

Capteurs Intelligents

Protocol de communication

Introduction aux systèmes intelligents et communicants

Exemples de systèmes intelligents



TPE



Compteurs communicants
(Smart Meters)



Réseaux électriques
(Smart Grids)

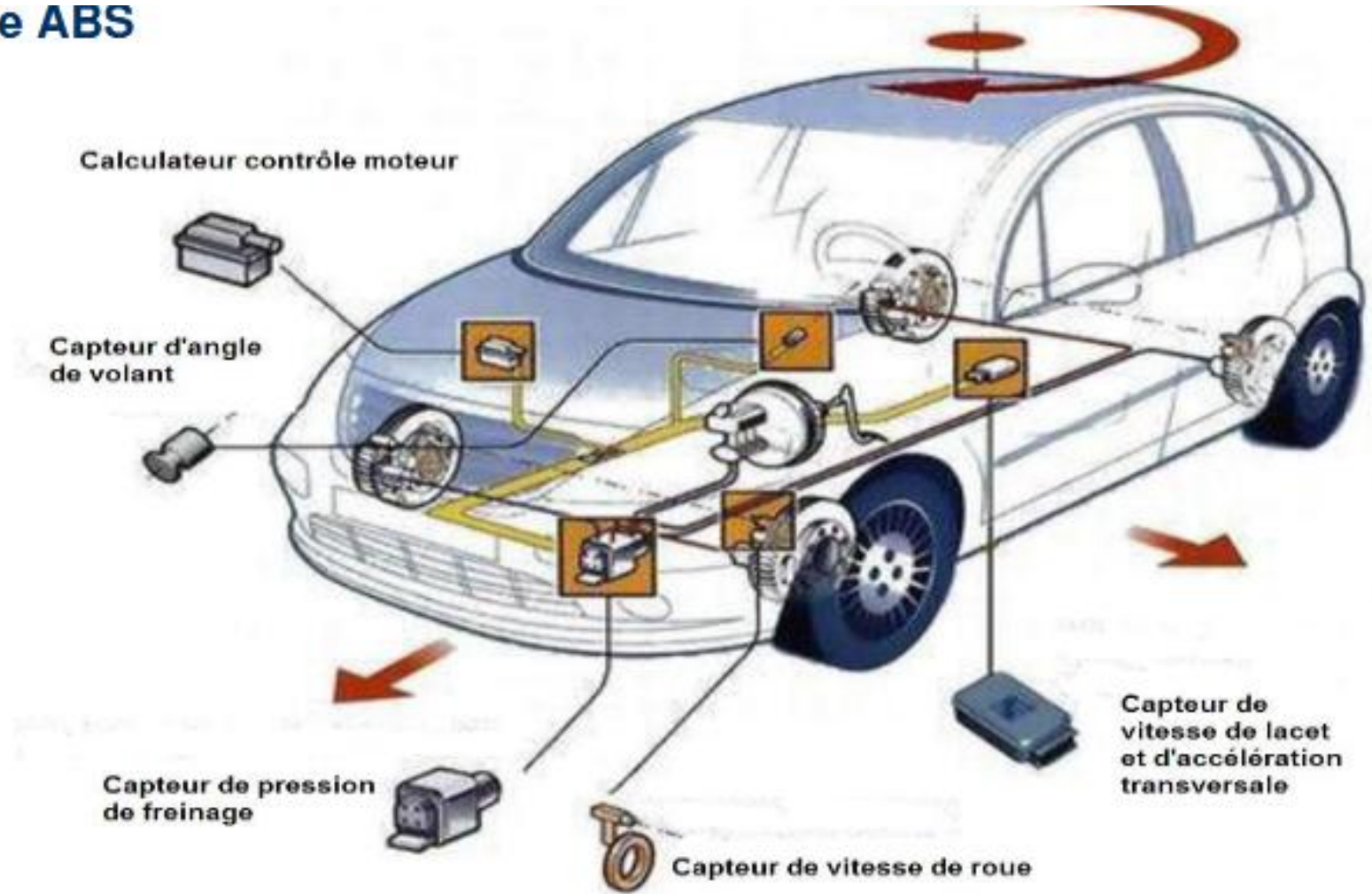


Automatismes industriels
(Intelligence artificielle)



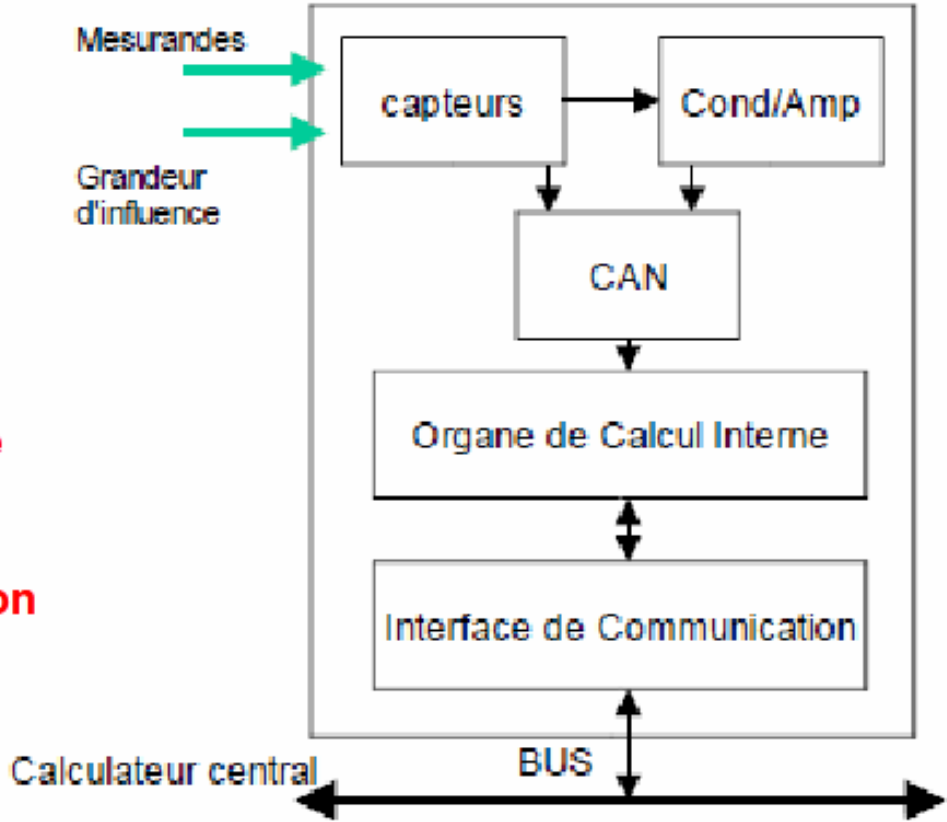
Applications domotiques
(Smart Home)

Systeme ABS

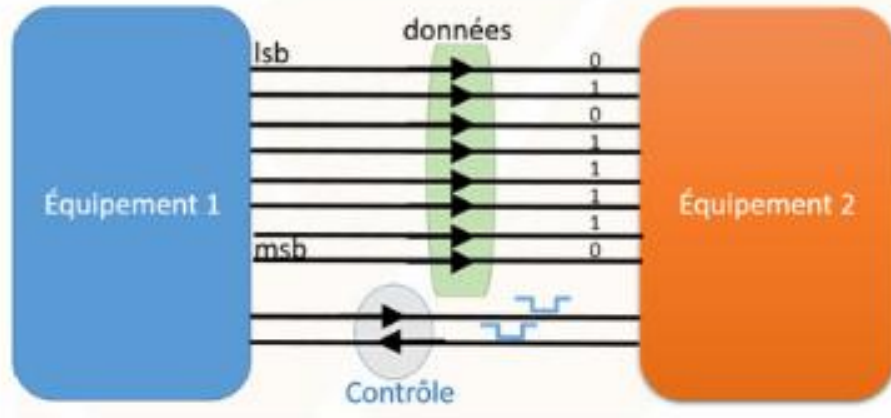


Architecture interne

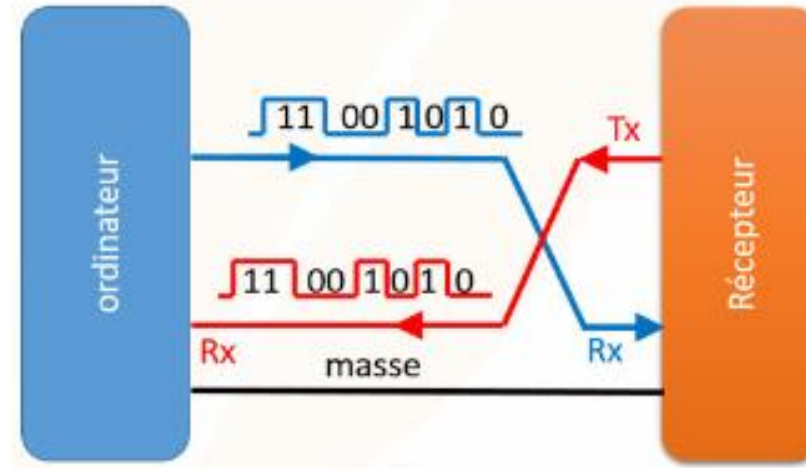
Capteur intelligent
=
Capteur ordinaire
+
Organe de calcul interne
+
Interface de communication bidirectionnelle



