Kathará

Kathará lab

one bridge

Version	2.0
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Description	One bridge and four computers are connected; the learning features of the bridge are experienced

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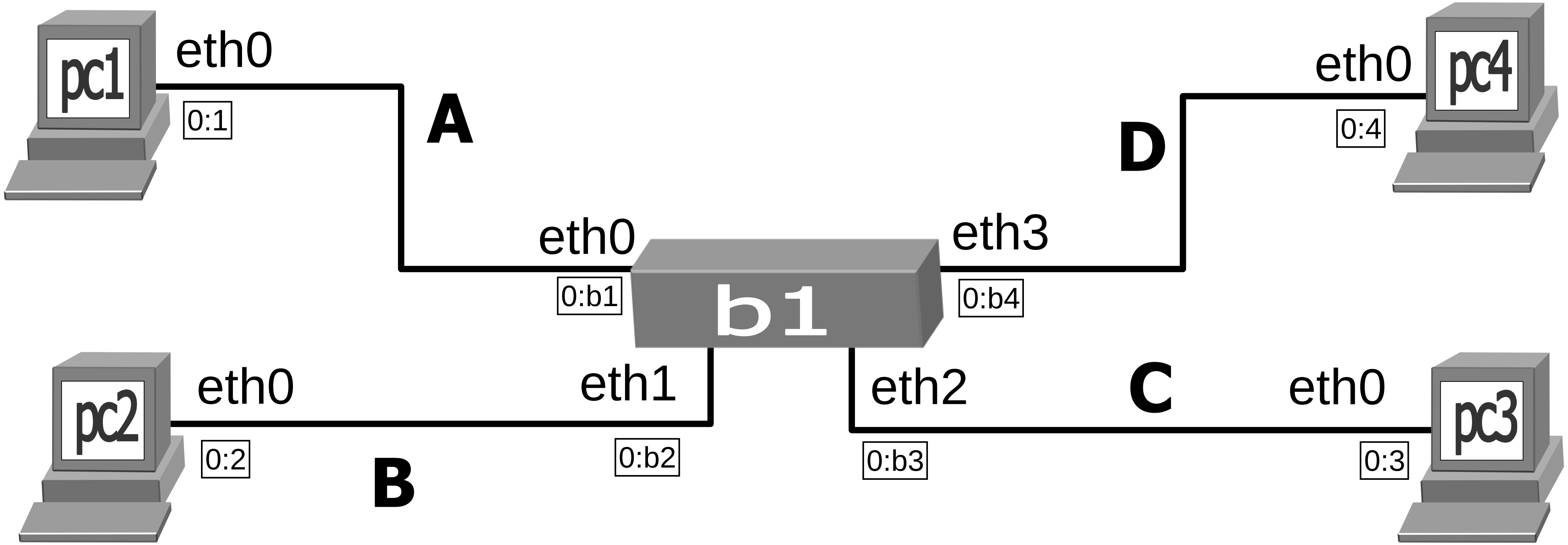
network topology



the lab.conf

lab.conf – part 1

```
pc1[0]="A/00:00:00:00:00:01"
pc1[image]="kathara/base"
pc1[ipv6]="false"

pc2[0]="B/00:00:00:00:00:02"
pc2[image]="kathara/base"
pc2[ipv6]="false"

pc3[0]="C/00:00:00:00:00:03"
pc3[image]="kathara/base"
pc3[ipv6]="false"

pc4[0]="D/00:00:00:00:00:04"
pc4[image]="kathara/base"
pc4[ipv6]="false"
```

