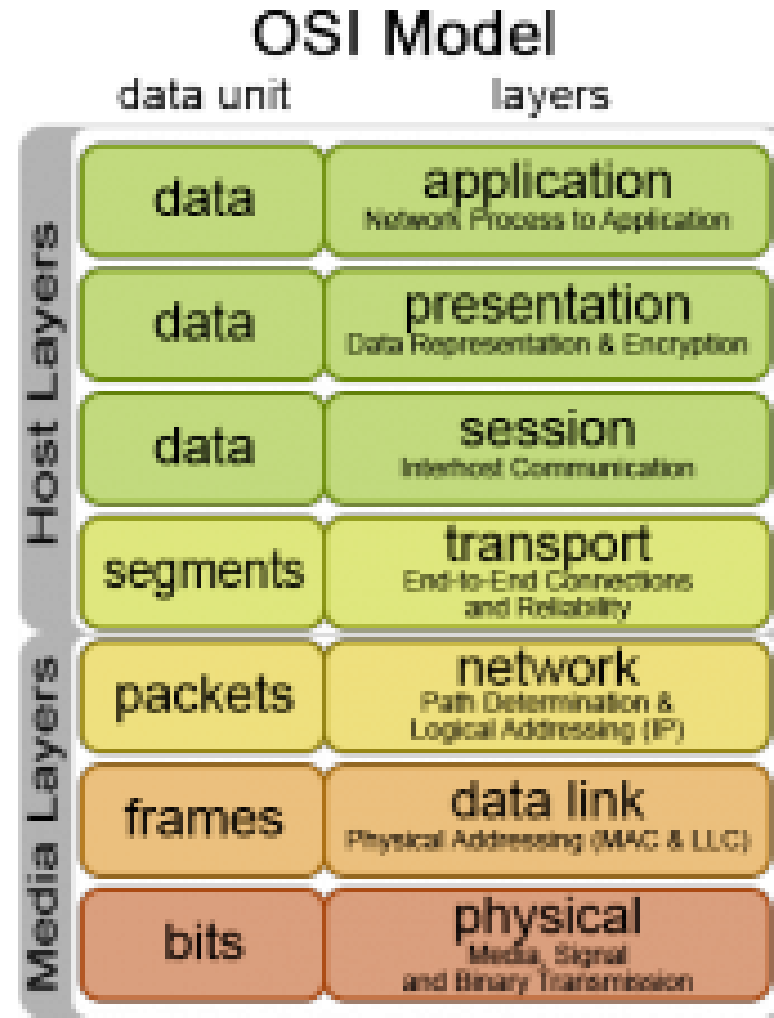
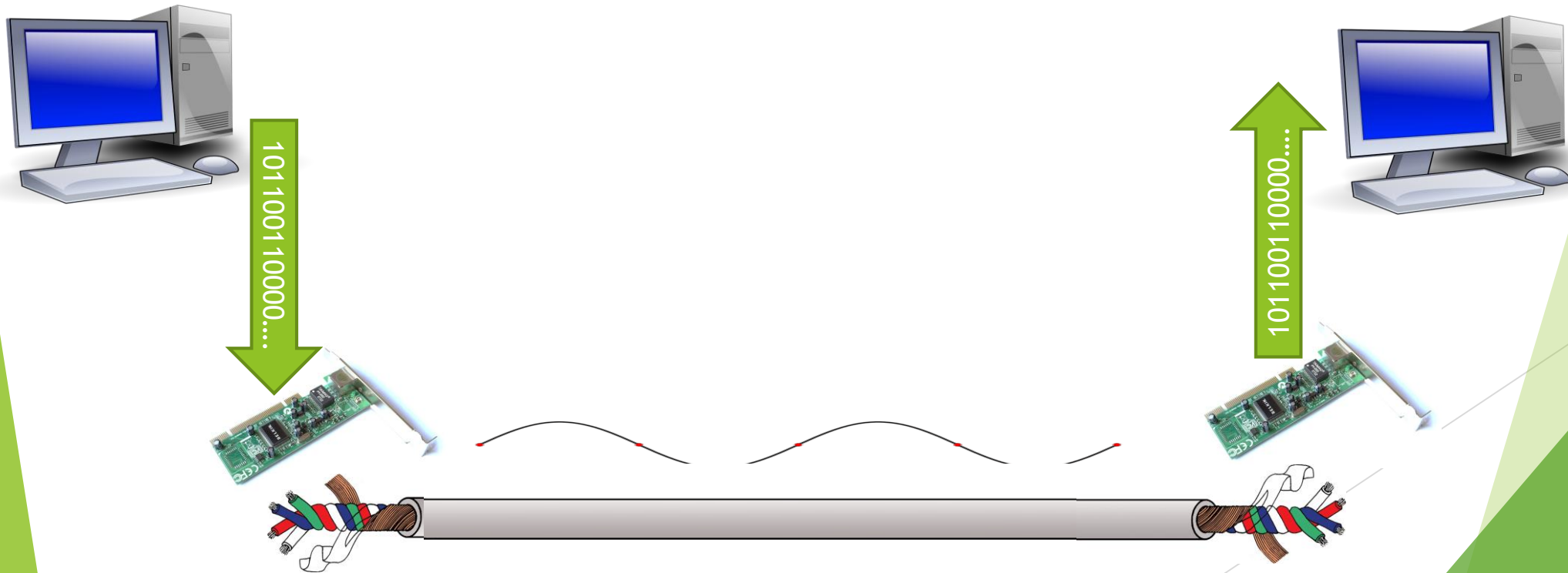