- **Communication parallèle ou série:**



Communication parallèle



Communication série

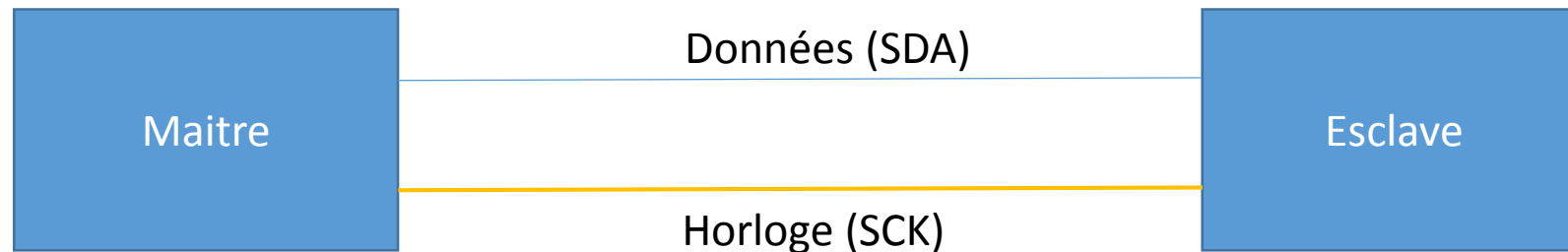
Protocol I2C

- Inventé en 1982 par NXP
- Utilisé dans : Les téléphones portables, l'automobile, l'aéronautique, la robotique, instrumentation industrielle, communications entre microcontrôleurs et autres périphériques (capteurs, afficheurs ...)
- C'est un Protocol :
 1. Simple
 2. Robuste
 3. Prix réduit
 4. Fiable

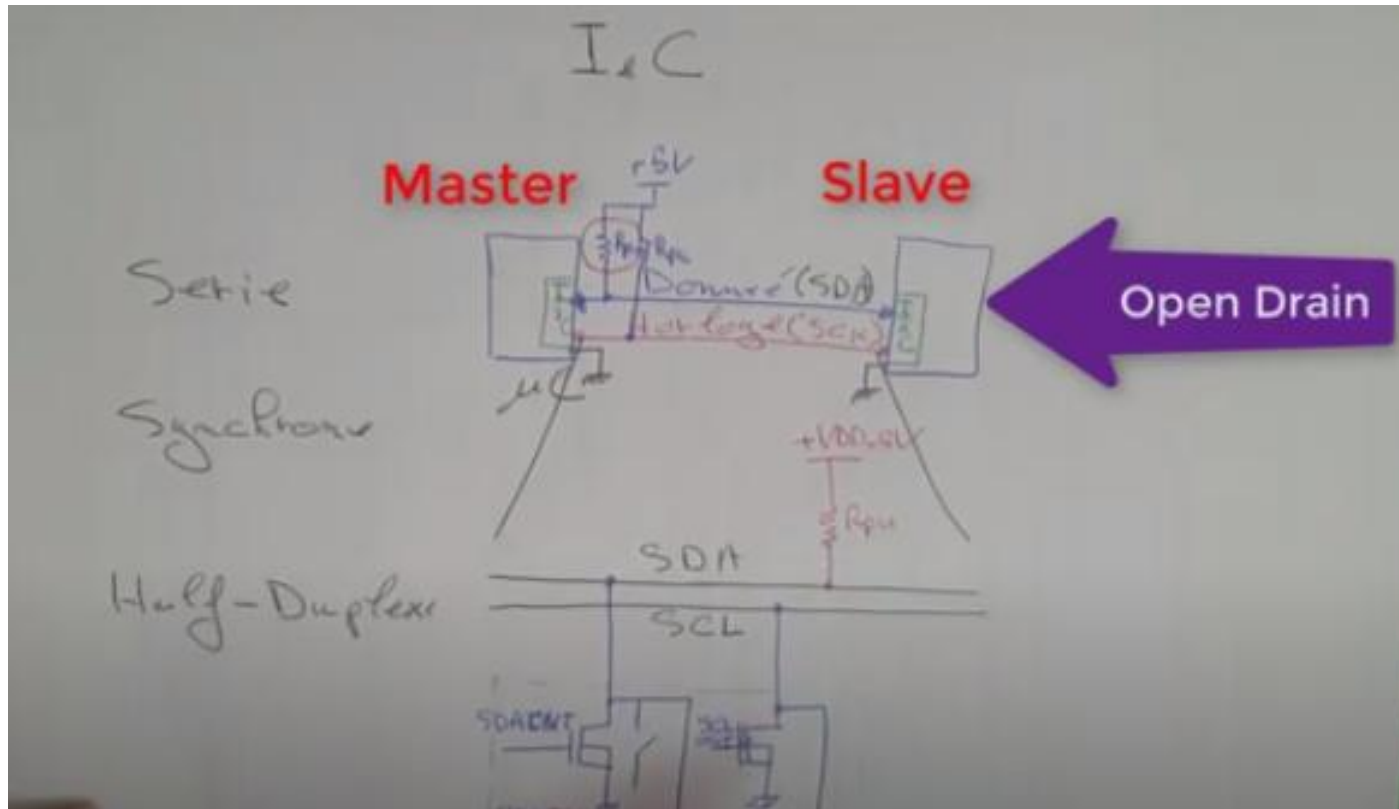
Protocol I2C

1. Caractéristiques

- a) Série (données en séquentielle)
- b) Synchrone (signal d'horloge physique)
- c) Half-duplexe (transmission alternée)



Protocol I2C



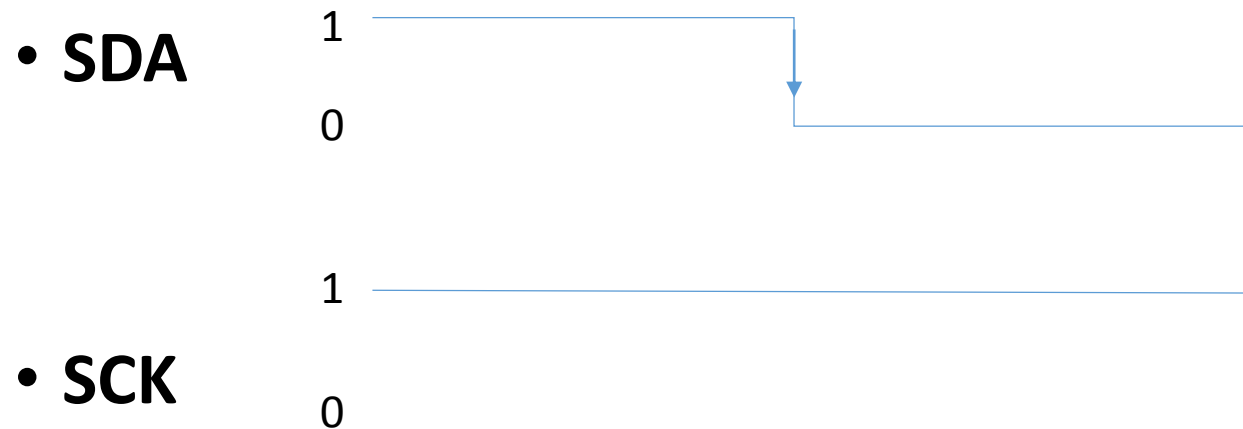
État de repos :

