IOT Assignment-1

Internet of Things

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CSE-2

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Questions

1. Differentiate between Microprocessor and MicroController

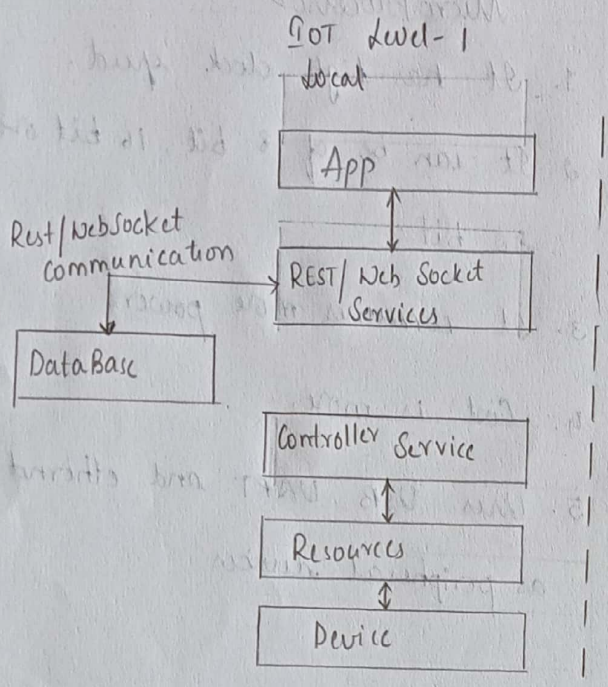
Micro Controller	Micro Processor
1. It has lower clock speed	1. It has high clock speed.
2. It can be of 32 bit or 64 bit.	2. It can be of 8 bit, 16 bit or 32 bit.
3. It consumes less power	3. It consumes more power.
4. Cost is less	4. Cost is more.
5. Uses USB, UART, I2C high speed ethernet as peripherial devices.	5. Uses USB, UART and ethernet as peripheral devices
6. Used by Microwave ovens and washing machine.	6. Used by personal computers and laptops.
7. Performs a single task, therefore it doesn't require more memory.	7. Microprocessor based applications perform multiple tasks, therefore it require more memory.
8. cpu and all other elements are integrated into single chip.	8. Memory, Io port, timers etc are connected to cpu externally.
9. A compact integrated circuit designed for a specific operation in an embedded systems.	9. A component that performs the instructions and task involved in computer processing.

2. Explain about different levels of IOT with diagram

Level-1

→ It has a single node that performs sensing and/or actuators stores data, performs analysis and hosts the applications stores

→ ~~data~~ They are suitable for modelling low cost and low complexity solutions where the data involved is not big.

