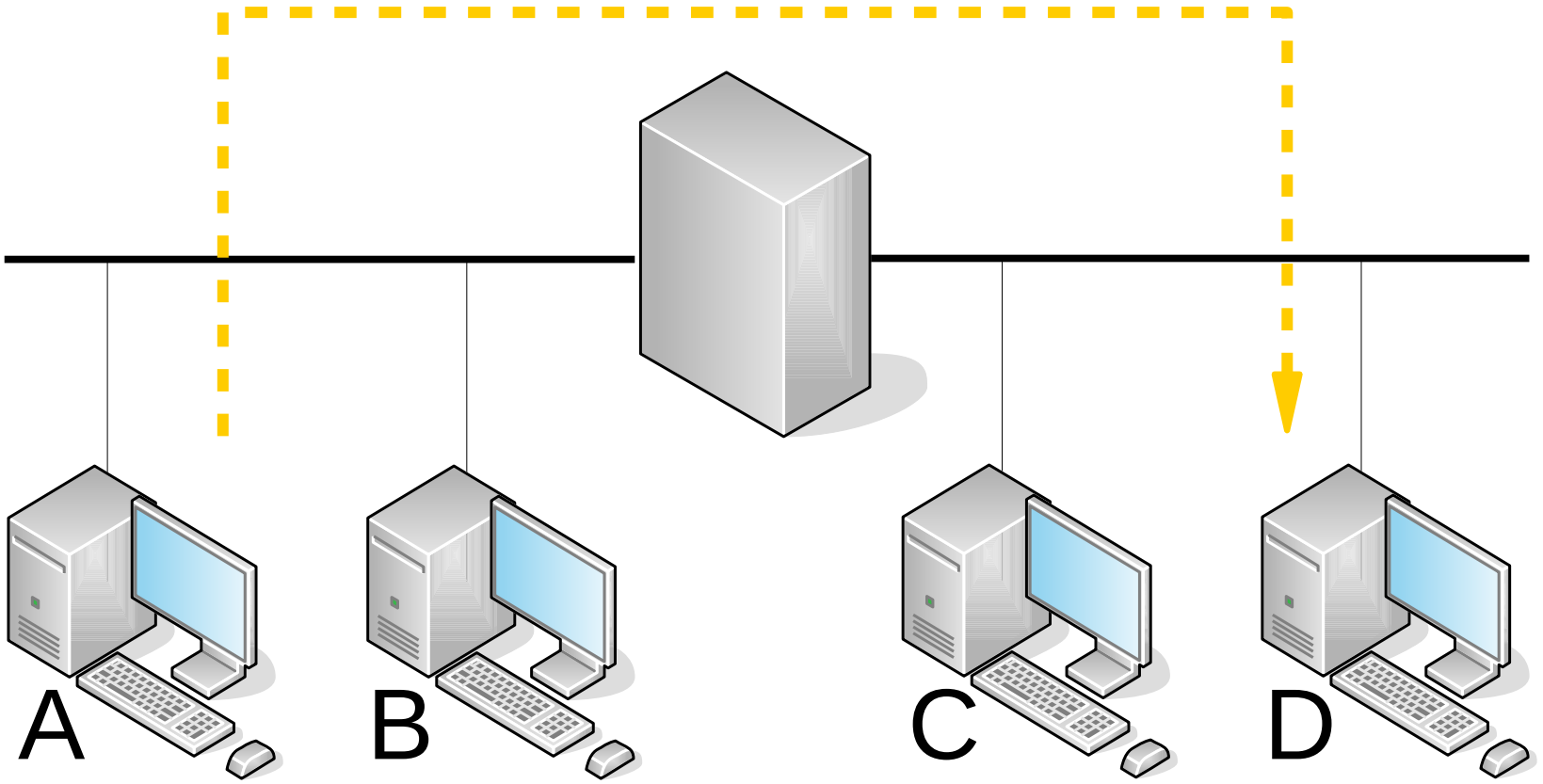

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter:
Expression... Clear Apply Save
No. Time Source Destination Protocol Length Info
155 2.533127 173.194.42.90 192.168.1.5 TCP 66 443→59709 [ACK] Seq=1 Ack=217 Win=4364
156 2.537225 173.194.42.90 192.168.1.5 TLSv1.2 1484 Server Hello
157 2.539993 173.194.42.90 192.168.1.5 TCP 1484 [TCP segment of a reassembled PDU]
158 2.542150 173.194.42.90 192.168.1.5 TLSv1.2 1244 Certificate
159 2.545182 190.193.195.252 192.168.1.5 TCP 1506 3149→51413 [ACK] Seq=72789 Ack=1 Win=6
160 2.548089 SamsungE_04:5d:06 Broadcast ARP 42 Who has 10.0.2.1? Tell 192.168.1.5
161 2.566028 190.193.195.252 192.168.1.5 TCP 1506 3149→51413 [ACK] Seq=74229 Ack=1 Win=6
162 2.589070 190.193.195.252 192.168.1.5 TCP 1506 3149→51413 [ACK] Seq=75669 Ack=1 Win=6
163 2.611234 190.193.195.252 192.168.1.5 TCP 1506 3149→51413 [ACK] Seq=77109 Ack=1 Win=6
Frame 160: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)
Ethernet II, Src: SamsungE_04:5d:06 (50:b7:c3:04:5d:06), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Destination: Broadcast (ff:ff:ff:ff:ff:ff)
Source: SamsungE_04:5d:06 (50:b7:c3:04:5d:06)
Type: ARP (0x0806)
0000 ff ff ff ff ff ff 50 b7 c3 04 5d 06 08 06 00 01 ......P. ..].....
0010 08 00 06 04 00 01 50 b7 c3 04 5d 06 c0 a8 01 05 ......P. ..].....
0020 00 00 00 00 00 00 0a 00 02 01 ....

