



SNS COLLEGE OF TECHNOLOGY COIMBATORE



AN AUTONOMOUS INSTITUTION

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DEPARTMENT OF MCA

Course Name : 19CAE725- INTERNET OF HINGS

Class : I Year / II Semester

Unit III – Building IoT With Raspberry Pi

Topic 3 – Raspberry Pi Interfaces & Setup

Outline

- Basic building blocks of an IoT Device
- Exemplary Device: Raspberry Pi
- Raspberry Pi interfaces
- Programming Raspberry Pi with Python
- Other IoT devices

What is an IoT Device

- A "Thing" in Internet of Things (IoT) can be any object that has a unique identifier and which can send/receive data (including user data) over a network (e.g., smart phone, smart TV, computer, refrigerator, car, etc.).
- IoT devices are connected to the Internet and send information about themselves or about their surroundings (e.g. information sensed by the connected sensors) over a network (to other devices or servers/storage) or allow actuation upon the physical entities/environment around them remotely.

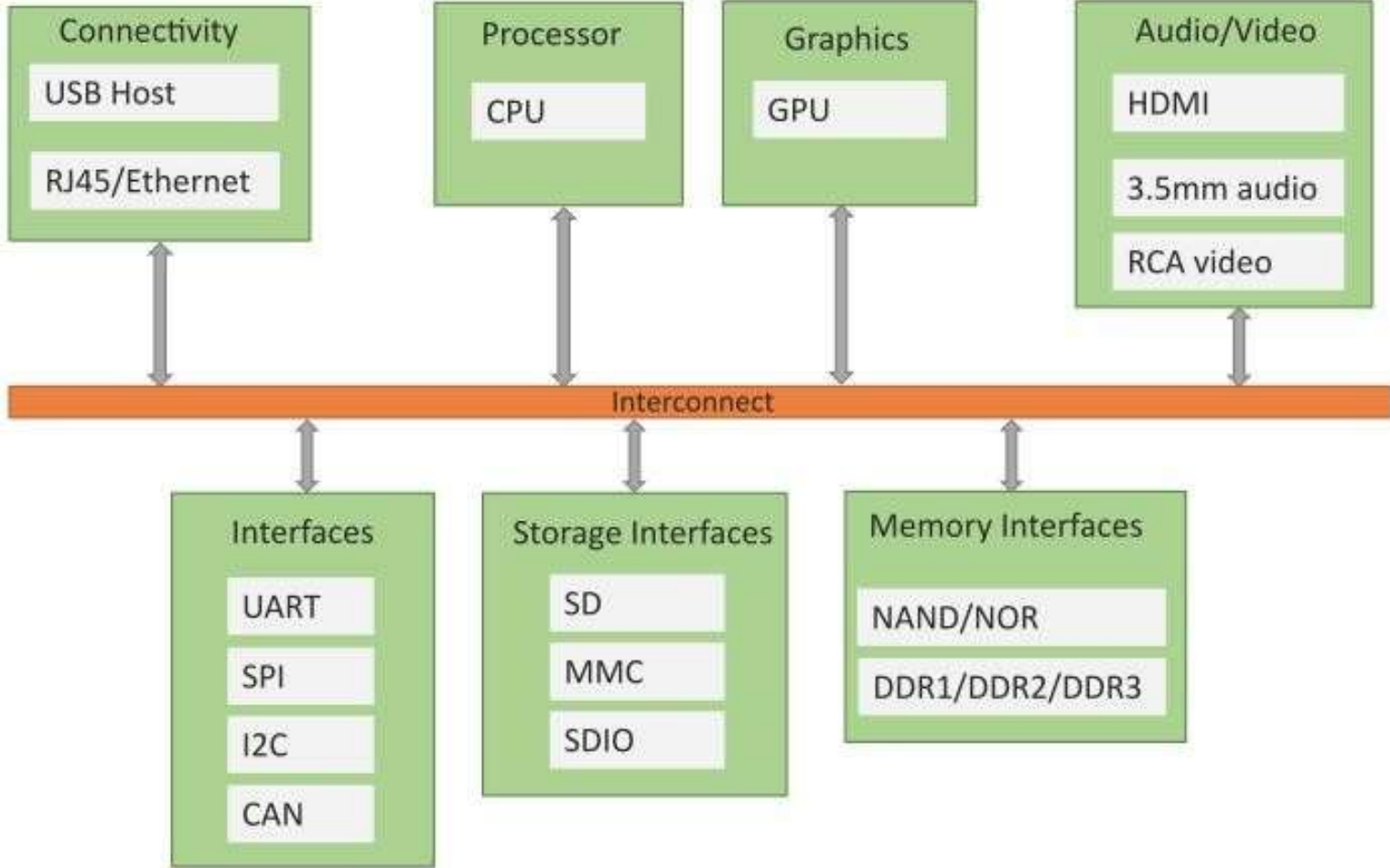
IoT Device Examples

- A home automation device that allows remotely monitoring the status of appliances and controlling the appliances.
- An industrial machine which sends information about its operation and health monitoring data to a server.
- A car which sends information about its location to a cloud-based service.
- A wireless-enabled wearable device that measures data about a person such as the number of steps walked and sends the data to a cloud-based service.

Basic building blocks of an IoT Device

- Sensing
 - Sensors can be either on-board the IoT device or attached to the device.
- Actuation
 - IoT devices can have various types of actuators attached that allow taking
 - actions upon the physical entities in the vicinity of the device.
- Communication
 - Communication modules are responsible for sending collected data to other devices or cloud-based servers/storage and receiving data from other devices and commands from remote applications.
- Analysis & Processing
 - Analysis and processing modules are responsible for making sense of the collected data.

