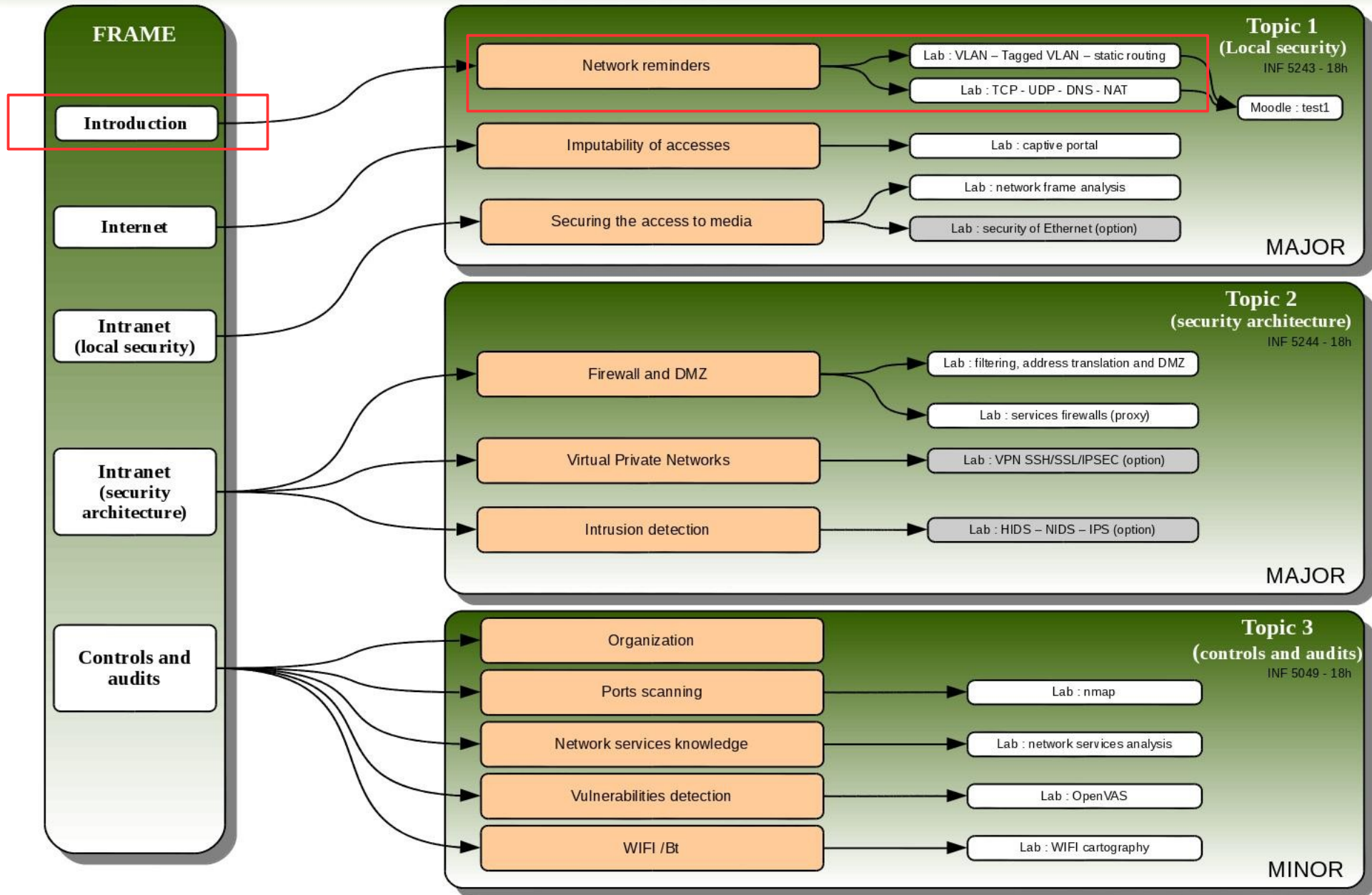


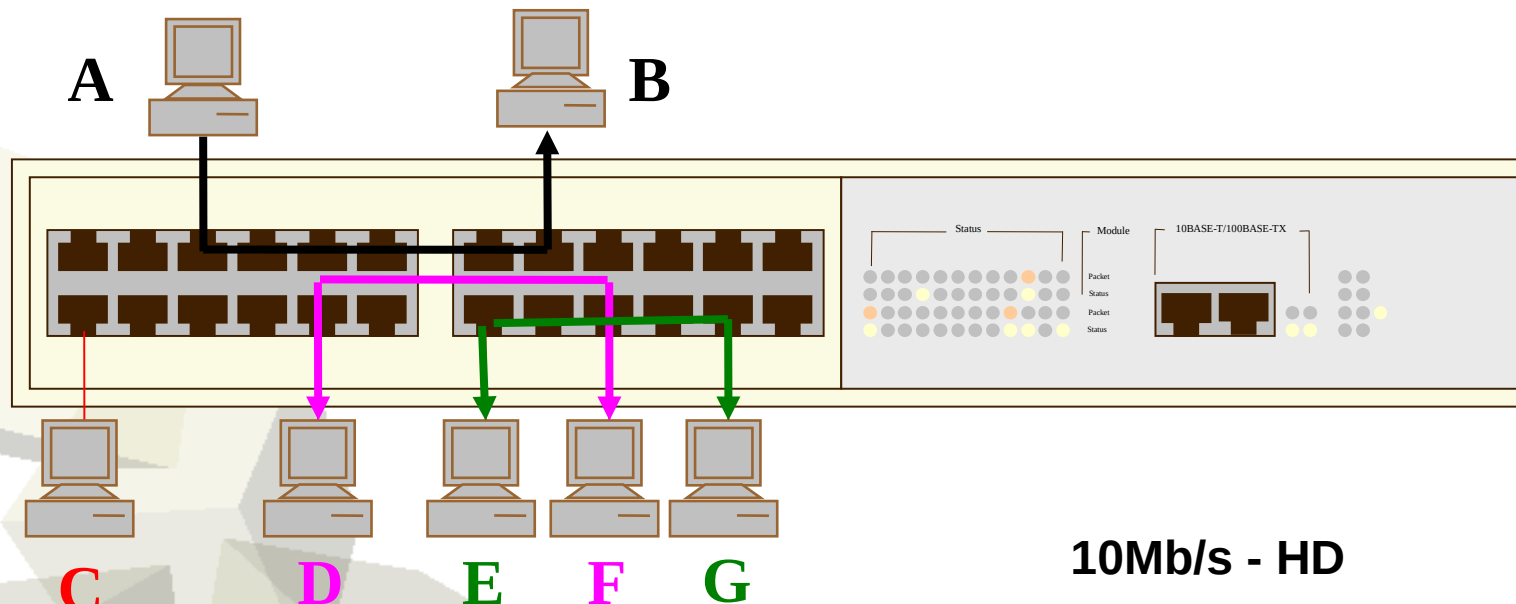


Course 5A - « network security »





- Bandwidth optimization
- Allows simultaneous communications
- Auto negotiation of the rate (10/100/1000 Mb/s) and of the exploitation mode (full-duplex/half-duplex)



