# Iot based smart water management..

Abstract:

The Smart Water Management System project aggregates three meters to enable remote and automatic real-time measurement of water consumption. Based on actionable decisions such as water leakage and consumption metrics, water supply through the pipes is controlled using solenoid valves. The consumer and the supplier can monitor, visualize consumption metrics and control the system through the designed android interface.
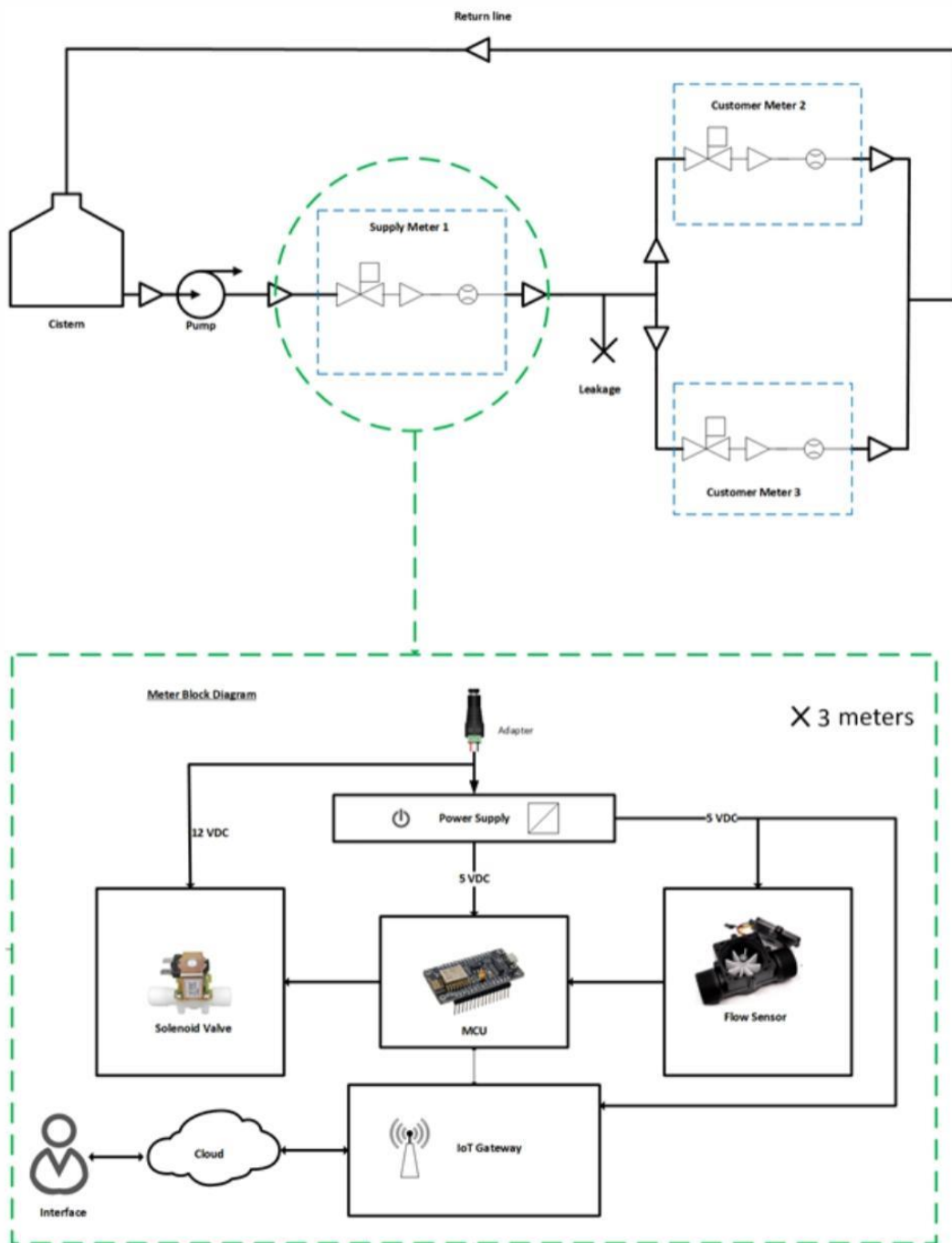
System overview:

The system consists of four functional modules, namely: the physical device, the gateway through which the device communicates with the backend service, the backend that allows storage of data, analysis, data access and notifications and the interface that allows visualization and control.
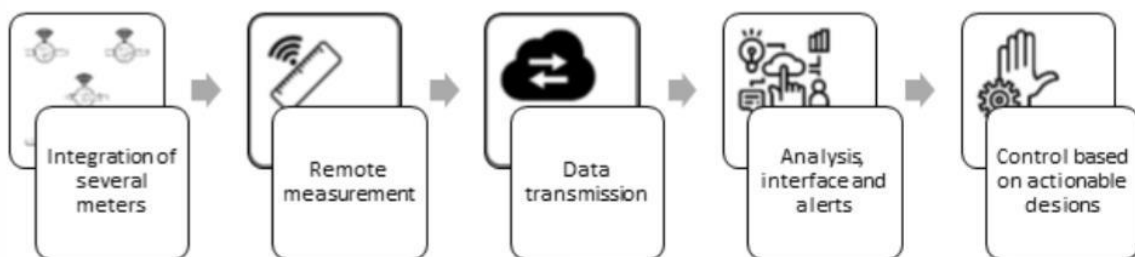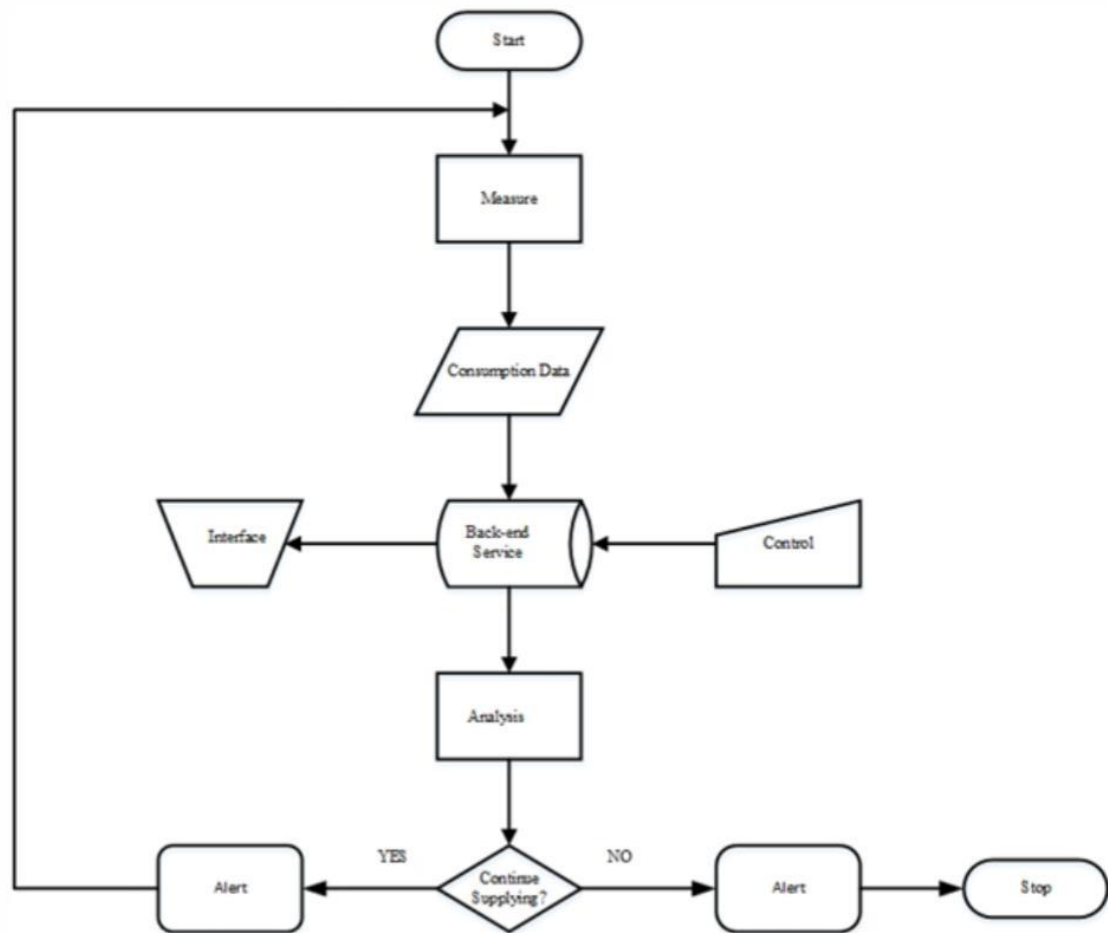

