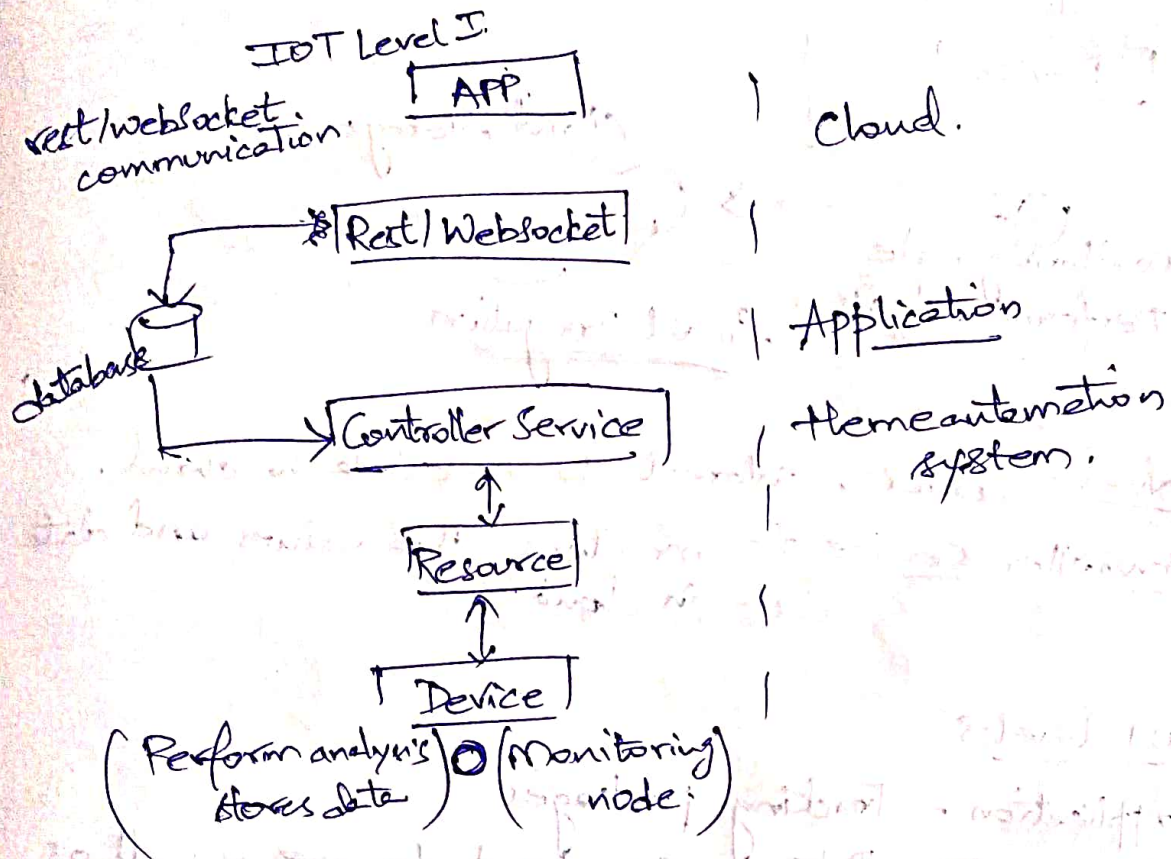


Technologies :-

- (1) Wireless sensor networks
(Sensor, sensor node, sensor networks)
- (2) Cloud Computing
- (3) Big Data Analytics.

IoT levels and Deployment Templates



Device

Resource - sensors, actuators,

Controller Service - data send to web and take commands from web data.