SDA = 1

SCK = 1

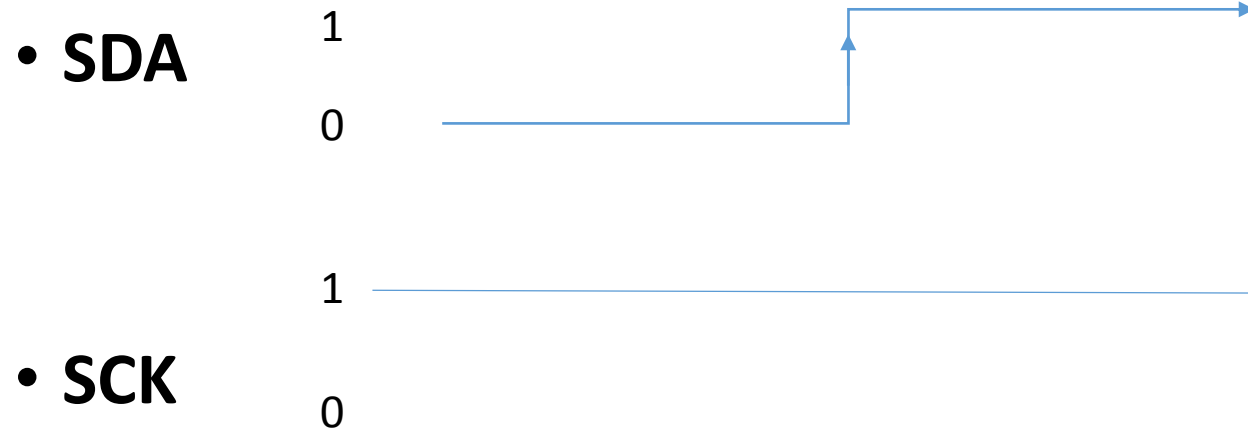
Protocol I2C

- **Start condition (Condition de départ)**



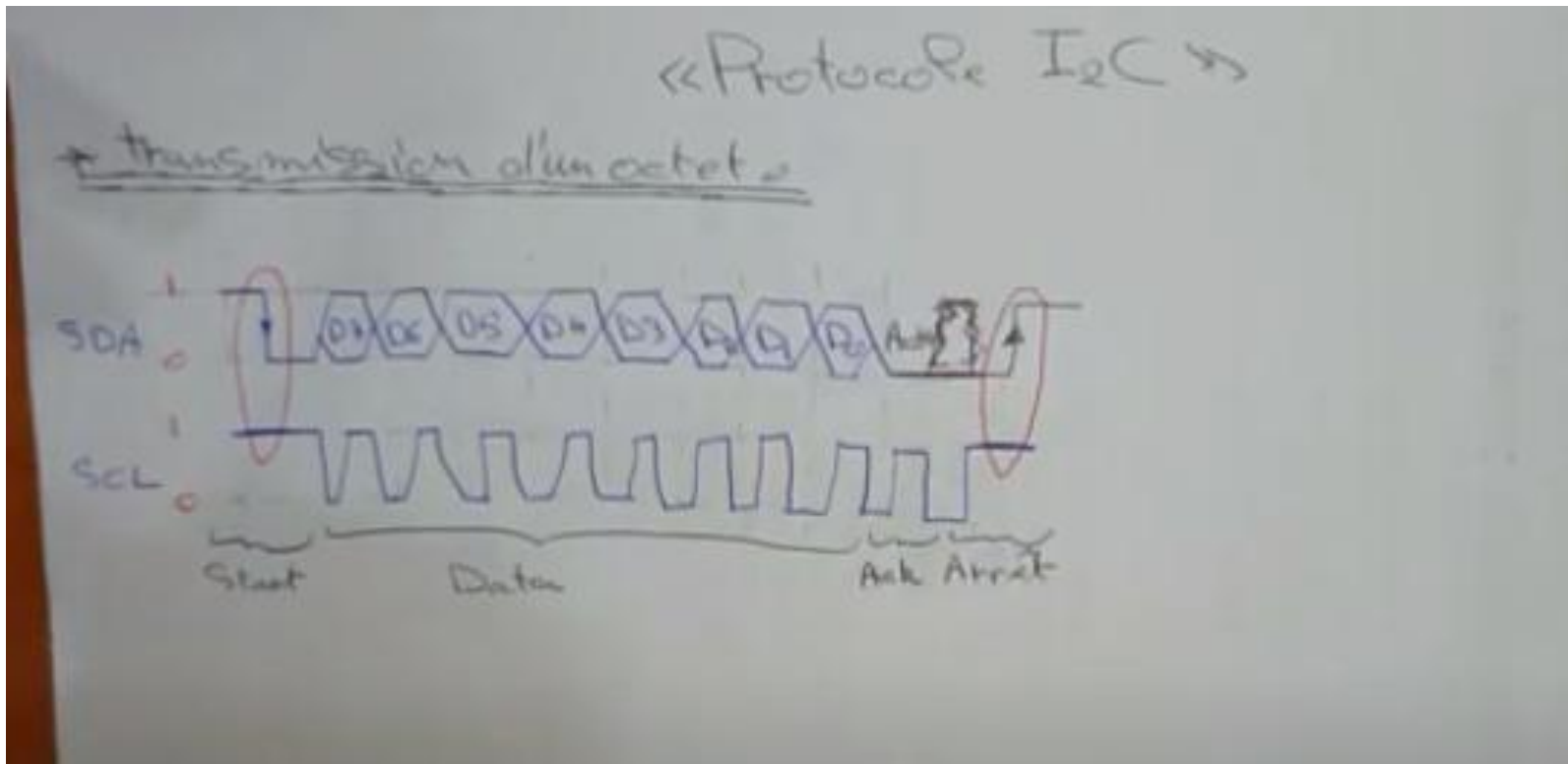
Protocol I2C

- **Stop condition (Condition d'arrêt)**



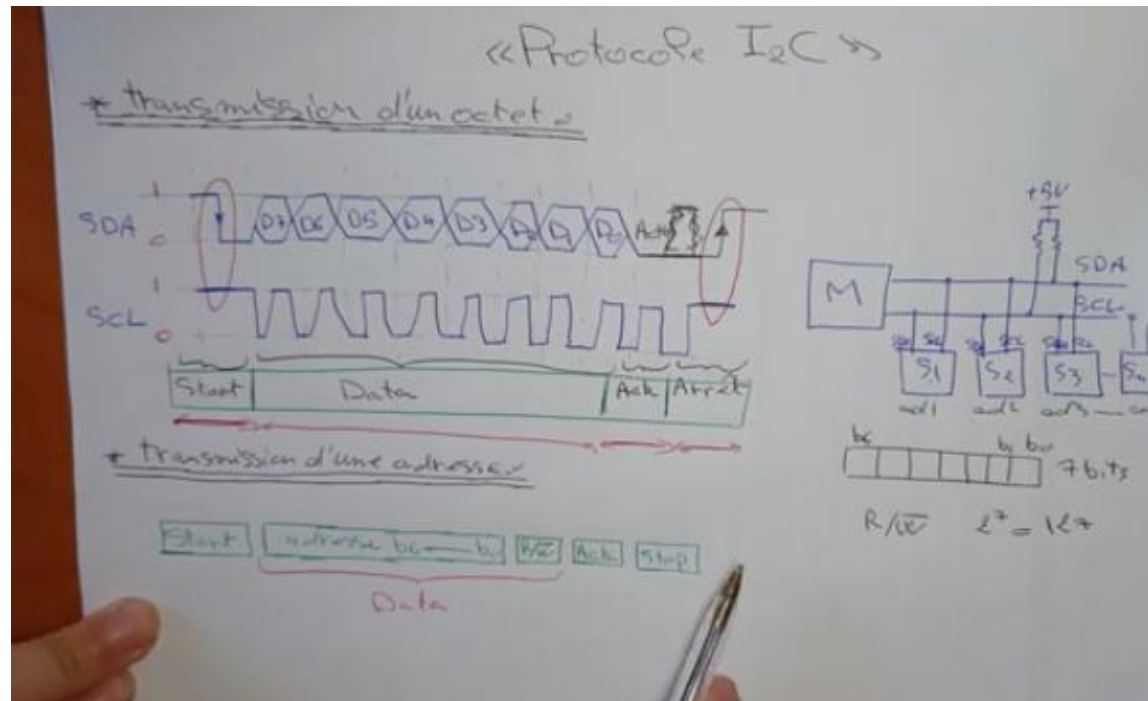
Protocol I2C

1. Transmission d'un octet (Start, Octet, bit ACQ, STOP)



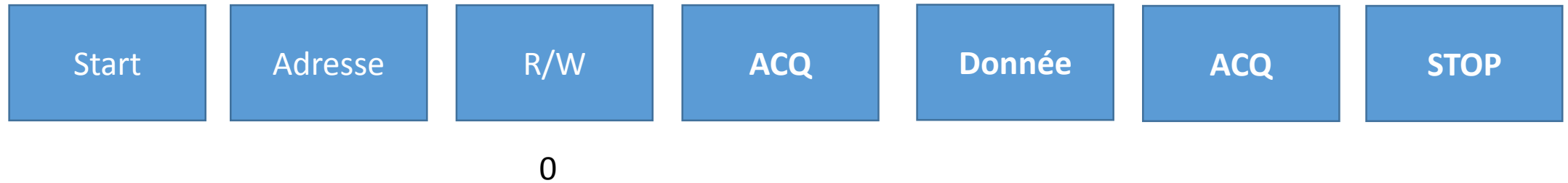
Protocol I2C

1. Adressage (Start, Adresse (7 bits, bit R/W, bit ACQ, STOP))



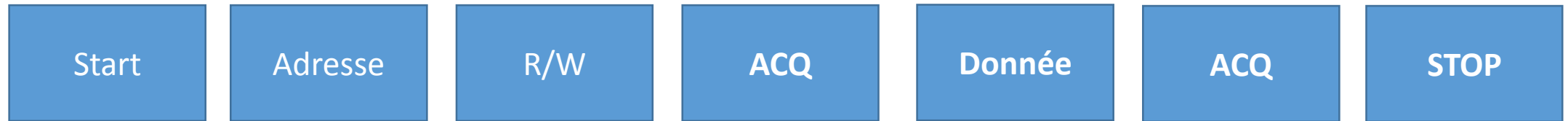
Protocol I2C

1. **Ecriture d'une donnée (Start, Adresse (7 bits, bit R/W [=0], bit ACQ, Donnée, ACQ, STOP)**



Protocol I2C

1. Lecture d'une donnée (Start, Adresse (7 bits, bit R/W [=1], bit ACQ, Donnée, ACQ, STOP)



Protocol I2C

1. En tant que protocole de communication, I2C présente les avantages suivants :
 - A. Taux de transmission de données flexibles.
 - B. Communication à plus longue distance que SPI .
 - C. Chaque périphérique sur le bus est adressable indépendamment.
 - D. Il ne nécessite que deux lignes de signal.

Protocol SPI

Serial Peripheral Interface

Série & Synchrone

C'est quoi le protocole SPI ?

