Lesson 9
Serial Data Communication Protocols

Advantages of Bus for inter-devices communication

1. Simplifies number of interconnections compared to direct connections between each of them
2. Provides a common way (protocol) of connecting different or same type of I/O devices
3. Device interfaces communicate over same set of wires

Bus Advantages

4. Can add new device or system's interface that is compatible with a system's I/O bus
5. Provides flexibility, allowing a system to support many different I/O devices depending on the needs of its users and allowing users to change the I/O devices that are attached to a system as their needs change

Serial Bus Interface

- Uses a protocol for serial-communication
- Microcontroller includes interfaces for serial-communication
- UART, SPI, I2C and several other protocols enable the serial-communication

Serial Asynchronous Communication

UART communication

- A RFID reader using a 125 kHz RFID UART module.
- A GPS device sending serial data using the UART.

Synchronous Serial-Communication

- Serial data using I2C or SPI interfaces in wired bus communication

Automotive Sensors

- Communicating serial data using LIN, CAN, MOST, IEEE 1394 serial protocols

UART Serial Bus

- Device sends 8-bit data at successive intervals, called baud intervals
- A start bit precedes the data (characters)
- Then 8-bit data
- Then a stop bit is 1 for a minimum interval equal to baud Interval

UART Serial Bus

- 10 bauds per character
- Each digit or command communicates 8-bits
- Each character communicates 8-bit
- Coded as per the ASCII (American Standard Code for Information Interchange) code

Software Serial Library

- Integrated development environment (IDE) for a microcontroller system provides a software serial-library
- A library consists of number of programs.
- Software serial-library has programs for number of protocols

Soft Serial Library with IDE

- Distinct programs for each serial interface protocol
- Enables direct use of a protocol
- For example, a library-program is used for reading an RFID tag
- Another used for sending data to USB port
- USB port is used for onward transmission to Internet

Using UART Communication for a RFID Tag

- A header character sent before the tag
- Then the tag ID of ten digit characters
- An end character consists of 1 byte
- Succeeds the 10 digits of tag
- Total number of digits communicates = 12

Using the I2C protocol for a Serial Bus

- I2C bus means different integrated circuits using I2C interface communicate over same set of wires
- Library program for I2C serial interface protocol
- Enables direct use of a sensor IC with I2C inbuilt interface

