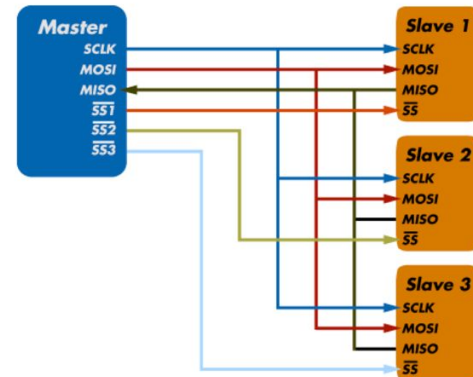
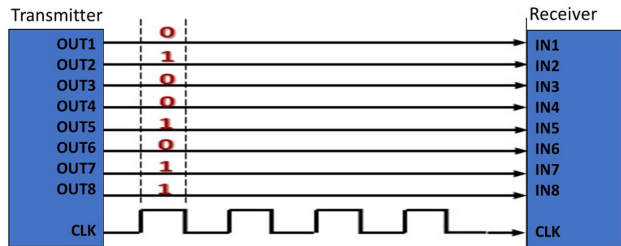


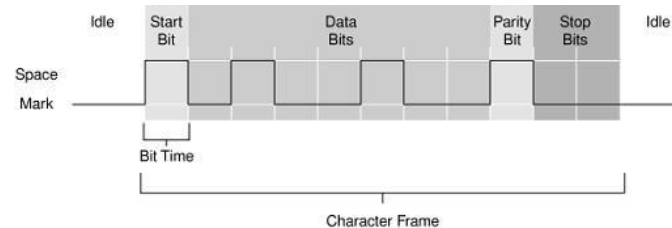
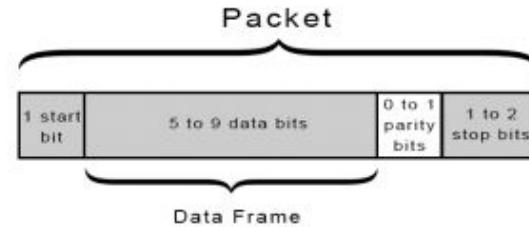
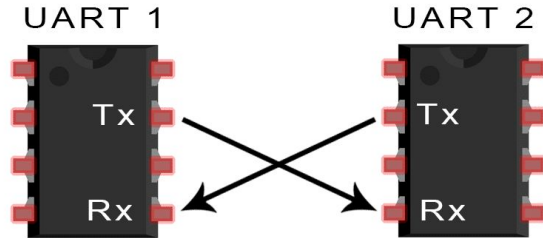
Section 2: UART - SPI - I2C

1.1. UART



Serial Communication using UART

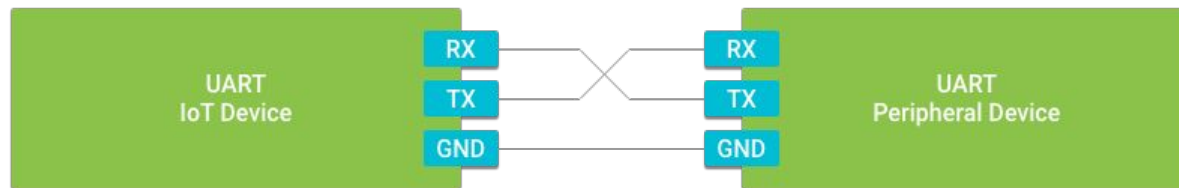
- The most popular connection in hardware devices



UART vs USART

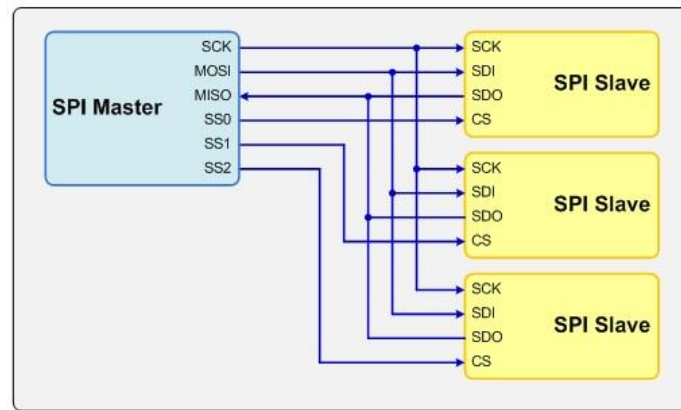
UART Device Driver on Android Things

- UART stands for Universal Asynchronous Receiver Transmitter
- It is **universal** because both the data transfer speed and data byte format are configurable.
- It is **asynchronous** in that there are no clock signals present to synchronize the data transfer between the two devices
- UART data transfer is **full-duplex**, meaning data can be sent and received at the same time