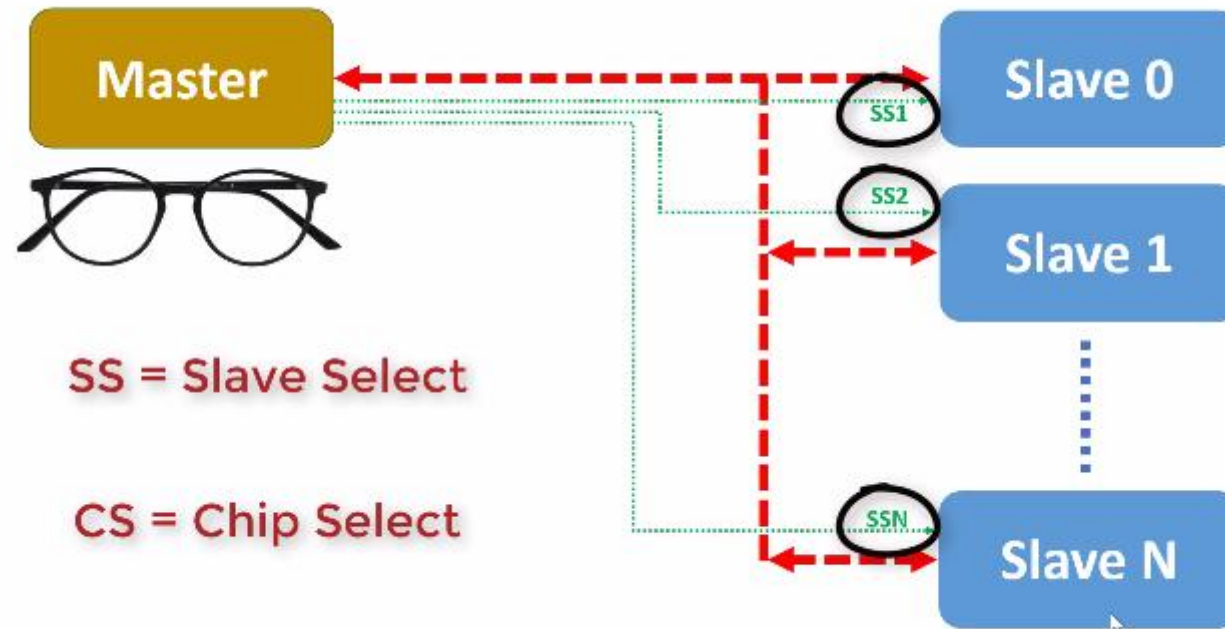


FULL DUPLEX

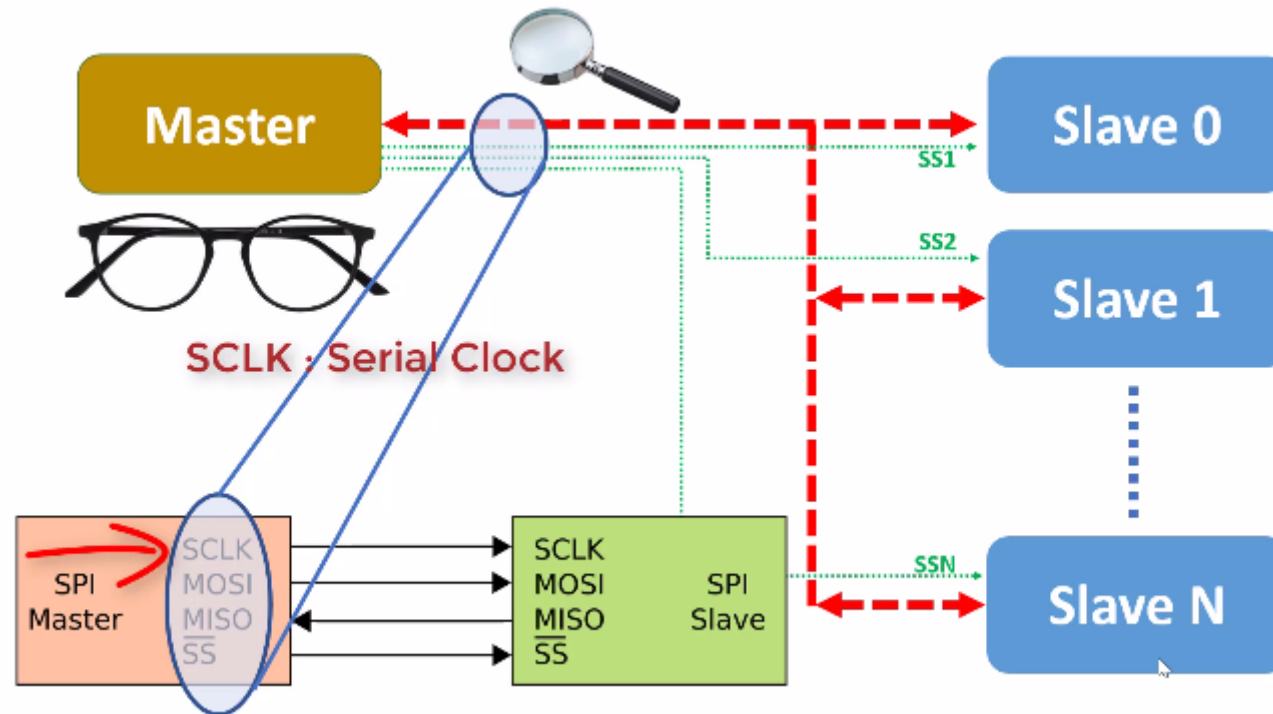


Le protocole SPI, Partie 1: "Principe & Architecture"

