Controlling Edge Devices with Whatsapp

What problem it solves:

It eases the process of how we control IOT devices.Generally there are softwares for each kind IOT devices of purchase these days.There is no unified medium to control these devices.Our goal is to control edge devices by sending simple messages.

Invention:

Idea is to make a unified system for controlling IOT devices by integrating whatsapp app business api with the iot cloud platform.This will enable the consumers to control their smart devices using whatsapp app in a very smooth way.

Competitive Advantage:

Since all the companies which are manufacturing IOT devices have their own platform ,it becomes difficult for the customers to manage such scattered IOT devices i.e use different apps to control different devices.By making the process of controlling the smart devices easier and smoother using whatsapp ,it will attract more users.
We can also provide service to other companies which makes iot devices by integrating them in our system.

Existing literature:

Application:

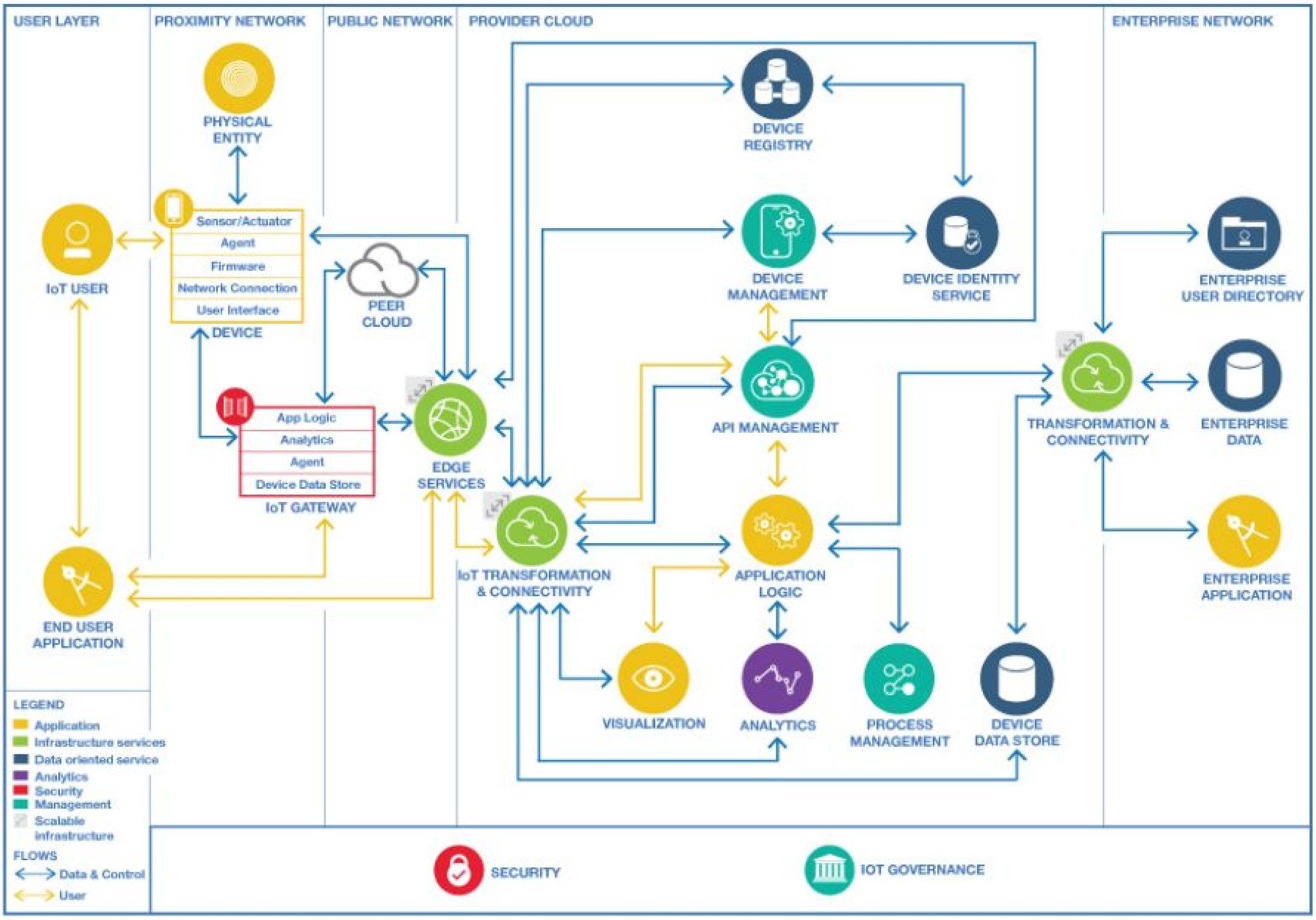
Smart water pumps can be made which will be used by farmers for irrigation in a smart way ,i.e farmers can send a whats app message to turn on or off the water pump.All he can get various data which are crucial in farming like temperature ,humidity etc. on his whatsapp.
Home Appliances can be made which can be controlled via whatsapp messages.