Bridges

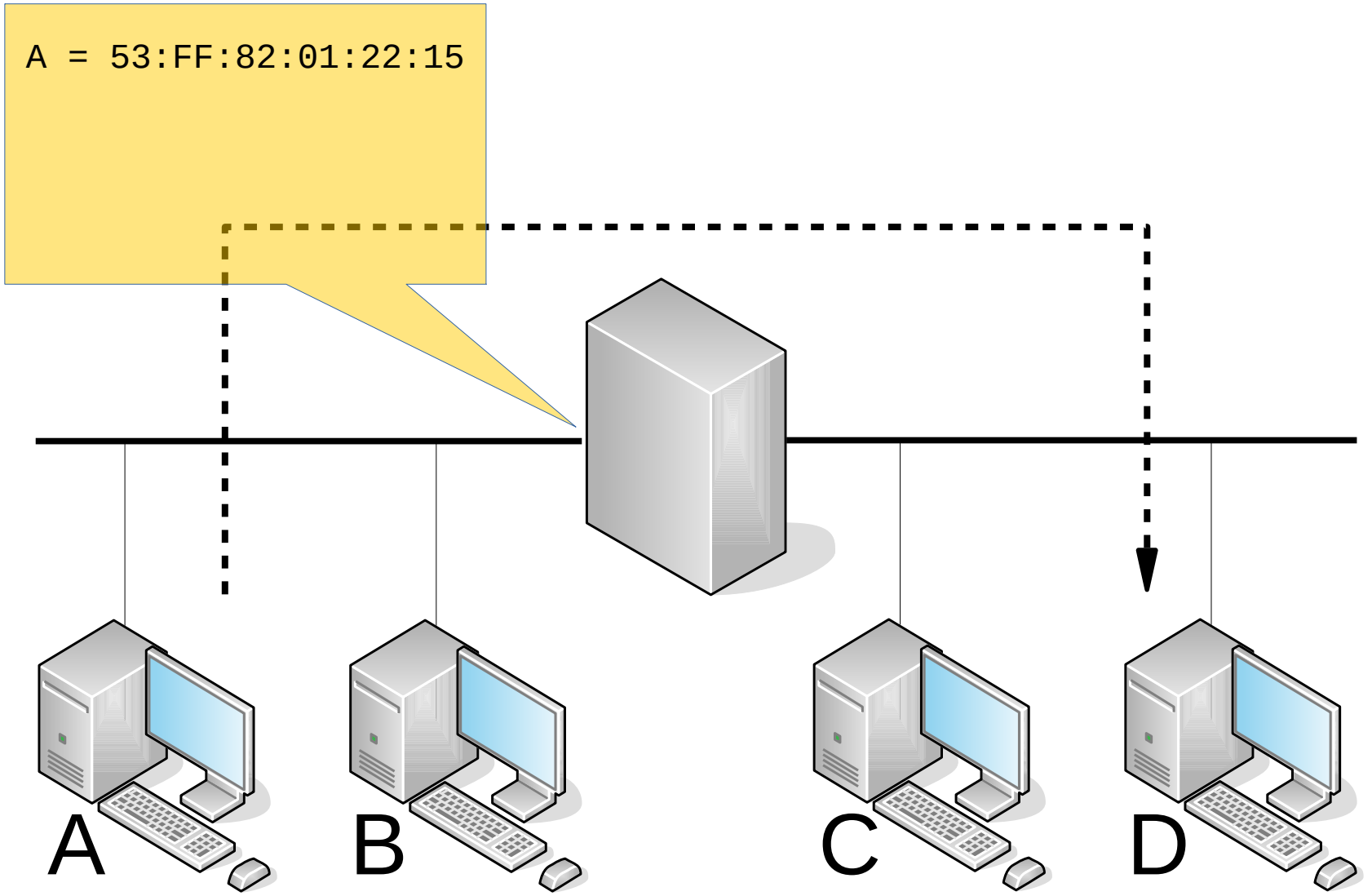


Bridges: inundación

