

Serial Communication Methods – Synchronous & Asynchronous

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Serial data communication or you can say serial communication in general uses two methods, that is, **Synchronous** method and **Asynchronous** method for data transmission and reception

Over the years, many serial protocols were made to meet certain needs of embedded systems. Ethernet and USB (universal *serial* bus), are a couple of the well-known computing serial interfaces.

Other common serial interfaces include SPI, I²C (pronounced as **I two C** or **I squared C**), and the serial standard we are here to talk about today. In general, these serial interfaces sorted into two categories –

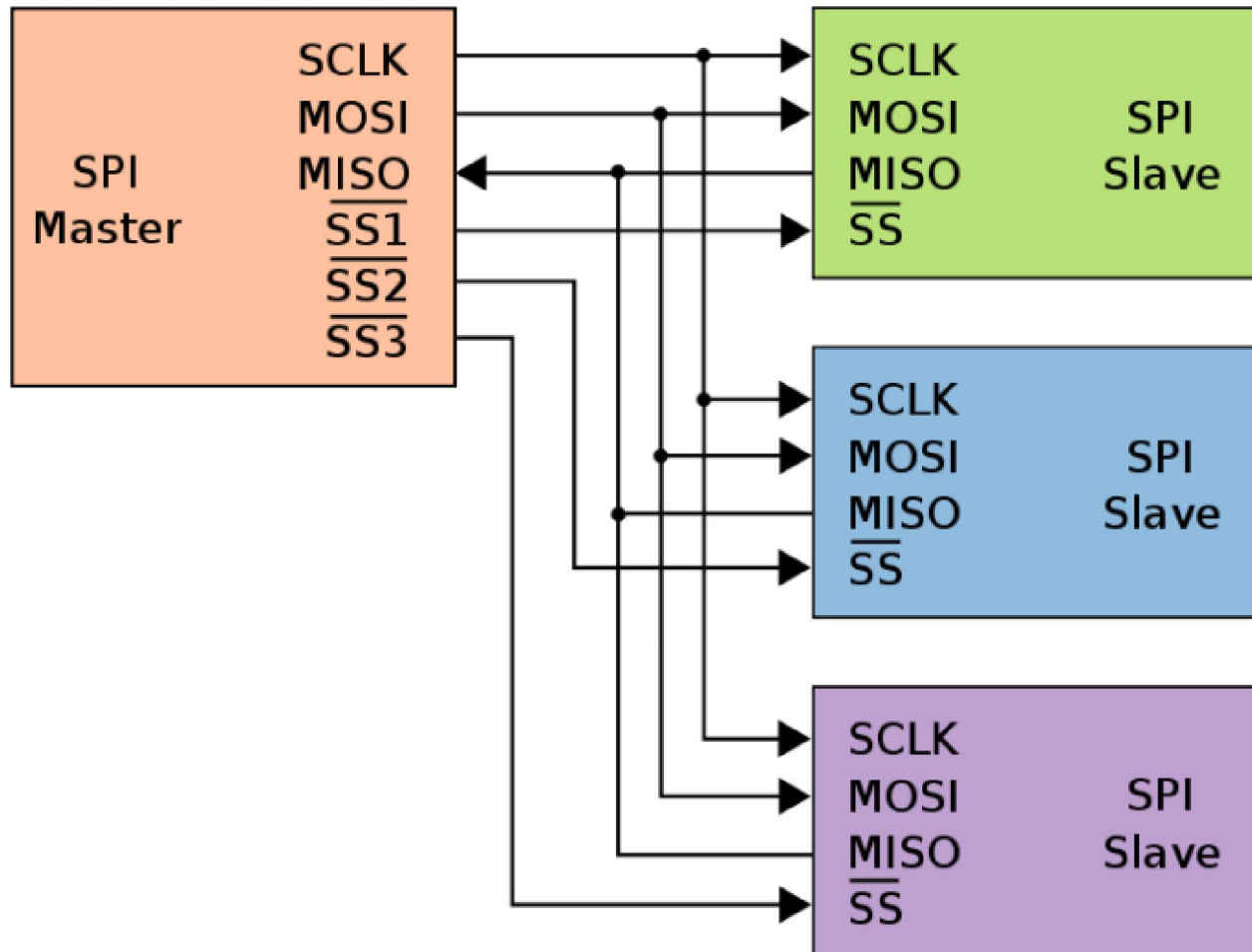
SERIAL COMMUNICATION METHODS — SYNCHRONOUS & ASYNCHRONOUS

IN SYNCHRONOUS METHOD

A synchronous serial interface always pairs its data line(s) with a clock signal, and all devices on a synchronous serial bus share a **common clock**. This makes for a more straightforward, even faster serial transfer, but it also requires at least one extra wire between communicating devices. In simple terms which **interface required SCK, SCLK pin the synchronous.**



In synchronous method, for example in **SPI there are 4 pins used, 2 pins** are for **MISO & MOSI** (Master In Slave Out & Master Out Slave In), **1 pin** for fixed **Clock** (from single master device) and **1 Data pin** for each slave device. Here SS1, SS2, SS3 are data pins for 3 slave devices.

