



Bridge & Switch

Pietro Nicoletti
piero@studioreti.it



Copyright note

- These slides are protected by copyright and international treaties. The title and the copyrights concerning the slides (inclusive, but non only, every image, photograph, animation, video, audio, music and text) are the author's (see Page 1) property.
- The slides can be copied and used by research institutes, schools and universities affiliated to the Ministry of Public Instruction and the Ministry of University and Scientific Research and Technology, for institutional purpose, not for profit. In this case there is not requested any authorization.
- Any other complete or partial use or reproduction (inclusive, but not only, reproduction on discs, networks and printers) is forbidden without written authorization of the author in advance.
- The information contained in these slides are believed correct at the moment of publication. They are supplied only for didactic purpose and not to be used for installation-projects, products, networks etc. However, there might be changes without notice. The authors are not responsible for the content of the slides.
- In any case there can not be declared conformity with the information contained in these slides.
- In any case this note of copyright may never be removed and must be written also in case of partial use.

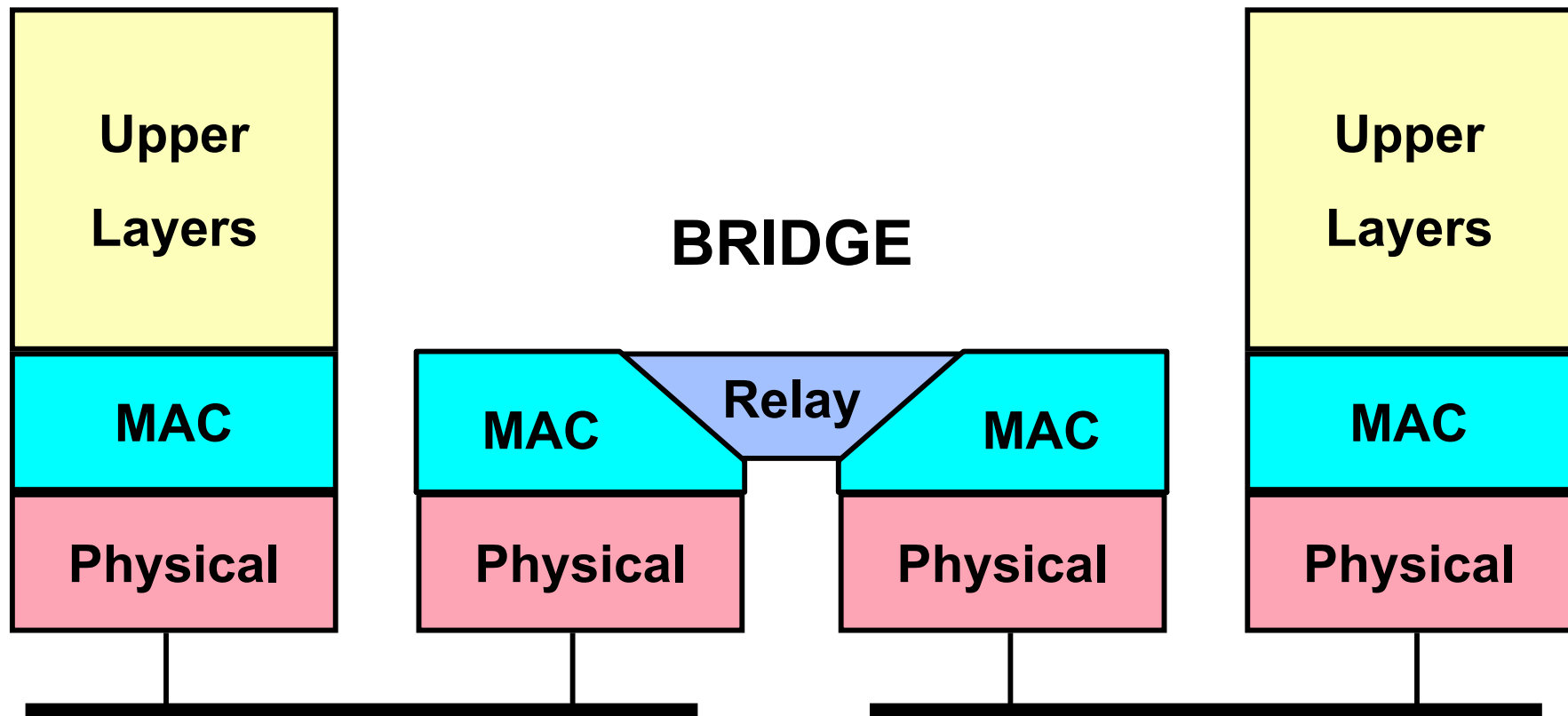


Bridge

- Called also MAC Bridge
 - operate at layer 2
 - use simple forwarding algorithm
 - forwarding technique based on MAC destination address
 - are normally used for local connections