10Mb/s - HD

100Mb/s - FD

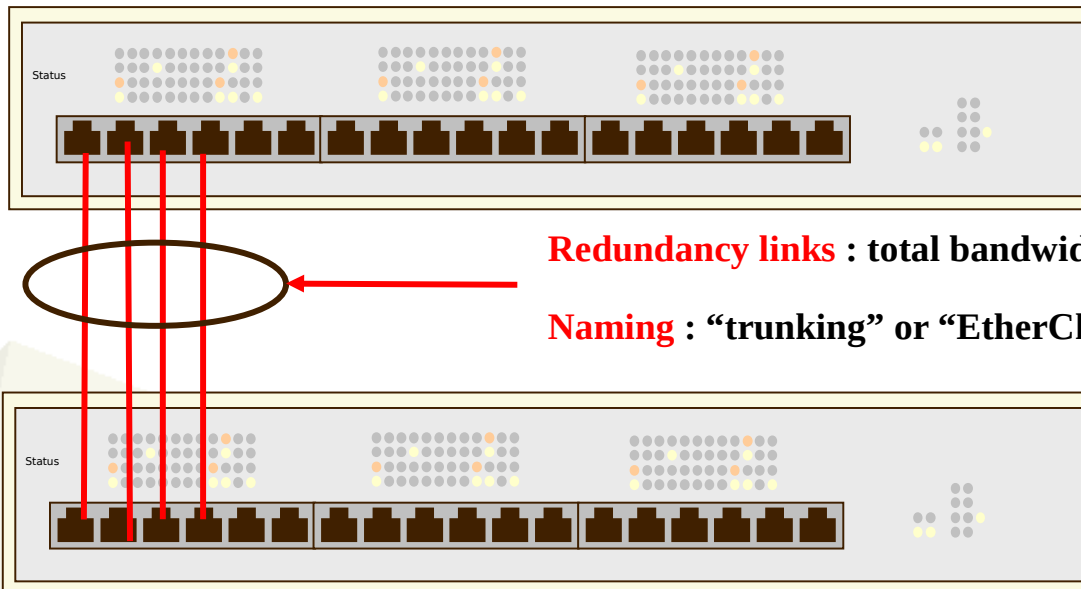
1Gb/s - FD





Redundancy :

- Aggregates links to improve bandwidth (trunking). Used to bind switches.
- Failover link to improve security (only one link active at a time).



Redundancy links : total bandwidth = 4 * single link bandwidth

Naming : “trunking” or “EtherChannel” (CISCO) or “802.3ab” (IEEE)

Mirroring : Copy one port traffic to an other (analyze).

Security :

- Disable not used ports
- Lock the port after learning a MAC address (MACLocking) ;
- Network Access Control with an external AAA server (IEEE 802.1X).

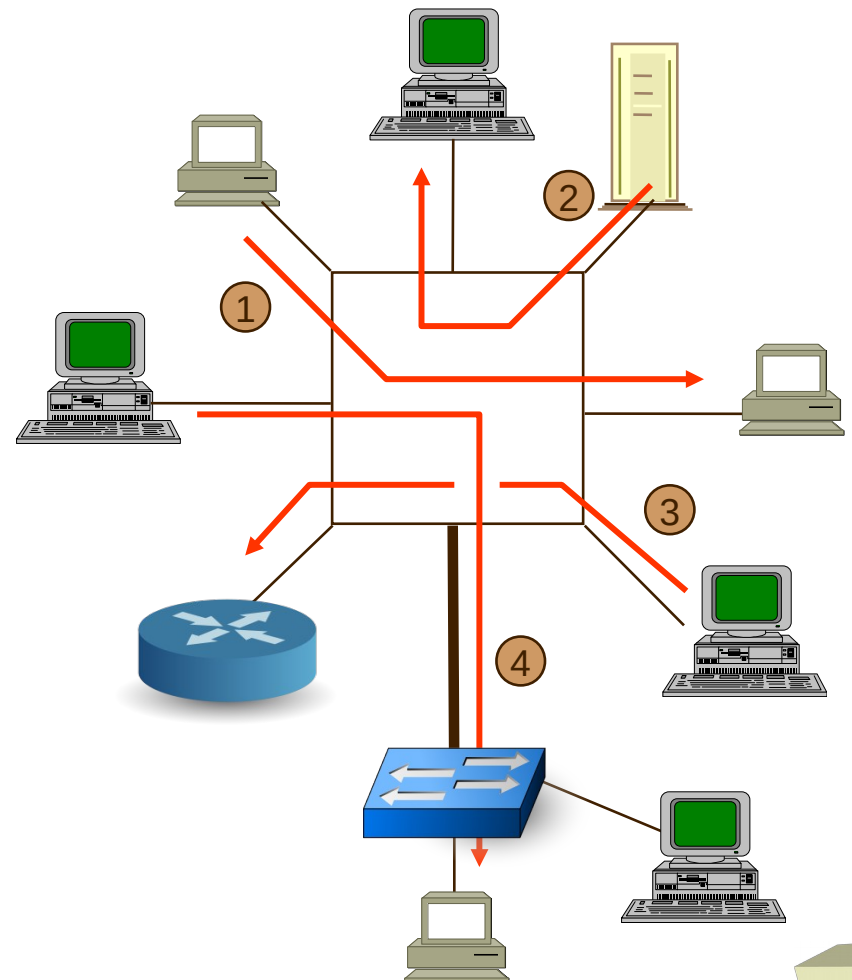




Operating principle

Unicast frames : only the destination port should send the frames

How the switch knows the port of an equipment ?
How long should it keep this information ?





