I2C protocol

I2C is a serial communication protocol where data is transferred bit by bit along a single wire. With I2C, single master can be connected to multiple slaves or single/multiple slave to multiple master. Like SPI, I2C is synchronous, so the output of bits is synchronized to the sampling of bits by a clock signal shared between the master and the slave. The clock signal is always controlled by the master.

With I2C, data is transferred in messages. Messages are broken up into frames of data. Each message has an address frame that contains the binary address of the slave, and one or more data frames that contain the data being transmitted. The message also includes start and stop conditions, read/write bits, and ACK/NACK bits between each data frame.

Pullup resistor:

Pull-up resistors are used in logic circuits to ensure a logical level at a pin under all conditions. Digital logic circuits have three logic states: high, low and floating. A good example of this is an unconnected input pin of a microcontroller.

It is used to ensure that a wire is pulled to a high logical level in the absence of an input signal. They are simple fixed-value resistors connected between the voltage supply and the appropriate pin that defines the input or output voltage in the absence of a driving signal. When the switch is open, the voltage of the gate input is pulled up to the level of the input voltage. When the switch is closed, the input voltage at the gate goes directly to the ground. You need to use a pull-up resistor when you have a low default impedance state and wish to pull the signal to ‘high’.

Pull down

It ensures that the wire is at a defined low logic level even when there are no active connections with other devices. The pull-down resistor holds the logic signal near to zero volts (0V) when no other active device is connected. It pulls the input voltage down to the ground to prevent an undefined state at the input. It should have a larger resistance than the impedance of the logic circuit. Otherwise, it will make the input voltage at the pin on constant logical low value no matter the position of the switch. When the switch is open, the voltage of the gate input is pulled down to the level of the ground. When the switch is closed, the input voltage at the gate goes to Vin. Without the resistor, the voltage levels would virtually float between the two voltages.

Active low and Active high

It describes how the pin is activated. If it's an active-low pin, then pull that pin LOW by connecting it to ground using pulldown citcuit. For an active high pin, connect it to HIGH voltage using pull up circuit.

3.Linux Booting Process

In Linux booting process there are 6 stages.

1.BIOS

BIOS stands for Basic Input/Output System. When the computer is powered on, it runs POST(power on self test) which is a part of BIOS.POST ensure that the computer hardware functions correctly. Then, the BIOS searches for boot sector which contains valid boot record and loads boot loader program into the memory.

2.MBR

MBR stands for Master Boot Record, which is responsible loading and executing boot loader which is GRUB-2. And passes the control to GRUB

3.GRUB

GRUB stands for GRand Unified Bootloader. When multiple kernels are available then the user can select the required kernel. When the automatic timeout happens then the default kernel will be loaded and the control is handed to kernel.

4.Kernel

All the kernels are in a self-extracting, compressed format to save space. When the kernel is loaded, it extracts itself and starts executing. Kernel will mount the root file system specified by grud file and executes the init file which is the first program to be executed. The systemmd instance from initramfs executes all unit of initrd.This includes actual mounting on /sysroot.

5.INIT

At this point, the system executes runlevel programs.There are 6 run levels available. Systemmd then begin executing runlevel programs.It uses its configuration file,to determine which state or target, into which it should boot the host. Once the target is reached then the startup is completed and the login page is displayed.

Zephyr RTOS

It is a small real time operating system for connected, resource-constrained and embedded devices supporting multiple architectures and released under the Apache License 2.0. Zephyr includes all the components and libraries needed to develop a full application such as device drivers, protocol stacks, file systems, and firmware updates.