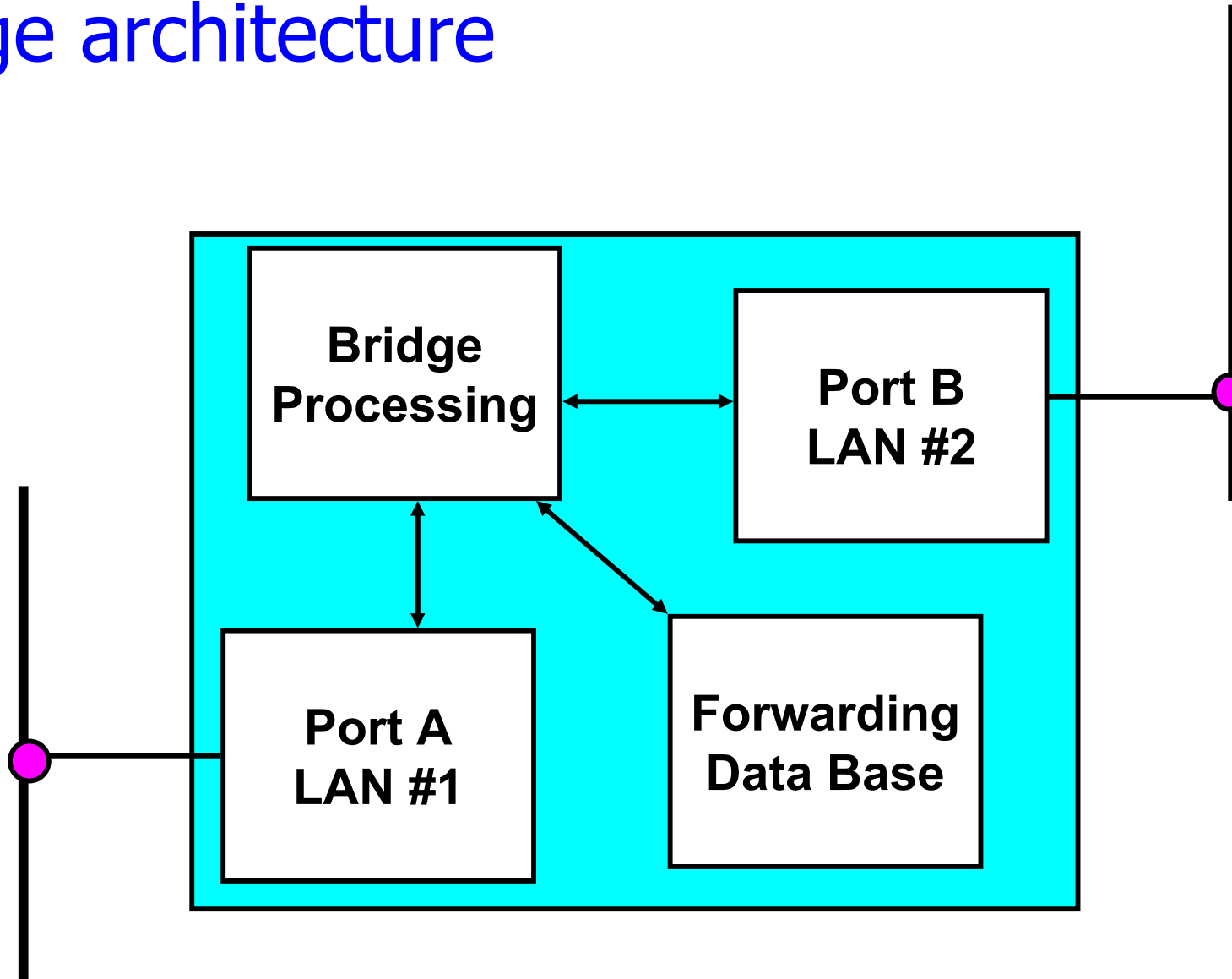


Bridge model





Bridge architecture





Forwarding

- Forwarding table is calculated by:
 - backward learning
 - looking the Source MAC address
- Backward learning
 - work only over LAN with tree topology
 - other topologies are transformed to tree topology by spanning tree algorithm
- Spanning tree algorithm operate periodically (any second)
 - decide which port set to forwarding state and which port set to blocking state

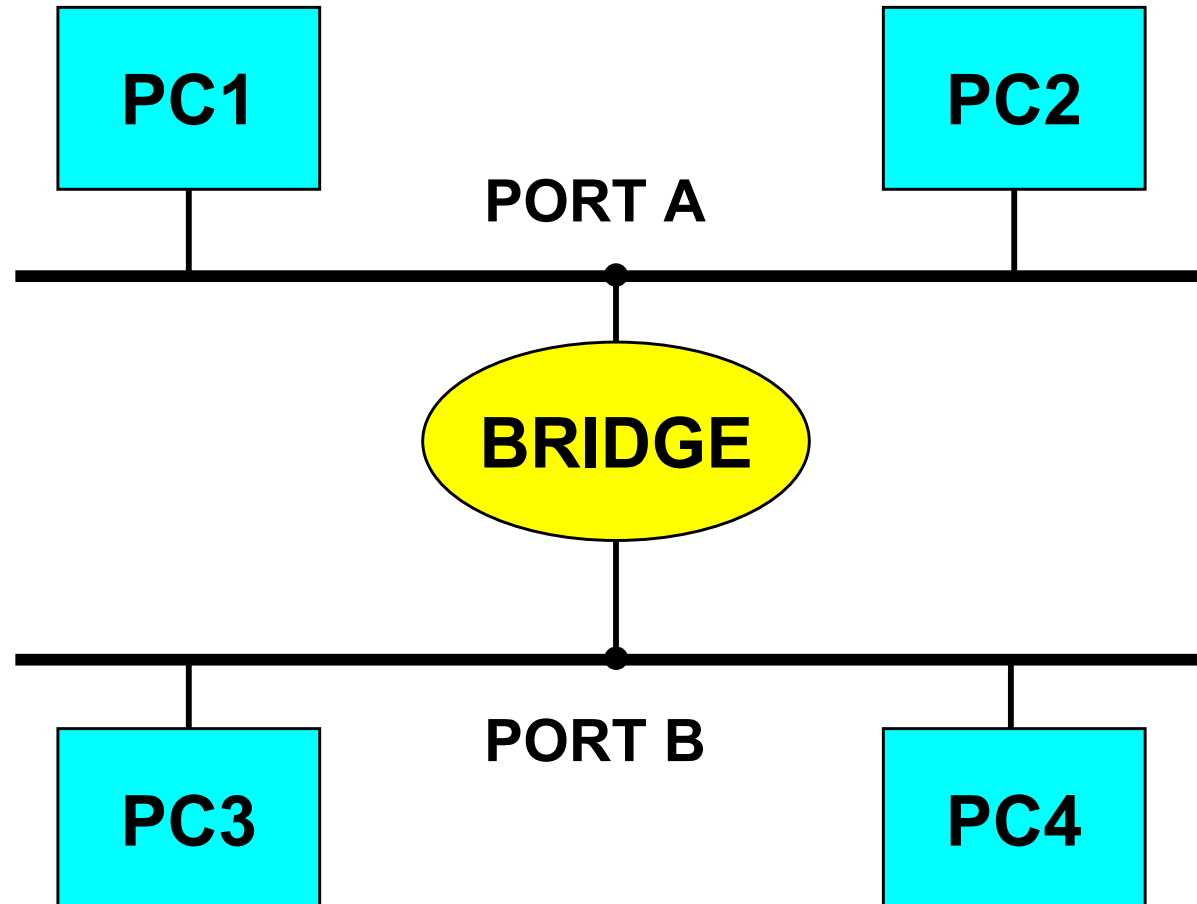


Transparent Bridge

- IEEE standardized the bridge functions by 802.1D standard
- The bridge 802.1D work in transparent mode, for this reason are also called transparent bridge:
 - are derived from Ethernet
 - have a local forwarding table
- The main functions of the bridge are:
 - frame forwarding
 - **Singlecast** frames forwarding based on *Destination MAC Address*
 - **Broadcast** frames are forwarded in every ports except the port where as been received
 - stations auto-learning
 - loop detection by spanning tree algorithm