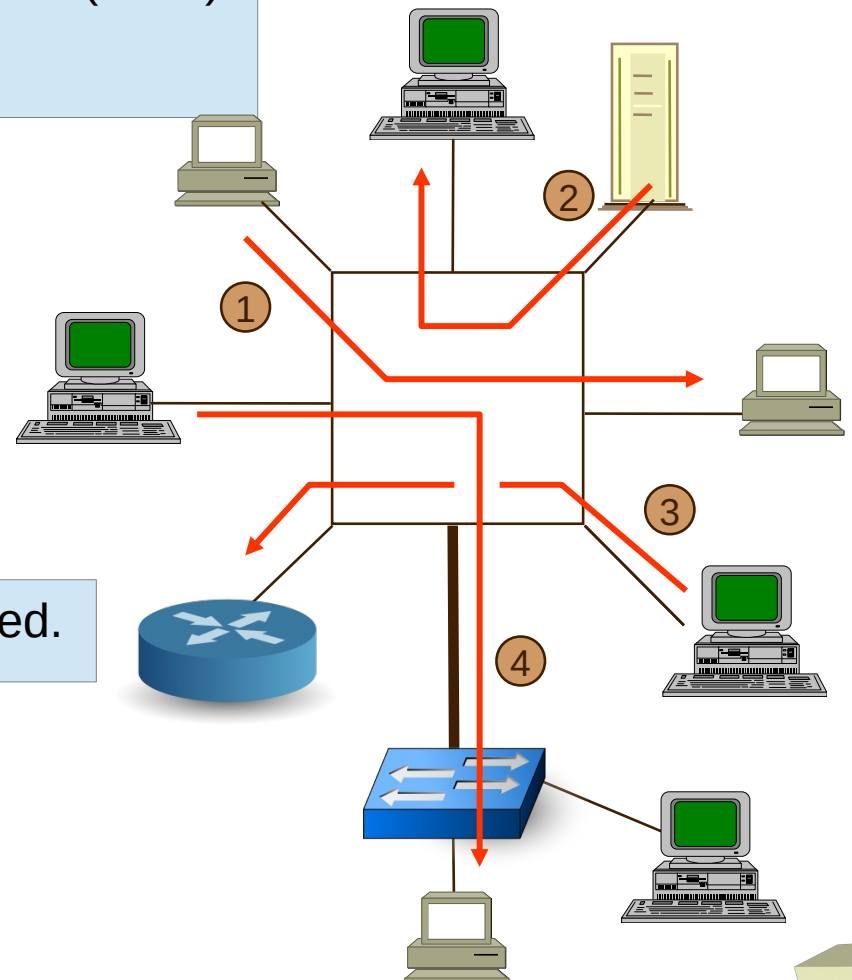
Operating principle

Unicast frames : only the destination port should send the frames

The switch embeds a Content Addressable Memory table (CAM) to record the association (@MAC , Port number).

CAM Table				
Station	Port1	Port2	Port3	Port4
00-00-3D-1F-11-01			X	
00-00-3D-1F-11-02				X
00-00-3D-1F-11-03	X			

Received Frame			
Destination	Source	Data	CRC
00-00-3D-1F-11-05	00-00-3D-1F-11-01		



Each record is removed when the aging time is reached.

Dynamic and Static Source MAC Learning

MAC Aging Time (sec)

Addresses

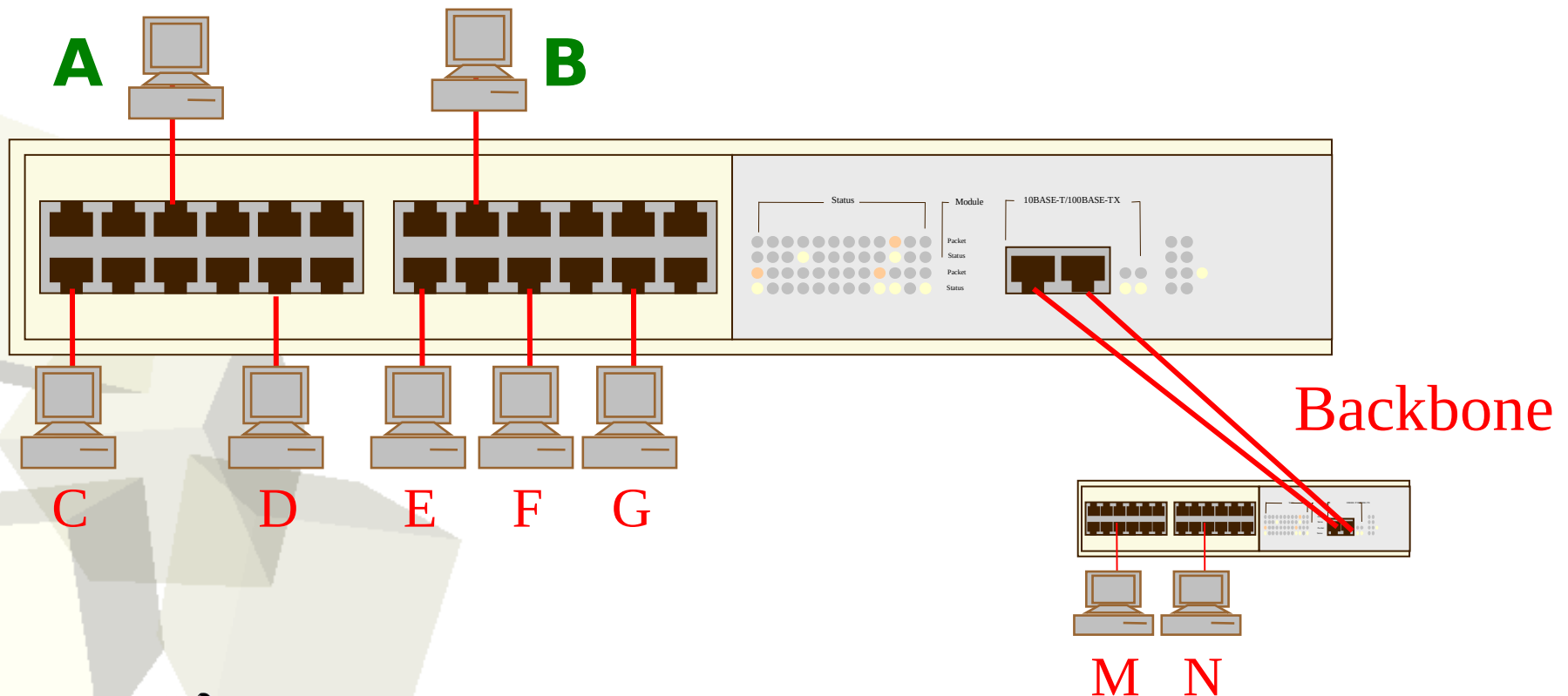
<input type="checkbox"/>	Slot ▾	Port ▾	VLAN ▾	MAC Address ▾	MAC Address Management Status
<input type="checkbox"/>	1	2	1	20:CF:30:E6:19:D7	Learned
<input type="checkbox"/>	1	4	1	BC:5F:F4:75:2B:D2	Learned
<input type="checkbox"/>	1	8	1	00:11:32:0F:F6:36	Learned





1st case :