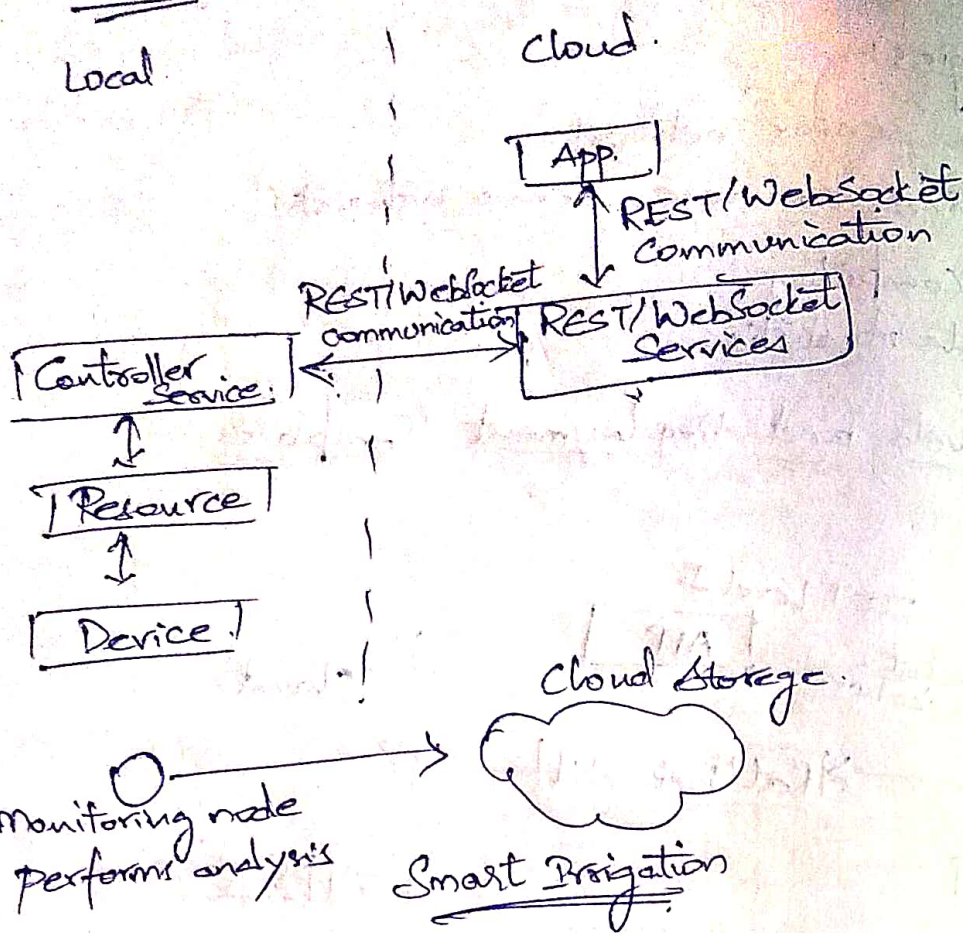
Database.

Web Service - link b/w IOT device, application, db and analysis components.

Analysis component - analyzing the data & generate results.

Application - provide an interface to users.