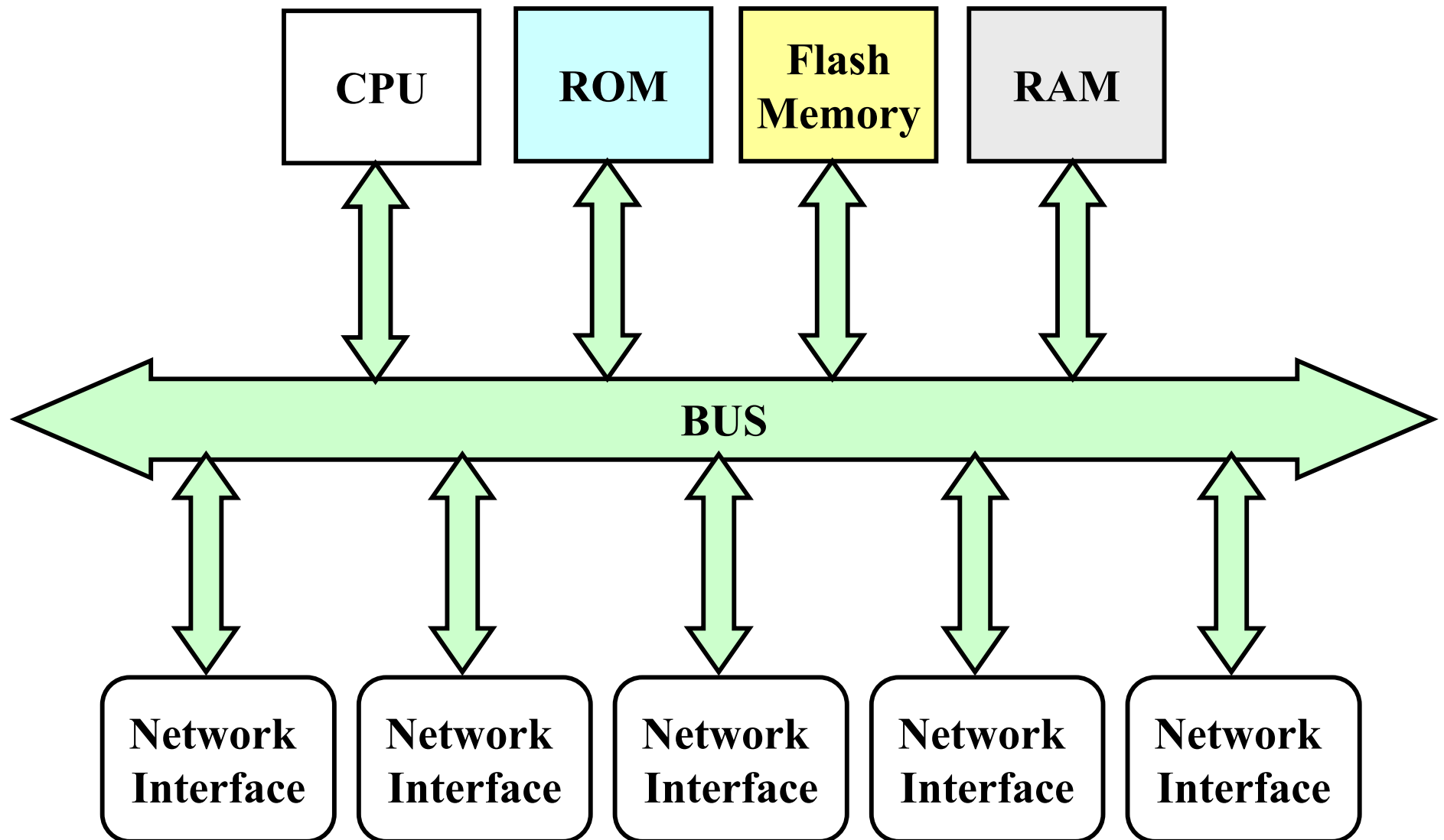


Transparent Bridge



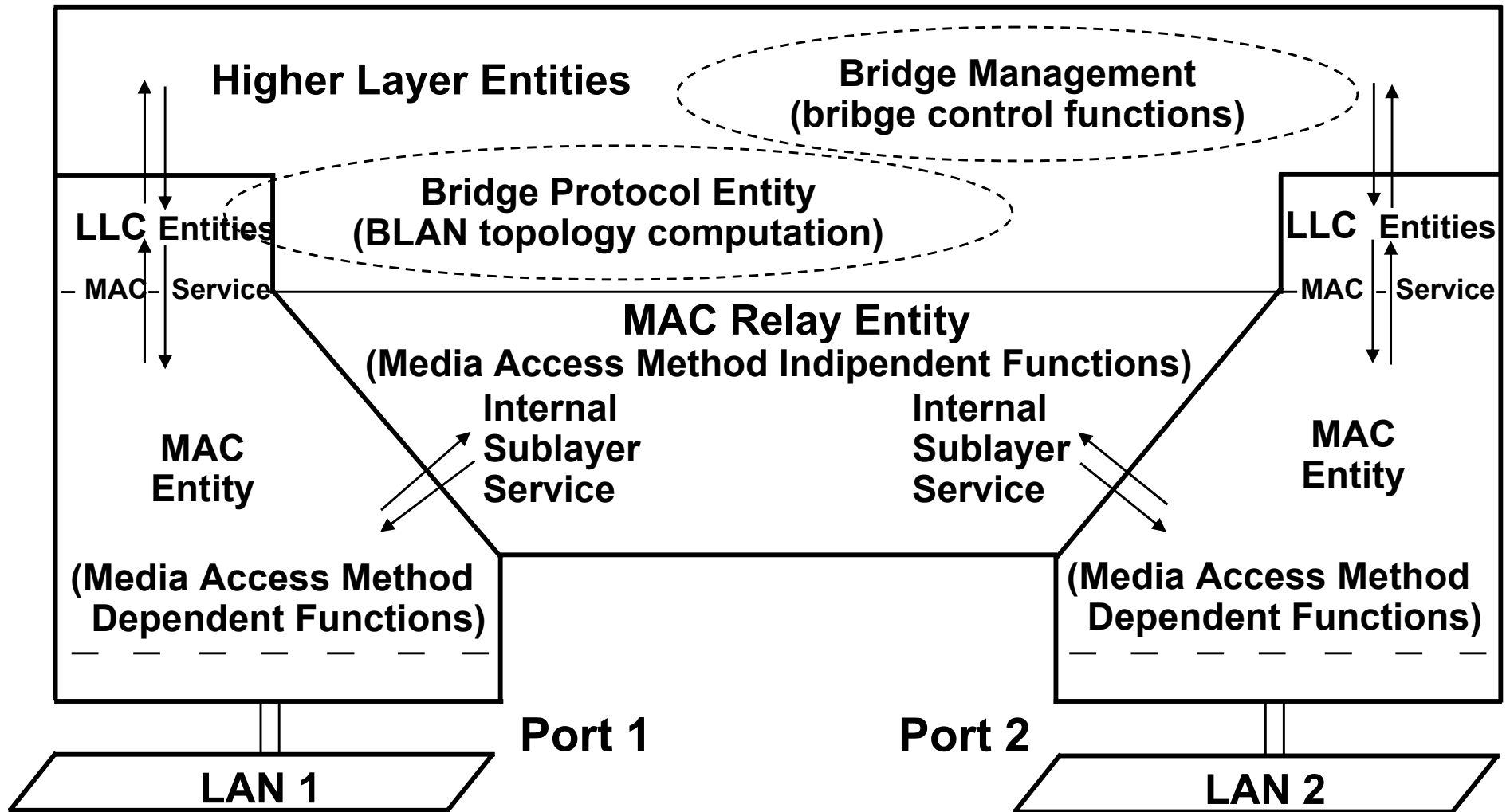


Bridge physical architecture



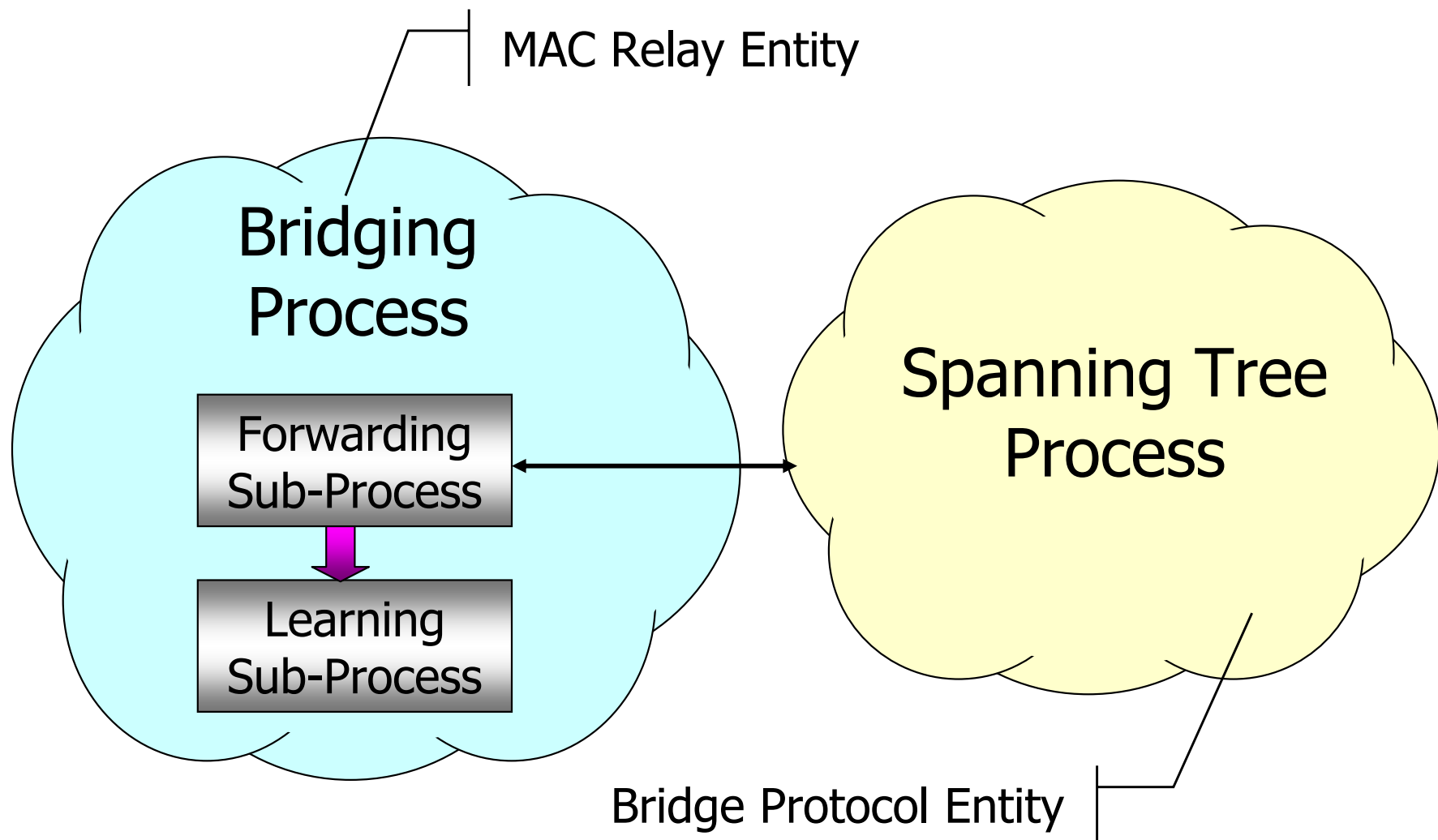


Bridge logical architecture





Bridge functions





Filtering data base

- **Entry** fields
 - MAC address
 - Destination port
 - Ageing time (default expire after 300 s)
 - Port status (depending by spanning tree protocol)
 - Entry type
 - dynamic
 - Updated by learning process
 - Max entries: 1024 ÷ 65 K
 - static
 - Not updated by learning process
 - 256 entries typically
- Lookup by CAM (Content Addressable Memory)



Filtering database example

filtering database show command

Switch-1> show cam dynamic

* = Static Entry. + = Permanent Entry.

= System Entry X = Port Security Entry

```

Dest MAC Address
-----
00-00-86-1a-a6-44
00-00-c9-10-b3-0f
00-00-f8-31-1c-3b
00-00-f8-31-f7-a0
00-01-e7-00-e3-80
00-02-a5-84-a7-a6
00-02-b3-1e-b4-aa
00-02-b3-1e-da-da
00-02-b3-1e-dc-fd
  
```

```

Ports      Age
-----
1/1        1
1/1        0
1/2        4
1/1        2
2/2        0
2/1        1
2/1        5
2/5        1
2/4        2
  