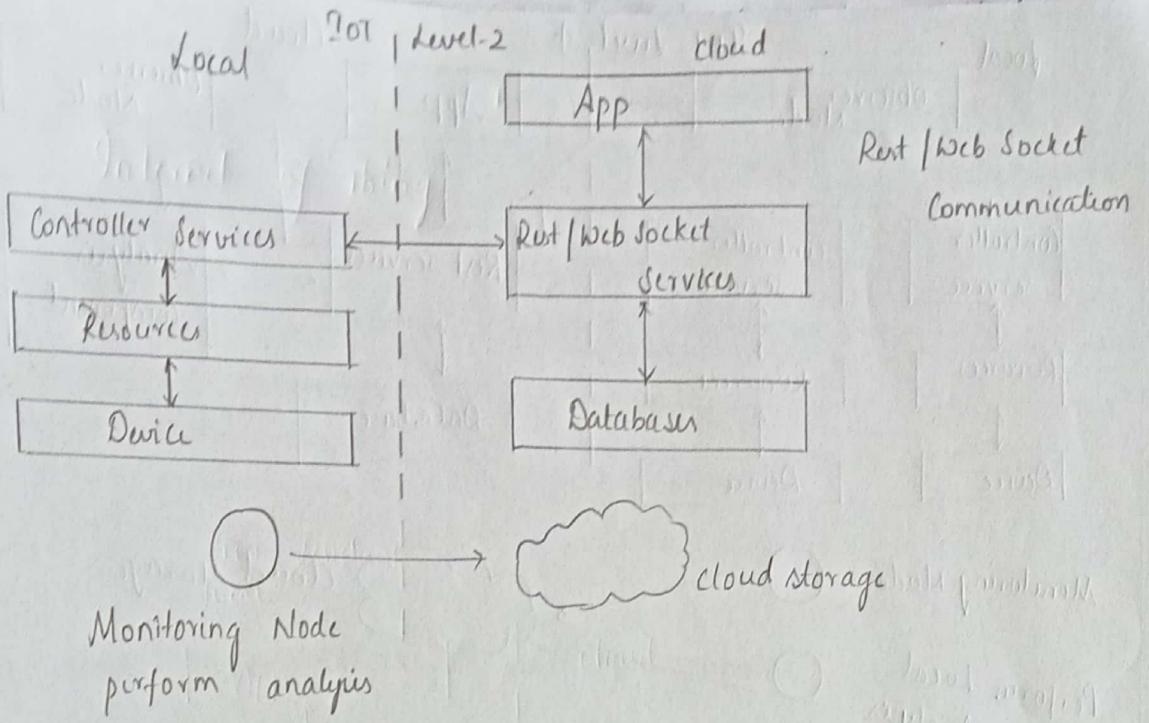


Level-2

→ These system has a single ~~node~~ node that perform sensing or ~~act~~ actuation and local analysis.

→ Data is stored in the cloud and application is usually cloud based.

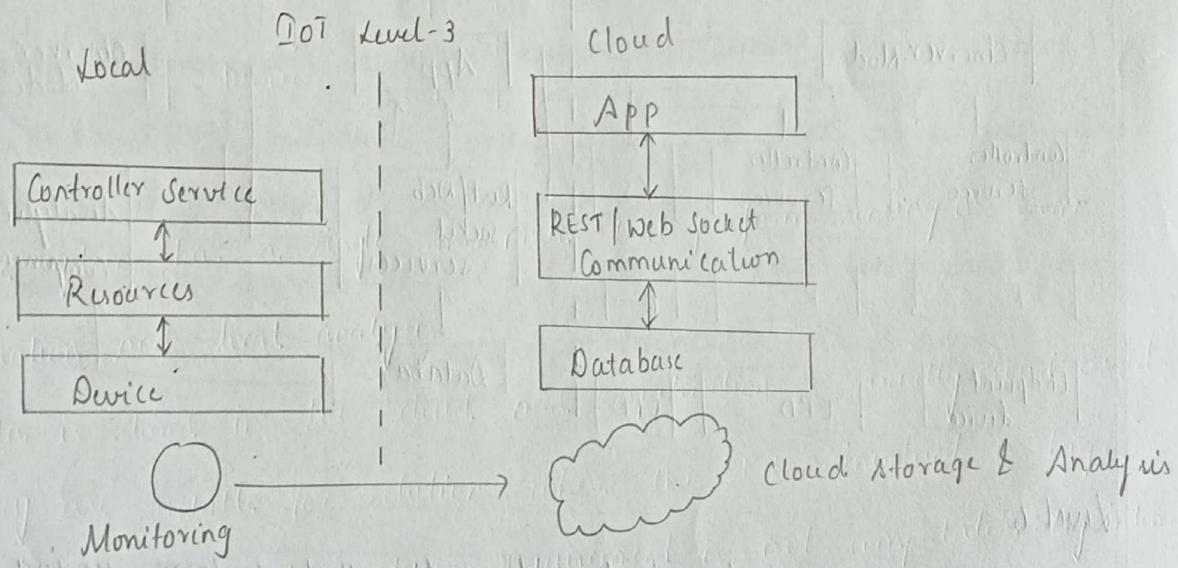
→ They are suitable for solution where the data involved is big. However the primary analysis requirement is not computationally intensive



Level 3

→ A level 3 IOT system has a single node, data is stored and analyzed in the cloud and application is cloud based.