Data Link Layer



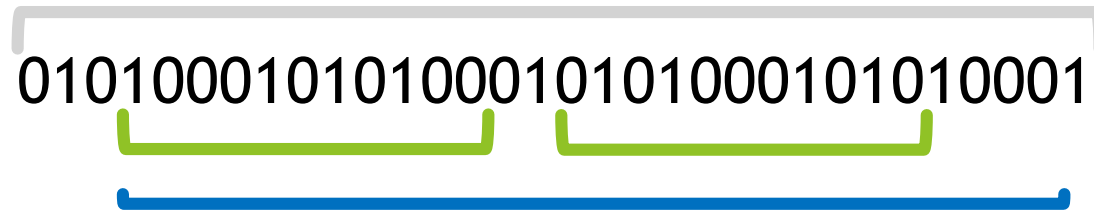
Physical Layer to Data Link Layer

- ▶ Thanks to the physical layer we can send some binary from an emitter to a receiver sharing a medium.



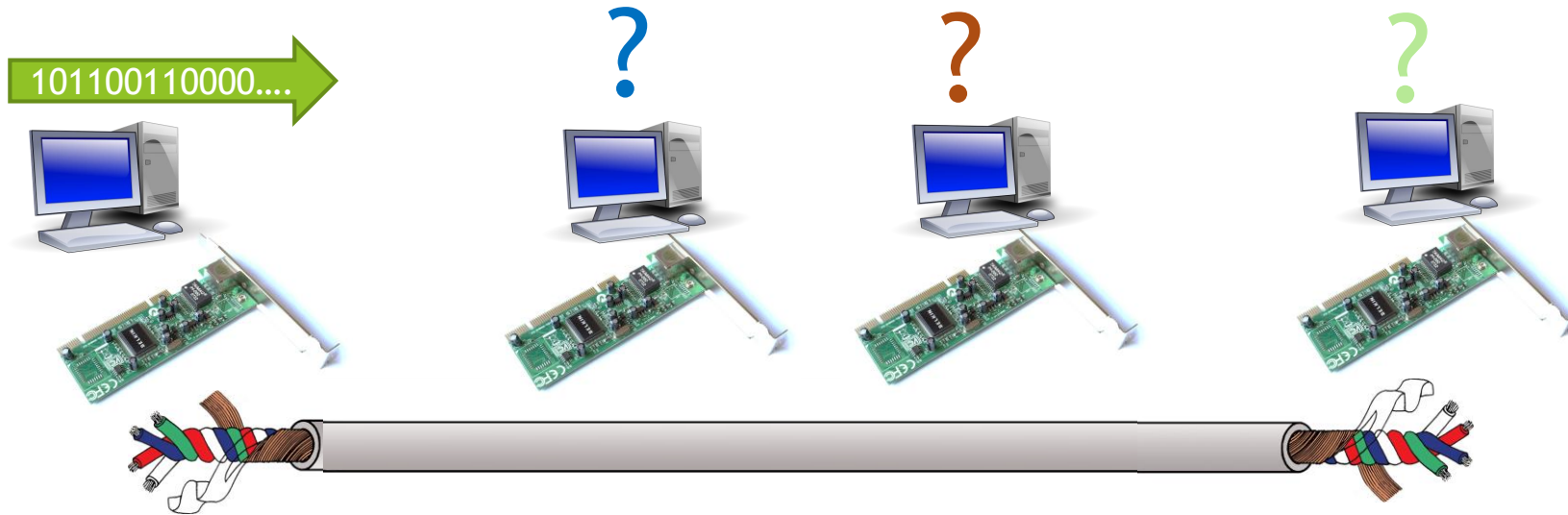
But how are encoded binary data ?