This method can also be employed in Fleet management System where location service of whatsapp can be in a efficient way.

Technical Details:

Architecture of IOT:

Basic Architecture of IOT



IOT has several layers like **Sensor Layer ,Network layer ,application layer (user layer) .**

Sensor Layer:
It contains the physical entities that are at the heart of the IoT system, along with the devices that interact with the physical entities and connect them to the IoT system

A sensor is a component that senses or measures certain characteristics of the real world and converts them into a digital representation. An actuator is a component that accepts a digital command to act on a physical entity in some way.

Network Layer:

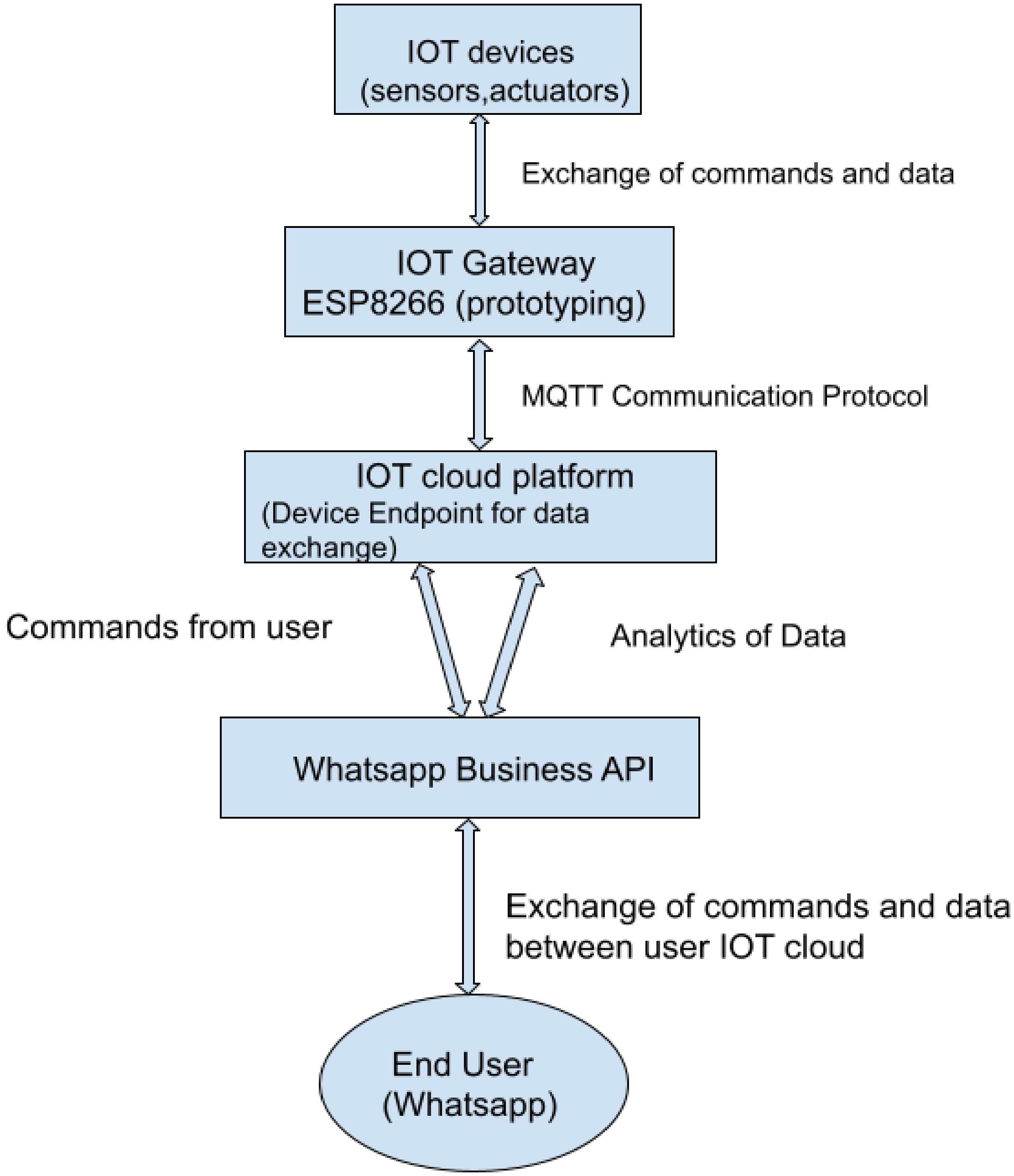
IoT Gateway - acts as a means for connecting one or more devices to the public network (typically the Internet). It is commonly the case that devices have limited network connectivity – they may not be able to connect directly to the Internet. This can be for a number of reasons, including the limitation of power on the device, which can restrict the device to using a low-power local network. The local network enables the devices to communicate with a local IoT Gateway, which is then able to communicate with the public network. It can also provide operational efficiency by allowing multiple devices to share a common connection.