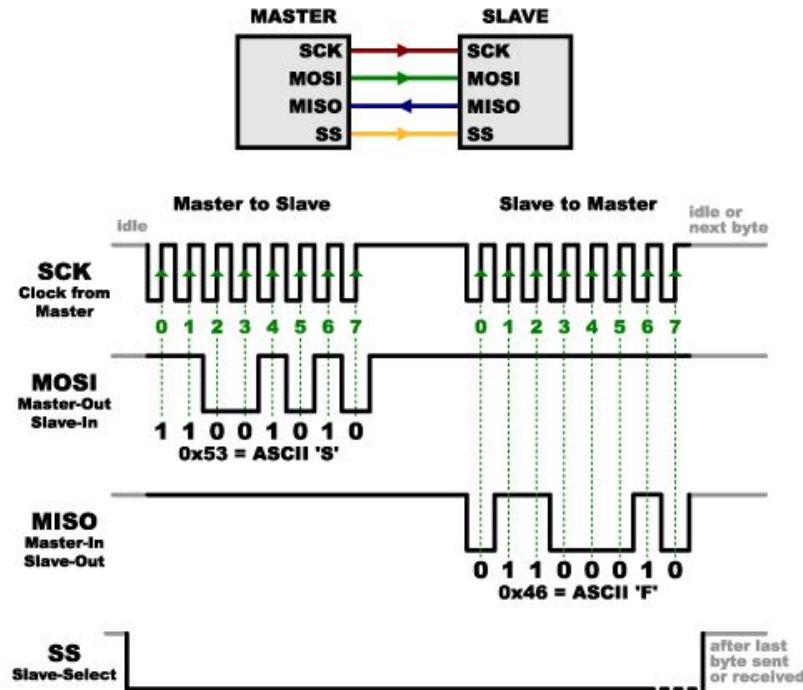


Serial Communication using SPI

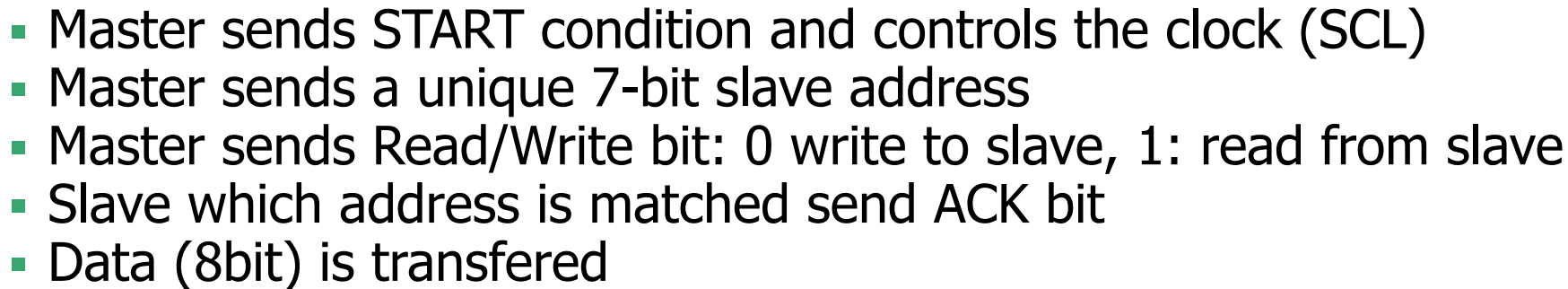
- **S**erial **P**eripheral **I**nterface (SPI) is an interface bus commonly used to send data between **microcontrollers** and small peripherals such as shift **registers, sensors, and SD cards**
- Separate clock (SCK), data lines (MISO, MOSI) and chip select (CS) are used.
- Synchronous protocol