lab.conf – part 2

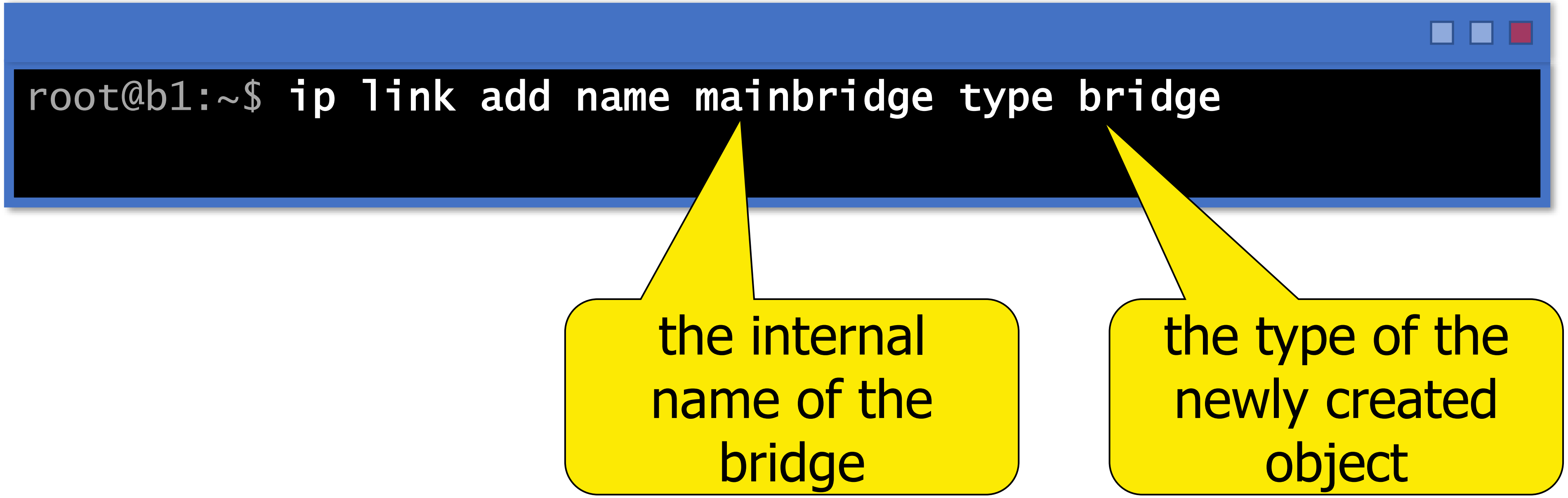
```
b1[0]="A/00:00:00:00:00:b1"
b1[1]="B/00:00:00:00:00:b2"
b1[2]="C/00:00:00:00:00:b3"
b1[3]="D/00:00:00:00:00:b4"
b1[image]="kathara/base"
b1[ipv6]="false"
```

how to create a bridge

- we want device b1 to be a bridge
- Linux has an already available software bridge
  - we will use it
  - there are different utilities that manages different parts of the bridge
    - ip link
    - brctl
    - bridge
    - …

how to create a bridge

- the command that lets b1 to be a bridge follows
  - the name of the device remains b1, the internal name we give to the bridge is mainbridge



```
root@b1:~$ ip link add name mainbridge type bridge
```

the internal name of the bridge

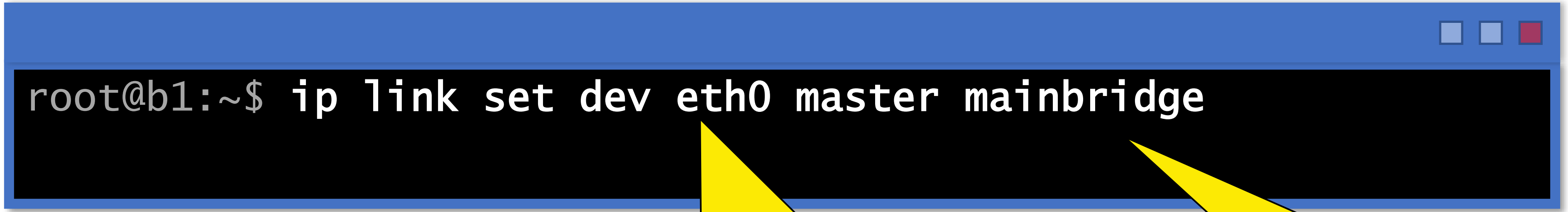
the type of the newly created object

remarks

- b1 is a name of the Kathará device
- mainbridge is the name of a bridge inside b1

connect interfaces to a bridge

- the bridge needs then to be connected to some network interfaces
- connecting an interface to a bridge is called "enslaving"
  - it is done setting the bridge as the master of that interface