IoT Level-II



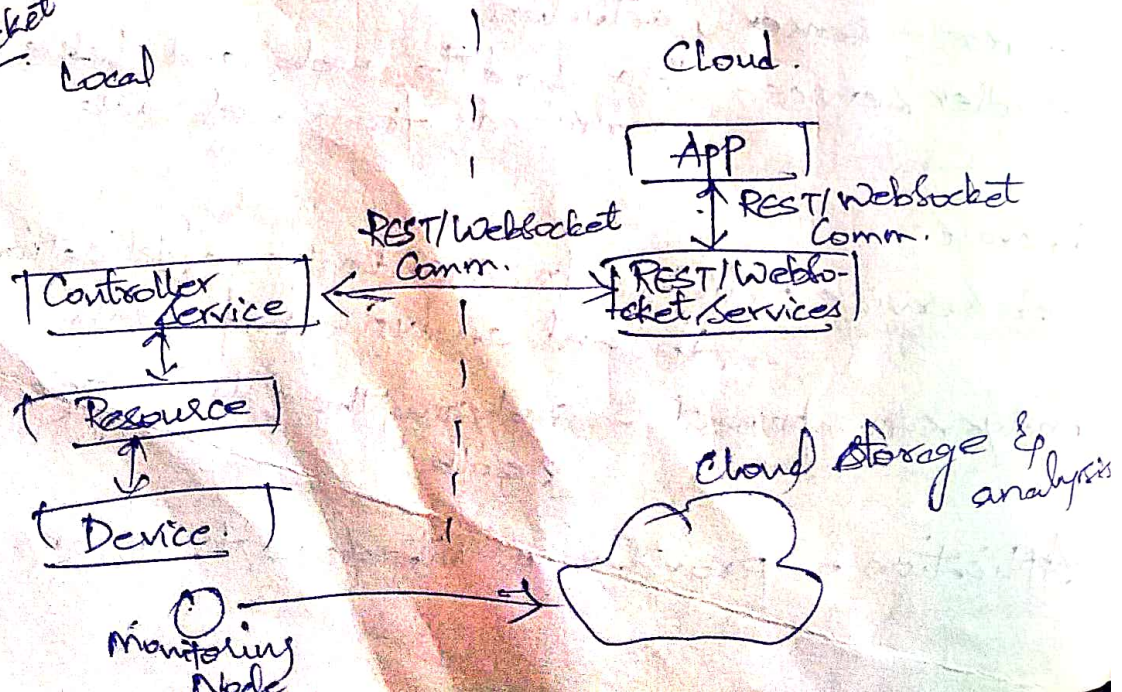
Device:- sensors, internet to move data to cloud.

Controller Service:- monitors the values and data in cloud.