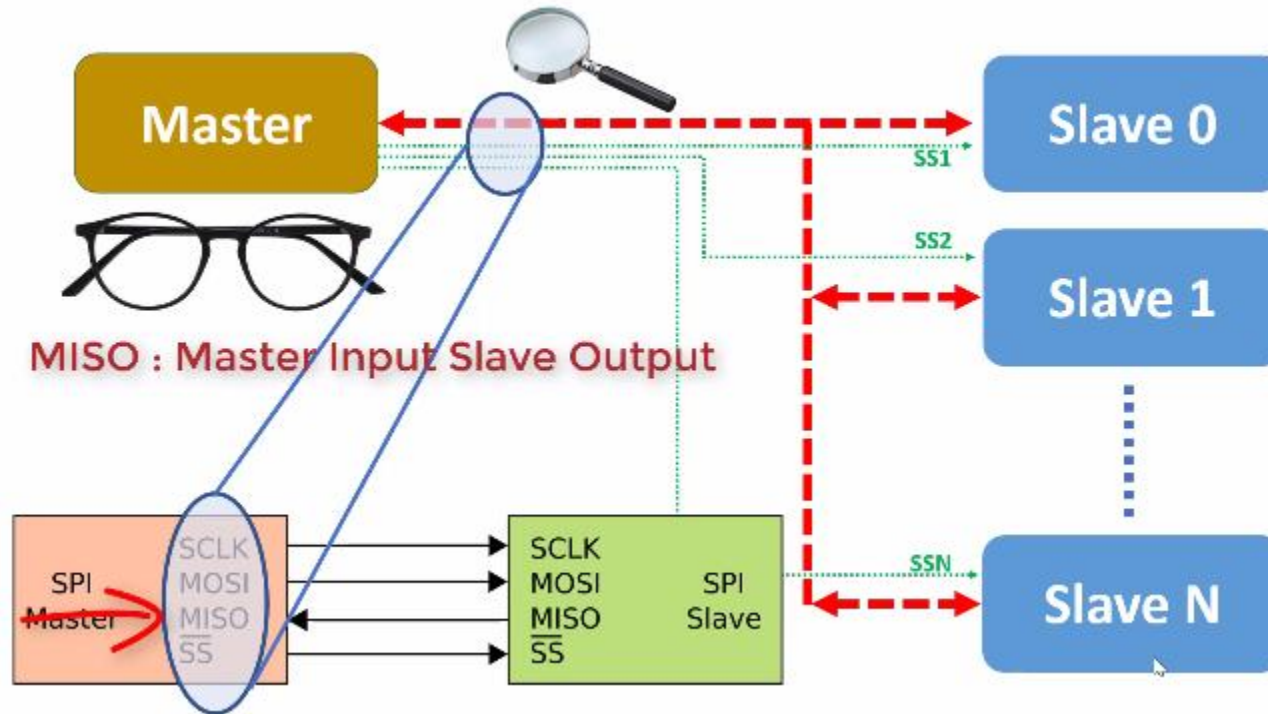
Principe Protocol SPI



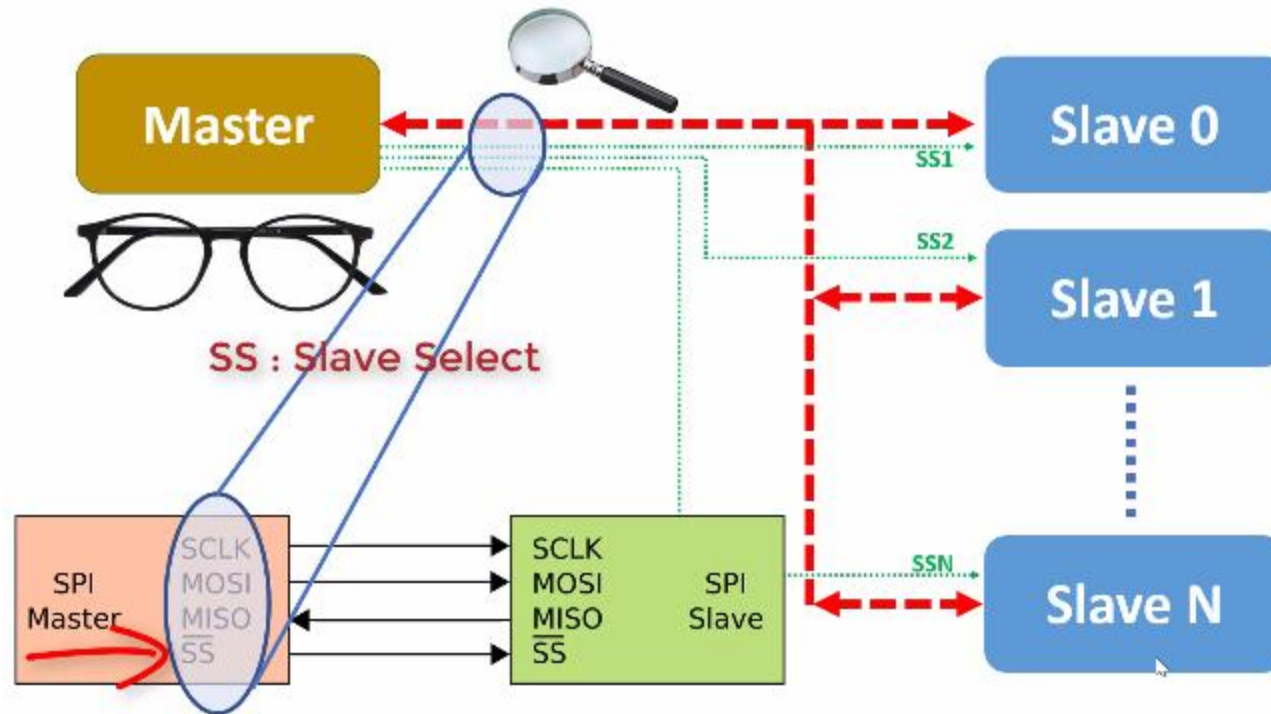
Principe du Protocol SPI



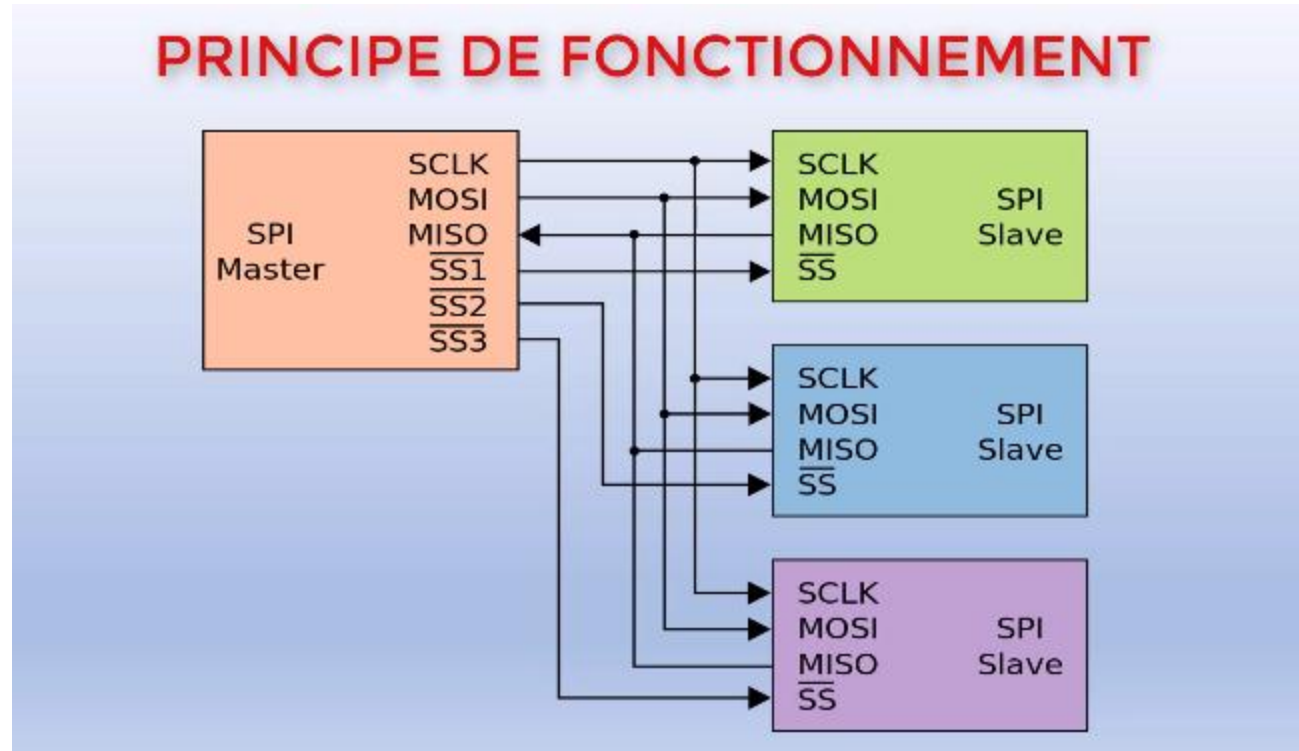
Principe du Protocol SPI



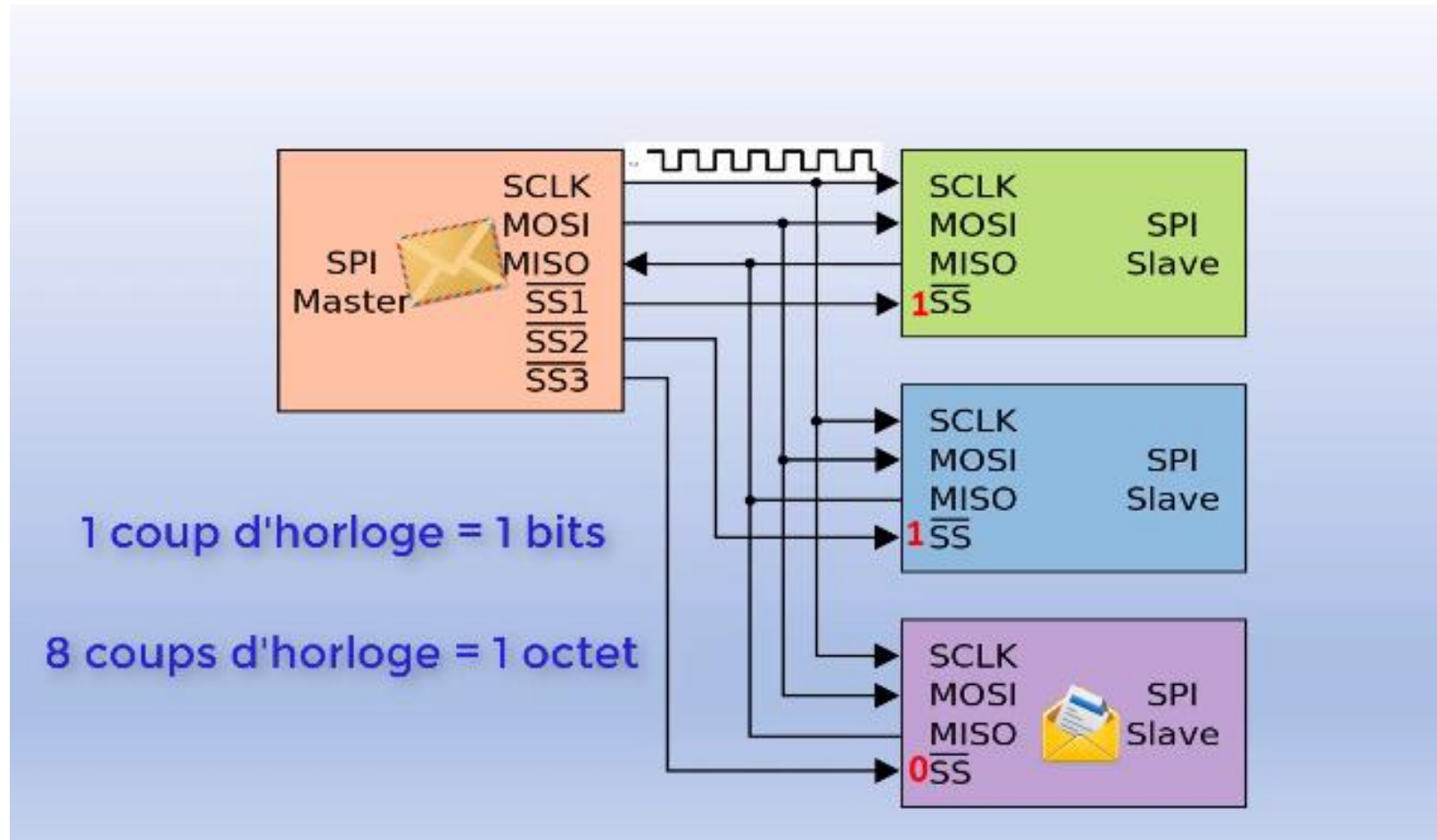
Principe du Protocol SPI



Principe du Protocol SPI



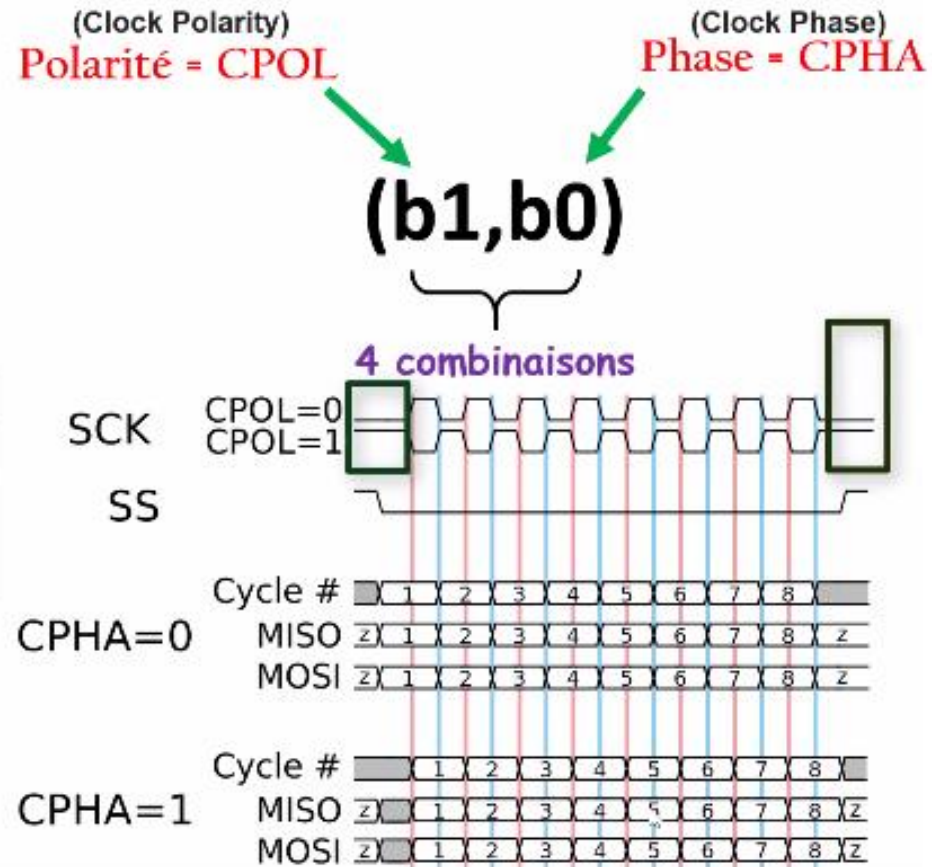
Principe du Protocol SPI



Principe du Protocol SPI

□ La polarité et la phase

Mode	CPOL	CPHA
0 (0,0)	0	0
1 (0,1)	0	1
2 (1,0)	1	0
3 (1,1)	1	1



Avantages Protocol SPI

- ✓ Full duplex
- ✓ Débit plus important
- ✓ Flexibilité du nombre de bits
- ✓ simplicité de l'interface