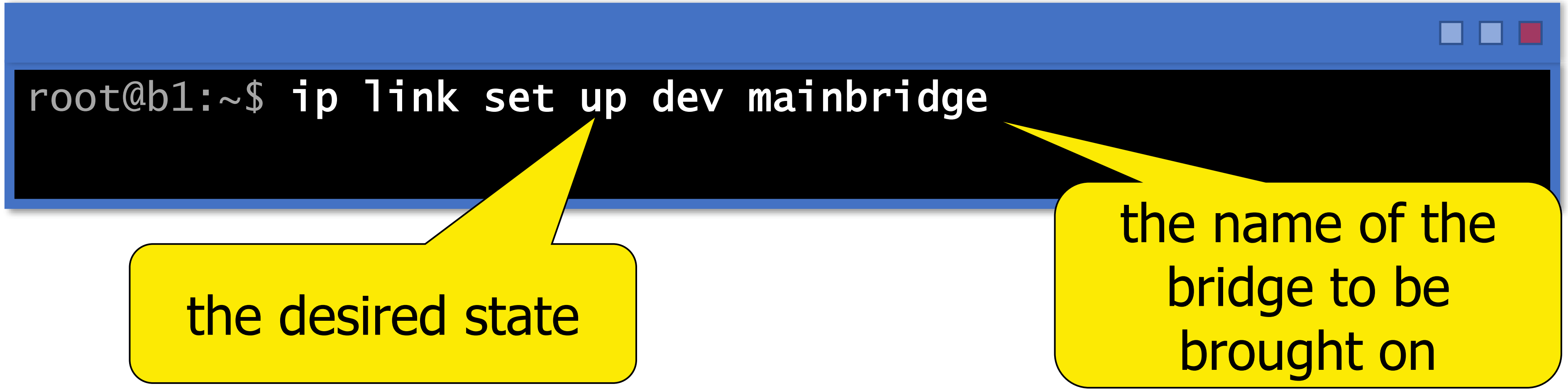
```
root@b1:~$ ip link set dev eth0 master mainbridge
```

the name of the interface to be connected

the name of the bridge to connect the interface

bringing up the bridge

- the bridge is born with its state DOWN
  - this means that it is switched off
- the following command allows to switch up/down a bridge (or even a network interface)
  - it can be also used for ethX interfaces



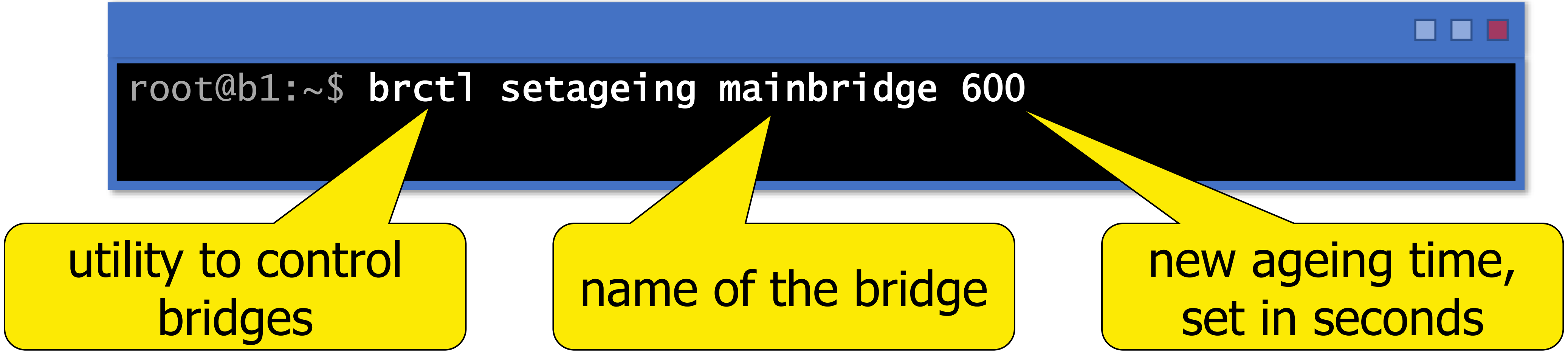
```
root@b1:~$ ip link set up dev mainbridge
```