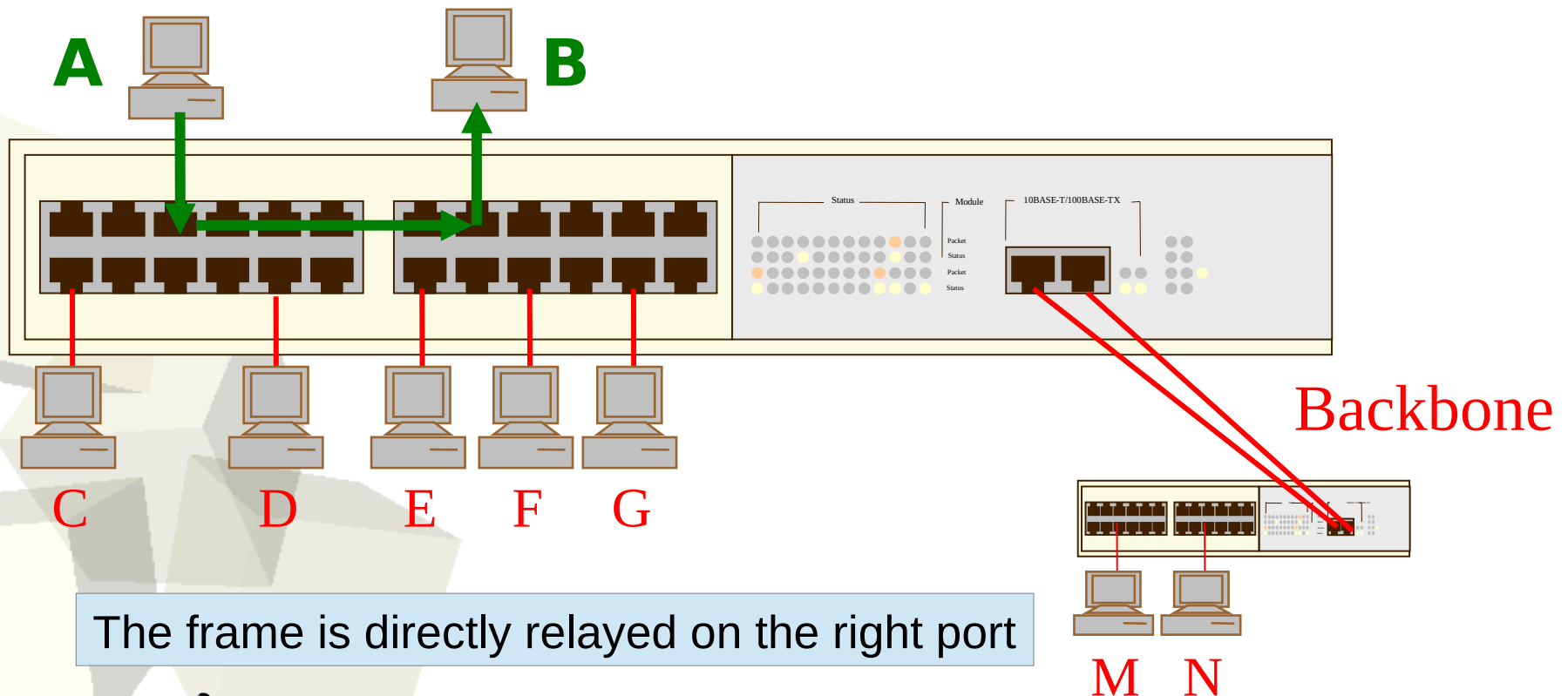
- Station **A** wants to join Station **B**
- @MAC of station B is already in the CAM





1st case :

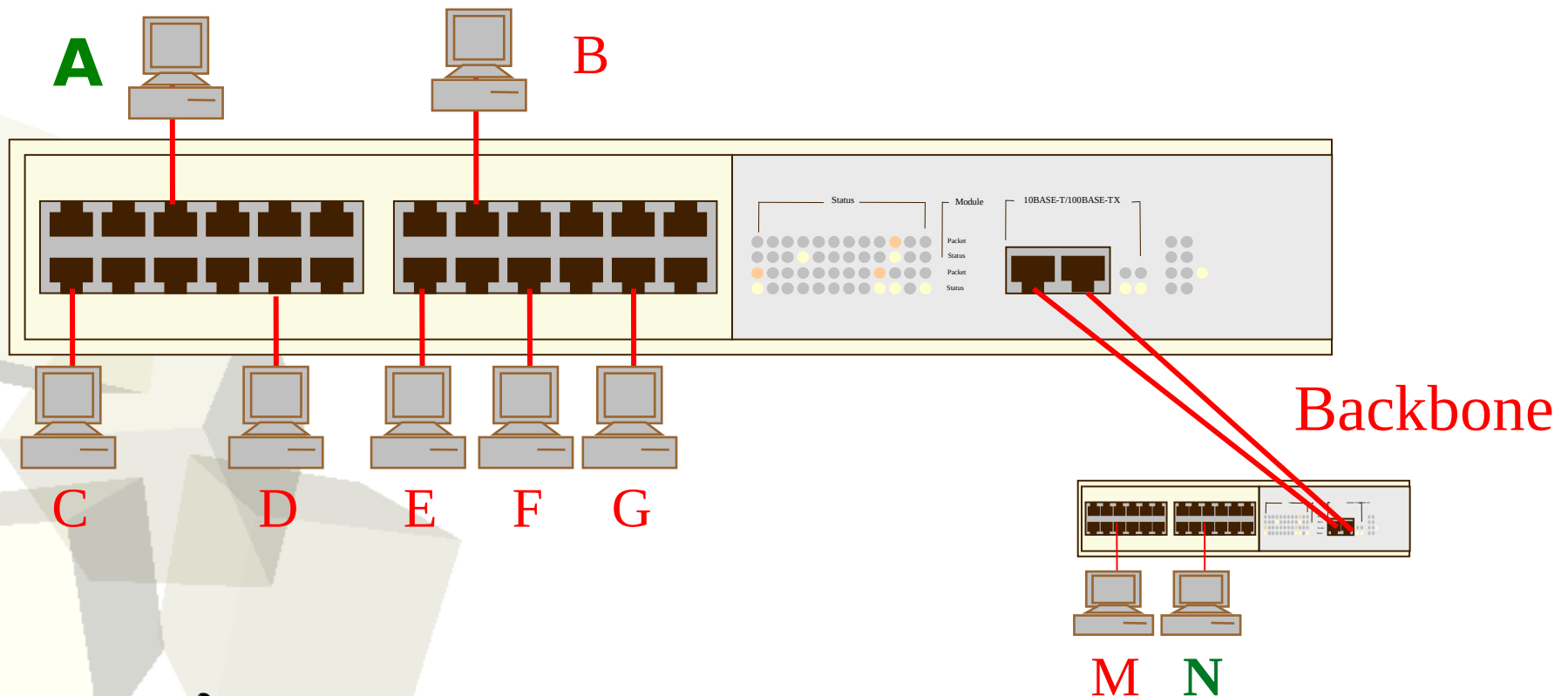
- Station **A** wants to join Station **B**
- @MAC of station B is already in the CAM





1st case (bis) :