```

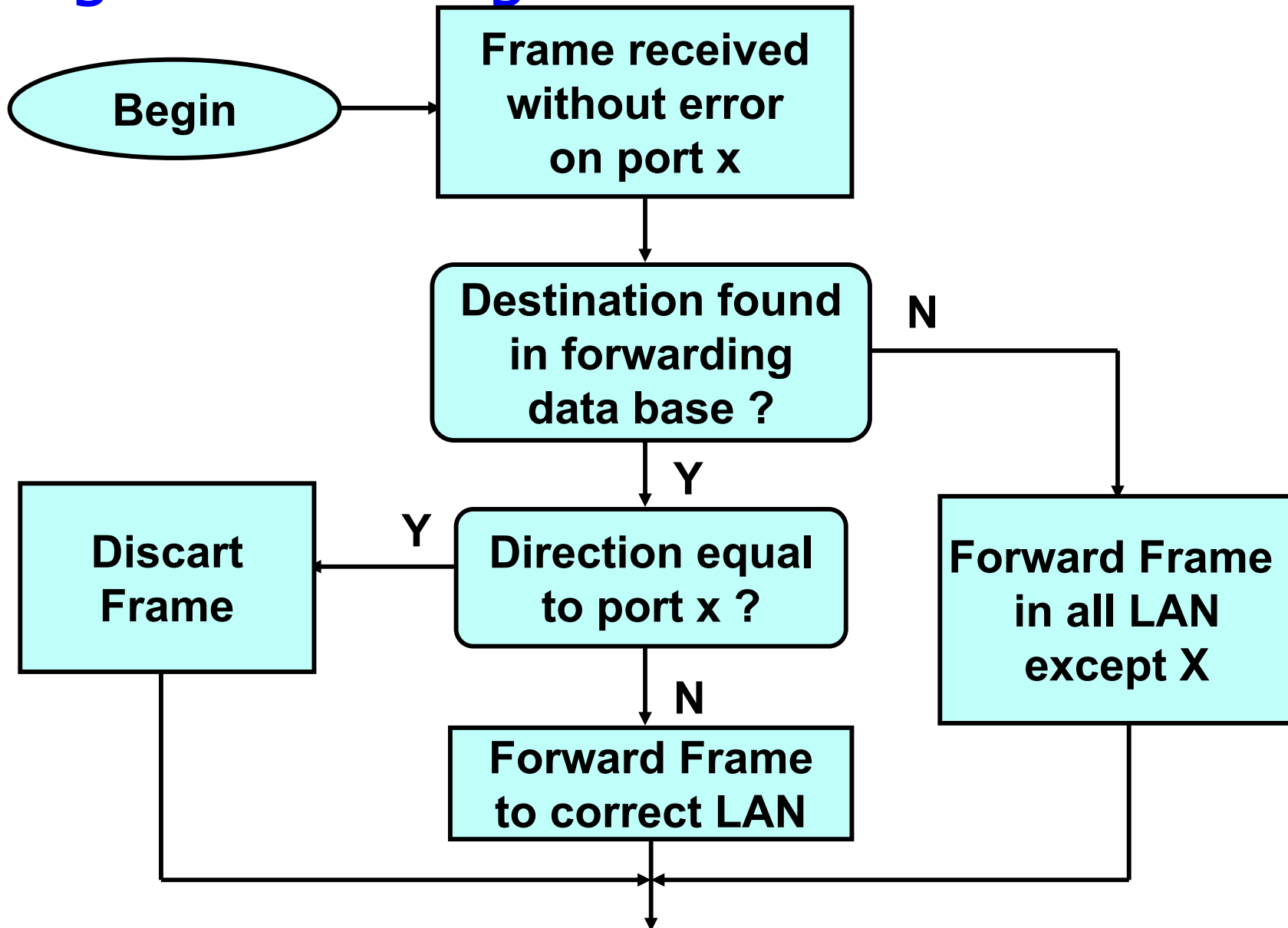
Modular switch:
slot/port

Ageing time

Stations MAC address

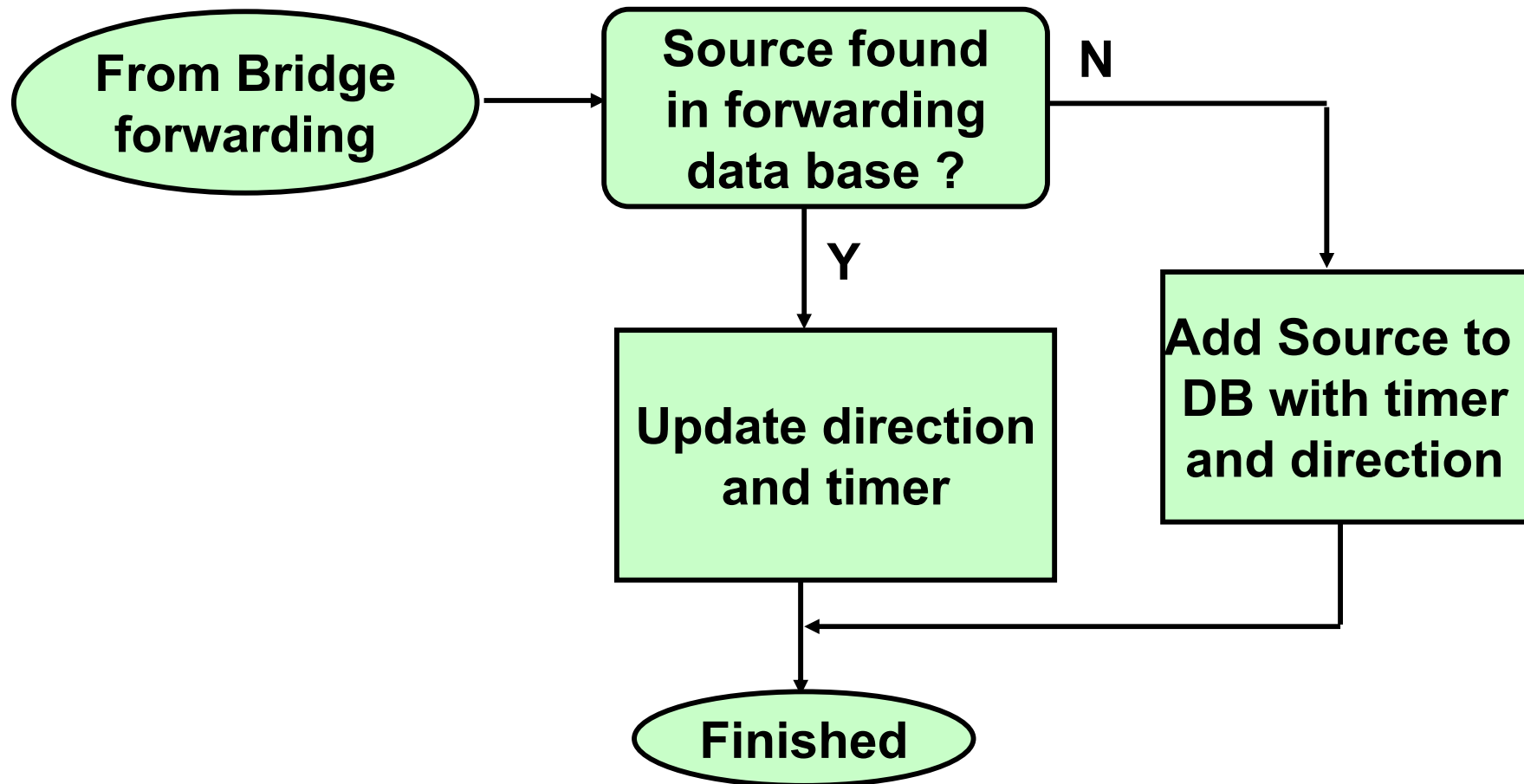


Bridge Forwarding



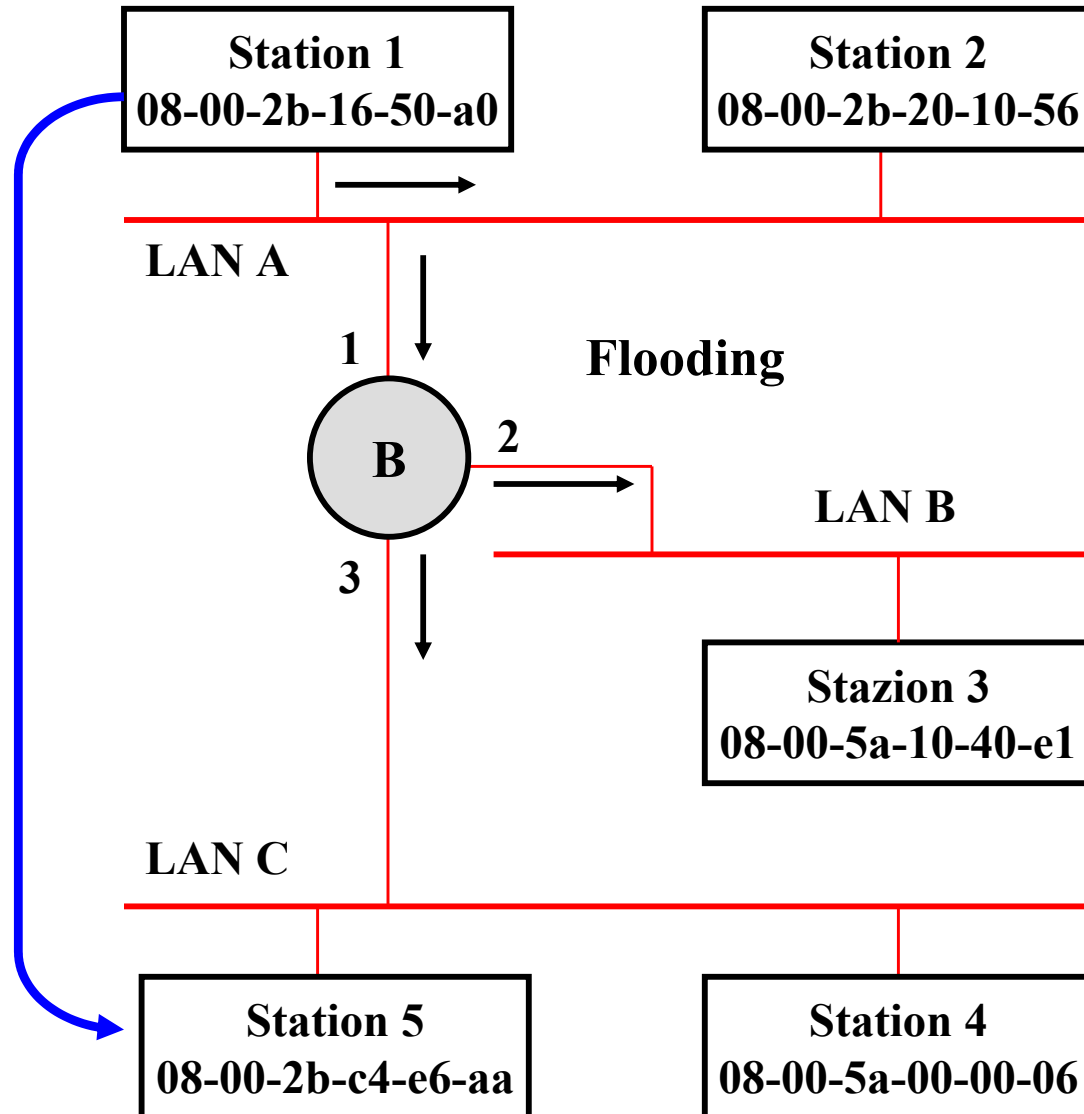


Bridge Learning