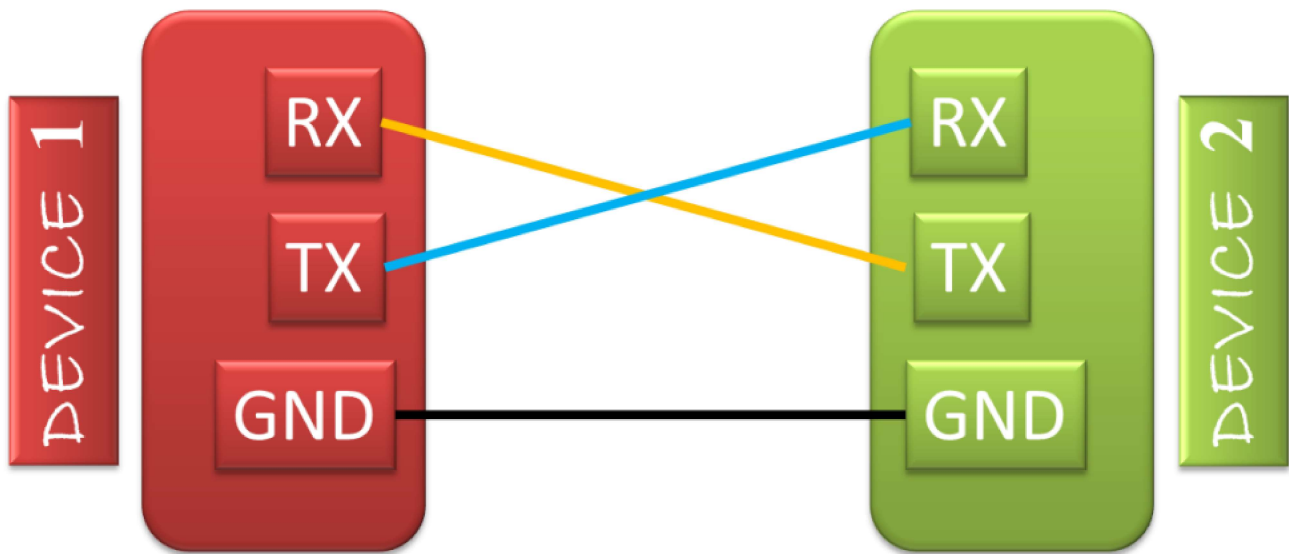


Examples of synchronous interfaces include USART, SPI, and USB etc.

IN ASYNCHRONOUS METHOD

This is also Serial communication but data transfer **without any support from an external clock signal**¹ or in other words in this you do not need a clock for communicating with other devices. For example UART, RS232 etc. are Asynchronous serial communication methods.

Usually RS232, RS422 & RS485 have two wires RX and TX with predefined data rate (called baud rate) and no predetermined master or slave device.



A few Synchronous and Asynchronous communication protocols or interfaces are follows

SYNCHRONOUS

- **USART** (Universal Synchronous-Asynchronous Receiver-Transmitter)
- **USB** (Universal Serial Bus)
- **RS232 ()** : The **RS-232** spec provides for both **synchronous** and **asynchronous** but PC's use a **UART chip** such as a 16450, 16550A, or 16650 and can't deal with **sync**.
- **I2C or I²C** (Inter-Integrated Circuit, pronounced as "I squared C" or "I two C")
- **SPI** (Serial Peripheral Interface)

ASYNCHRONOUS

- **UART** (Universal Asynchronous Receiver-Transmitter) (**used in Arduino**)
- **RS232 (used in PC)**
- **CAN** (Control Area Network Bus) : **According to Wikipedia**, **CAN** does not include a clock in the data transmission. All nodes on the **CAN** network must operate at the same bit rate, and the error between each node's internal clocks must be within tolerance, for the nodes on the network to communicate. This is the same as a PC's RS-232 serial port which is considered as **asynchronous**.



Note : It is possible to write programs in our microcontroller to use either of these communication protocols/interfaces (SPI, UART etc.). But the programs will become tedious and lengthy. So it is better to use these special IC chips made by many manufacturers for serial communications.

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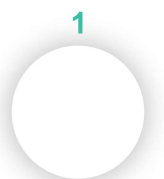
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- Delete bookmarks that are not urgently required and search for them again when they are needed
- Use the search function in the Chrome Bookmark Manager
- Rename and organize bookmarks into themed folders so they are labeled clearly
- Create a Doc that lists all favorite websites with links

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Ms. Villagarcia has been tasked by the Principal to improve communication and discussion between teachers and support staff. What is the most appropriate tool to fulfil this need?

- She can use Google Sheets to take minutes during faculty meetings and share them with participants and missing faculty members.
- She can use Google Docs to build a website containing all of the school's policy documentation and set up a content page so staff members can send their comments directly to her or other teachers or support people.
- She can use Google Groups to easily create an online discussion forum and invite all relevant people to join conversations and participate in different discussion topics in an accessible place.
- She can use Google Drive to create a shared folder containing school administration policy documents, useful templates and other shared resources.

Ms. Villagarcia has been tasked by the Principal to improve communication and discussion between teachers and support staff. What is the most appropriate tool to fulfil this need?

What are the benefits of using Google Groups? (Select all that apply.)

- All students are listed under the same email id
- You can add or delete members in the Google Groups
- Google Groups can be found on the web by anyone based on owner's settings
- Google Groups can be created to collaborate with like minded people world wide

What are the benefits of using Google Groups? (Select all that apply.)

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