System diagram:

The system consists of three meters: the supply meter, 1 and customer meters, s and 3 as shown below.
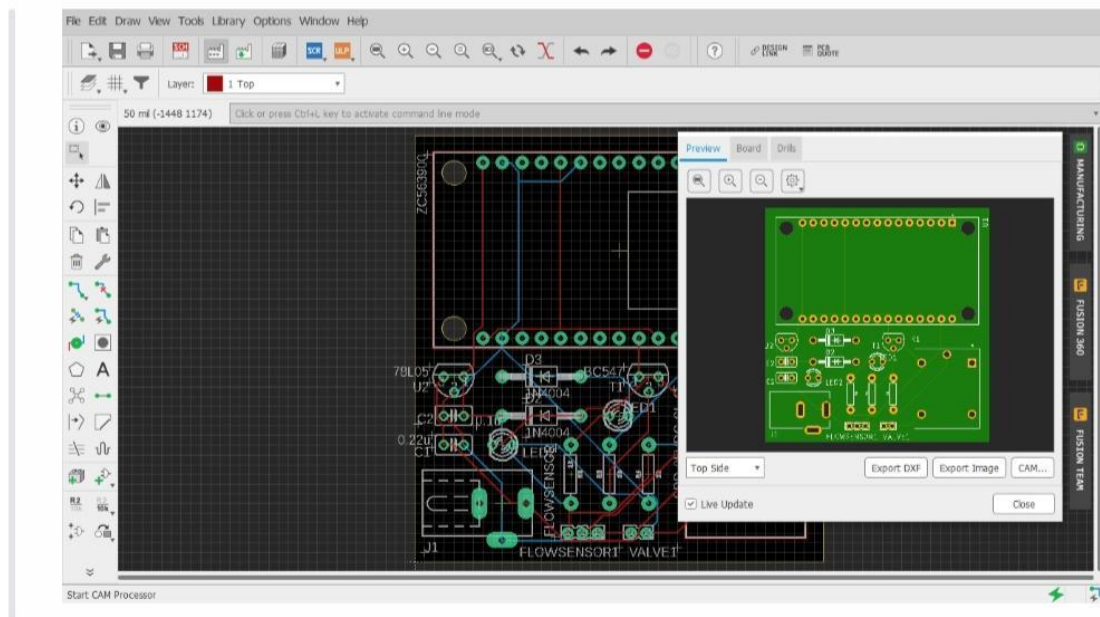

Flow chart:

The system's flow chart diagram is as shown in the figure below.

Start

Measure

Consumption Data

Interface ← Back-end Service ← Control

Analysis

Continue Supplying?

YES → Alert

NO → Alert → Stop
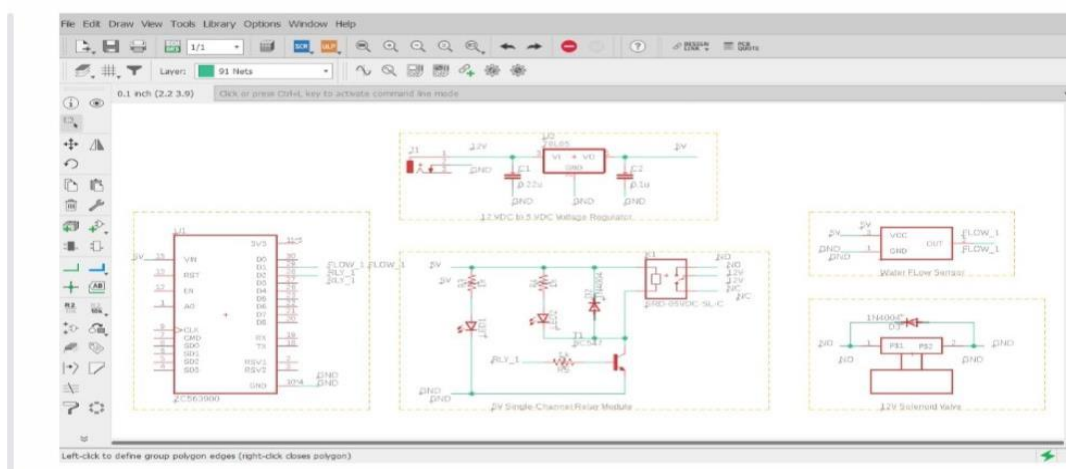
Schematic diagram:

PCB design:

Design of the board from the schematic diagram was done as shown below.