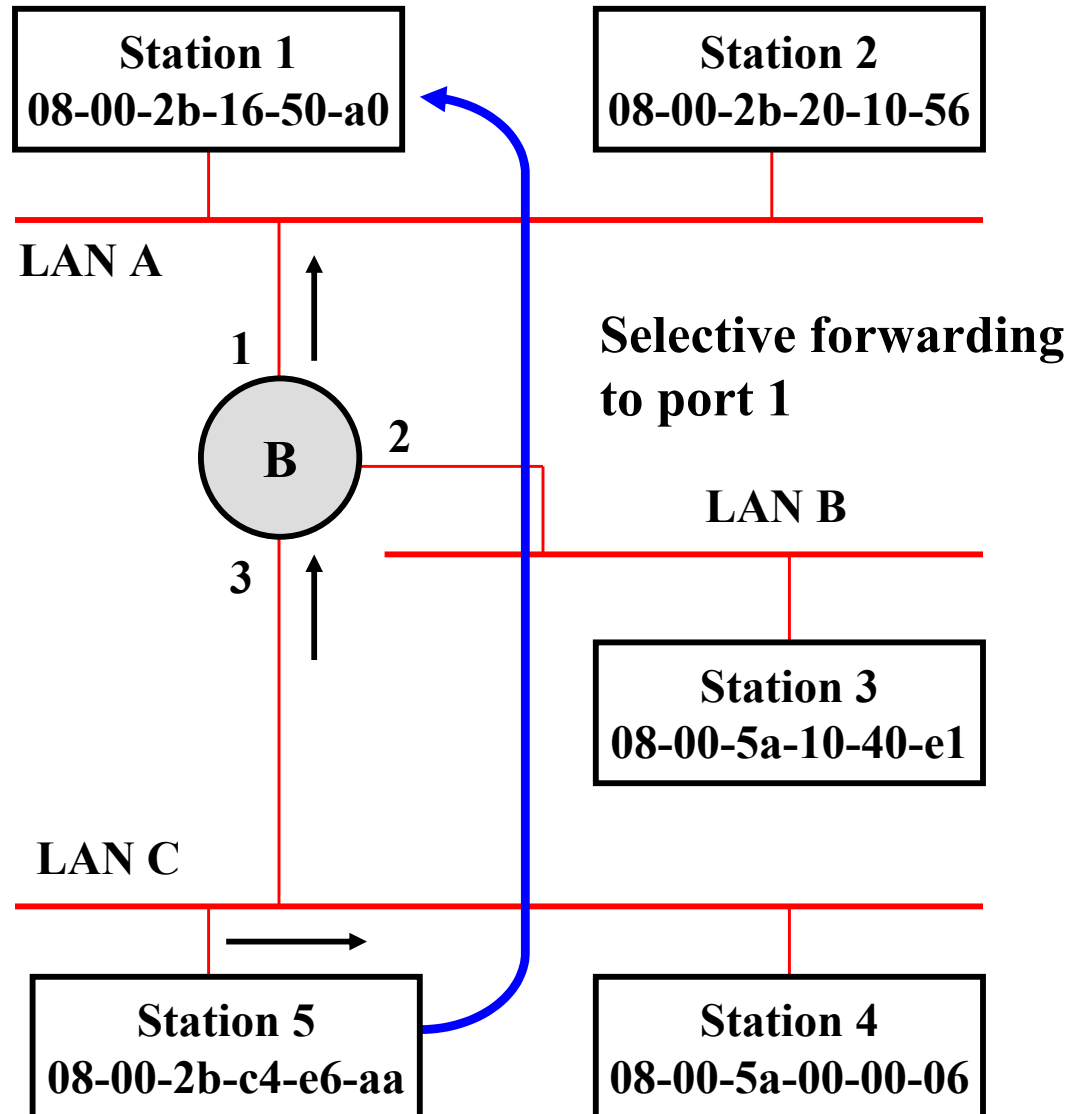
Forwarding frame to unknown destination



Port	MAC address	Ageing time
1	08-00-2b-16-50-a0	0



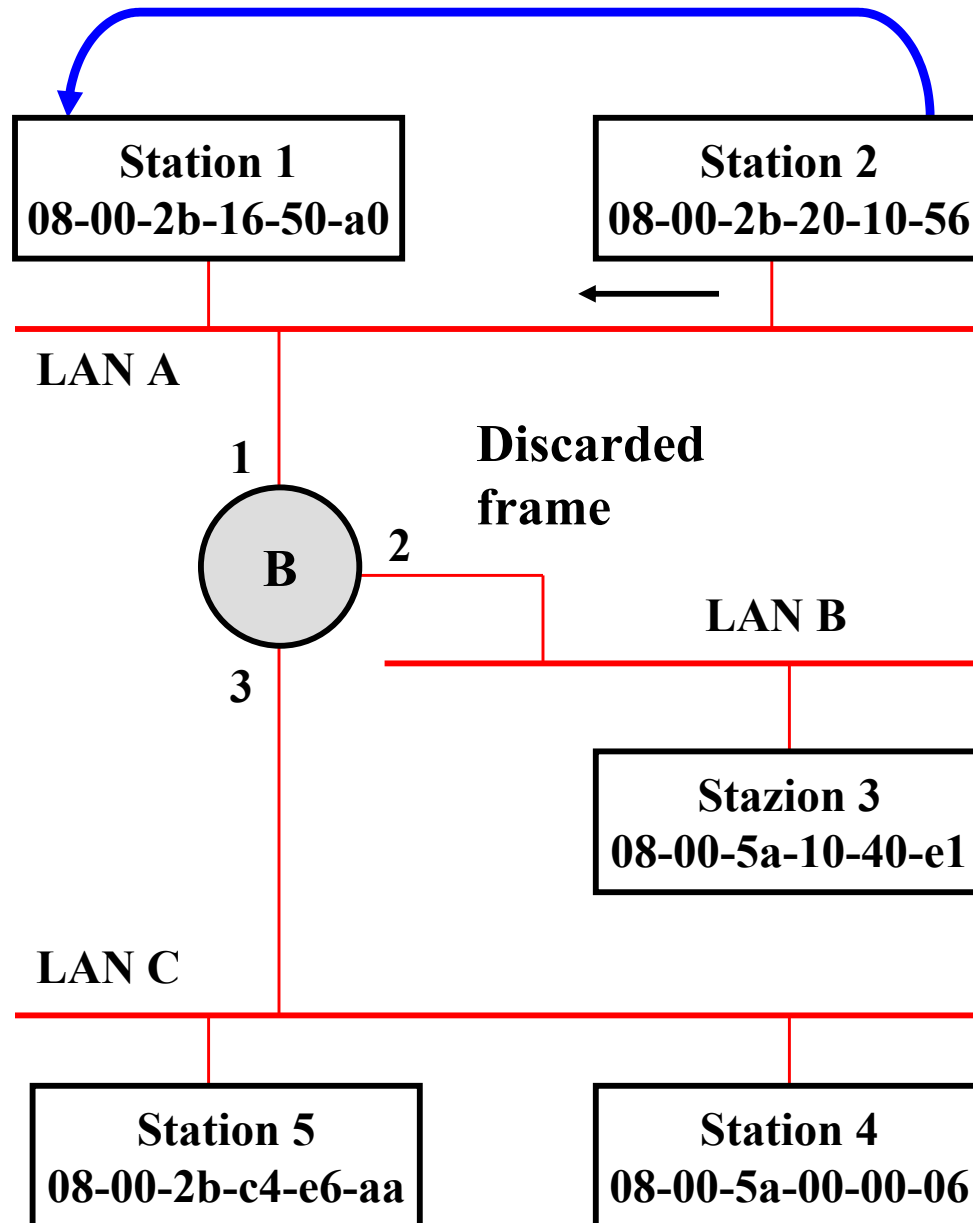
Forwarding frame to known address destination