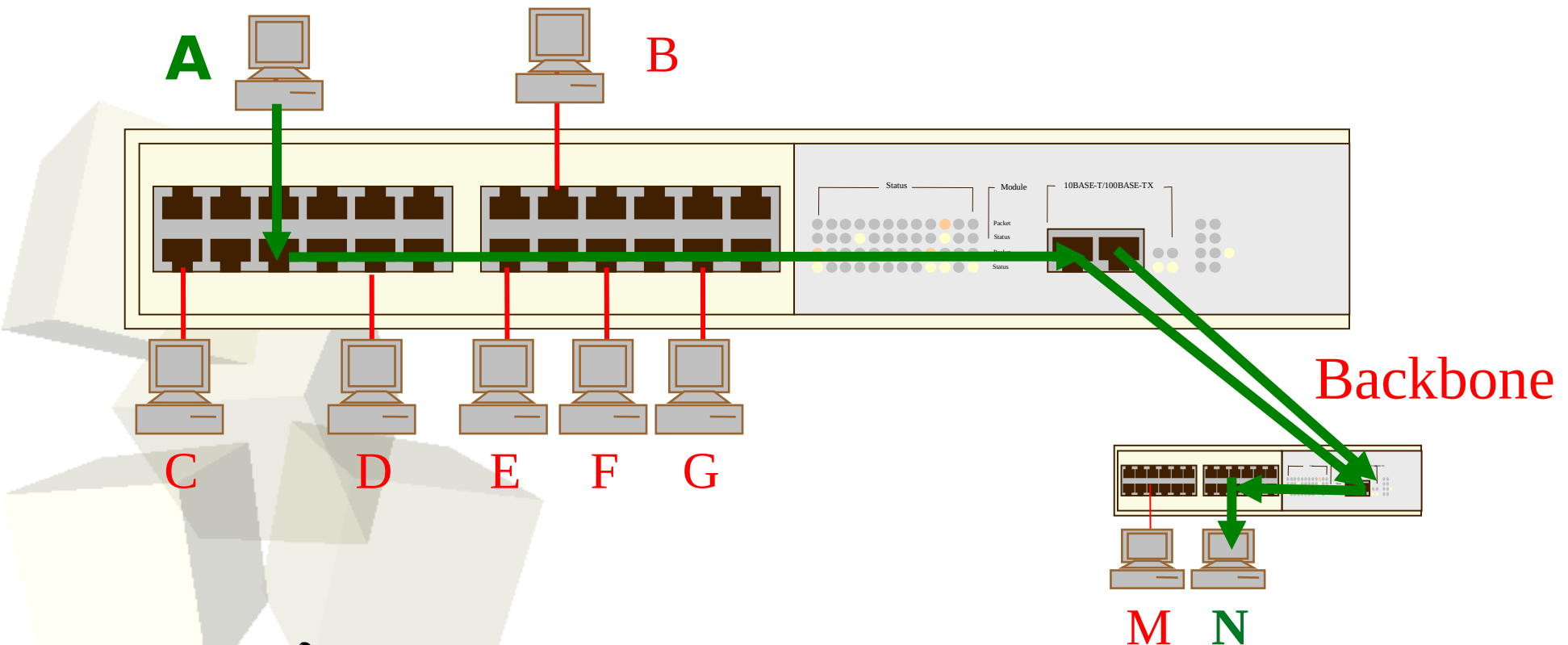
- Station **A** wants to join Station **N**
- @MAC of all stations of switch2 are already in the CAM





1st case (bis) :

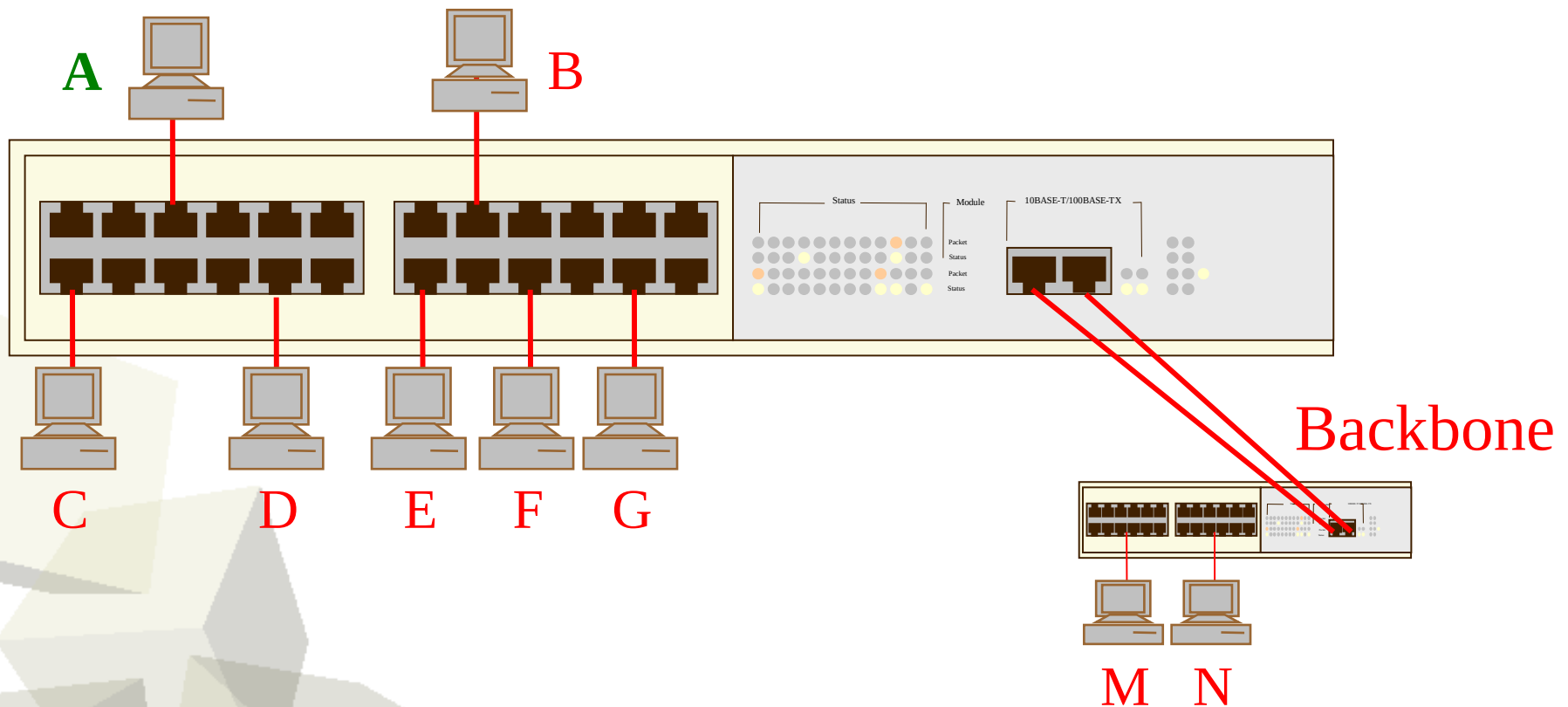
- Station **A** wants to join Station **N**
- @MAC of all stations of switch2 are already in the CAM





2nd case :