- **Wi-Fi Settings**

The SSID and password are set to allow the NodeMCU to connect to a network


```
const char* ssid = "mySSID"; // wireless network name (SSID)
const char* password = "myPassword"; // Wi-Fi network password
```

- **ThingSpeak Settings**

ThingSpeak credentials and API key are set to allow sending data to specific channel.

```
// ThingSpeak Settings
const int channelID = YYYYYYY;
String writeAPIKey = "XXXXXXXXXXXXXXXX";
const char* server = "api.thingspeak.com";
```

- **Serial Communication**

The baud rate for serial communication set was to 115200.

```
void setup() {
Serial.begin(115200); // Start the Serial communication
delay(100);
```

- **Define pins and initialize variables**

```
pulseCount_1 = 0;
flowRate_1 = 0.0;
flowMilliLitres_1 = 0;
totalMilliLitres_1 = 0;

pinMode(flowSensor_1, INPUT_PULLUP);
pinMode(relayValve_1, OUTPUT);
digitalWrite(relayValve_1, 0);
```

- **Connect to Wi-Fi network**

The NodeMCU waits until it is connected to a network then sends the IP address, Netmask and Gateway to the serial monitor.

```
WiFi.begin(ssid, password);        // Connect to the WiFi network
 Serial.print("Connecting to ");
 Serial.print(ssid); Serial.println("...");

 while (WiFi.status() != WL_CONNECTED) { // Wait for the Wi-Fi to connect
  delay(500);
 }

 Serial.println("WiFi connected!");
 // Send the IP address of the ESP8266 to serial monitor
 Serial.print("IP address:\t");
 Serial.println(WiFi.localIP());
 // Send the Netmask of the ESP8266
 Serial.print("Netmask:\t");
 Serial.println(WiFi.subnetMask());
 // Send the Gateway of the ESP8266
 Serial.print("Gateway:\t");
 Serial.println(WiFi.gatewayIP());
```

- **Measure Wi-Fi Strength**

The Wi-Fi strength is measured and sent to the serial monitor.

```
// Measure Signal Strength (RSSI) of Wi-Fi connection
long rssi = WiFi.RSSI();
String strgth = String(rssi);
Serial.println("signal strength: " + strgth
```

Interface:

The android app used as interface to visualize consumption data and control water supply remotely was designed using [MIT App Inventor](#).

The [.aia source code](#) file is attached.

Download and install the [android app](#)