Port	MAC address	Ageing time
1	08-00-2b-16-50-a0	5
3	08-00-2b-c4-e6-aa	0



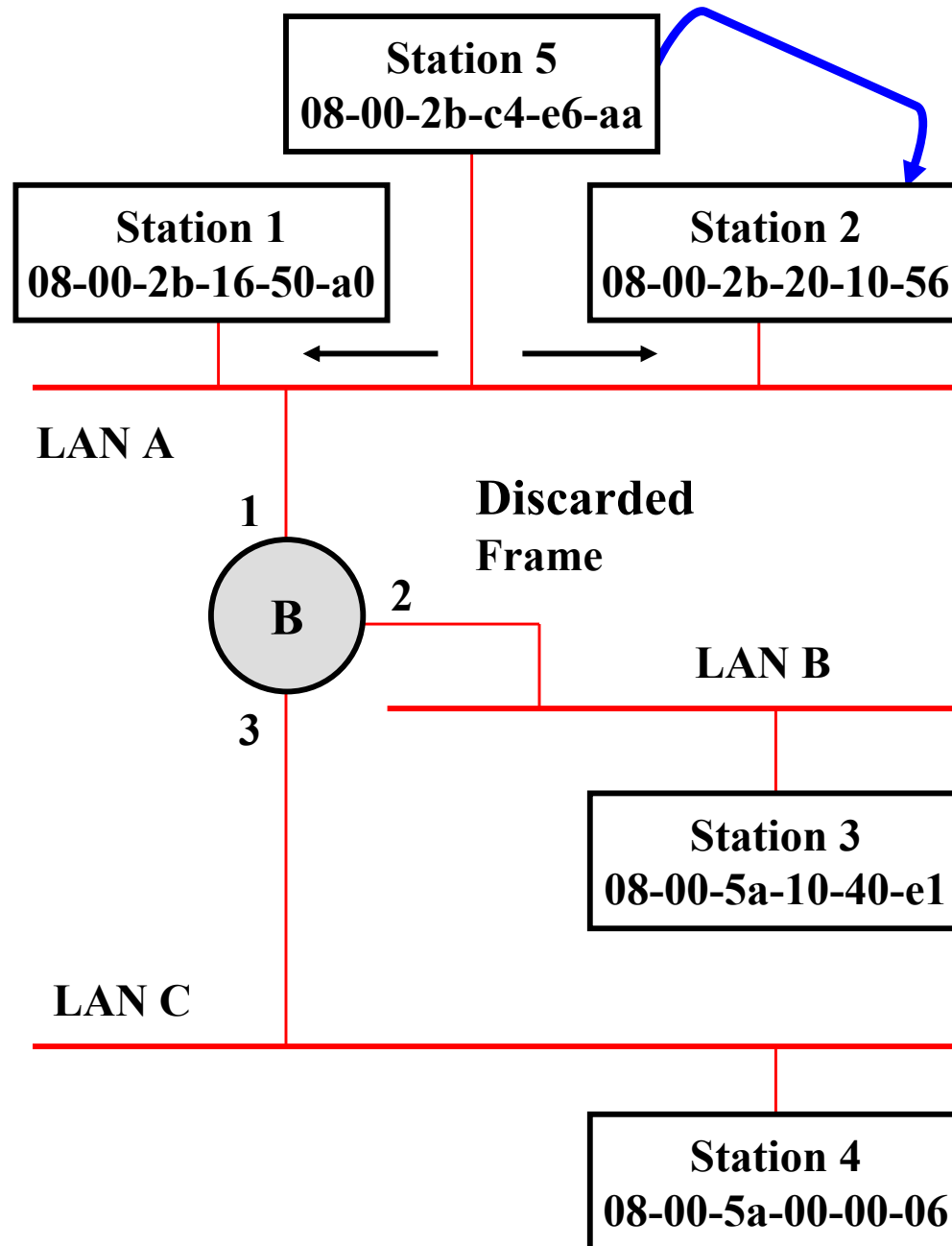
Traffic limitation



Port	MAC address	Ageing time
1	08-00-2b-16-50-a0	12
3	08-00-2b-c4-e6-aa	13
1	08-00-2b-20-10-56	0