- ▶ What 01010001 does mean ?
- ▶ When data begins, ends ?



- ▶ Control Data are required !
- ▶ Example :
 - ▶ Preamble : 0101010111
 - ▶ Silence between Frame : 0110.....0101010111
 - ▶ Result: 010101011111010110001.....

Data for which receiver ?

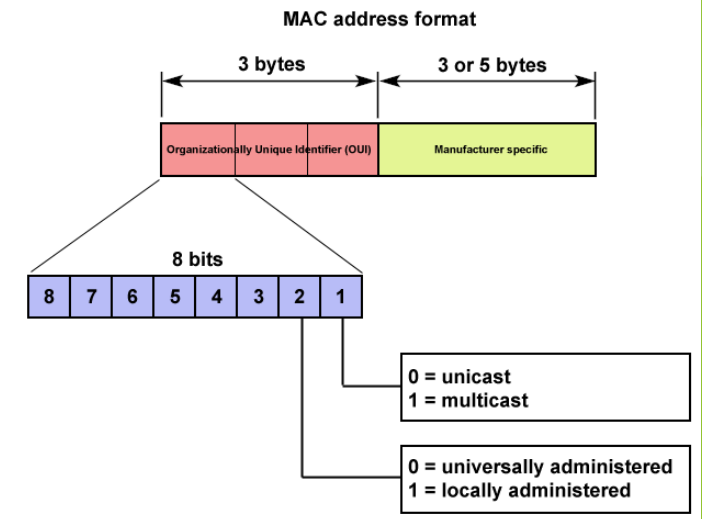


► Some Data are Address:

- Emitter Address
- Receiver Address

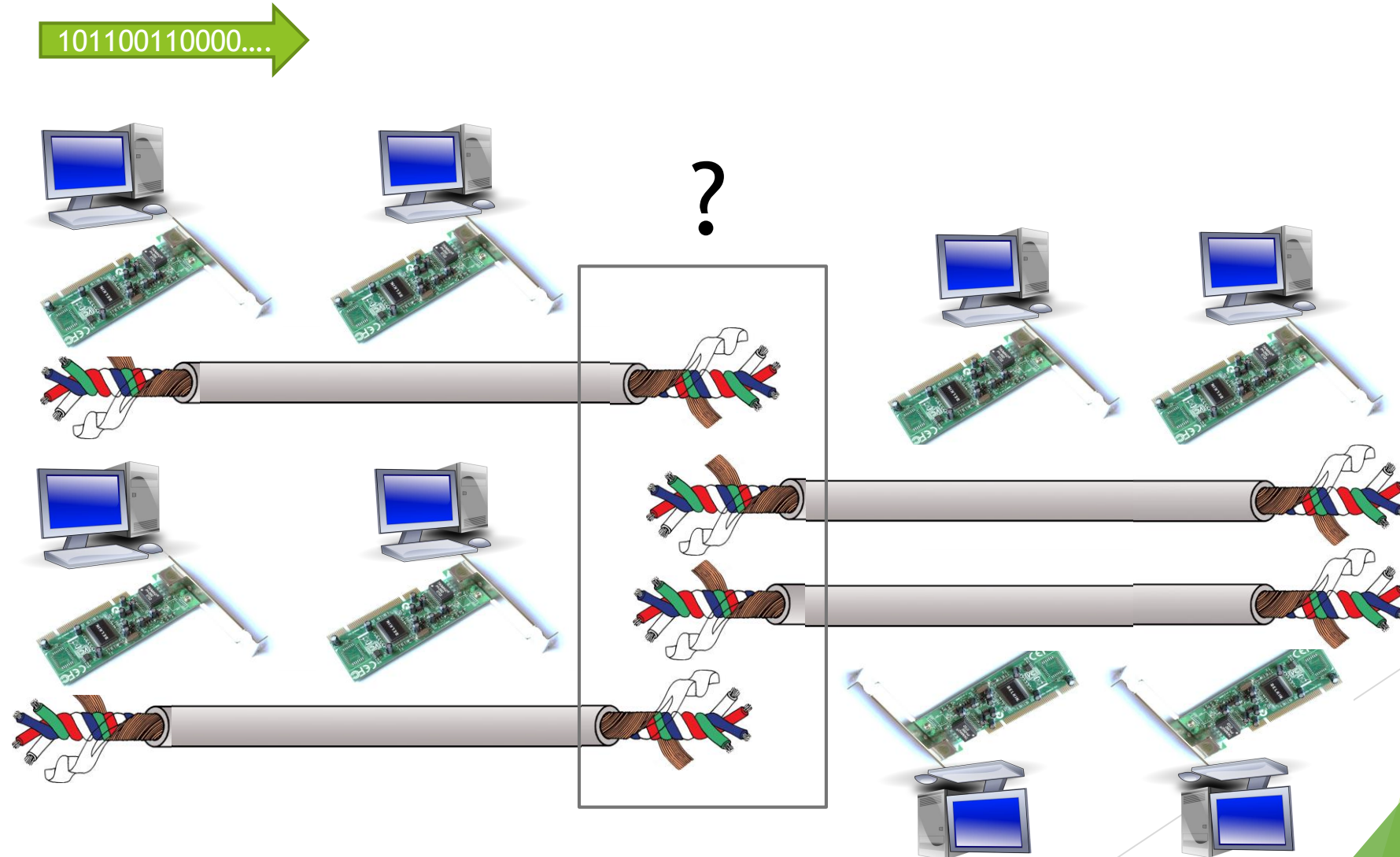
They are MAC Address :

