

Lesson 4

Embedded Hardware Units, Software Platforms and Components

Hardware

Includes in one of the following forms:

- Single VLSI (very large integrated) chip
- A core in an application specific instruction set processor (ASIP), called microcontroller (MCU)

Hardware

Includes in one of the following forms:

- A core in an application specific integrated circuit (ASIC) core
- A core in system-on-chip (SoC)
- An SoC chip with an SD card for embedded software and operating system-software (OS).

Microcontroller Unit

- Application-specific
- Basic on-chip functional units, such as Internal RAM, flash, IO ports, GPIOs, serial interfaces, timers, serial ports and timers.
- Additional on-chip functional units
- PWM circuits (1, 2 or 3)
- ADC (1, 2, 4 or higher)
- Other functional units (Figure 8.1).

System-on-Chip

- A circuit on a single silicon chip, consisting of multiple processors, hardware units and the embedded software
- A VLSI chip that has multiple processors, software and all the needed digital as well as analog circuits' on-chip
- Embeds processing circuit with memory and is specific to dedicated application(s) and may have the analog circuits

SOC With An Associate A External SD Card

- Card stores the external programs and operating system and enables use of the chip distinctly for distinct purposes
- Secure Digital Association created the SDIO (Secure Data Input-Output) card
- An SoC can be for different platforms, for examples, Raspberry Pi and BeagleBone

Software Platforms and Components

- Embedded software
- IDE with device APIs, libraries, OS or RTOS, emulator, simulator and other environment components
- Middleware with communication and Internet protocols
- Cloud and sensor-cloud platform for applications development, data storage and services

Open Source Framework Eclipse IoT Implementation

- Number of standards including MQTT CoAP, LWM2M and services and frameworks
- IoT can be programmed in any open source language like Python or Java or PHP also using the tools
- Eclipse tool work with Lua

Arduino Development Tools

- Provide a set of software that includes an IDE
- The Arduino programming language for a hardware specification for interactive electronics that can sense and control more of the physical world

Middleware

- OpenIoT, an open source middleware
- Enables communication with sensor clouds and enables cloudbased ‘sensing as a service’
- IoT SyS, enables provisioning of communication stack for smart devices using IPv6, and number of other standard protocols

Web Services

- Web server or cloud server or clients use SOAP, REST, JSON, HTTP, HTTPS, web sockets, web APIs, URI
- The building blocks (software components) for writing the codes for Web Services

Cloud and sensor-cloud platform for applications development, data storage and services

- Xively (Pachube/Cosm) open source for basic services
- Software and server platform for data capture
- Data visualization real-time and other features over the Internet
- Nimbits enables IoT on an open source distributed cloud.
- PaaS at the Nimbits cloud deploys an instance of
- Nimbits server at the device nodes

Summary

We learnt

Hardware units for Prototype development

- MCU
- SoC or SoC with program in external SD card

Software and OS

- IDE

- Eclipse IoT stack
- Xively, Nimbits Cloud platform for applications development, data storage and services

End of Lesson 4 on Embedded Hardware Units, Software Platforms and Components