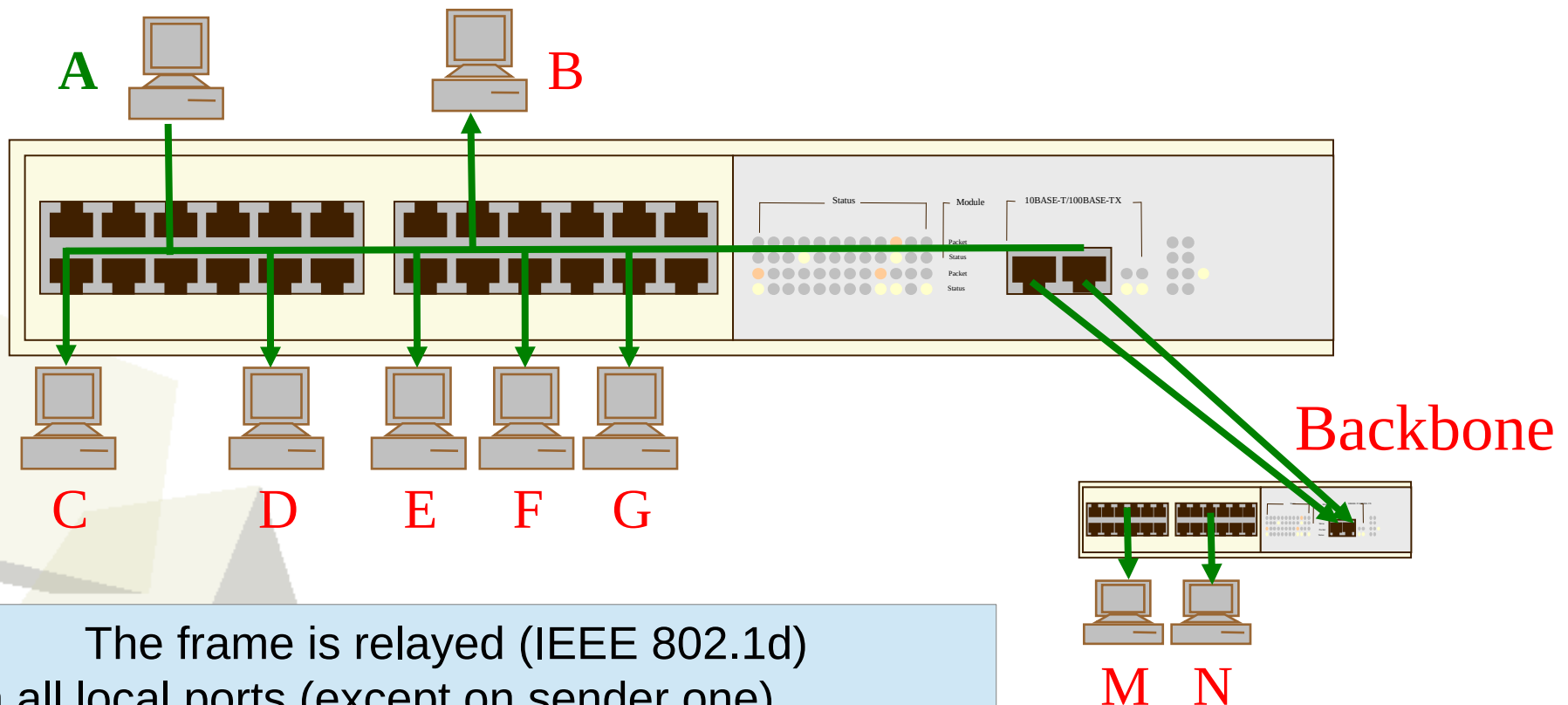
- Station **A** sends a broadcast or a multicast frame





2nd case :

- Station **A** sends a broadcast or a multicast frame



The frame is relayed (IEEE 802.1d)

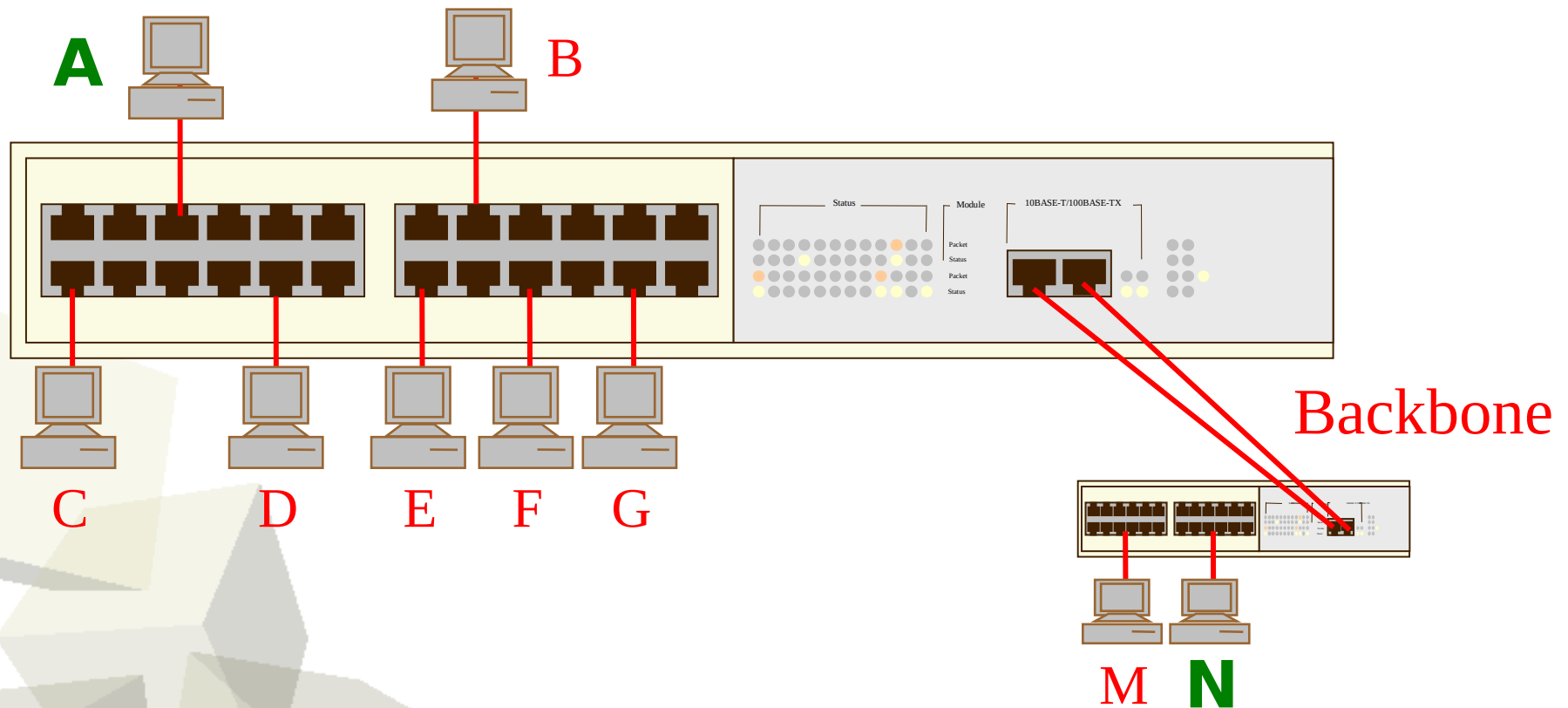
- On all local ports (except on sender one)
- On backbone link
- The destination @MAC is **FF:FF:FF:FF:FF**





3rd case :