101010111011010100111011110001....

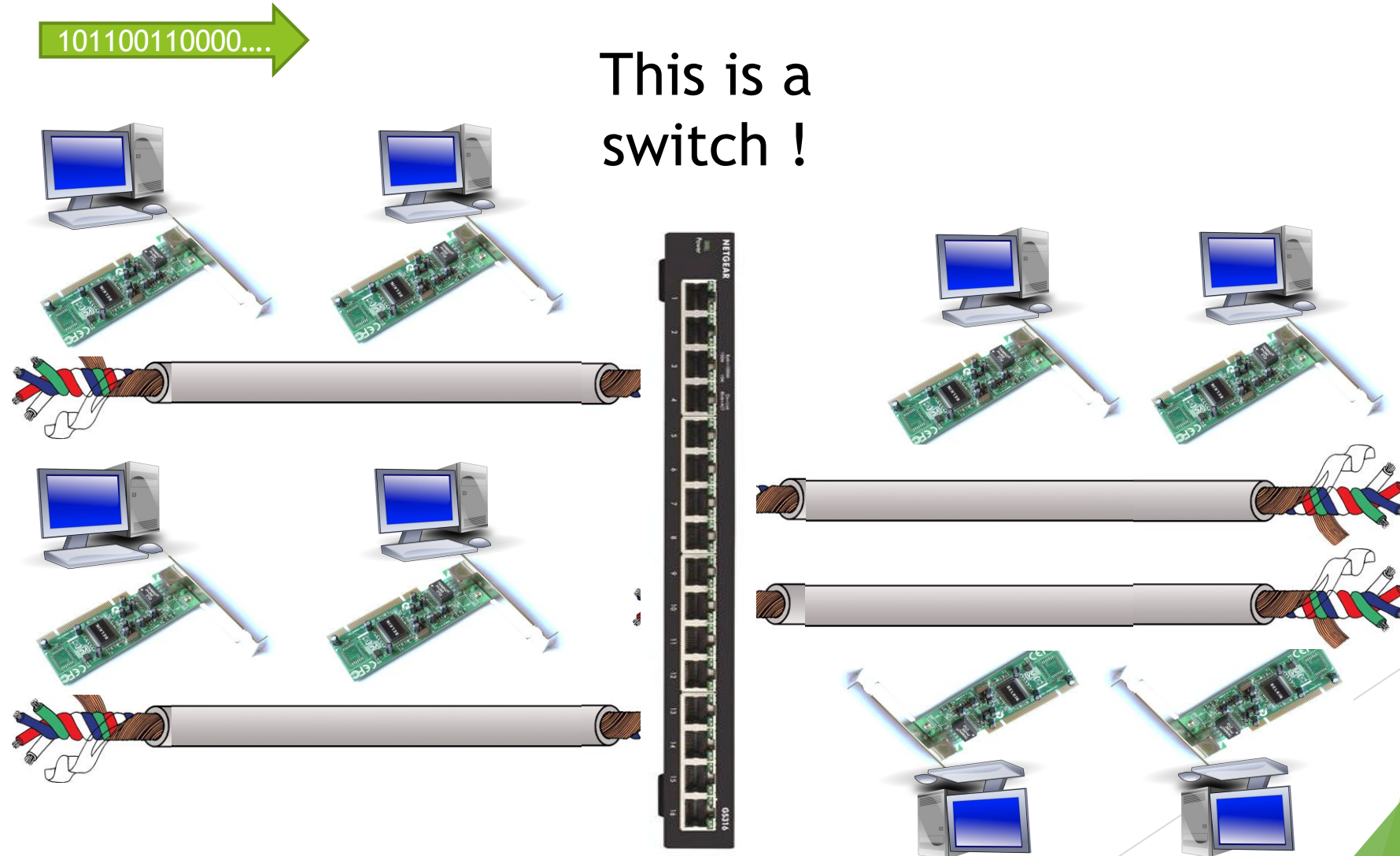


Look at your computer : `ipconfig/ifconfig`

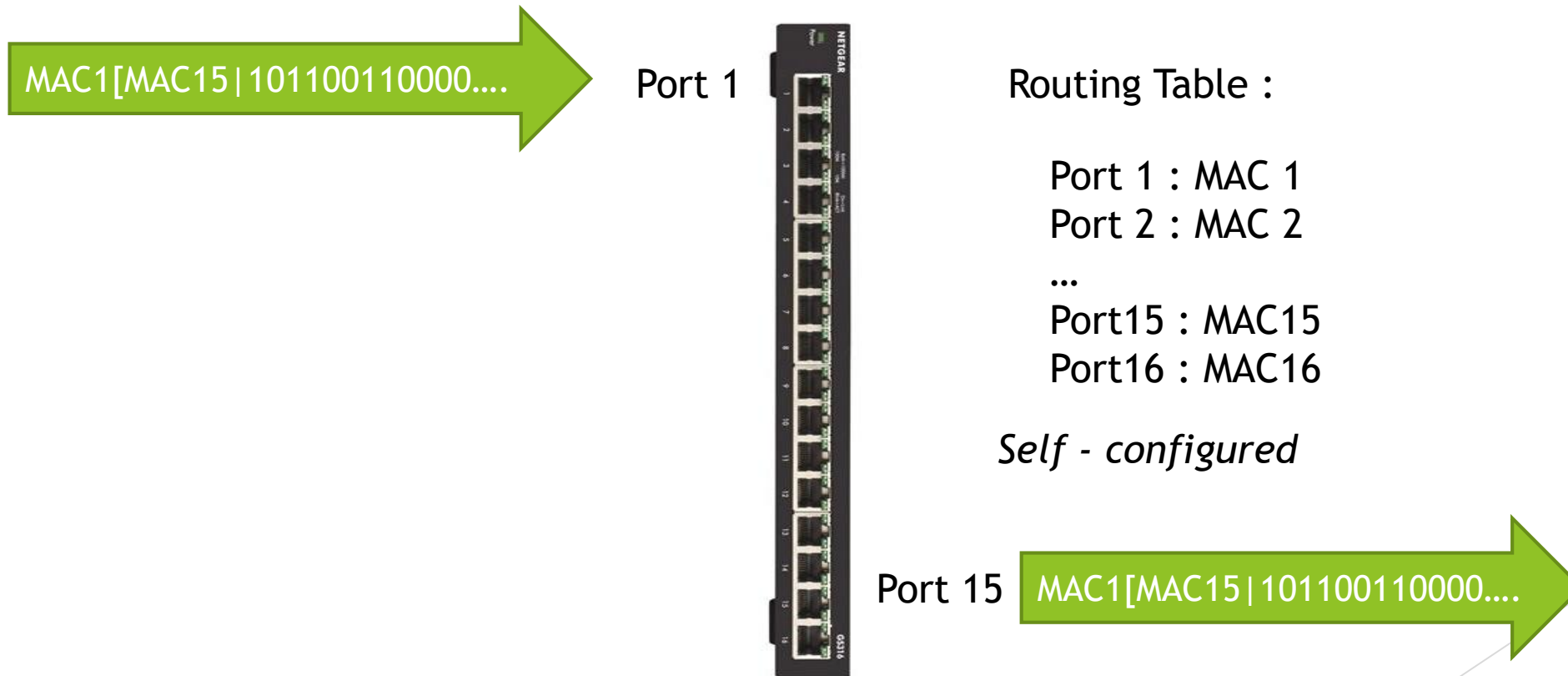
What Happens ?



We need a switch (Ethernet case) !



Switch equipement (Data Link Layer)



Be carefull, switches are have a max bandwidth or speed in Bytes / s (ex. 100Mb/s, 1Gb/s, 10GB/s ...)