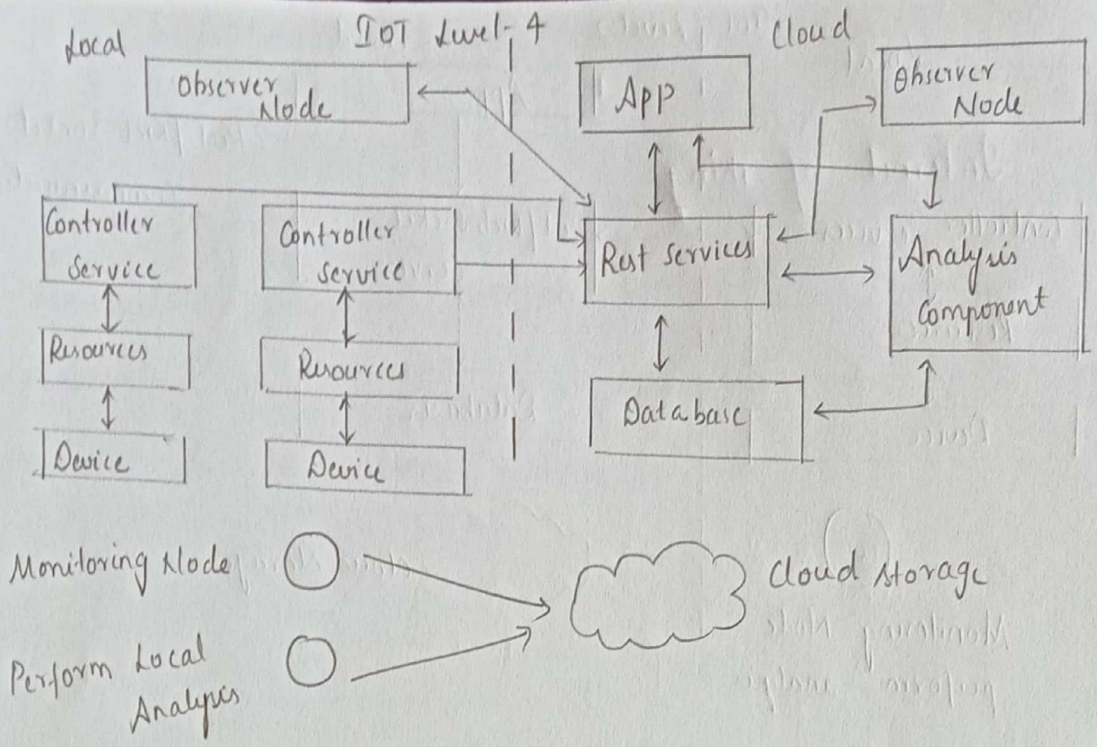
→ A level 3 IOT systems are suitable for solutions where the data involved is big and the analysis requirement are computationally intensive.



Level 4

→ A level-4 IOT system has multiple nodes that perform local analysis. It also consists of observers node.

→ Level-4 contains local and cloud based observer node which can subscribe to and receive information collected in the cloud from IOT devices.

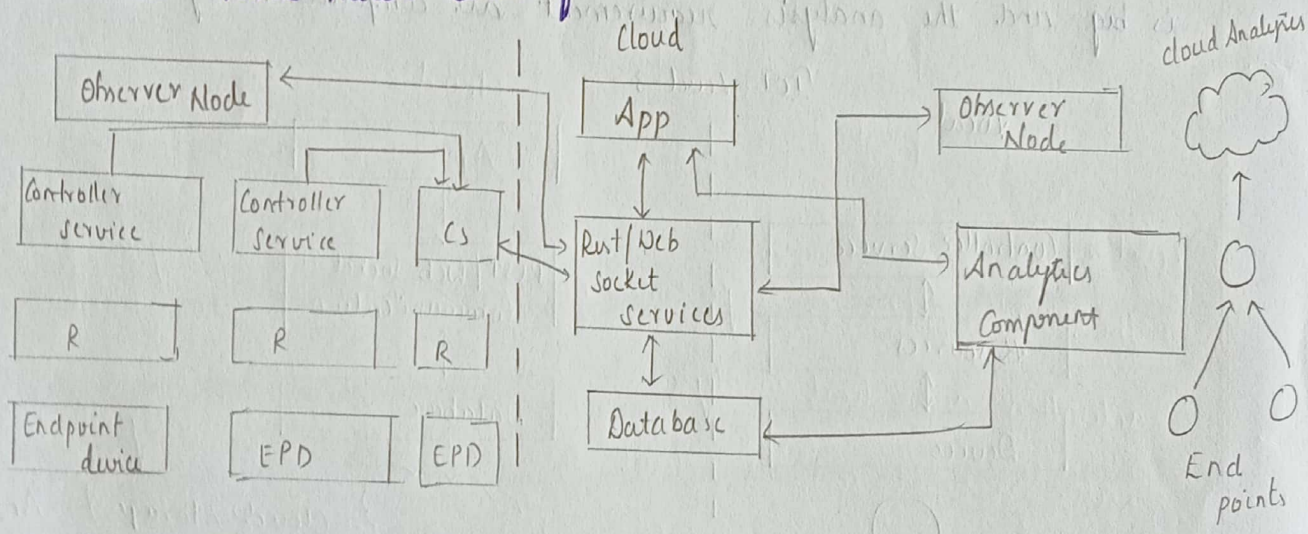


Level-5

→ A level-5 IOT system has multiple end nodes and one coordinate node.