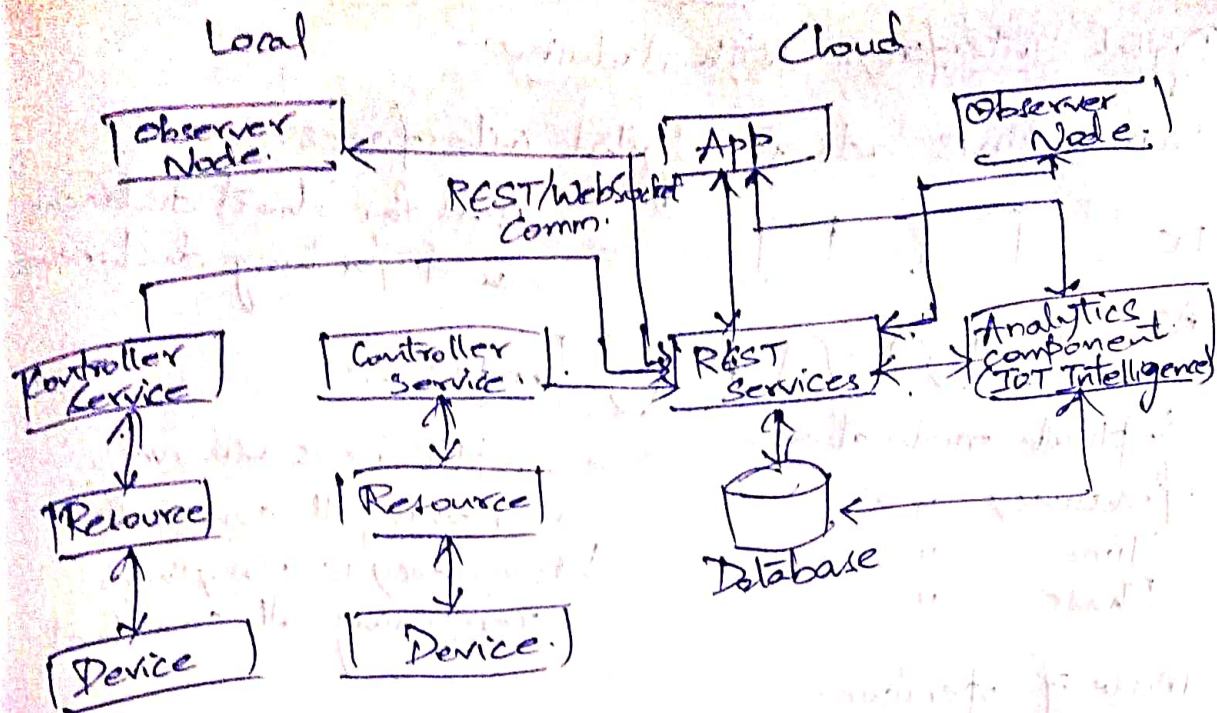
IoT Level-3

Application - Tracking packages
Here, Big Data. So, cloud storage as well as analysis.

Here
Websocket



IOT Level-4 :- Noise Tracking



Monitoring nodes perform local analysis.

The diagram shows two circles representing monitoring nodes. Arrows from these nodes point towards a cloud icon labeled **Cloud Storage**.

IOT Level-5:- Forest fire detection

Here coordinator is either router/gateway.

IOT Level-6:- Weather monitoring.

Here, there is centralized controller.




Digital Interfaces with Arduino:-

Pin 0 to Pin 13 acts as digital interfaces.

DS 

used for short distance
used for long distance

AS  Amplitude:

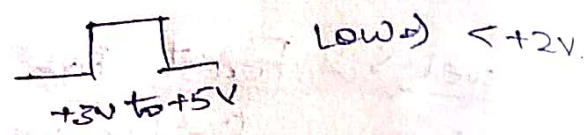
Amplitude modulation \rightarrow Amplitude is varying, remaining all constant.
Frequency \rightarrow Frequency is varying, remaining all constant.
Time
Phase

Mode of operation:-

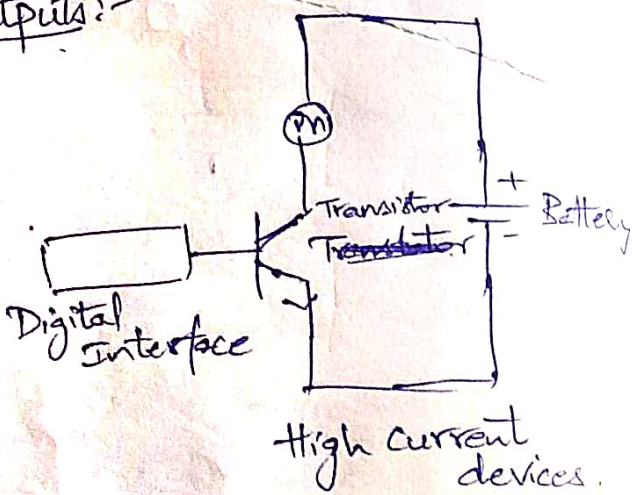
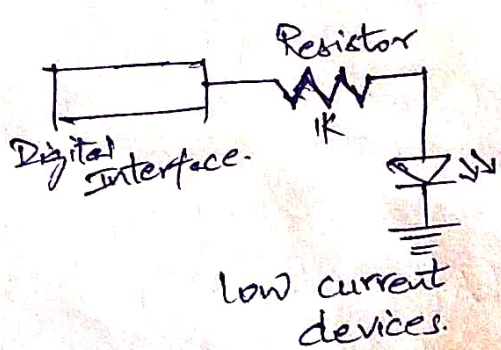
1) PinMode (pin, mode)
Pin no. \rightarrow INPUT/OUTPUT.

