Internet of Things Laboratory

Assignment 2

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Problem statement- Study of different operating systems for Raspberry-Pi. Understanding process of OS installation on Raspberry-Pi.

1. Difference between the versions of Raspberry-Pi board.

	Raspberry pi-3 model B	**Raspberry pi-2 model B**	**Raspberry pi model B+**	**Raspberry pi model A+**
Ethernet Port	Yes	Yes	Yes	No
GPU	Videocore IV	Videocore IV	Videocore IV	Videocore IV
Processor Speed	1.2GHz Quad-core processor	900MHz Quad core processor	700MHz Single core processor	700MHz Single core processor
Wi-Fi	Built-in	No	No	No
Bluetooth LE	Built-in	No	No	No
Storage	Micro SD	Micro SD	Micro SD	Micro SD
RAM	1 GB SDRAM of 400MHz	1 GB SDRAM of 400MHz	512 MB SDRAM of 400MHz	256 MB SDRAM of 400MHz
GPIO	40 Pin	40 Pin	40 Pin	40 Pin
USB 2.0	4 x USB Port	4 x USB Port	4 x USB Port	1 x USB Port
Maximum power/voltage	The maximum power is about 2.5A and voltage is 5V	The maximum power is 1.8A and voltage is about 5V	The maximum power is 1.8A and voltage is about 5V.	The maximum power is 1.8A and voltage is about 5V.

2. Difference between Beagle Bone Black, Arduino and Raspberry-Pi.

Name	Arduino Uno	Raspberry Pi	BeagleBone
Model Tested	R3	Model B	Rev A5
Price	$29.95	$35	$89
Size	2.95"x2.10"	3.37"x2.125"	3.4"x2.1"
Processor	ATMega 328	ARM11	ARM Cortex-A8
Clock Speed	16MHz	700MHz	700MHz
RAM	2KB	256MB	256MB
Flash	32KB	(SD Card)	4GB(microSD)
EEPROM	1KB		
Input Voltage	7-12v	5v	5v
Min Power	42mA (.3W)	700mA (3.5W)	170mA (.85W)
Digital GPIO	14	8	66
Analog Input	6 10-bit	N/A	7 12-bit
PWM	6		8
TWI/I2C	2	1	2
SPI	1	1	1
UART	1	1	5
Dev IDE	Arduino Tool	IDLE, Scratch, Squeak/Linux	Python, Scratch, Squeak, Cloud9/Linux
Ethernet	N/A	10/100	10/100
USB Master	N/A	2 USB 2.0	1 USB 2.0
Video Out	N/A	HDMI, Composite	N/A
Audio Output	N/A	HDMI, Analog	Analog

3. Different applications using Beagle Bone Black, Arduino and Raspberry-Pi.

Applications using Raspberry Pi

Home Automation System: The Raspberry Pi system can easily host some of the most power packed home automation applications. It can be used to attach sensors, relays, cameras, and lights with a computer or phone.

Minecraft Game Server: The application of Raspberry Pi isn't limited to old and outdated systems. Very few people know that the default OS of Raspberry Pi comes with a special pre-installed version of Minecraft. Also, there are very few who know that Pi can be used as a game server as well.

Motion Capture Security Camera: If you have a generic USB webcam, you just need a Raspberry Pi Camera Module to build a motion capture security system. Just make sure you have a good stock of USB storage devices and high capacity microSD cards to store footage from the device.

Applications using Arduino:

Home Automation: This application makes use of the Arduino Uno board, Bluetooth interface for connectivity, and smartphones. Software loaded boards are connected to the home devices like lamps, A/C, TV, Refrigerator, and Bluetooth software is interfaced with the board.

IoT: Arduino board based on the input from the central server send a signal to right bulb in the circuit and illuminates it.

Applications using Beagle Board Black:

Various applications of Beaglebone Black include IoT, digital sensors and devices and applied to the development of many types of high-level embedded applications. It is used in Home Automation, Temperature & Humidity measurement, Network Monitoring Device, etc.

4. What are the different operating systems that can be installed on Raspberry-Pi?

- **Raspbian** - Raspbian is the first stop on the journey of learning with the Pi. Raspbian is packed full of tools and features to make the best universal use of your PCB (printed computer board). It's also a great introduction to Linux. Raspbian is part of most Raspberry Pi distros and is compatible with every version of the computer.
- **Ubuntu MATE** - Ubuntu MATE for the Raspberry Pi provides a complete, familiar, desktop environment that can be used for basic desktop computing. It is also of interest to makers and device hackers who want to target Ubuntu for their projects. Ubuntu MATE is available for the Raspberry Pi Model B 2, 3, and 3+.
- **DietPi** - DietPi is the lightest Raspberry Pi distro available, DietPi runs on a highly optimized version of Debian. DietPi images are as small as 400MB in size,making it three times lighter than the slimline Raspbian Lite.
- **FydeOS**: Chromium OS for Raspberry Pi - Based on the same code as Google's Chrome OS, Chromium OS can be installed on netbooks, laptops and the Raspberry Pi. With Chromium OS installed, we'll have access to the same cloud-based tools found on Chrome OS.

5. List step by step process for installing operating system on Raspberry-Pi.

Step 1: Download and Install Raspberry Pi Imager

The first step is to download the Raspberry Pi Imager from the official Raspberry Pi website. This tool will allow you to choose an OS, have it downloaded automatically, and write it to the SD card of your choice.

Step 2: Choose OS

Several operating systems are available for selection within the Raspberry Pi Imager, but we will focus on Raspberry Pi OS.

Step 3: Choose SD Card

You'll now need your SD card connected to your computer to copy over the OS you chose.

Step 4: Write to SD Card

This step will write the selected OS to the SD card and run a verification that the copy was successful.

Step 5: Booting Your Raspberry Pi

Insert your microSDHC card into your Raspberry Pi. Then, hook up your Raspberry Pi to power, keyboard, mouse, and monitor. When done, click Continue, then close the imager tool.

6. Explain use of RPi.GPIO library with its functions.

The RPi.GPIO Python library (included with Raspbian) lets you configure, read, and write to GPIO pins.

```
import RPIO

# set up input channel without pull-up

RPIO.setup(7, RPIO.IN)


# set up input channel with pull-up control. Can be

# PUD_UP, PUD_DOWN or PUD_OFF (default)

RPIO.setup(7, RPIO.IN, pull_up_down=RPIO.PUD_UP)
```

```
# read input from gpio 7
input_value = RPIO.input(7)

# set up GPIO output channel
RPIO.setup(8, RPIO.OUT)

# set gpio 8 to high
RPIO.output(8, True)

# set up output channel with an initial state
RPIO.setup(8, RPIO.OUT, initial=RPIO.LOW)

# change to BOARD numbering schema
RPIO.setmode(RPIO.BOARD)

# set software pullup on channel 17
RPIO.set_pullupdn(17, RPIO.PUD_UP) # new in RPIO

# get the function of channel 8
RPIO.gpio_function(8)

# reset every channel that has been set up by this program,
# and unexport interrupt gpio interfaces
RPIO.cleanup()
```