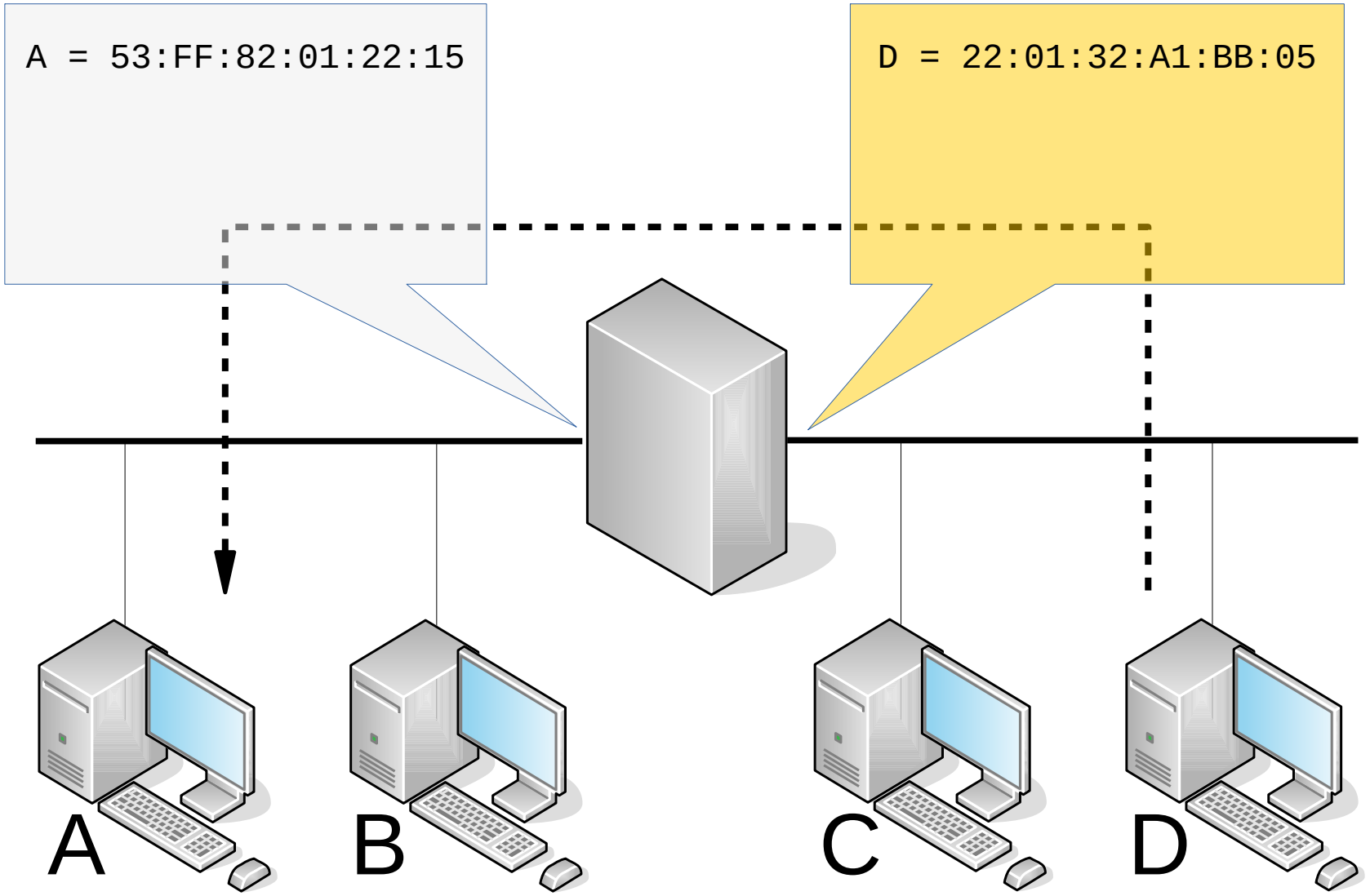
Destino D	Origen A	Tipo 2 B	Paquete IP Entre 46 y 1500 bytes