Ethernet Switch equipments

simple switch

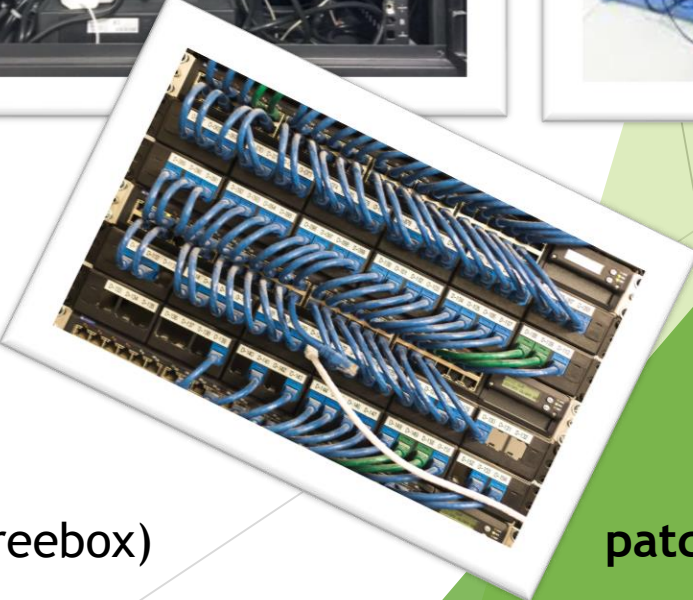


Rackable switch



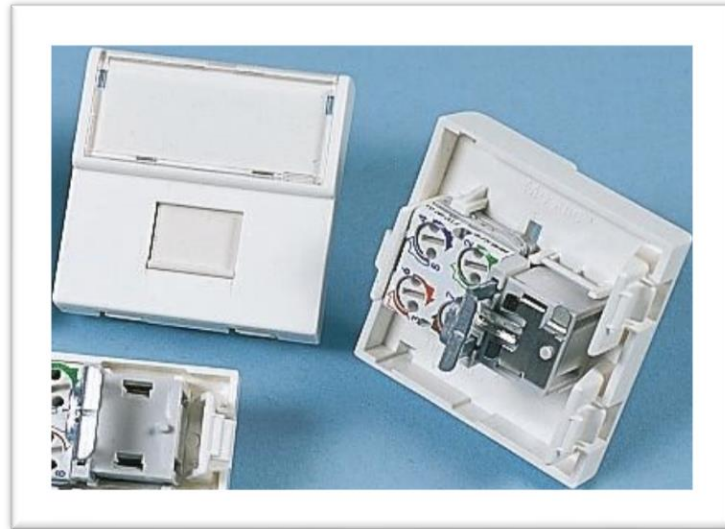
Integrated switch (ex. freebox)

Rack

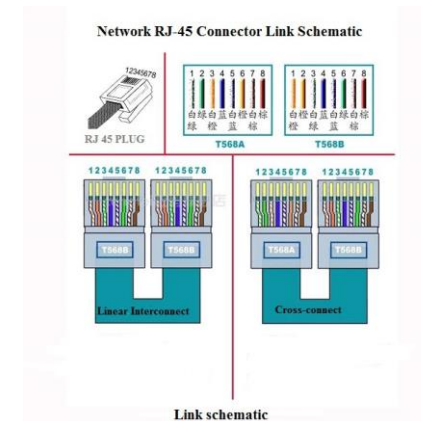


patch bay

Plugs



Plugs



Plug and cable Connexion

Plug must be compatible with cables !

Cables

- See : <http://www.latelierducable.com/cable/cable-rj45/bien-choisir-son-cable-rj45/>

Les différentes catégories ou classes sont établies par la norme et permettent de classer en fonction des performances et de la qualité des transmissions sur les différents types de câbles RJ45.

Catégorie	Classe	Débits max	Fréquence	Usage
CAT5	D	100 Mbit/s sur 100m	100 Mhz	Abandonné pour le CAT5e
CAT5e	De	2,5 Gbit/s sur 100m et 10 Gbit/s sur 30m	100 Mhz	Réseau personnel de tous les jours
CAT6	E	5 Gbit/s sur 100m et 10 Gbit/s sur 55m	250 Mhz	Réseau d'entreprise ou dans les nouveaux bâtiments
CAT6a	Ea	10 Gbit/s sur 100m	500 Mhz	Datacenter ou grands réseaux inter-entreprises
CAT7	F	40 Gbit/s sur 50m et 100 Gbit/s sur 15m	600 Mhz	-
CAT7a	Fa	-	1 Ghz	-

La CAT8 est actuellement en cours de développement et offrira un débit max de 40 Gbit/s