the desired state

the name of the bridge to be brought on

bridge ageing time

- the ageing time is the number of seconds that a MAC address will be kept in the FDB (Filtering Data Base)
- by default, it is set to 300 (5 minutes)
- to change the ageing time:



```
root@b1:~$ brctl setageing mainbridge 600
```

utility to control bridges

name of the bridge

new ageing time, set in seconds

b1.startup

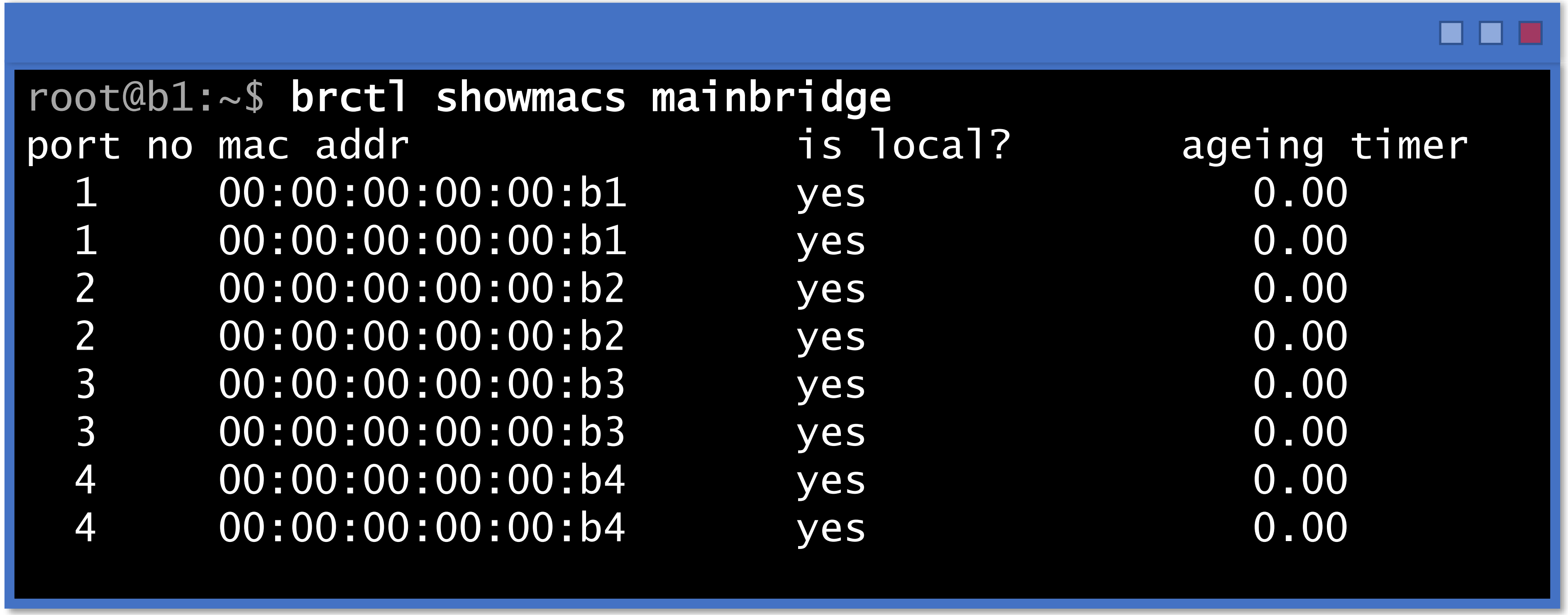
b1.startup

```
ip link add name mainbridge type bridge

ip link set dev eth0 master mainbridge
ip link set dev eth1 master mainbridge
ip link set dev eth2 master mainbridge
ip link set dev eth3 master mainbridge

ip link set up dev mainbridge

brctl setageing mainbridge 600
```