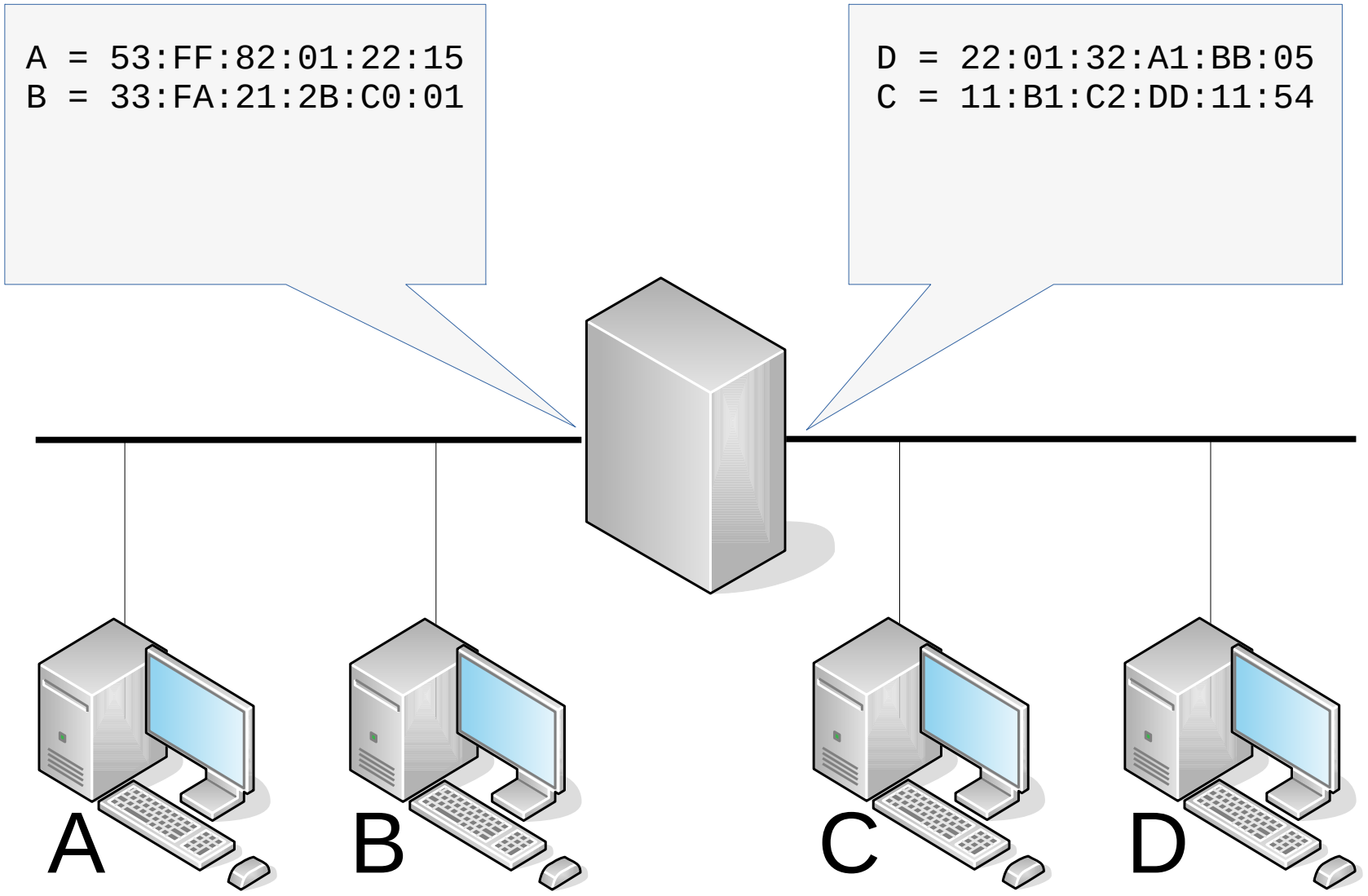
Bridges: aprendizaje



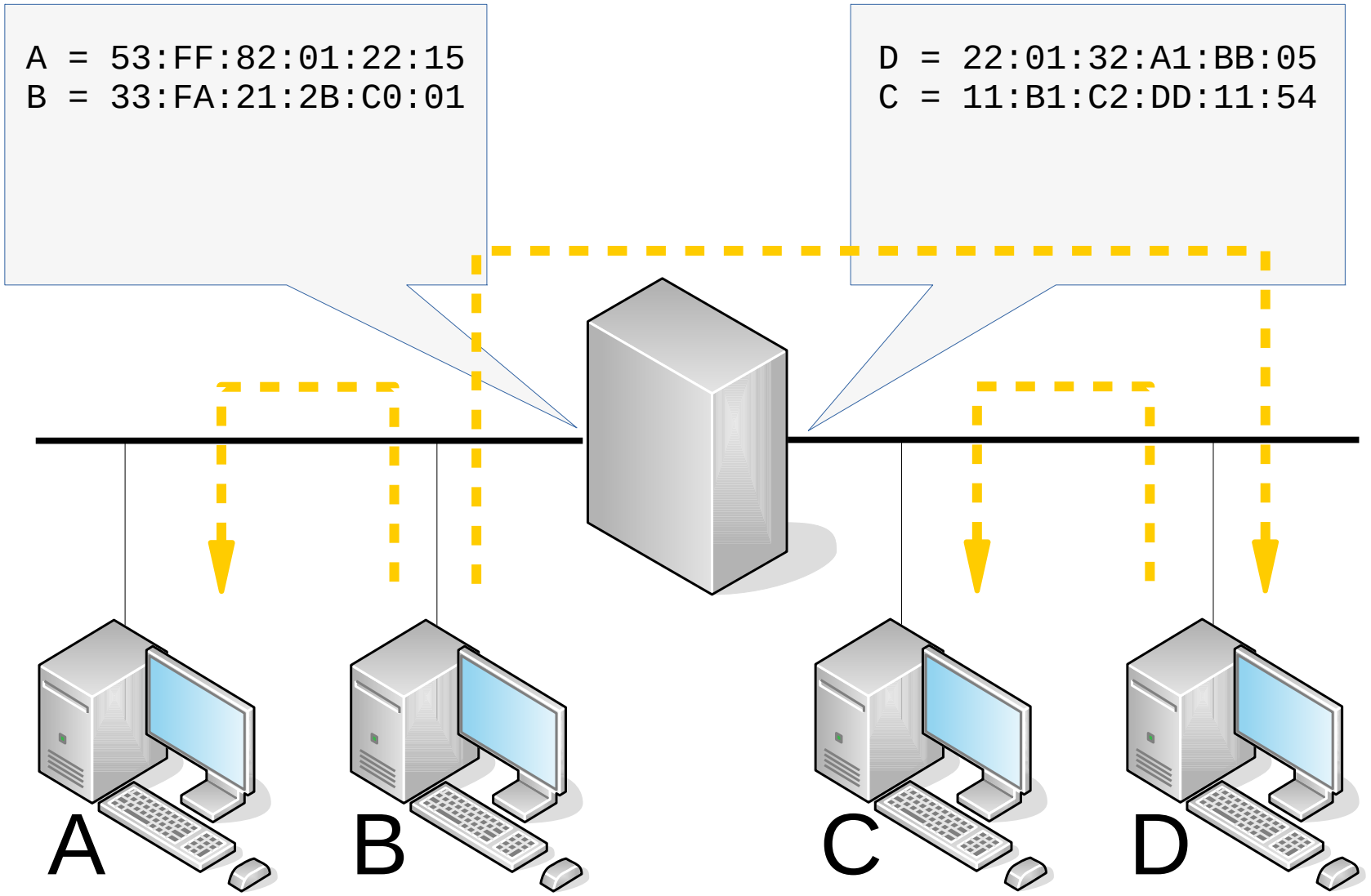