Cables

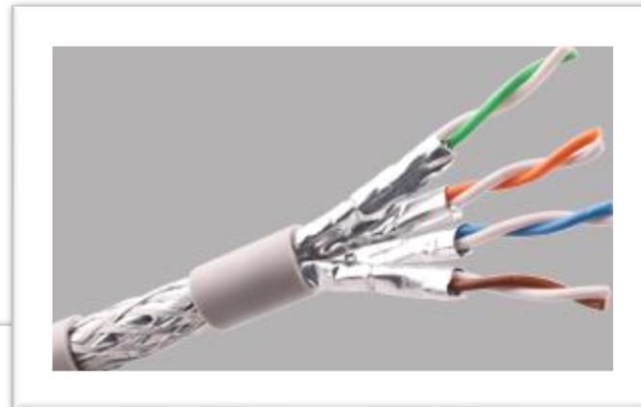
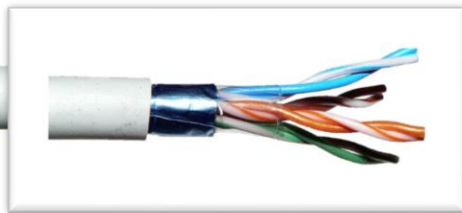
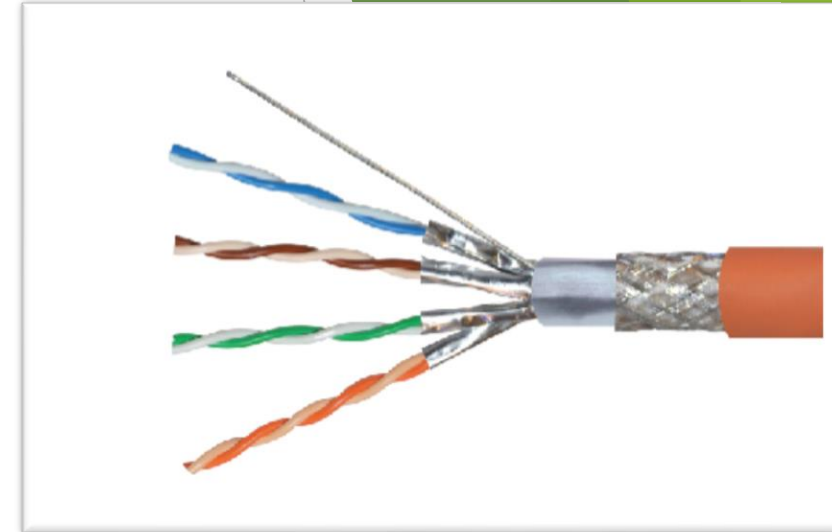
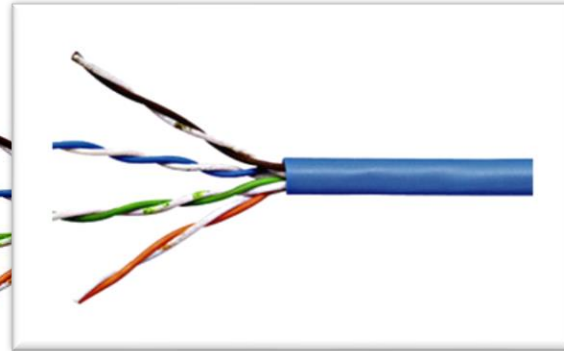
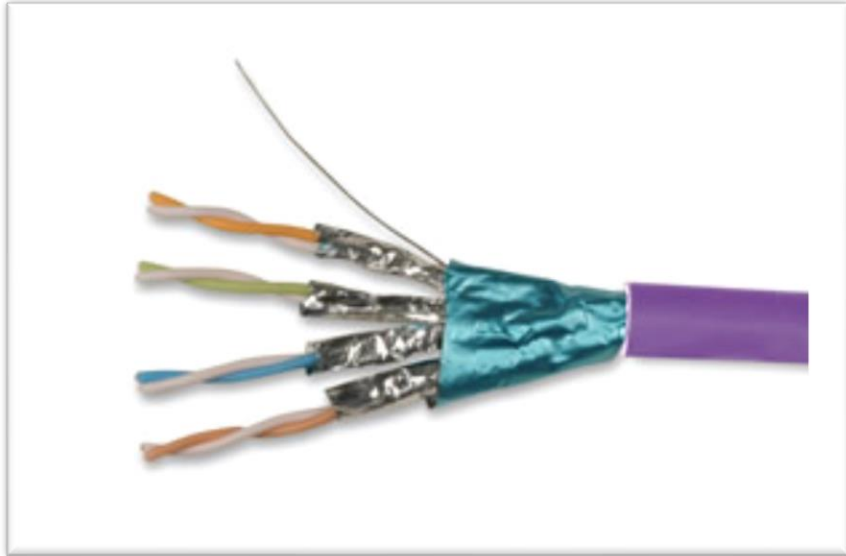
- See : <http://www.latelierducable.com/cable/cable-rj45/bien-choisir-son-cable-rj45/>

Les différents blindages



Les différentes techniques de blindages permettent aux câbles ethernet de limiter au maximum les erreurs pendant les transmissions de données. En effet, les câbles RJ45 sont composés de plusieurs fils qui, lorsqu'ils sont parcourus par un courant électrique, *rayonnent* et interfèrent entre eux. Un environnement compliqué pourra également perturber la transmission du signal. Plus le taux d'erreurs est important moins les échanges de données seront efficaces.