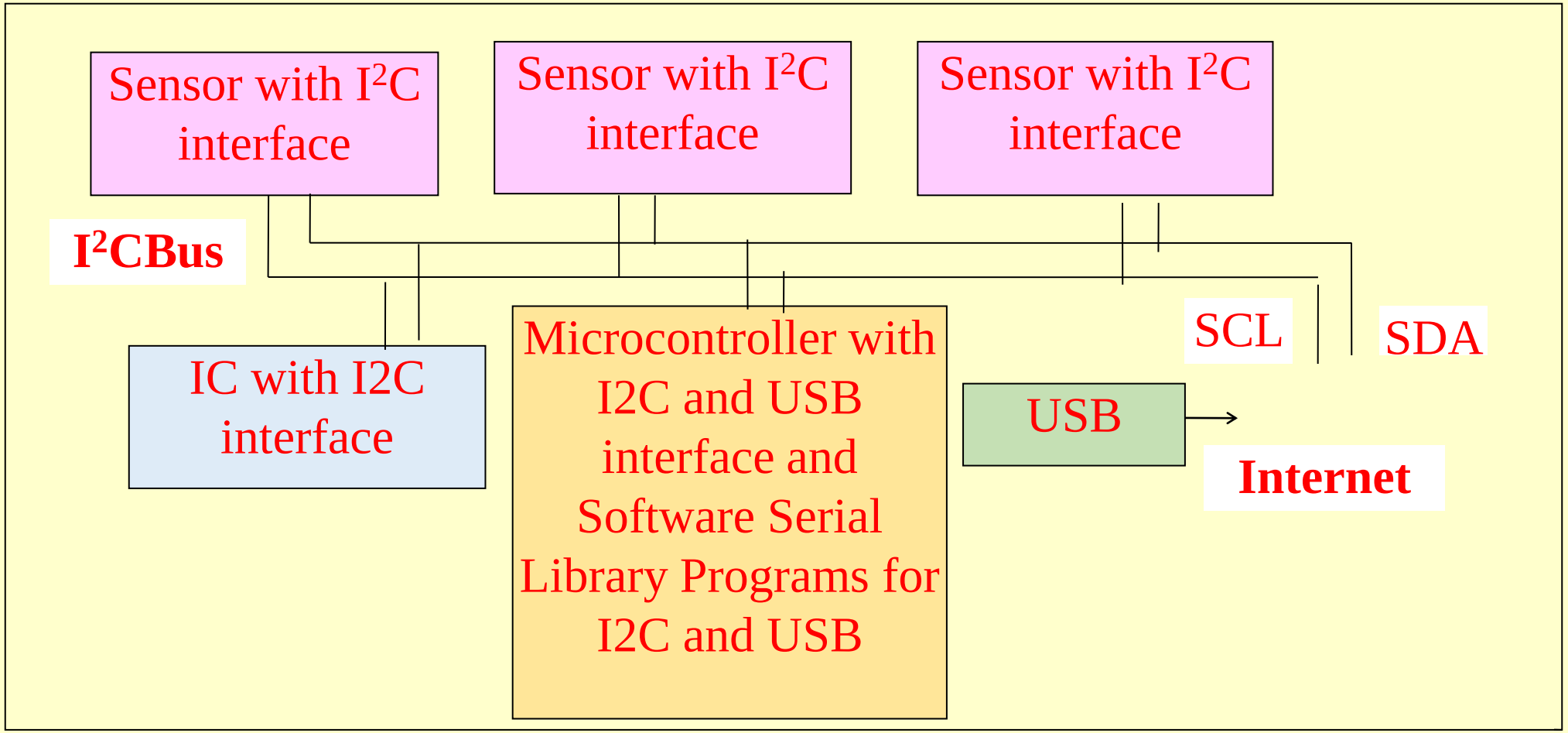

Fig. 7.12 Bus SCL and SDA lines for serial synchronous data communication using I2C protocol

Using the CAN Protocol for Serial Bus

- The embedded controllers with sensors and actuators networked and are controlled through the CAN bus
- Example, automobiles
- A serial bidirectional line network of number of CAN controllers and devices

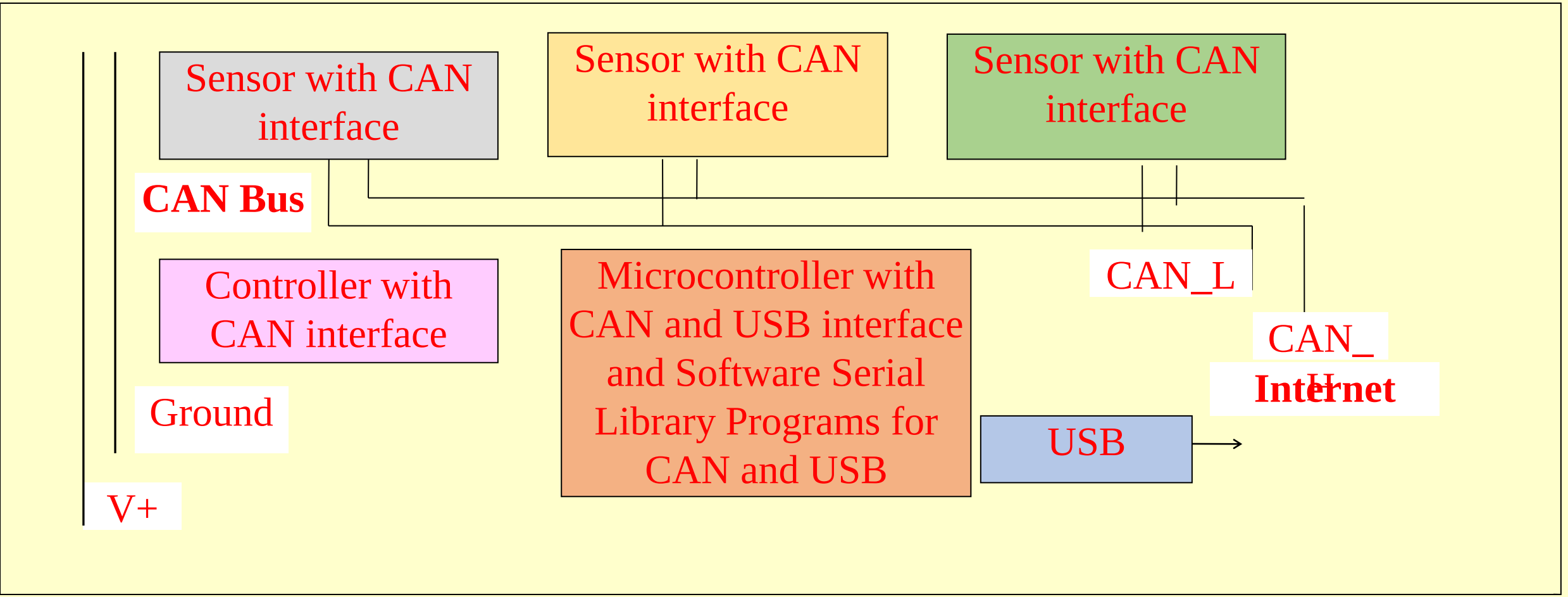

Fig. 7.14 CAN_H and CAN_L serial bi-directional Bus network of number of CAN controllers and devices on a CAN bus

Summary

We learnt

- Serial Bus asynchronous or synchronous communication
- Soft serial library at IDE
- UART
- I2C
- CAN
- Other serial protocols, for example, USB

End of Lesson 9 on
Serial Data Communication Protocols