Bridges: aprendizaje



Bridges: aprendizaje

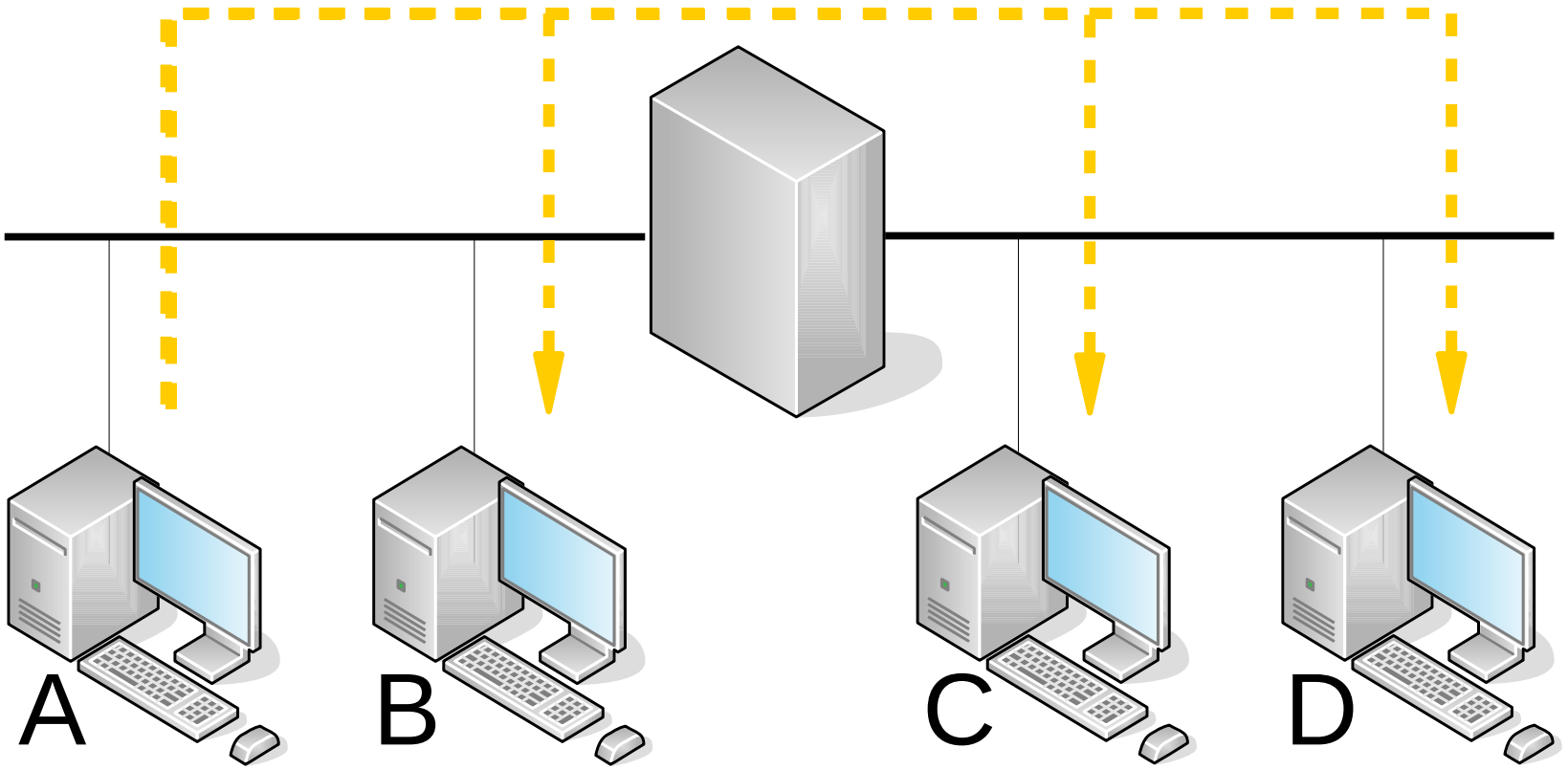


