Lesson 1
Key Terms- Embedded Devices Hardware and Software

Embedded System

- Denotes a system that embeds software into a computing platform
- System dedicated for either an application(s), specific part of an application, product or a component of a large system

Embedded device

- Refers to a device, which embeds software into a computing platform
- Performs the computations and communication for specific to the system

Microcontroller unit (MCU)

- Means a single-chip VLSI unit (also called microcomputer)
- May be having limited computational capabilities but
- Possesses memory, flash, enhanced input-output capabilities, and a number of on-chip functional units.

Timer

- Timer refers to a device
- Enables initiating new action(s)
- On timer start
- On the clock inputs
- Time outs
- When the number of clock inputs equal to a preset value

General Purpose Input-Output (GPIO Pins)

- A pin that can be used in addition to digital input and output for other purposes and protocol based reception and transmission
- Examples, Rx and Tx used during UART serial bits transfer
- SDA and SCK used during use of I2C bits transfers
- PWMs
- Analog inputs or outputs
- Timer outputs

Port and USB Port

- A device that enables input output (IO) communication between the MCU and another device
- Used for Communication with circuit with sensor or actuator or keypad or with an external computing device
- USB port communicate to another USB port using the USB prottocol

Interrupt (Software)

- Means diversion to a new function (interrupt service routine) similar to function run on catching an exception (condition) or callback function
- An interrupt on execution of a software instruction for interrupt
- On execution of the INT instruction, the system runs another function

Interrupt (Hardware)

- An action in which a running program interrupts on hardware signal such as timer timeout
- Action is diversion to a new function (interrupt service routine)
- System runs another function

Electronic Circuit Board

- Board is an electronic hardware—an electronic circuit board with MCU or SoC, circuits and
- Connectors—which provide the connections to other ICs and circuit components.

Electronic Circuit Board Usages

- ICs and circuit components can also be inserted or joined or put in place onto the board, for example, by surface mount technology
- Board may also have battery, power supply, voltage regulator or the connections for the power

Platform

- Denotes a set consisting of computing and communication hardware, software and operating system (OS)
- Enables working with different software, APIs,
- Enables using IDE and middleware
- May enable the development of codes at the development stage
- May enable prototype development for an application(s) or specific part of an application

Hardware Module

- A smaller form-factor hardware which can be placed onto a board
- May embed the software
- May enable use of the board circuit with shorter form factor
- Example an RF module placed onto an electronic board.

Shield

- A supporting circuit with connection pins, socket(s) and supporting software.
- Enables the connectivity of a board or computing platform to external circuits
- Connects the elements that can be plugged onto a board or platform

Shield

- Usage provides extra features, for example, connectivity to wireless devices
- To use the ZigBee, ZigBee IP, and Bluetooth LE, Wi-Fi or GSM
- To RF module
- Ethernet shield for Ethernet interface and connectivity to Wi-Fi

Header

- Means plastic-coated strip or plastic-capped plug-in
- Placed on top of the pin holes when enables connection of the wires without electronic soldering
- Also provides jumpers

Jumper

- A wire with a solid tip at each end which is normally used to interconnect the components on an electronic-circuit breadboard
- Usages of jumpers for transferring IOs or signals to or from the pins

Integrated Development Environment (IDE)

- Means a set of software components and modules which provide the software environment for developing and prototyping

Operating System

- A system software which facilitates the running of processes
- Allocation of memory
- System calls to the Ios
- Facilitates use of network subsystems
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Operating System

- Manages devices
- Priority allocations of processes and threads
- Enables multitasking and running of number of threads
- Enables many system functions, such as display using the given computing-device hardware

Real-time Operating System (RTOS)

- An OS that enables real-time execution of processes on computing and communication hardware
- Processes uses prioritization and run as per assigned priorities
- Priority assignment enables the execution of processes in real time

APIs and Device Interfaces

- Software a major components of IoT devices Application Programming Interfaces (APIs)
- Device interface for communication over the network and communication circuit/port(s) that also includes a middleware.
- The middleware creates IPv4, IPv6, 6LowPAN, MQTT, COAP, LWM2M,
- REST and other communication protocol stacks.

Device Interfaces

- A connectivity interface consists of communication APIs, device interfaces and processing units
- Software commands the action on the message or information received followed by hardware port outputs for the actuators

Simulator

- Software that enables development on the computer without any hardware need
- Then prototyping the hardware which can be connected for embedding the software and further tests.

Summary

We learnt key terms such as

- Embedded System
- Embedded Device
- Microcontroller
- Port
- Interrupt
- Shield

Summary

We learnt key terms such as

- Module
- Header
- Jumper
- IDE
- Operating System
- RTOS

Summary

We learnt key terms such as

- Device APIs
- Device Interfaces
- Simulator

End of Lesson 1 on

Key Terms- Embedded Devices Hardware and Software