→ The end nodes that perform sensing or actuation.

→ Coordinator Node selects data from the end nodes and sends to the cloud.



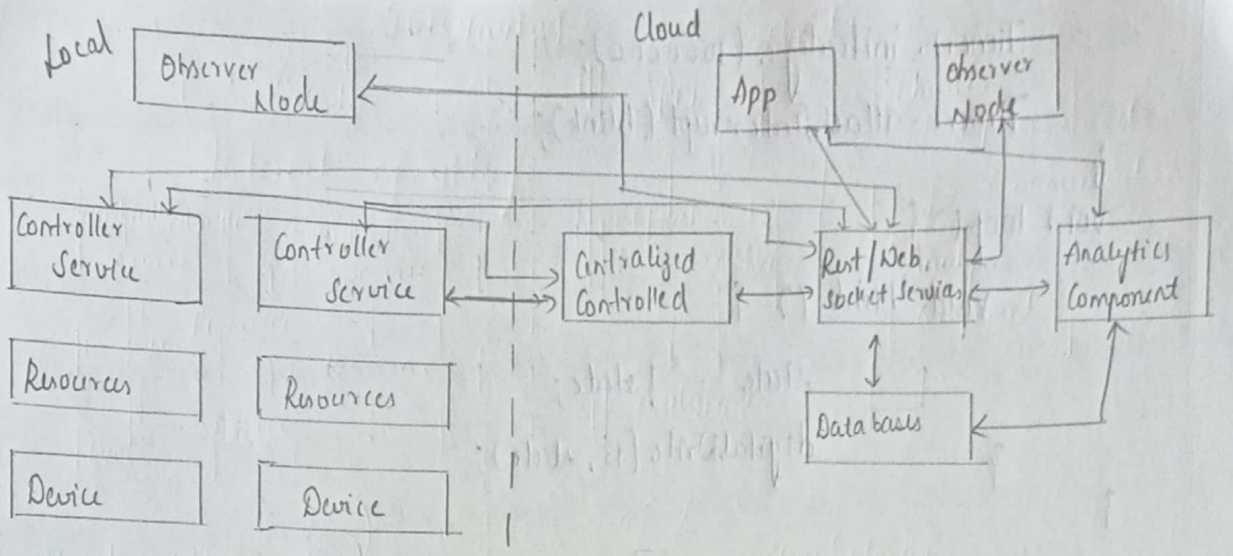
Level-6

→ It has multiple independent end nodes that perform sensing or actuatic and send data to the cloud.

→ Data is stored in the cloud & application is cloud based.

→ The centralized controller is aware of the status of all the end nodes and sends control commands to the nodes

→ The analytics component analyze the data & stores the results in the cloud databases.



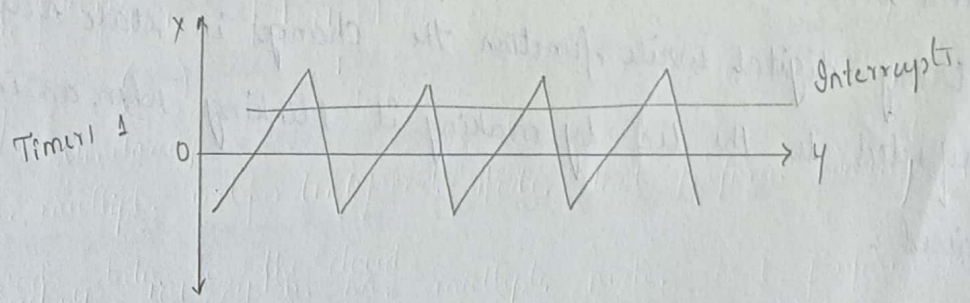
3. Explain about Timer Interrupt with program

Timer Interrupts:

They pause the sequential execution of a program loop() function for a predefined no. of seconds to execute a different set of commands. After the set of commands are executed, the program resumes again from same position.

→ The arduino comes with 3 timers known as timer 0 (8 bit timer). Timer 1 (16-bit timer) & Timer 2 (8-bit timer). They act as a clock and are used to keep track of time based events.