Inconvénients Protocol SPI



- ❖ Monopolise plus de broches
- ❖ Absence d'une procédure pour l'adressage
- ❖ Pas d'acquittement
- ❖ Ne s'utilise que sur de courtes distances

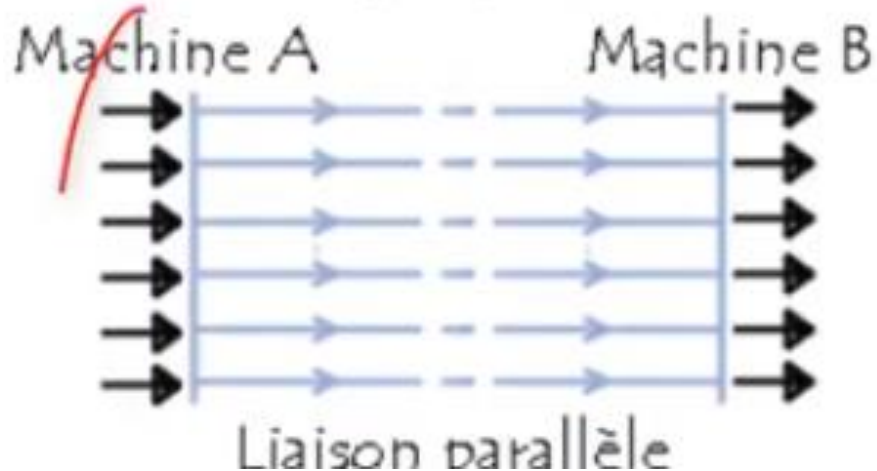
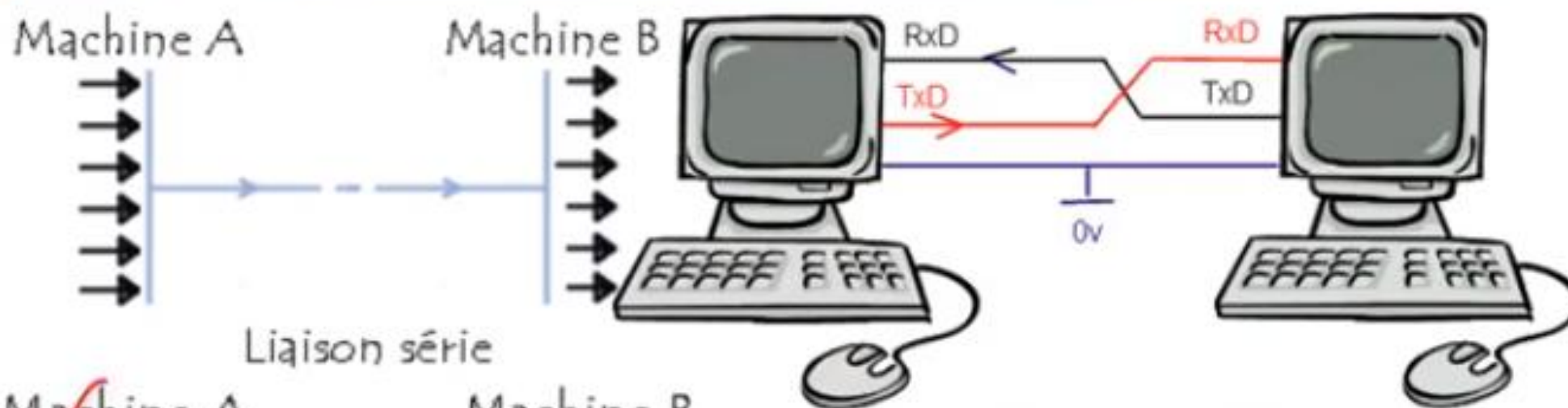
Protocol UART



Protocol UART

1

Introduction Générale du Protocole

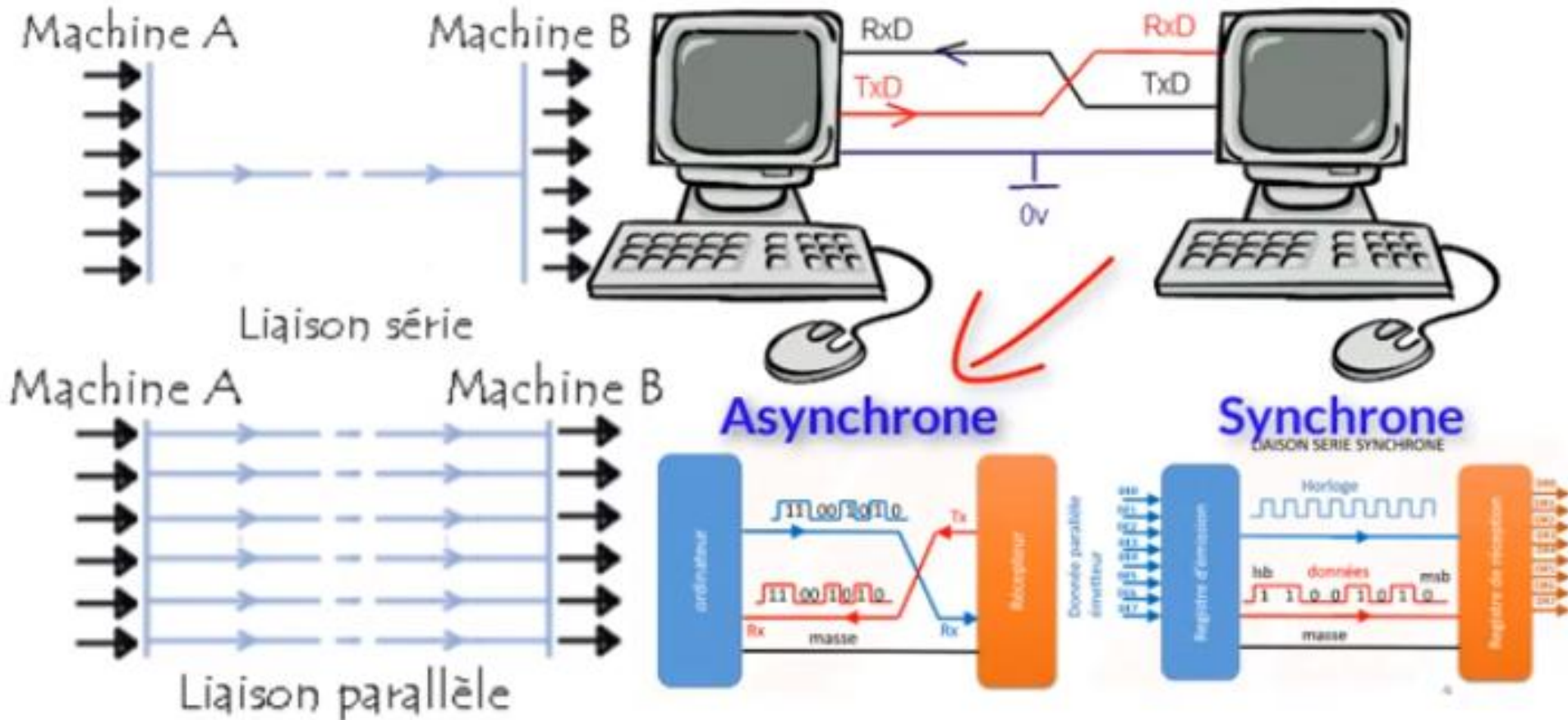


c'est quoi la liaison UART ?