SPI Protocol

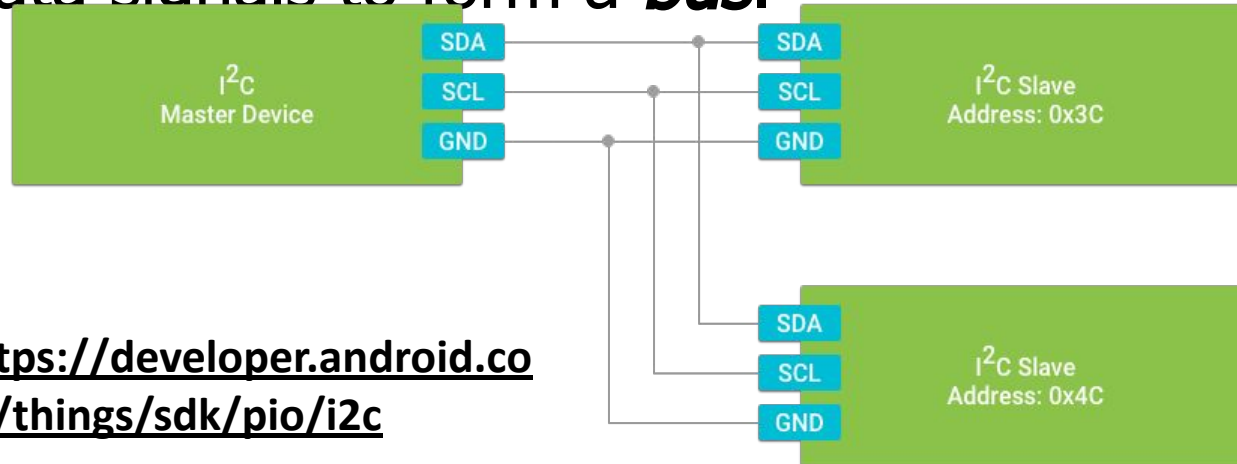


- Clock is generated by the master



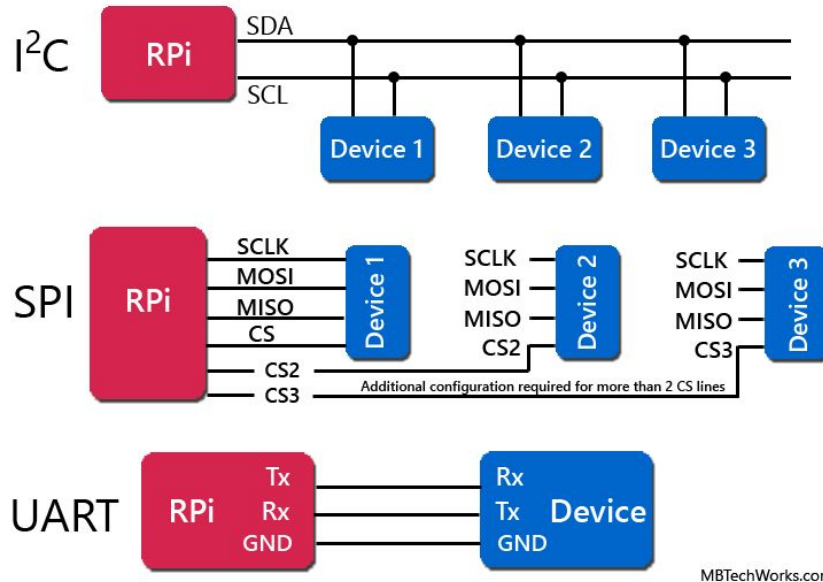
Implement I2C

- I2C is a ***synchronous*** serial interface. The device in control of triggering the clock signal is known as the ***master***. All other connected peripherals are known as ***slaves***. Each device is connected to the same set of data signals to form a ***bus***.



<https://developer.android.com/things/sdk/pio/i2c>

Summary



MBTechWorks.com

- UART = Universal Asynchronous Receiver / Transmitter
- SPI = Serial Peripheral Interface
- I²C = Inter-Integrated Circuit

Serial Communications Methods

Name	Description	Function
I²C	Inter-Integrated Circuit	Half duplex, serial data transmission used for short-distance between boards, modules and peripherals. Uses 2 pins.
SPI	Serial Peripheral Interface bus	Full-duplex, serial data transmission used for short-distance between devices. Uses 4 pins.
UART	Universal Asynchronous Receiver-Transmitter	Full-duplex, Asynchronous, serial data transmission between devices. Uses 2 pins.

Conclusion

- **UART** - simple; not high speed; no clock needed; limited to one device, but **long range communication**
- **I2C** - faster than UART, but not as fast as SPI; easier to chain many devices; Pi drives the clock so no sync issues.
- **SPI** - fastest of the three; Pi drives the clock so no sync issues; practical limit to number of devices on the Pi.