What are the differences ?



Question : Ethernet requires 4 wires

- ▶ Most of Cables have 8 wires
- ▶ Why ?
- ▶ Because copper is expensive, what can we do ?

Question : Ethernet requires 4 wires

- ▶ Most of Cables have 8 wires
- ▶ Why ?
- ▶ Because copper is expensive, what can we do ?

Yes that exists !



9€92

Summary : Ethernet Equipments

- ▶ Gateway to connect Ethernet to other networks (most of the time : Internet Provider Box, ADSL - Ethernet)
- ▶ Ethernet Cables
(<http://www.latelierducable.com/cable/cable-rj45/bien-choisir-son-cable-rj45/>)
- ▶ Ethernet Plugs (most of the time RJ45 standard)
- ▶ Switches (features are ports number, speed, ...)
- ▶ Plug to supply electricity to all the equipments, except when they are powered by a same medium (ex. POE, Power on Ethernet, CPL etc...)

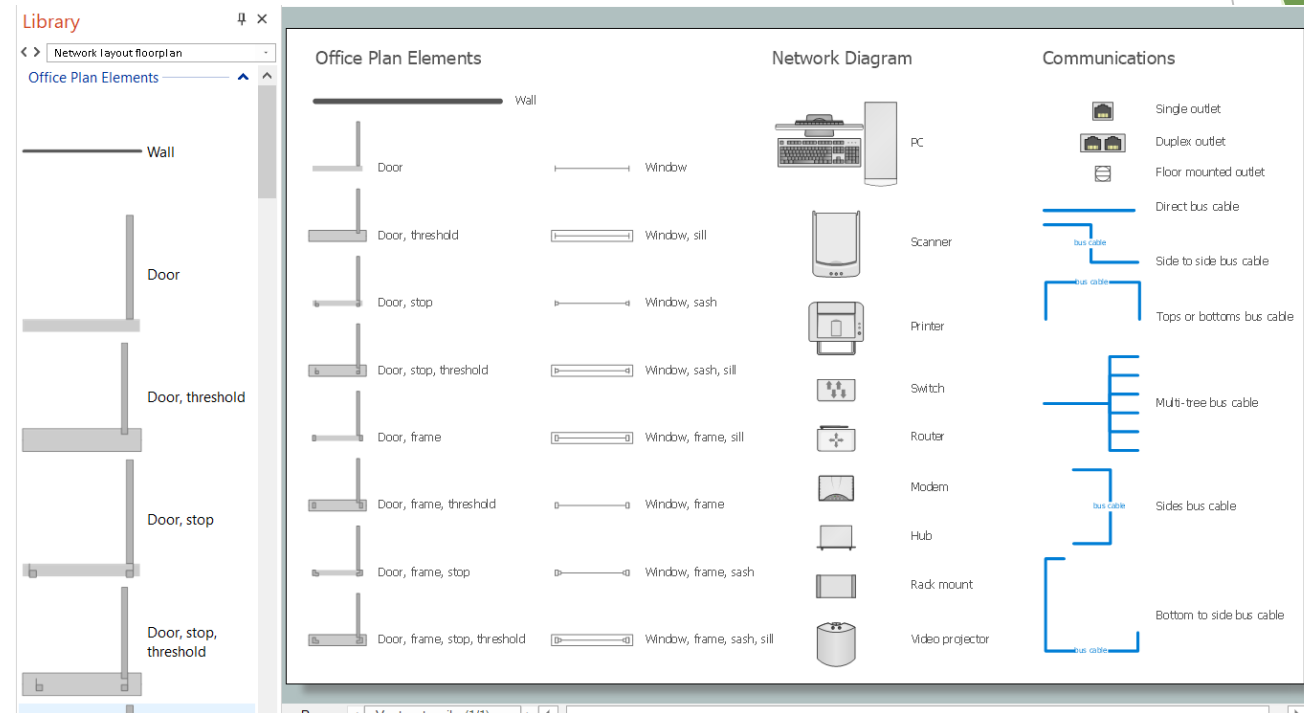


On this place, put all the Ethernet equipments !

All switches are here



ConceptDraw : all design elements you need



- ▶ If some of you want to try ConceptDraw : Feel free !
 - ▶ After ConceptDraw installation, you can download the file of the exercise on the Course Wiki (in www.tigli.fr)