Protocol UART

1

Introduction Générale du Protocole



Protocol UART

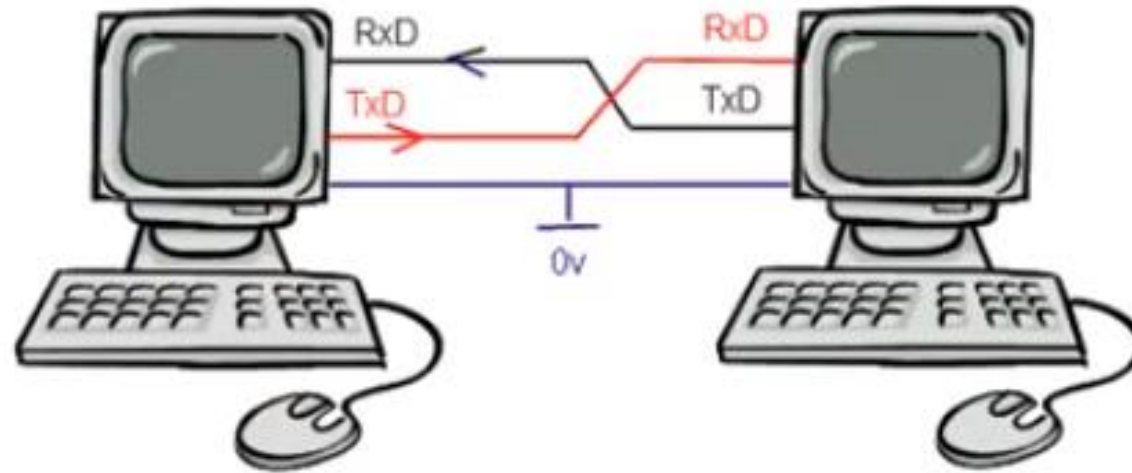
1

Introduction Générale du Protocole

(a) *SIMPLEXE*

(b) *Full DUPLEXE*

(c) *Half DUPLEXE*



(a) simplex

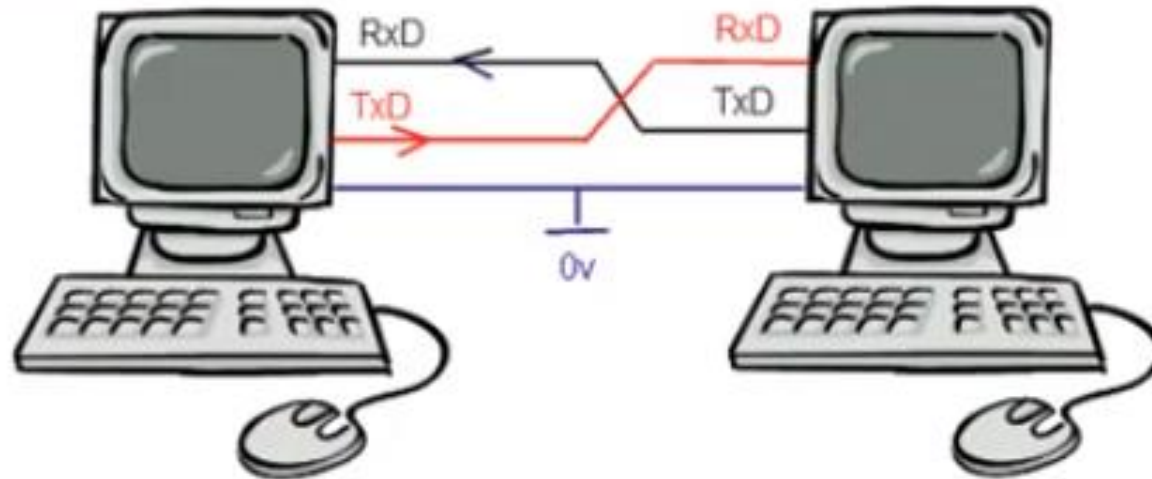


Protocol UART

1

Introduction Générale du Protocole

- (a) SIMPLEXE
 - (b) Full DUPLEXE**
 - (c) Half DUPLEXE
- 



Protocol UART

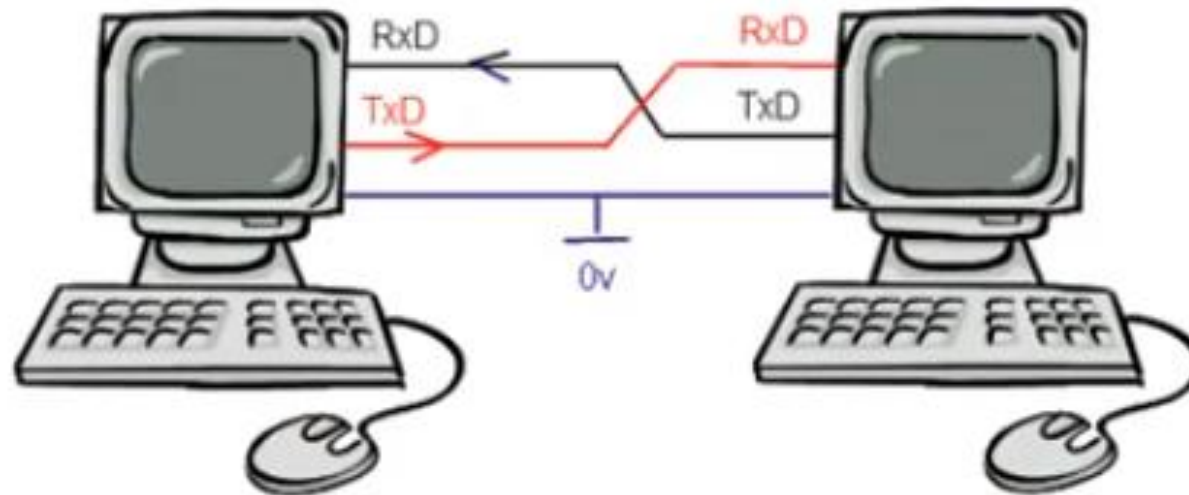
1

Introduction Générale du Protocole

(a) SIMPLEXE

(b) Full DUPLEXE

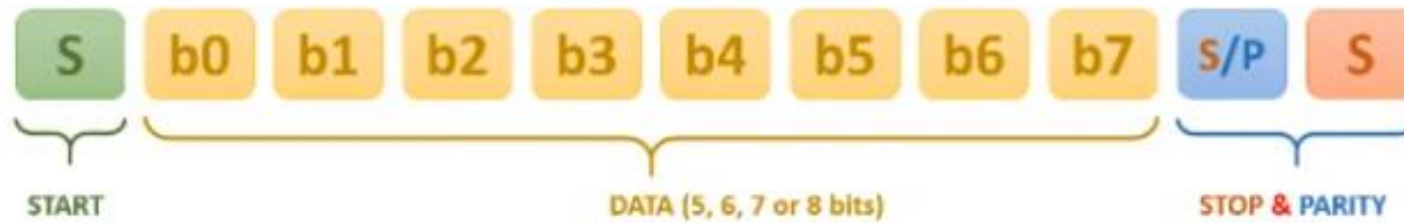
(c) Half DUPLEXE



Protocol UART

2

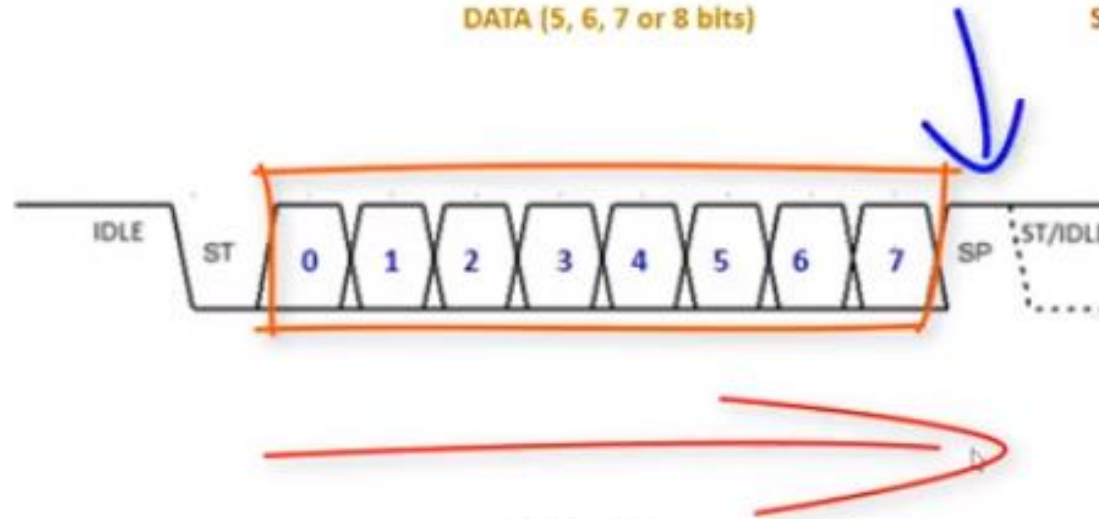
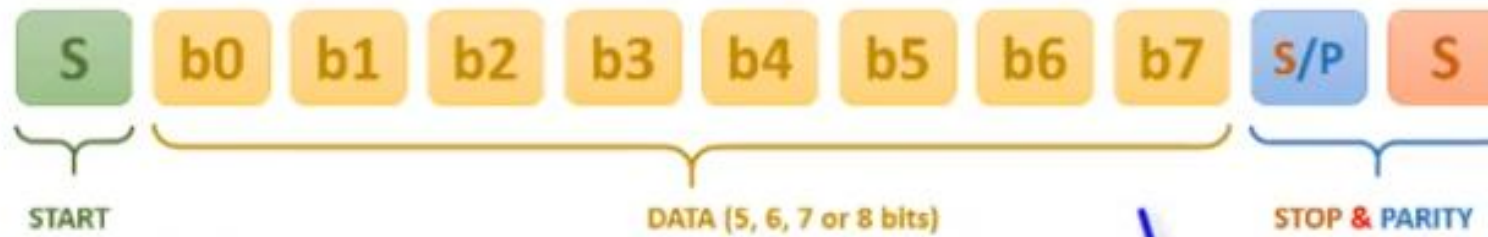
Format D'une Trame UART