Block diagram of an IoT Device



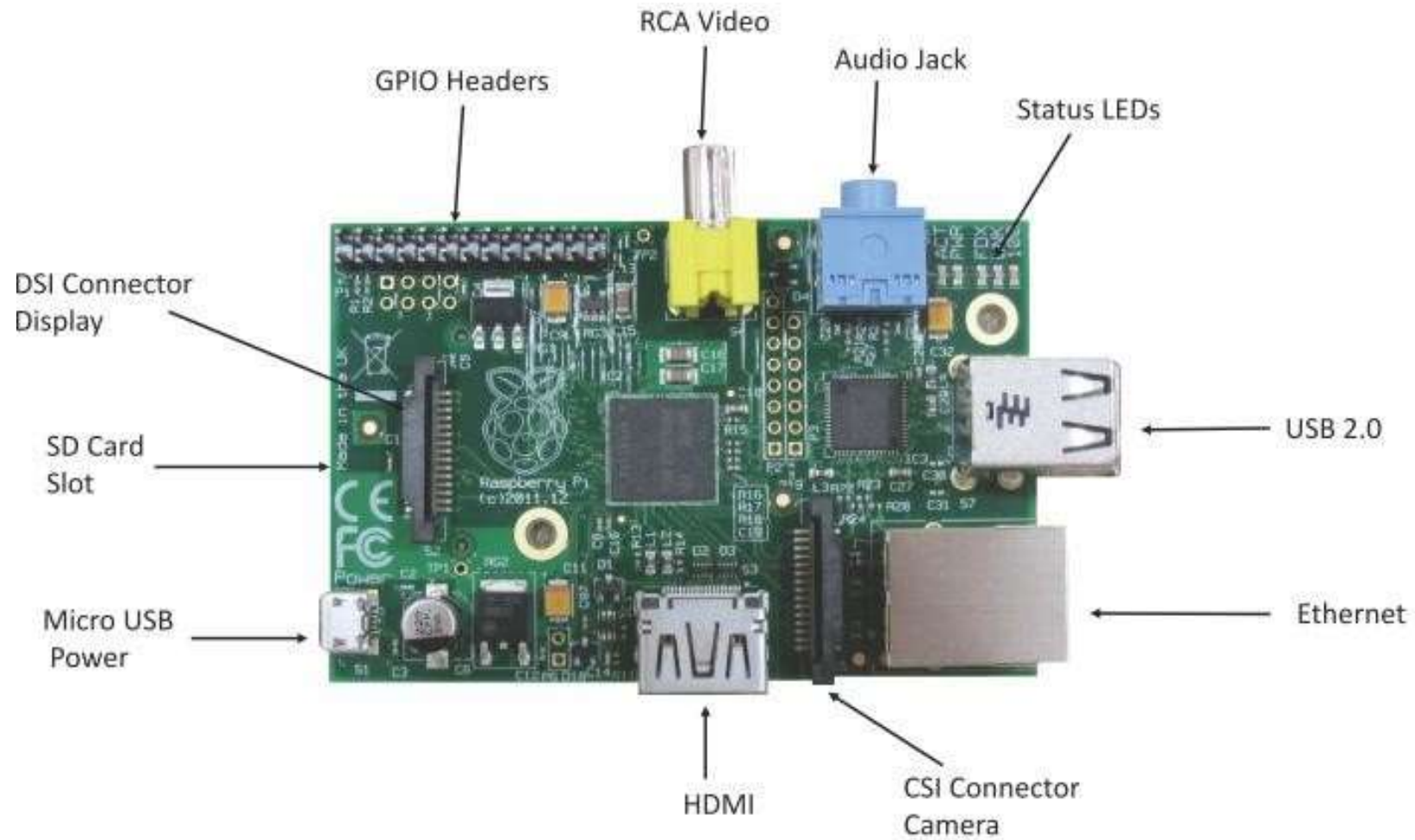
Exemplary Device: Raspberry Pi

- Raspberry Pi is a low-cost mini-computer with the physical size of a credit card.
- Raspberry Pi runs various flavors of Linux and can perform almost all tasks that a normal desktop computer can do.
- Raspberry Pi also allows interfacing sensors and actuators through the general purpose I/O pins.
- Since Raspberry Pi runs Linux operating system, it supports Python "out of the box".