let's start the lab

show the FDB of a bridge

- to show the FDB of a bridge, the `brctl` command can be used



```
root@b1:~$ brctl showmacs mainbridge
port no mac addr                is local?       ageing timer
  1     00:00:00:00:00:b1       yes                0.00
  1     00:00:00:00:00:b1       yes                0.00
  2     00:00:00:00:00:b2       yes                0.00
  2     00:00:00:00:00:b2       yes                0.00
  3     00:00:00:00:00:b3       yes                0.00
  3     00:00:00:00:00:b3       yes                0.00
  4     00:00:00:00:00:b4       yes                0.00
  4     00:00:00:00:00:b4       yes                0.00
```

auto-learning local interfaces

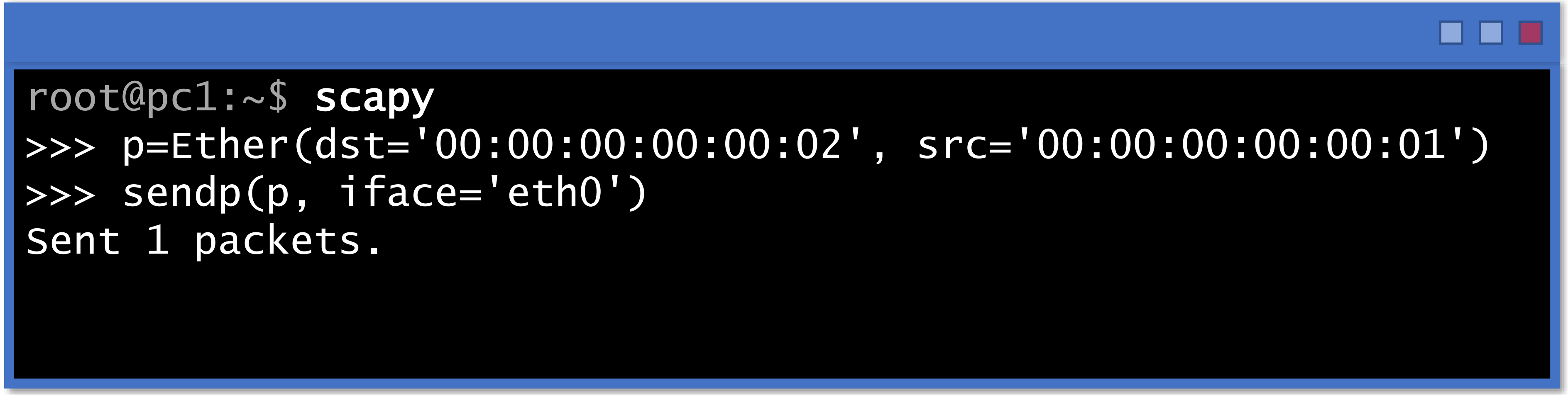
- the Linux bridge automatically learns the MAC addresses of all its local interfaces
  - he already knows them because they are hosted on the same device
- the ageing timer is shown as 0.00 because those entries never expire

the port column

- in the `brctl showmacs <bridge_name>` command, the first column of the output is called port
- the port indicates the number of the virtual port of the bridge
- a linux bridge has a hard limit (hardcoded in the Kernel) of 1024 ports
- the ports are assigned starting from 1 in the order they are connected to interfaces
  - the order of the commands that enslave the interfaces