→ As Timer 1 & 2 are 16 bit & 8 bit timers, they can count from $0-2^{16}-1$ and $0\ 2^{8}-1$. They creates a triangular shaped curve.



Program:

```
# Include <TimerOne.h>
int. state = 0;
void setup() {
        pinMode (13, OUTPUT);
        digitalWrite (13, State);
```

```
        Timer1.initialize(1000000);
        Timer1.attachInterrupt(blink);
    }
    void loop(){
        void blink () {
                state = !state;
        }       digitalWrite(13, state);
    }
}
```

→ In this Timer1, should generate an interrupt after every one second the onboard LED will blink every second.

→ In this we will set default led pin 13 as an OUTPUT pin

→ Intially the state variable will set to LOW.

→ As we have include the TimerOne.h header file. We can set the default gap between the Timer1 interrupts i.e, 1000000 ms.

→ Here we use attach interrupt function in TimerOne.h. to generate the interrupts externally. Whenever it's invoked it will call the blink function in void loop().

→ When blink() is invoked then the state bit changed to 0 to 1 and vice versa.

→ Using digital write function the change in state variable get reflected to the Led by making it blinking when an interrupt is raised.

4 Explain any 10 Sensors?

There are different type of sensors that are commonly used in various applications all these are used for measuring one of the physical properties like temperature, resistance capacitance etc.

1. Temperature Sensor: These sensors measures the changes in the temperature. There are different type of temperature sensors like RCS, Thermistors, Thermo couples, RTD etc.

→ They can be analog or digital. In an Analog one, the change in temperature correspond to change in physical property like resistance or voltage (LM35)

→ In digital temperature sensor the output is a discrete digital value

2. Proximity Sensors: Its' a non contact type sensor that detects the presence of an object. They can be implemented using different techniques like optical, sound, magnetic, capacitive etc.

→ They are used in mobile phones, cars, industries, ground proximity in aircrafts etc.

3. Infrared Sensor: These are light-based sensors that are used in various applications like proximity & object detection.

→ They are 2 types of IR sensors. They are

1) Transmissive Type.

2) Reflective Type.

4. Ultrasonic Sensor: It's a non ~~conduct~~ contact type device that can be used to measure distances as well as velocity of an object. It works on the properties of the sound waves with frequency greater than that of a human audible range.

→ Doppler shift property of the sound wave is used to measure the velocity of an object.

5. Smoke & Gas Sensors: They are used in safety related applications, They are used in Laboraties, kitchens & industry.

→ They can detect different gases like LPG, propane, butane, methane etc

7. Touch Sensors: As the name suggests, detect touch of a finger or styler. often touch sensors are classified into resistance & capacitive type.

→ All modern touch sensors are of capacitive types as they are more accurate & have better signal to noise ratio.

8. Humidity Sensor: They are used to measure the humidity. All humidity sensors measure relative humidity and relative humidity is dependent on temperature of air. Hence almost all humidity sensors can measure temperature. They can be of either capacitive, ~~resistan~~ resistive or thermal conductive type. Eg: DHT11 & DH722

9. Tilt Sensors: Used to detect indication or orientation, previously they were made of mercury. Present till sensors contain a roller ball. Eg: Aircrafts uses tilt sensors

10. Color Sensor: It's an useful device in building color sensing application in the field of Image processing, color identification, industrial object tracking etc.

Eg: tcs3200 is a simple color sensor, which can detect any color & output a square wave proportional to wave-length of detected color.

5. Write a program to find greatest & smallest of 3 integers using User Defined Library.

Header file creation

```
#ifndef Mylib_h
# define Mylib_h
# include "Arduino.h"
```

```
class Mylibclass {
    public:
        int min_max (int, int, int);
};
extern Mylibclass Mylib;
```

Program:

```
#include "Arduino.h"
#include "Mylib.h"
int Mylibclass: min_max (int a, int b, int c)
{
    int arr[2];
    int small = a;
    int large = b;
    if (b < small) { small = b; }
    if (c < small) { small = c; }
    if (c > large) {large = c;}
    if (b > large) {large = b; }
    arr[0] = small;
    arr[1] = large;
  return arr;
}
```

Sample

```
#include "Mylib.h"
void setup() { }
void loop() {
    int ar[2];
    ar = Mylib.min_max (22, 14, 27);
    Serialprint ("Minimum ", ar[0]);
```

```
Serial-print ("Maximum, ar[i]);
}
```