The IoT Gateway contains the app Logic , provides domain specific or IoT solution specific logic that runs on the IoT Gateway. For IoT systems that have Actuators which act on physical entities, a significant capability of the app logic is the provision of control logic which makes decisions on how the actuators should operate, given input from sensors and data of other kinds, either held locally or held centrally.

Application Layer:

Application layer contains IoT users and their end user applications.
IoT Users use one or more end user applications to achieve some goal.
The IoT User is one of the main beneficiaries of the IoT solution.
The IoT user may use end user applications that run on smartphones, tablets, PCs or alternatively on specialised IoT devices including control panels.

Overall IOT Architecture using whatsapp Business API



Technical overview of Each block:

- **IOT Devices**

  This block contains all the physical sensors and actuators whom we want to control wirelessly.This block may include temperature sensor ,relays,humidity sensors,voltage sensors ,GPS modules etc.

- **IOT Gateway**

  Above sensors when live are continuously generating data.Now we want to make useful conclusions out of these data and also control the devices.For these purposes we need to connect these devices to the cloud where we will collect and analyse the data and control them as well.

  We will connect these Edge devices to IOT Gateway through wire.(we may also achieve wireless connection whenever it is necessary)

  IOT Gateway will perform the task of connecting these devices to the cloud.For this it will use MQTT communication protocol which is a very light weight protocol suitable for memory and processing power constrained devices in IOT.

- **IOT Cloud platform**

  IOT cloud is the location where IOT gateway will connect and exchange the data from device to cloud and cloud to device.

  Each IOT Gateway will be preflashed with this end point location so that whenever it gets internet access it will connect to its endpoint location in the cloud.

- **Whatsapp Business API**

  This is the most important block where we aim to make the difference. The iot devices available in the market do not use this layer.

We want to integrate whatsapp business API in the cloud platform so that all data exchange between user and IOT devices take place via whatsapp.

- **End User**

End user can go Provided Business whatsapp number and type his query. This message will go to whatsapp server and from there it will reach our cloud platform.In cloud platform pre-defined will logic will interpret the query and send the request to the IOT gateway ,IOT gateway then sends the corresponding commands to the edge devcies.In this way we have achieved a complete cycle of data exchange from user to device via whatsapp. Similarly data from End device will reach the End user on whatsapp.

Our Prototype (proof of concept):

We used ESP8266 wifi module which will act as an IOT gateway and connected one relay ,one temperature sensor ,one voltage sensor to ESP8266 module.

We then used third party cloud platform ***THINGSESP*** and generated the end point location for IOT gateway as mentioned above.

We then used third party service ***TWILIO*** for whatsapp messaging service.We connected whatsapp service provided by Twilio with the third party cloud platform using Webhook.

After doing all the above processes we will get a whatsapp number from ***TWILIO*** which we need to join.

Now we are good to go ,we can type messages in the chat box and based on the predefined logic in the backend our end devices will respond accordingly and we will also receive periodic data from the end devices which will be defined by us in the code.

Code which will be flashed into the IOT Gateway:

```
#include <ESP8266WiFi.h>
#include <ThingESP.h>
#include<DHT.h>
#define DHTPIN 5     // corresponding pin D1
#define DHT DHT11
DHT dht(DHTPIN, DHTTYPE);

ThingESP8266 thing("sharma6354", "smartthing2", "6354814758");

int LED = LED_BUILTIN;
int relay =14;    //corresponding pin D5
unsigned long previousMillis = 0;
const long INTERVAL =10000;


void setup()
{
  Serial.begin(115200);

  pinMode(LED, OUTPUT);
  pinMode(relay,OUTPUT);
  thing.SetWiFi("viveksharma", "6354814");
  thing.initDevice();
  dht.begin();
  delay(800);
}


String HandleResponse(String query)
{

  if (query == "led on") {
    digitalWrite(LED, 0);
    return "Done: LED Turned ON";
  }
  else if (query == "led off") {
    digitalWrite(LED, 1);
    return "Done: LED Turned OFF";
  }

  else if (query == "led status")
    return digitalRead(LED) ? "LED is OFF" : "LED is ON";
    else if(query=="relay on")
    {
      digitalWrite(relay, 0);
    return "Done: Relay Turned On";
    }
    else if(query=="relay off")
    {
      digitalWrite(relay, 1);
    return "Done: Relay Turned Off";
    }


  else return "Your query was invalid..";

}


void loop()
{  float h = dht.readHumidity();
   float t = dht.readTemperature();
   if (millis() - previousMillis >= INTERVAL) {
    previousMillis = millis() ;

    String temp=String(h);
    String humidity=String(t);
    String result=temp+" "+humidity;
    thing.sendMsg("+916354814759", result);
   delay(800);
 }

 thing.Handle();
}
```