Protocol UART

2

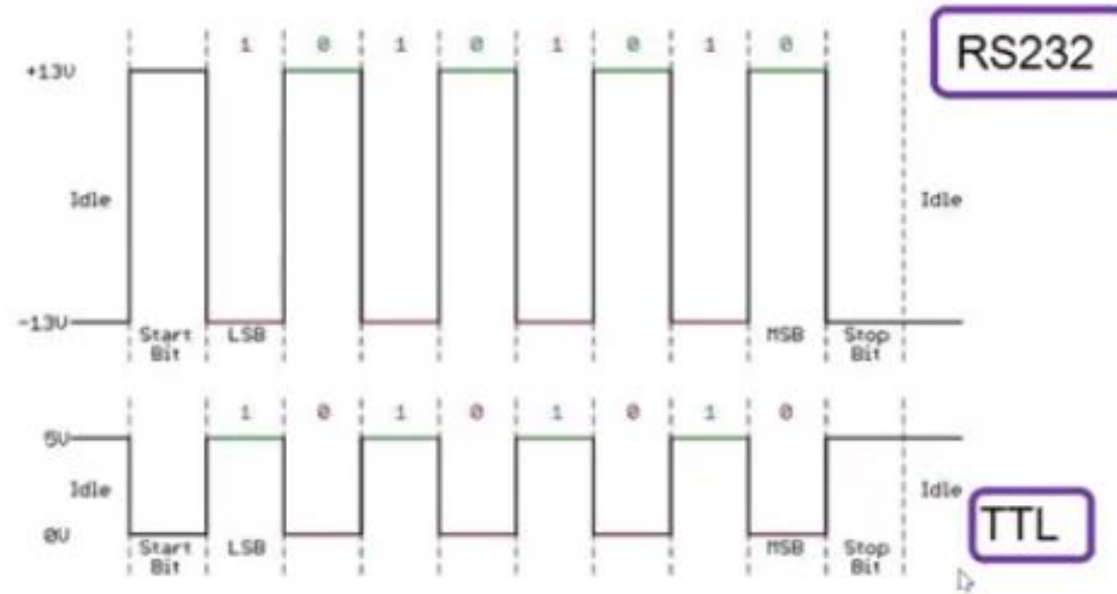
Format D'une Trame UART



Protocol UART

3

Niveaux Electriques

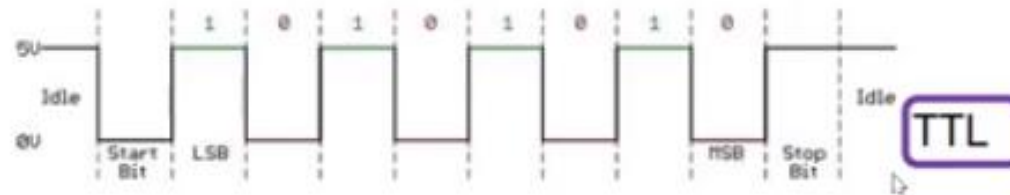


Protocol UART

3

Niveaux Electriques

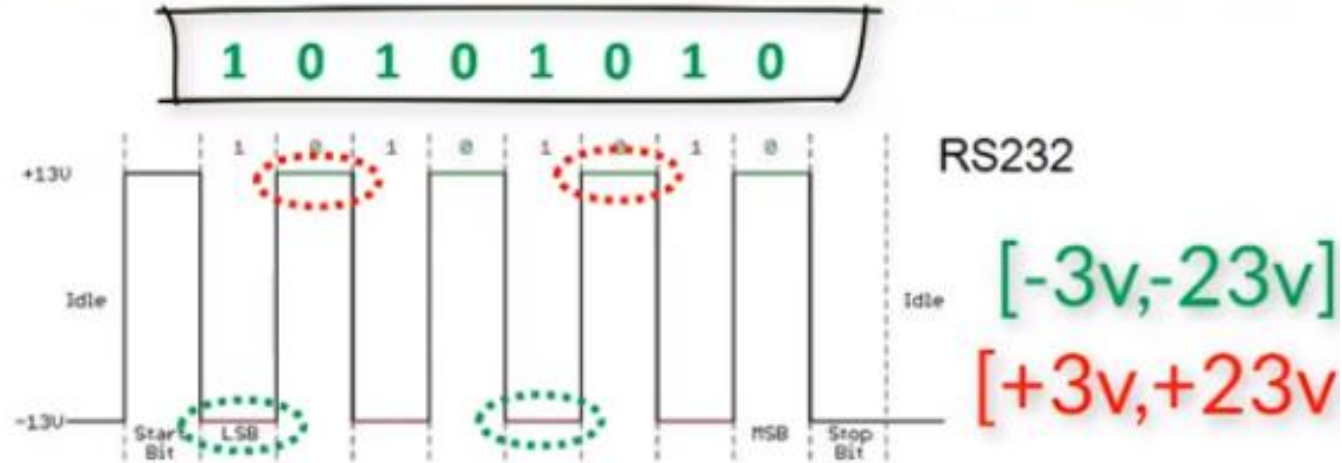
1 0 1 0 1 0 1 0



Protocol UART

3

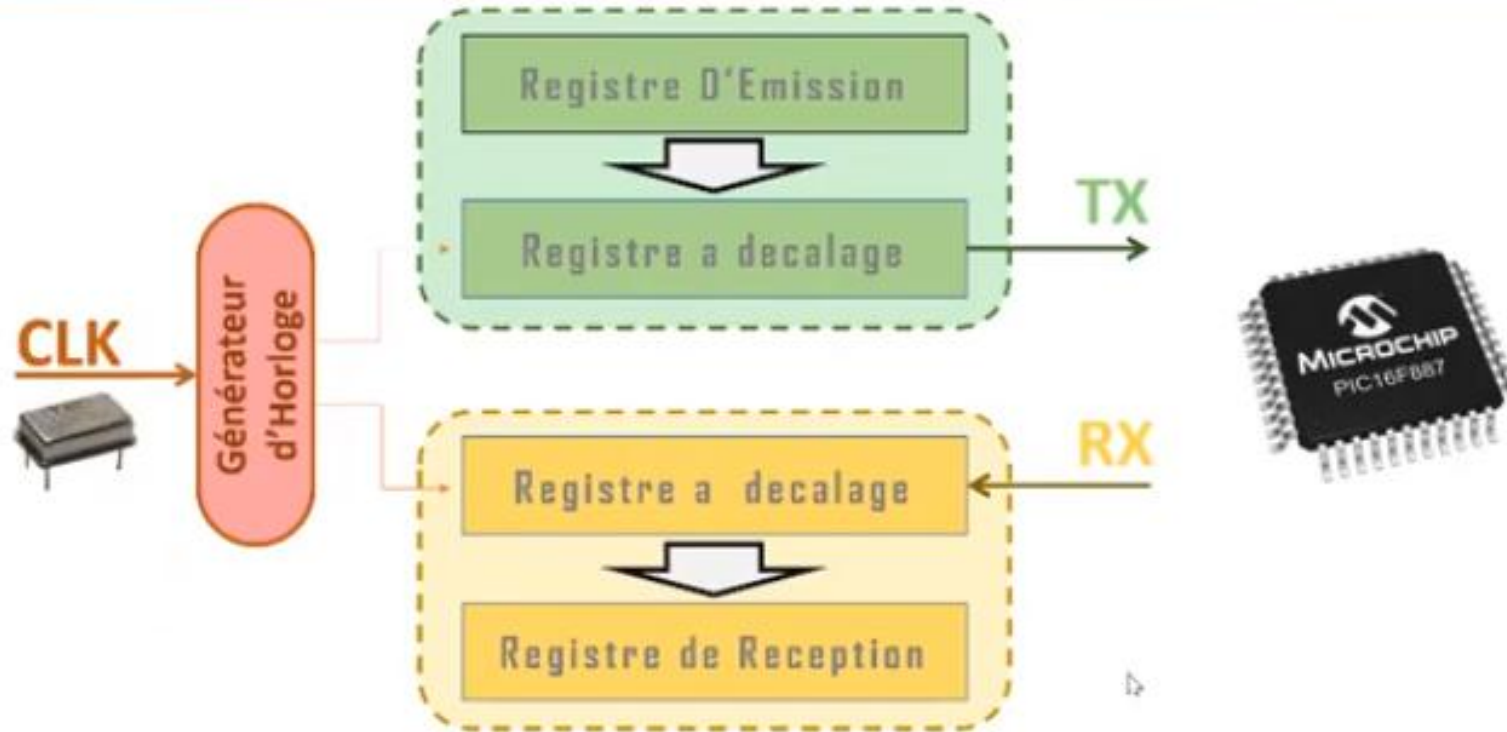
Niveaux Electriques



Protocol UART

5

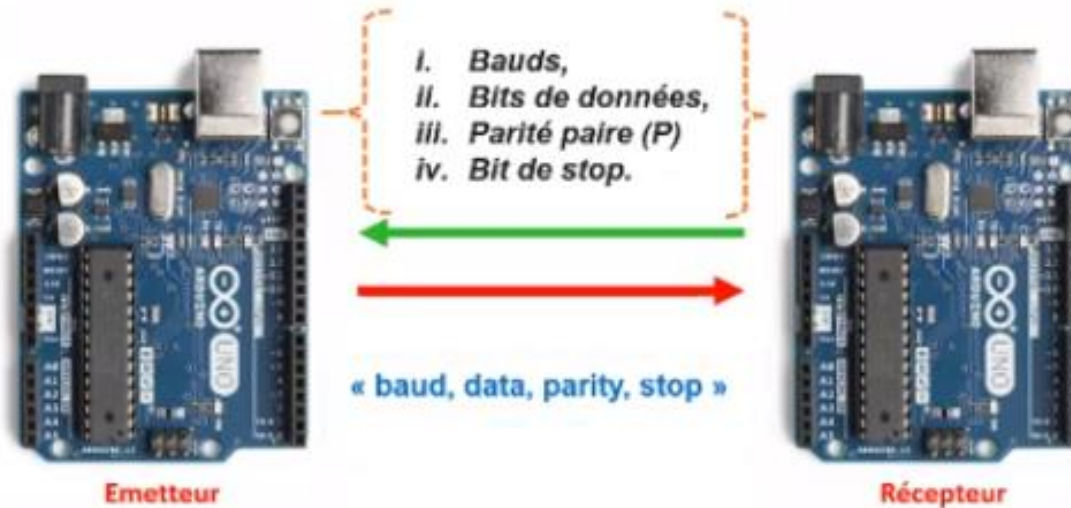
Schéma Bloc D'un Contrôleur UART



Protocol UART

6

Configuration De Base d'une Communication UART



Exemple: « 9600 712 »

Pr. Ahmed GAGA