learn dynamic FDB entries – part 1

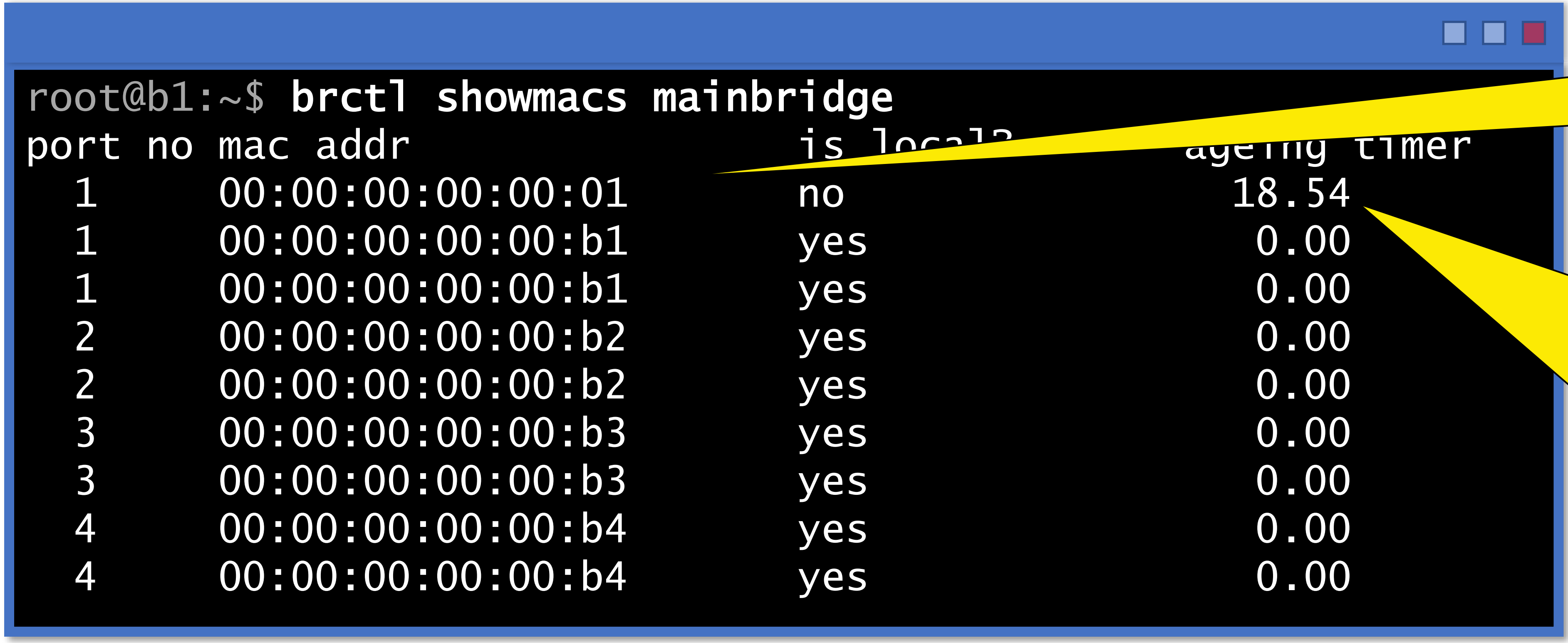
- if a packet is sent from a PC, the bridge will automatically learn its MAC address
- try to send a packet from pc1 to pc2 using `scapy`



```
root@pc1:~$ scapy
>>> p=Ether(dst='00:00:00:00:00:02', src='00:00:00:00:00:01')
>>> sendp(p, iface='eth0')
Sent 1 packets.
```

learn dynamic FDB entries – part 2

- now, take a look at the FDB of `mainbridge` again



```
root@b1:~$ brctl showmacs mainbridge
port no mac addr                is local?               ageing timer
  1     00:00:00:00:00:01       no                        18.54
  1     00:00:00:00:00:b1       yes                        0.00
  1     00:00:00:00:00:b1       yes                        0.00
  2     00:00:00:00:00:b2       yes                        0.00
  2     00:00:00:00:00:b2       yes                        0.00
  3     00:00:00:00:00:b3       yes                        0.00
  3     00:00:00:00:00:b3       yes                        0.00
  4     00:00:00:00:00:b4       yes                        0.00
  4     00:00:00:00:00:b4       yes                        0.00
```

the MAC address of pc1 has been learnt

this timer always increases, showing how long the entry has been in the FDB

bridge ageing time

- the "ageing timer" of the previous slide always increases, showing how long the entry has been in the FDB
- eventually, the entry expires and simply disappears

exercises

- why, after the above experiment, in the FDB there is no entry for pc2?
- try to sniff from pc3 while sending the packet from pc1 to pc2, what happens?
- send a "reply" packet from pc2, how the FDB changes?
- try again to sniff from pc3 while sending the packet from pc1 to pc2, is the result the same?
- try to send packets with the wrong source address