Smart Water Management System

Username
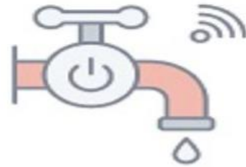
Password

Login

Forgot Password   Create Account

Smart Water Management System

Time: 11/28/2021 02:37:35 pm

Visualization

View System Data

Manage Meter

Supply Meter 1
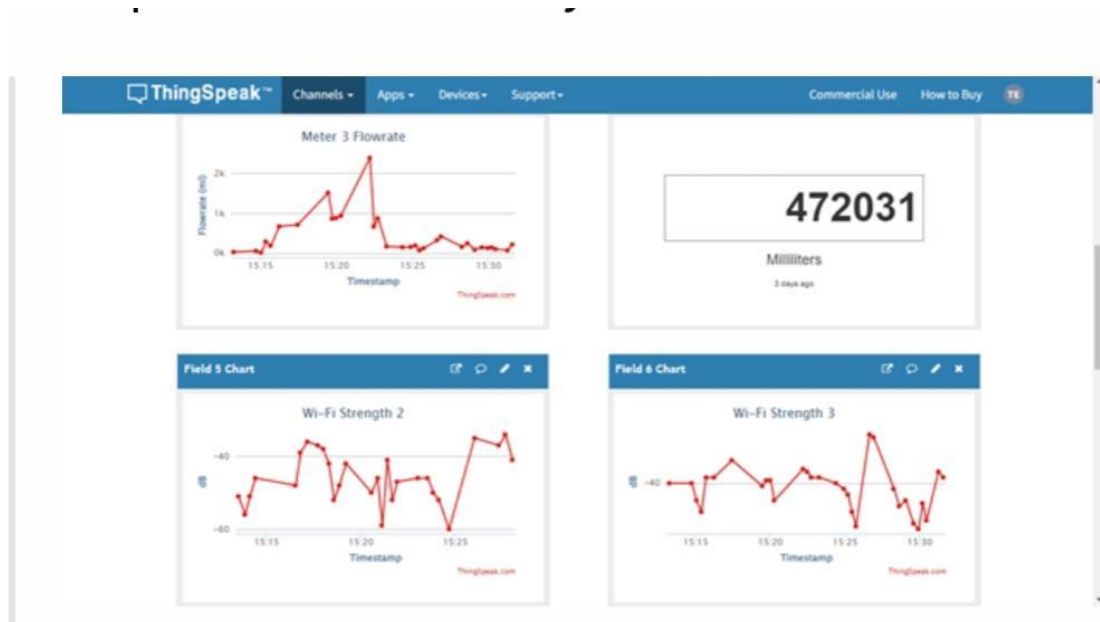
Customer Meter 2

Customer Meter 3

Loss Analysis

Loss Analysis

Loss (ml)

Result:

The system utilized IoT solutions to enable remote and automatic and real-time measurement of water consumption data which is transmitted to a remote server for manipulation and analysis.

The data was then displayed on an interface where consumption metrics, over a period, was be viewed.

Meter 2 Wi-Fi Strength

Wi-Fi Strength 2

Customer Meter 3

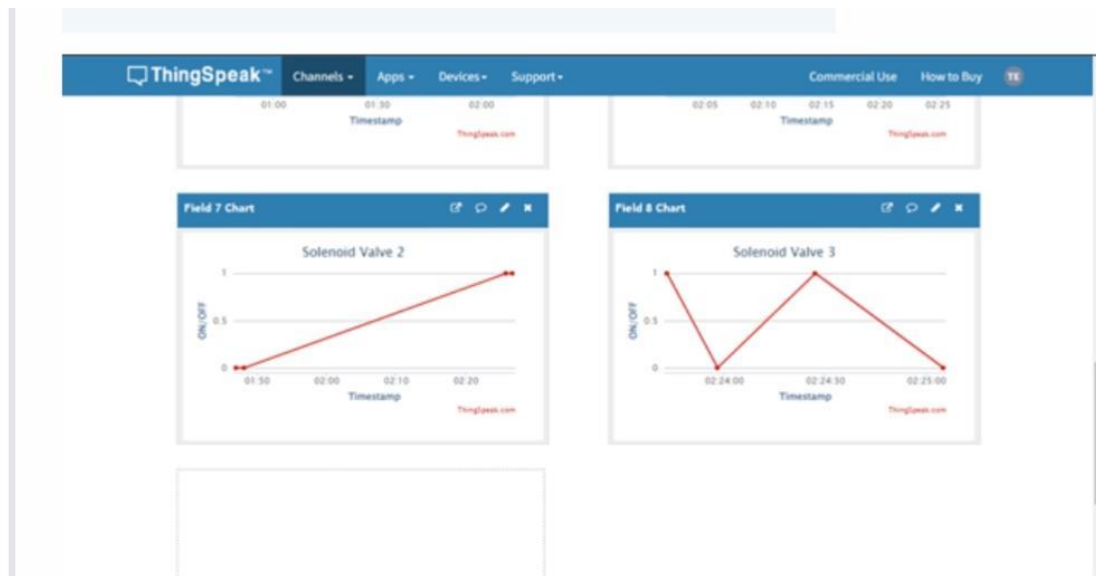### Meter 3 Volume

472031

Milliliters

3 days ago

Meter 3 Flowrate

Meter 3 Flowrate

Users could control water supply remotely from the interface based on actionable decisions.

Conclusion:

The Smart Water Management System solution would be revolutionary for home and industrial systems by enabling remote and automatic measurement of consumption data, convenient monitoring and control of water systems and reducing water leakage - reducing non-revenue water hence saving on cost.