2) digitalWrite (pin, HIGH/LOW)

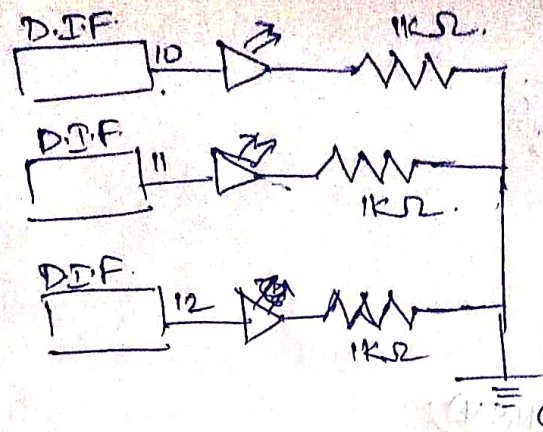
3) digitalRead (pin)
returns LOW/HIGH
reads the voltage
0 if <+2V (Low)
1 if HIGH



Working with digital outputs:-



Write a program blinking of three LEDs alternatively. Use pin no. 10, 11, 12 as output pins.



```
void setup() {
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(12, OUTPUT);
}
```

```
void loop() {
  digitalWrite(10, HIGH);
  delay(1000);
  digitalWrite(11, LOW);
  digitalWrite(12, LOW);
  delay(1000);
  digitalWrite(10, LOW);
  digitalWrite(11, HIGH);
  digitalWrite(12, LOW);
  delay(1000);
  digitalWrite(10, LOW);
  digitalWrite(11, LOW);
  digitalWrite(12, HIGH);
  delay(1000);
}
```

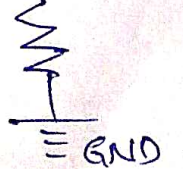
3.

Working with digital inputs:-

Digital Read (pin)

D.I.F

Push button




```

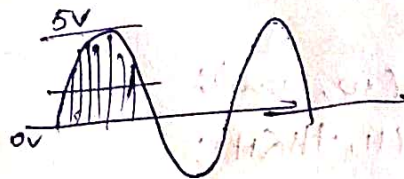
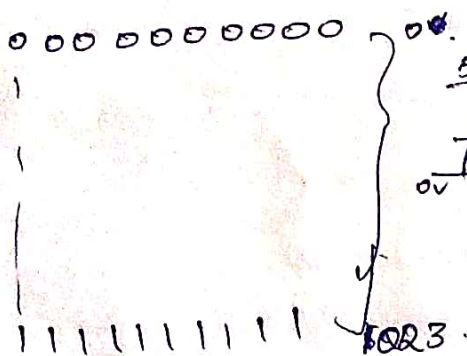
void setup() {
  pinMode(10, OUTPUT);
  pinMode(11, INPUT);
}

void loop() {
  val = digitalRead(11);
  digitalWrite(10, HIGH);
  if (val == 0) {
    digitalWrite(10, LOW);
  }
  else {
    digitalWrite(10, HIGH);
  }
}

```

Interfacing with analog devices:-

ADC 10 bit $2^{10} = 1023$.



ADC \rightarrow Analog to Digital Converter

A0-A5 - UNO
A0-A7 - NANO

```

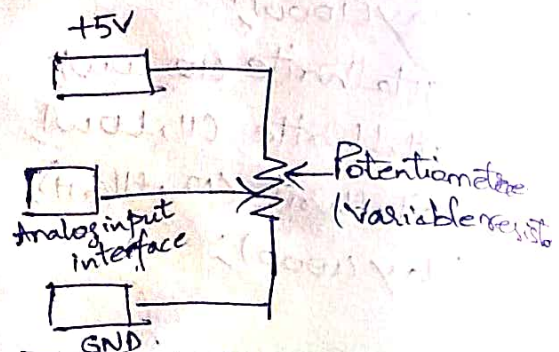
int input;
void setup() {
  Serial.begin(9600);
}

```

```

void loop() {
  input = analogRead(A0); // A0-A5
  Serial.print("The current value is ");
  Serial.print(input);
  delay(1000);
}

```



Analog input
Test

DAC \rightarrow Digital to Analog converter.

Duty cycle = $\frac{\text{ON}}{\text{Total}}$.