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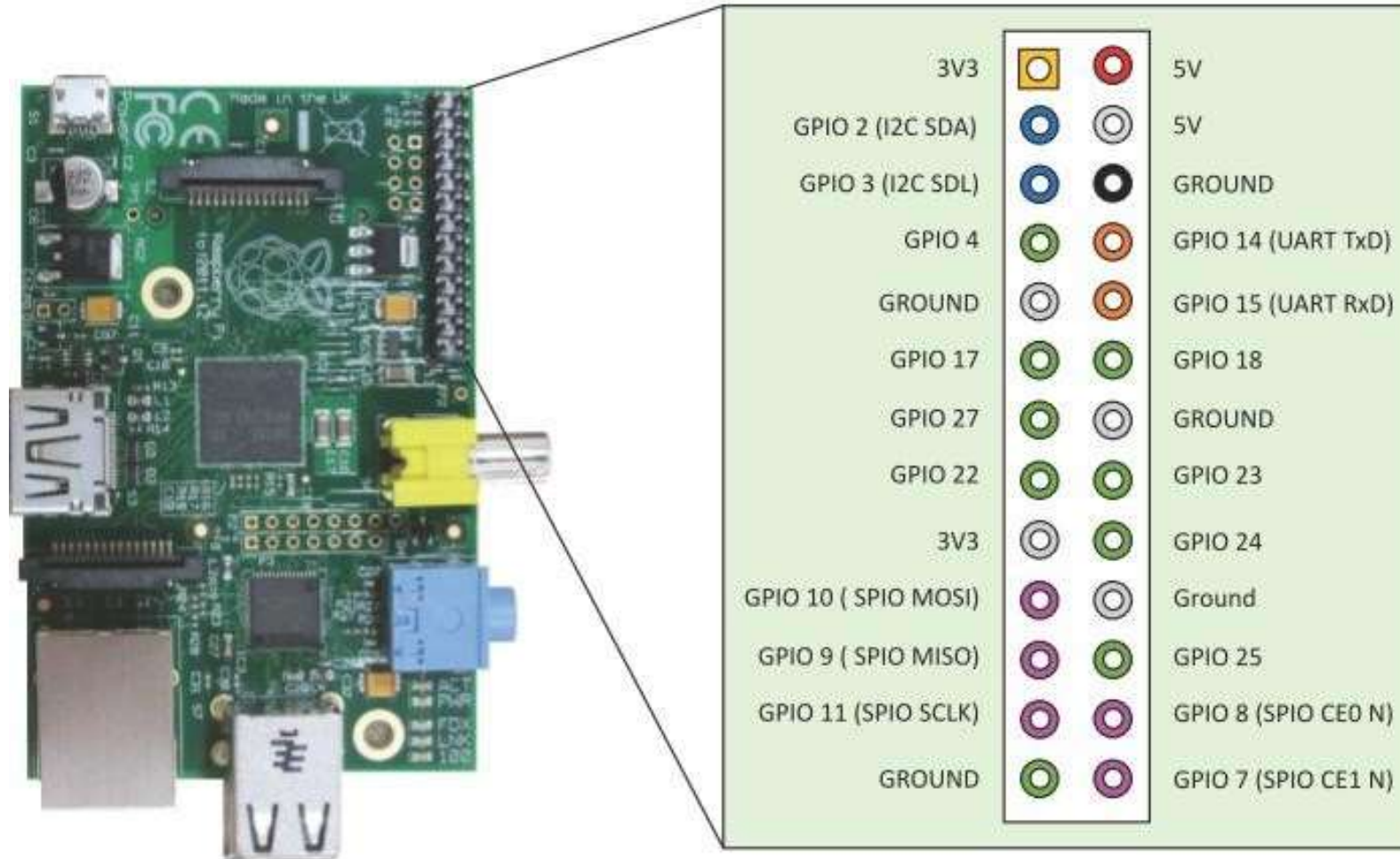
Raspberry Pi



Linux on Raspberry Pi

- Raspbian
 - Raspbian Linux is a Debian Wheezy port optimized for Raspberry Pi.
- Arch
 - Arch is an Arch Linux port for AMD devices.
- Pidora
 - Pidora Linux is a Fedora Linux optimized for Raspberry Pi.
- RaspBMC
 - RaspBMC is an XBMC media-center distribution for Raspberry Pi.
- OpenELEC
 - OpenELEC is a fast and user-friendly XBMC media-center distribution.
- RISC OS
 - RISC OS is a very fast and compact operating system.

Raspberry Pi GPIO



Raspberry Pi Interfaces

- Serial
 - The serial interface on Raspberry Pi has receive (Rx) and transmit (Tx) pins for communication with serial peripherals.
- SPI
 - Serial Peripheral Interface (SPI) is a synchronous serial data protocol used for communicating with one or more peripheral devices.
- I2C
 - The I2C interface pins on Raspberry Pi allow you to connect hardware modules. I2C interface allows synchronous data transfer with just two pins - SDA (data line) and SCL (clock line).