Bridges: filtrado

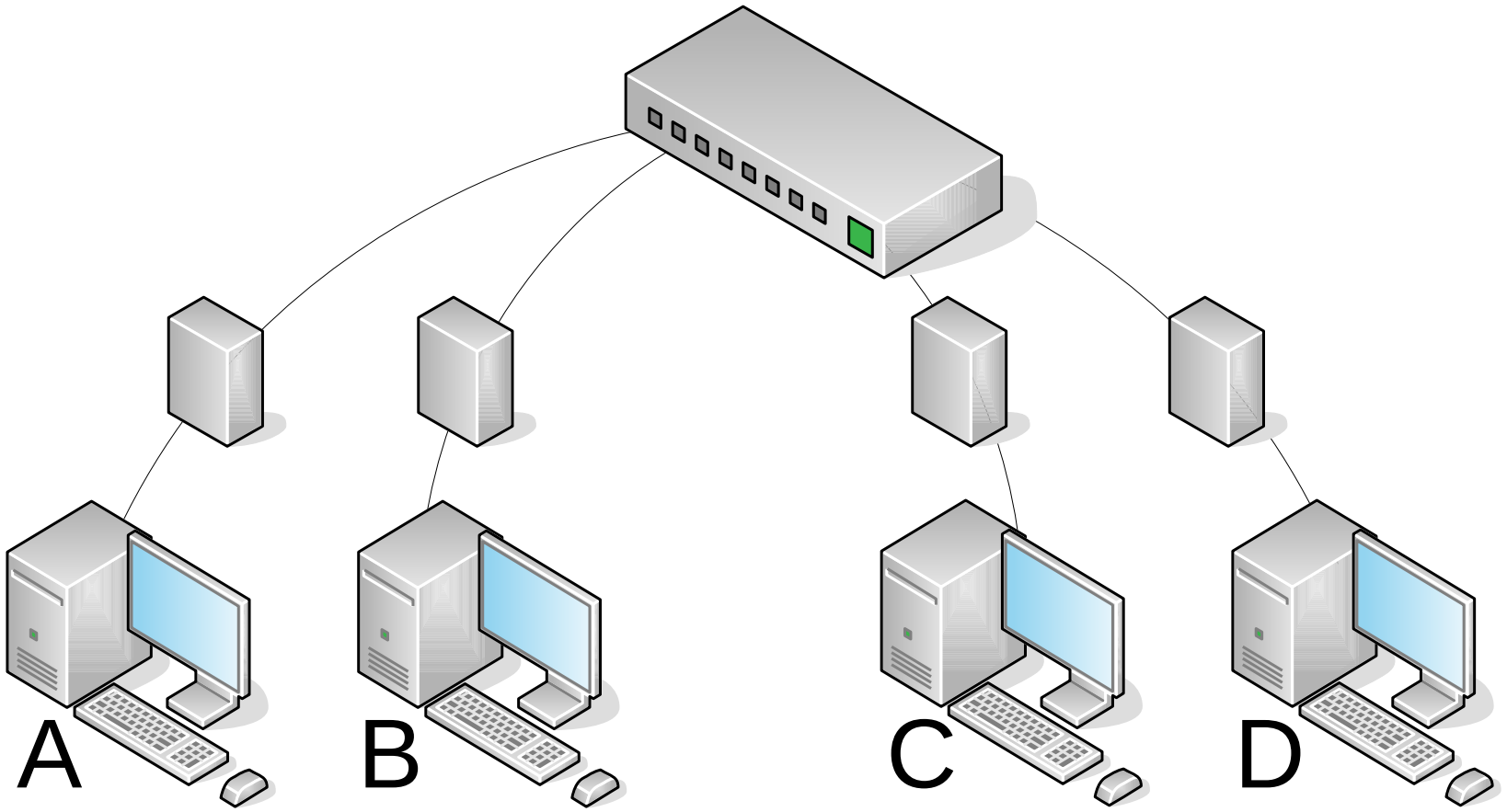


Bridges: broadcasts

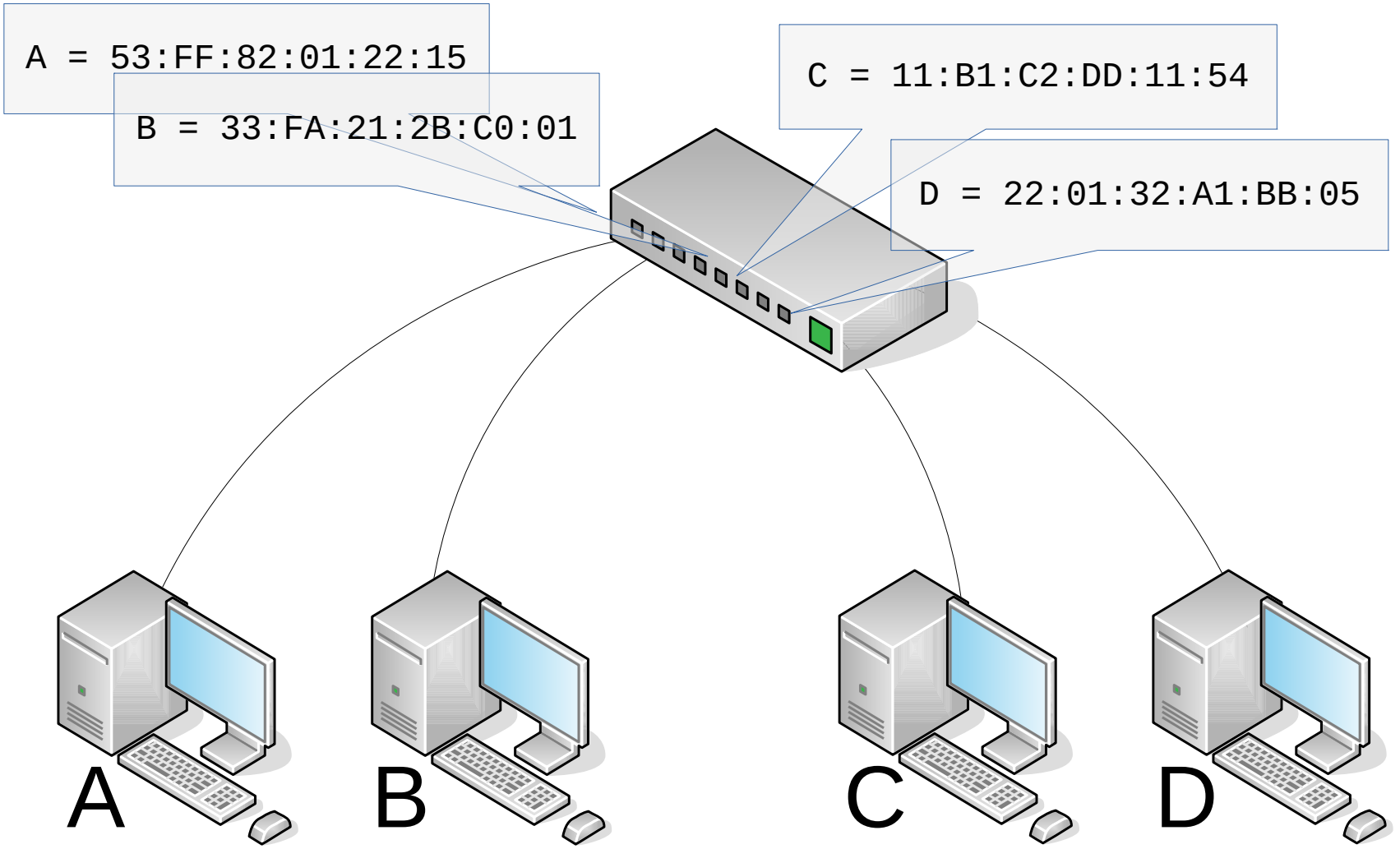
Destino	Origen	Tipo	Paquete IP
FF:FF:FF:FF:FF:FF	A	2 B	Entre 46 y 1500 bytes