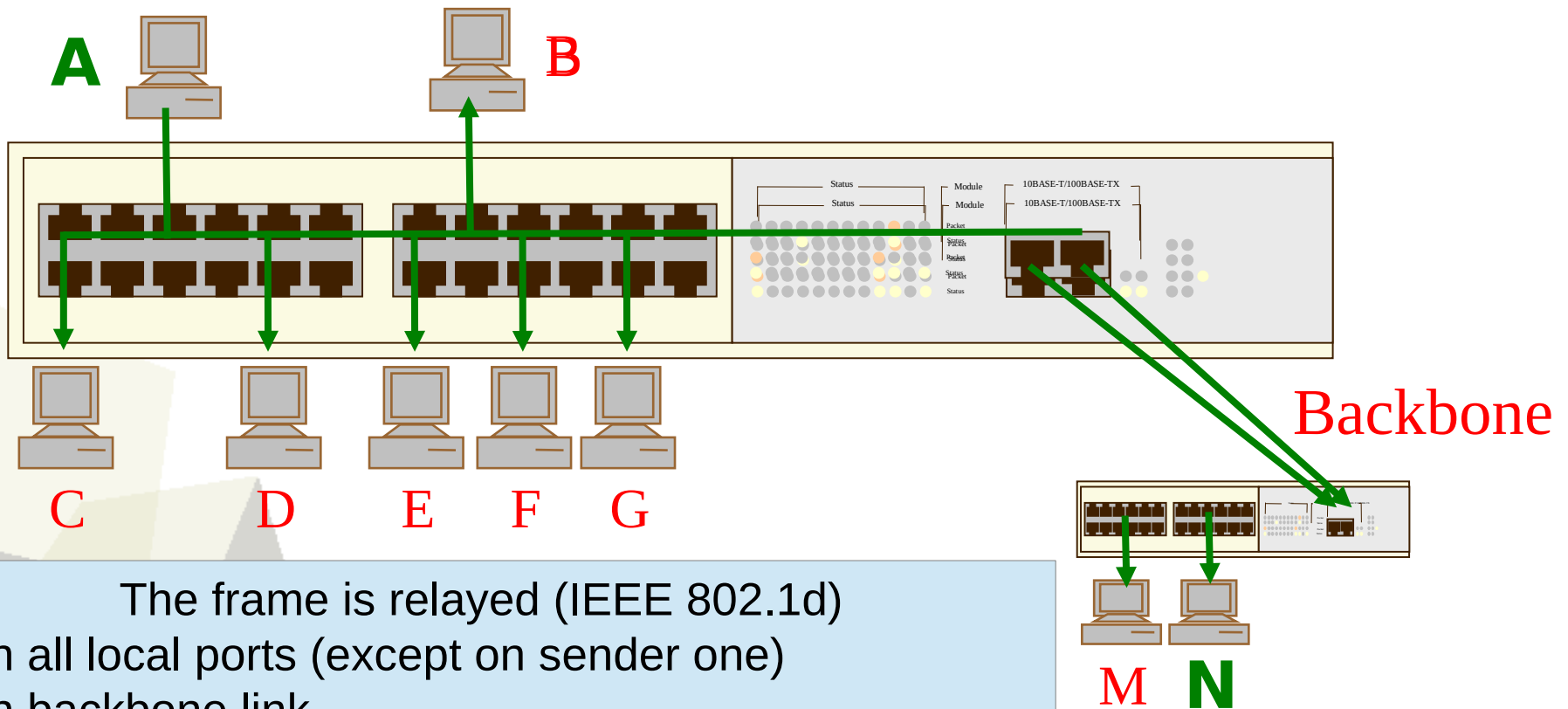
- Station **A** wants to join Station **N**
- @MAC of station N isn't in the CAM (very rare situation)





3rd case :

- Station **A** wants to join Station **N**
- @MAC of station N isn't in the CAM (very rare situation)



The frame is relayed (IEEE 802.1d)

- On all local ports (except on sender one)
- On backbone link

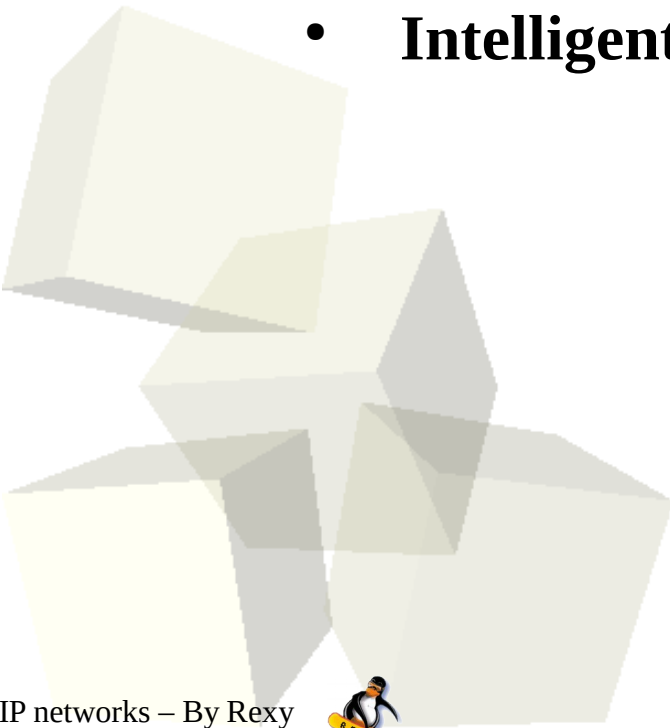
The Destination @MAC is @MAC_N (not broadcast)

The CAM is updated with the station N response



Switching modes

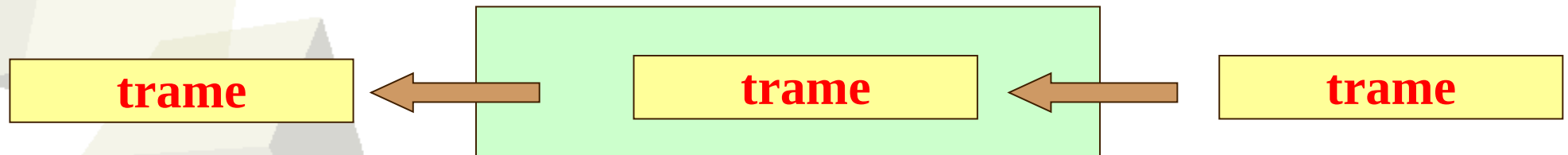
- **Store and Forward (differed switching)**
- **On the Fly / Cut and Through / Fast Forward**
- **Intelligent**





Store and Forward

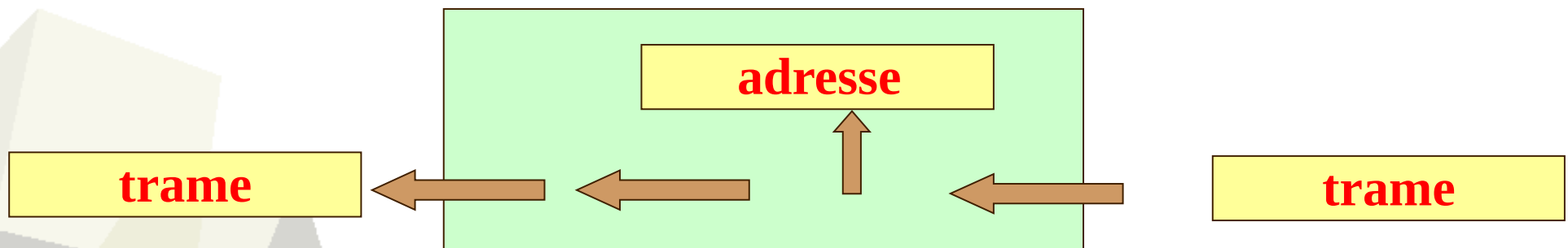
- 1) Stores the frame
- 2) Controls its validity (CRC & size)
- 3) Reads the destination @MAC
- 4) Decides to switch the frame





On the Fly - Cut and Through - Fast Forward

- 1) Reads the destination @MAC soon as it arrives (first field of the frame 😊)
- 2) Switches the frame immediately
- 3) Doesn't store the frame
- 4) Can't control the CRC nor the size (CRC is at the end of the frame ☹)