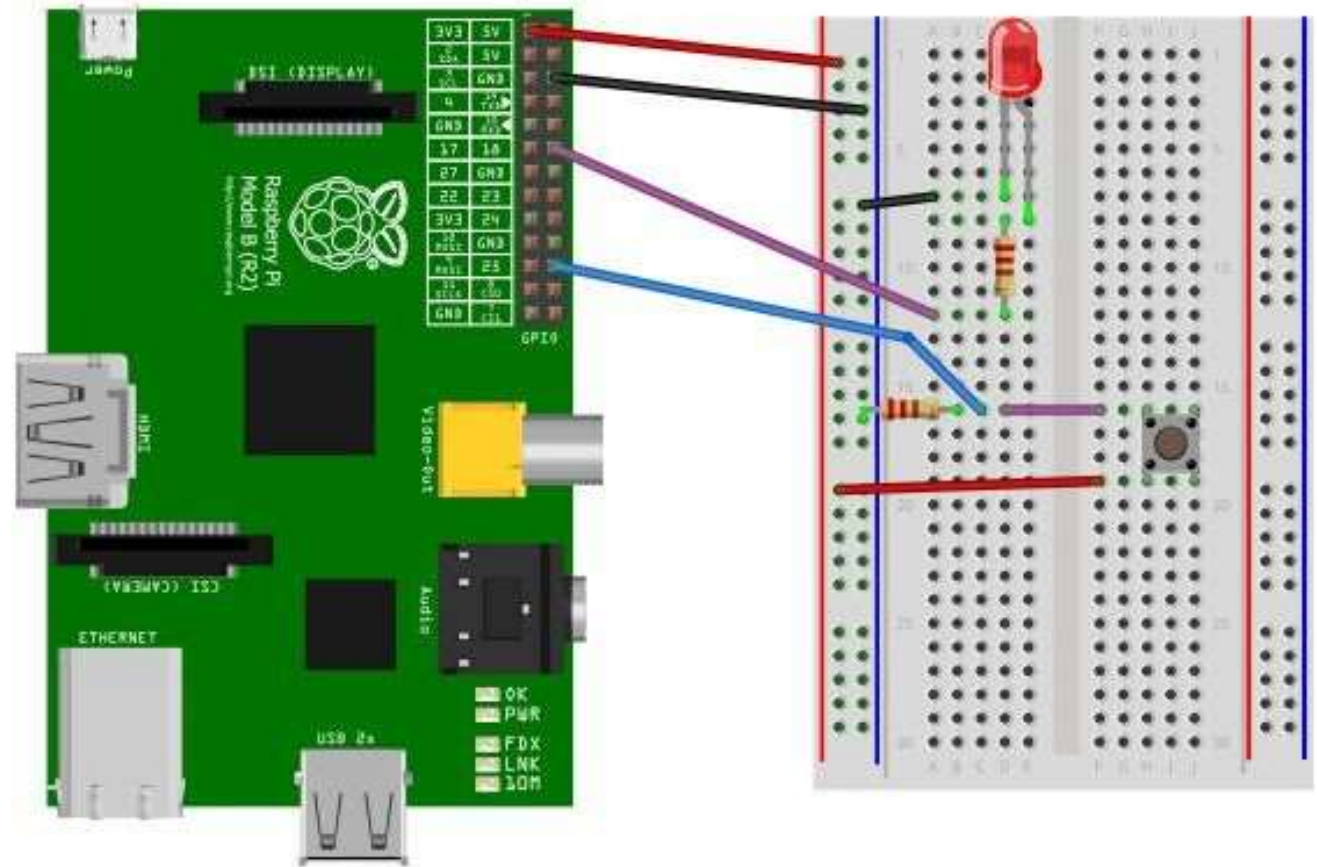
Raspberry Pi Example: Interfacing LED and switch with Raspberry Pi

```
from time import sleep
import RPi.GPIO as GPIO
GPIO.setmode(GPIO.BCM)

#Switch Pin
GPIO.setup(25, GPIO.IN)
#LED Pin
GPIO.setup(18, GPIO.OUT)
state=false

def toggleLED(pin):
    state = not state
    GPIO.output(pin, state)

while True:
    try:
        if (GPIO.input(25) == True):
            toggleLED(pin)
            sleep(.01)
    except KeyboardInterrupt:
        exit()
```



Other Devices

- pcDuino
- BeagleBone Black
- Cubieboard