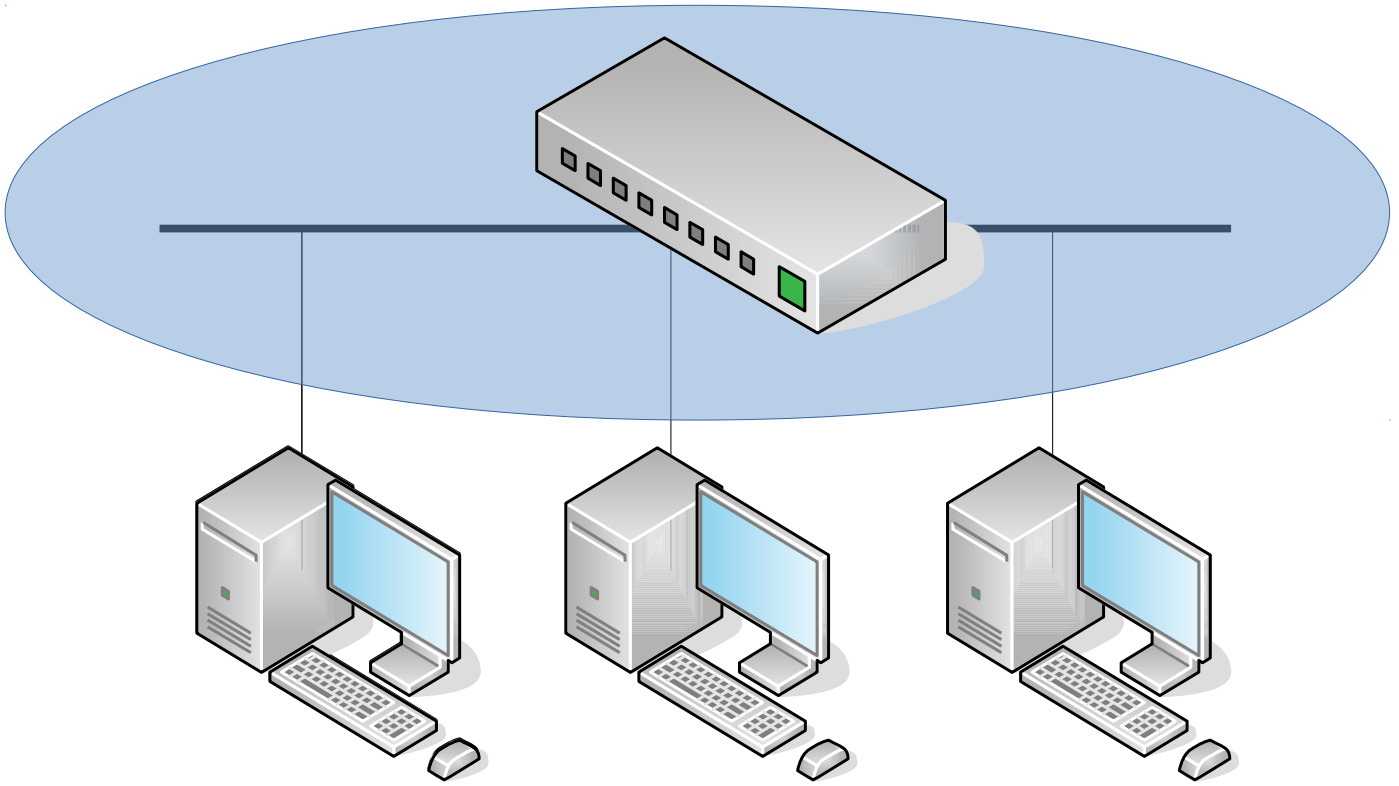
Switches: bridges multivía



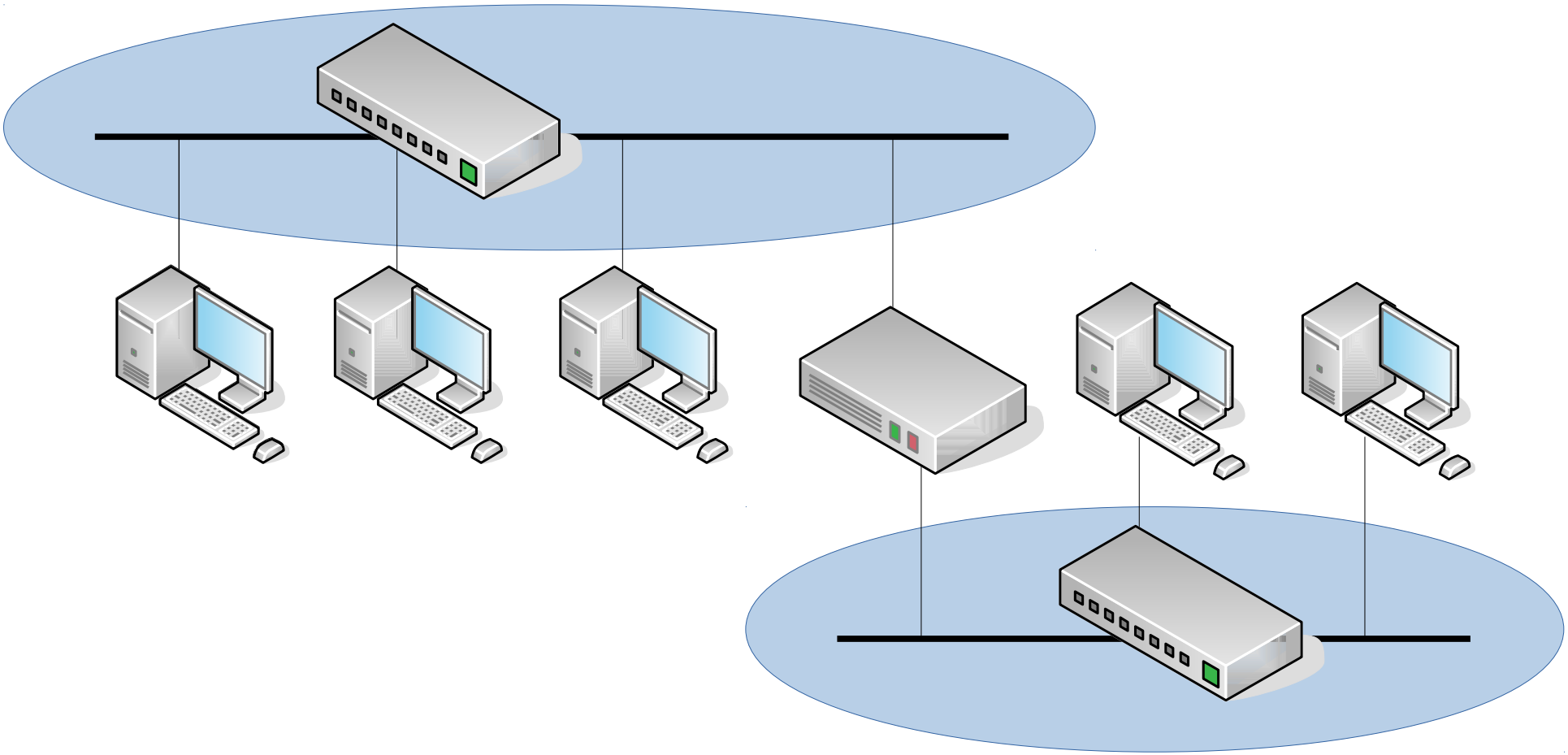
Switches: bridges multivía



Dominio de broadcast



Broadcast y routers



Broadcast y routers