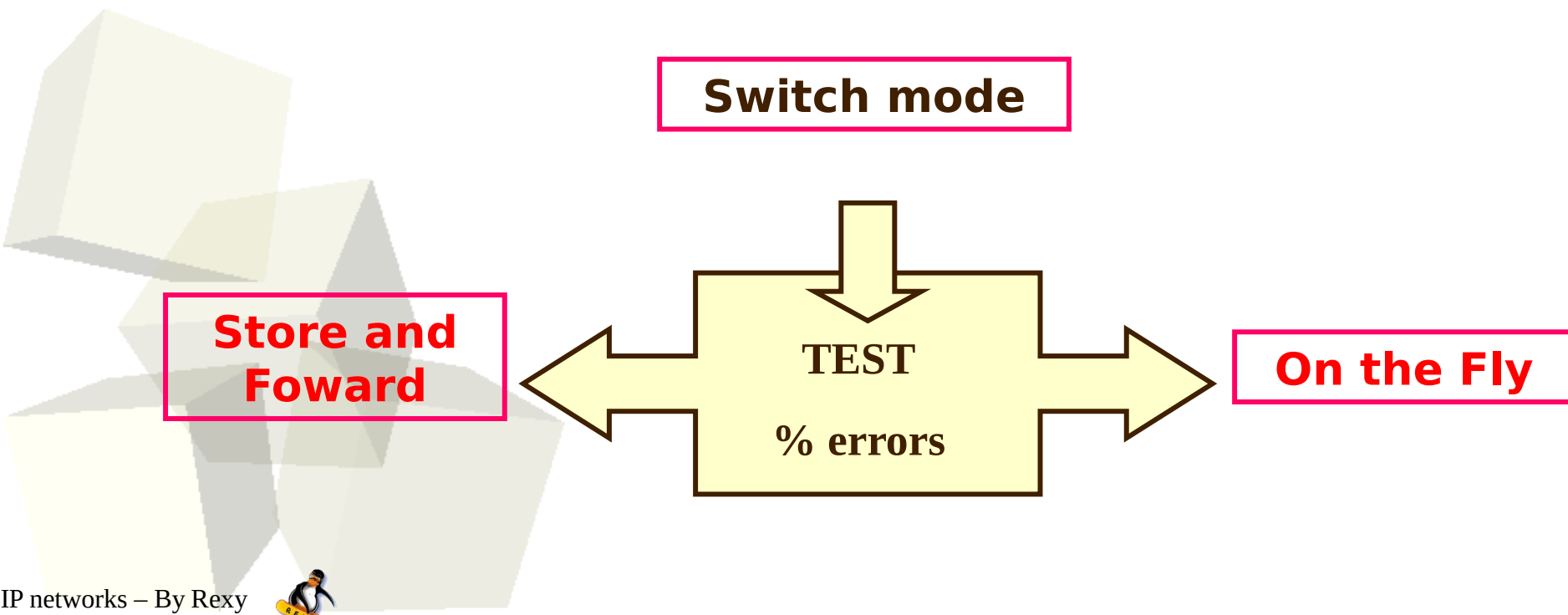
Quick switching but the quality of the network must be good enough :

- Low error rate
- Not to high load rate



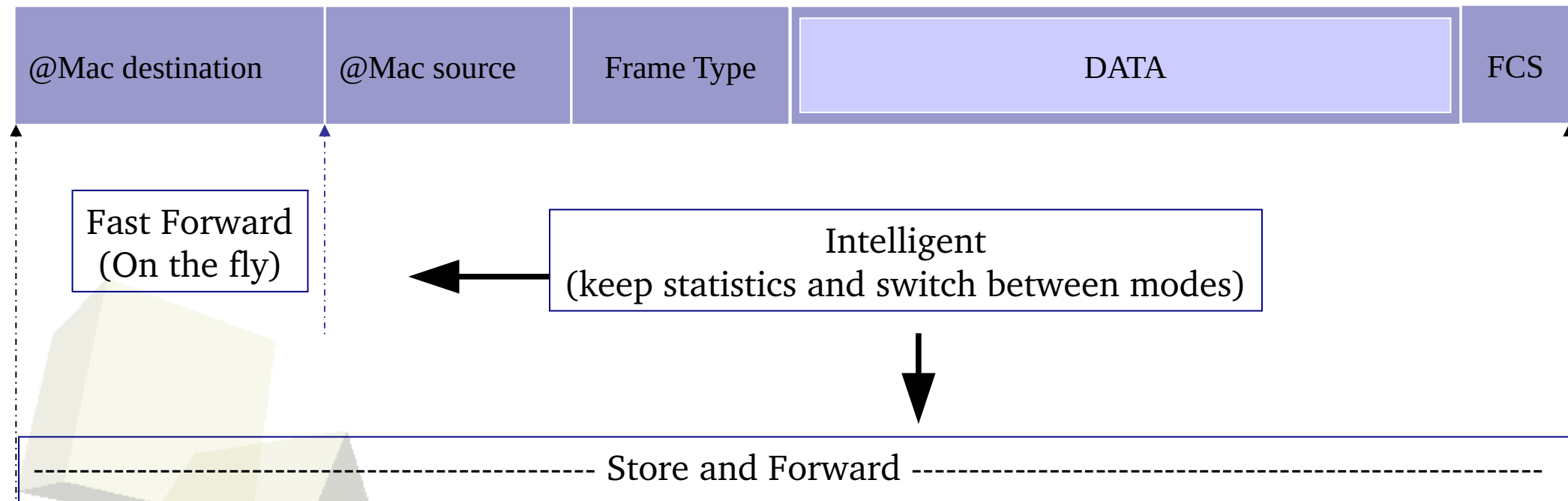
Intelligent

Keep permanent statistics and can change its behavior dynamically





Resume



In Gb/s, « Jumbo frames » are allowed.





1) Généralités

1) Historique

- 1) De shape à l'ENIAC
- 2) Du traitement centralisé au cloud computing

2) Normalisation

- 1) Les différentes entités de normalisation
- 2) Le modèle OSI
- 3) L'IEEE 802 - L'IETF
- 4) L'UIT

3) Classification

- 1) En fonction de l'espace
- 2) En fonction de la topologie
- 3) En fonction de l'emploi

2) Les concepts fondamentaux

- 1) La chaîne téléinformatique
- 2) Le traitement du signal
 - 1) La numérisation
 - 2) Le transcodage
 - 3) La modulation

3) Les technologies d'accès

1) Les médias

- 1) Électriques
- 2) Optiques
- 3) Radioélectriques

2) Les méthodes d'accès

- 1) Les accès concurrentiels
- 2) La commutation
- 3) L'adressage physique

3) L'accès à Internet

- 1) Les boucles locales xDSL et FTTx
- 2) Introduction au CPL
- 3) Introduction au GSM et au Satellite

4) Ethernet et TCP-IP (LAB 3418)

TD + cours (cf.diapo suivante)

5) Les services IP (LAB 4413)

TD + cours (cf.diapo suivante)

3A : 36 h (INF 3037 + LAB 3418)

4A : 36 h (INF 4032 + LAB 4413)

Rexy

18 slides

2015