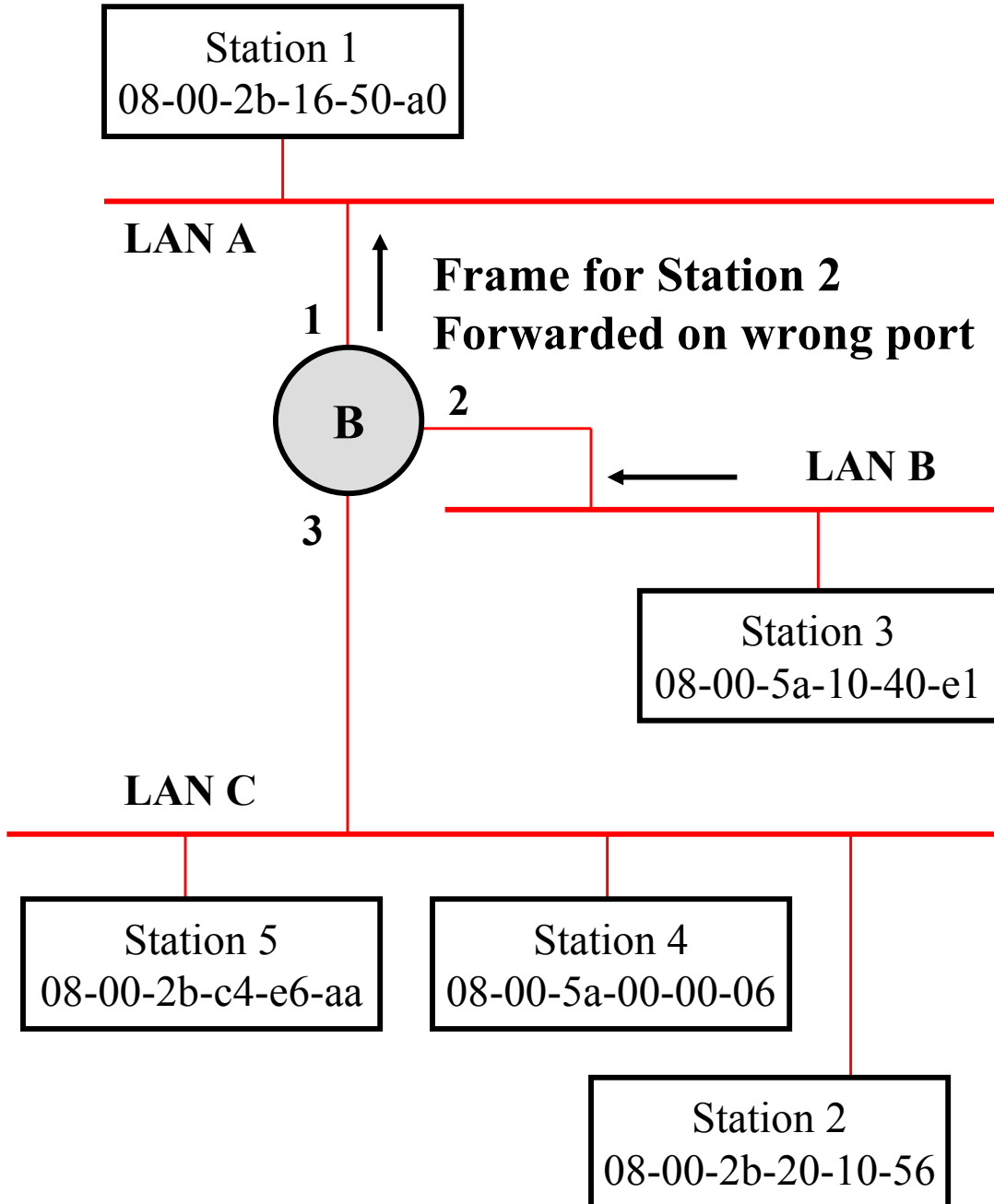
Station 5 move and Filtering Data Base update



Port	MAC address	Ageing time
1	08-00-2b-16-50-a0	40
1	08-00-2b-c4-e6-aa	0
1	08-00-2b-20-10-56	20



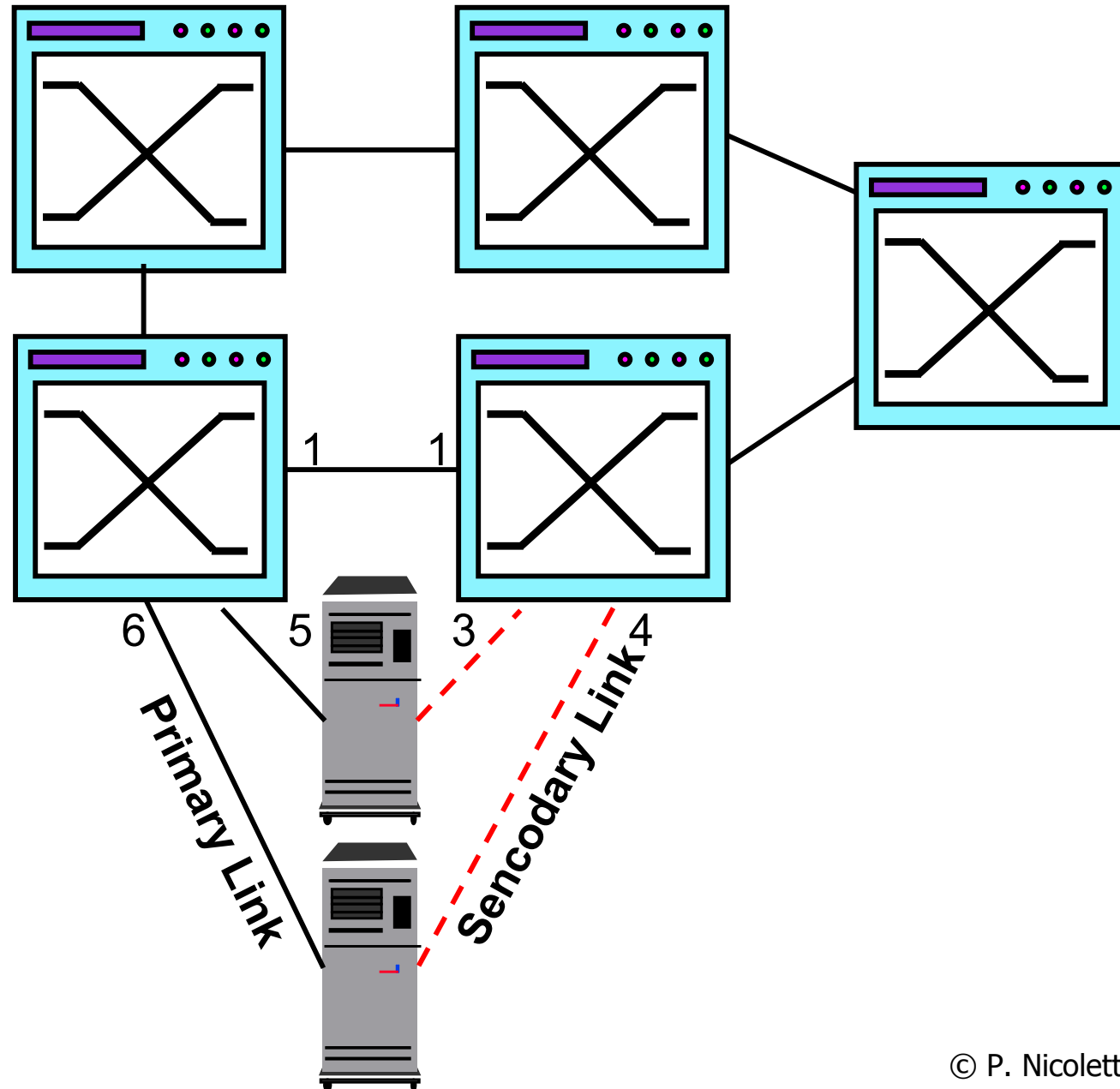
Station 2 move and forwarding error



Port	MAC address	Ageing time
1	08-00-2b-16-50-a0	50
3	08-00-2b-c4-e6-aa	51
1	08-00-2b-20-10-56	40
2	08-00-5a-10-40-e1	0



Fault Tolerant network and Filtering Data Base Update





Loop on the network

- Broadcast are not filtered: **broadcast storm**

