Smart Green House

The Problem

1. Space problems
   - The lack of spaces
   - The lack of fertile, arable land
2. Soil problems
   - Submerging agricultural lands with excess water
   - An imbalance in the ratio of nutrients to the soil, including nitrogen, which is higher than the elements
   - Poor interest in soil and providing it with soil

The Problem

3. Watering problems
   - The lack of water, and its fluctuation in some areas
   - The waters of the Nile River do not reach all areas
4. Problems of workers and working hands
   - High air costs in the production of crops
   - Merchants resort to the Gulf Business Countries

The Problem

5. The climatic changes
   - Especially with the increase in evapotranspiration, water requirements, vegetation

The Solution

- A smart greenhouse is a type of greenhouse that uses advanced technology to control the environment inside the greenhouse and optimize plant growth.
- Moisture
- Temperature
- Humidity
- Brightness
- Air Quality

The Value

1. The ability to control and optimize the environment for plant growth.
2. The use of advanced technology such as sensors, automation systems.
3. The use of smart technology allows for more precise control of factors.

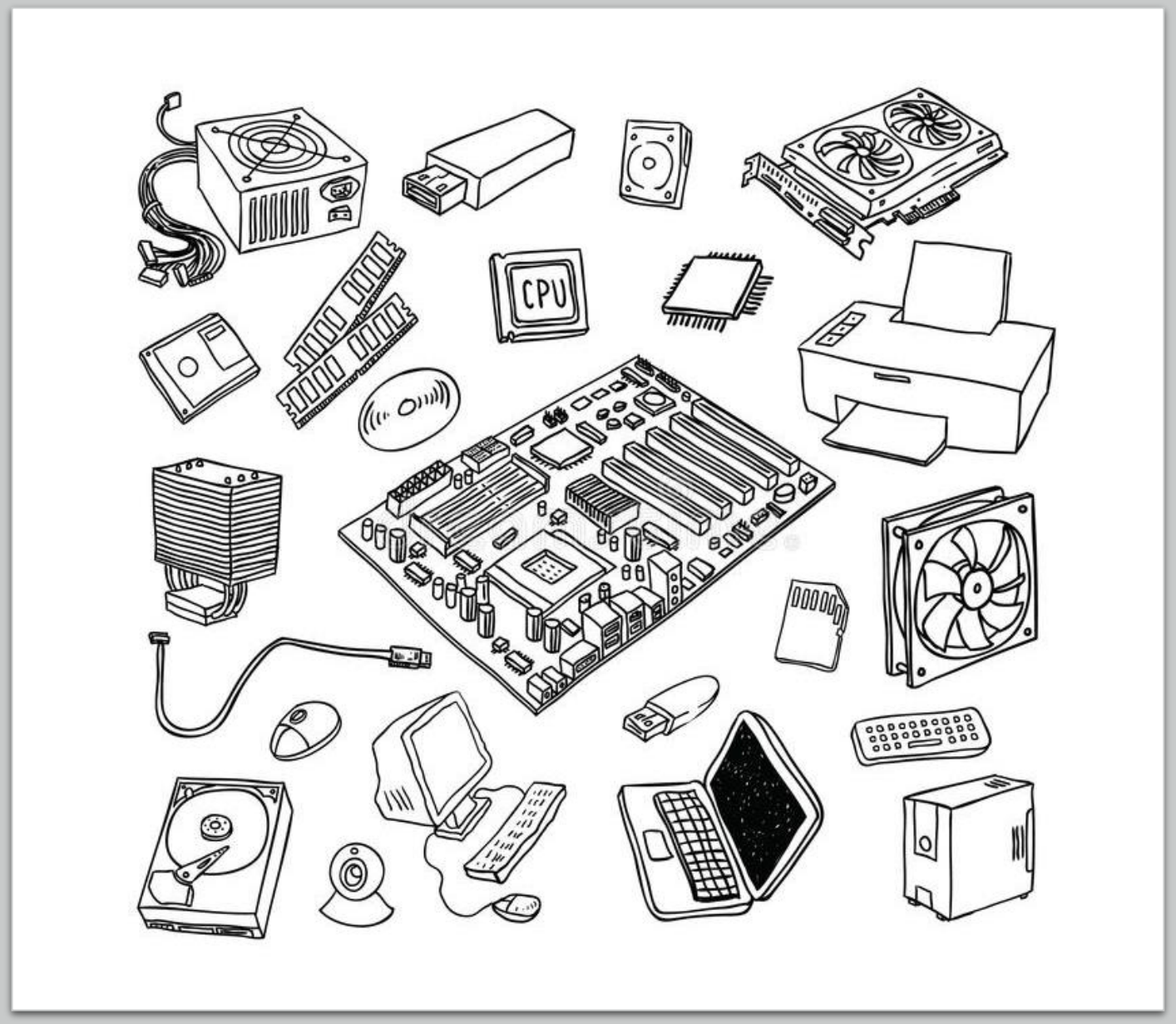
2030 Vision

1. Preserving, maintaining, improving and developing available agricultural economic resources.
2. Achieving a great deal of food security.
3. Establishing new integrated agricultural societies that include all related activities.

The Target Customer

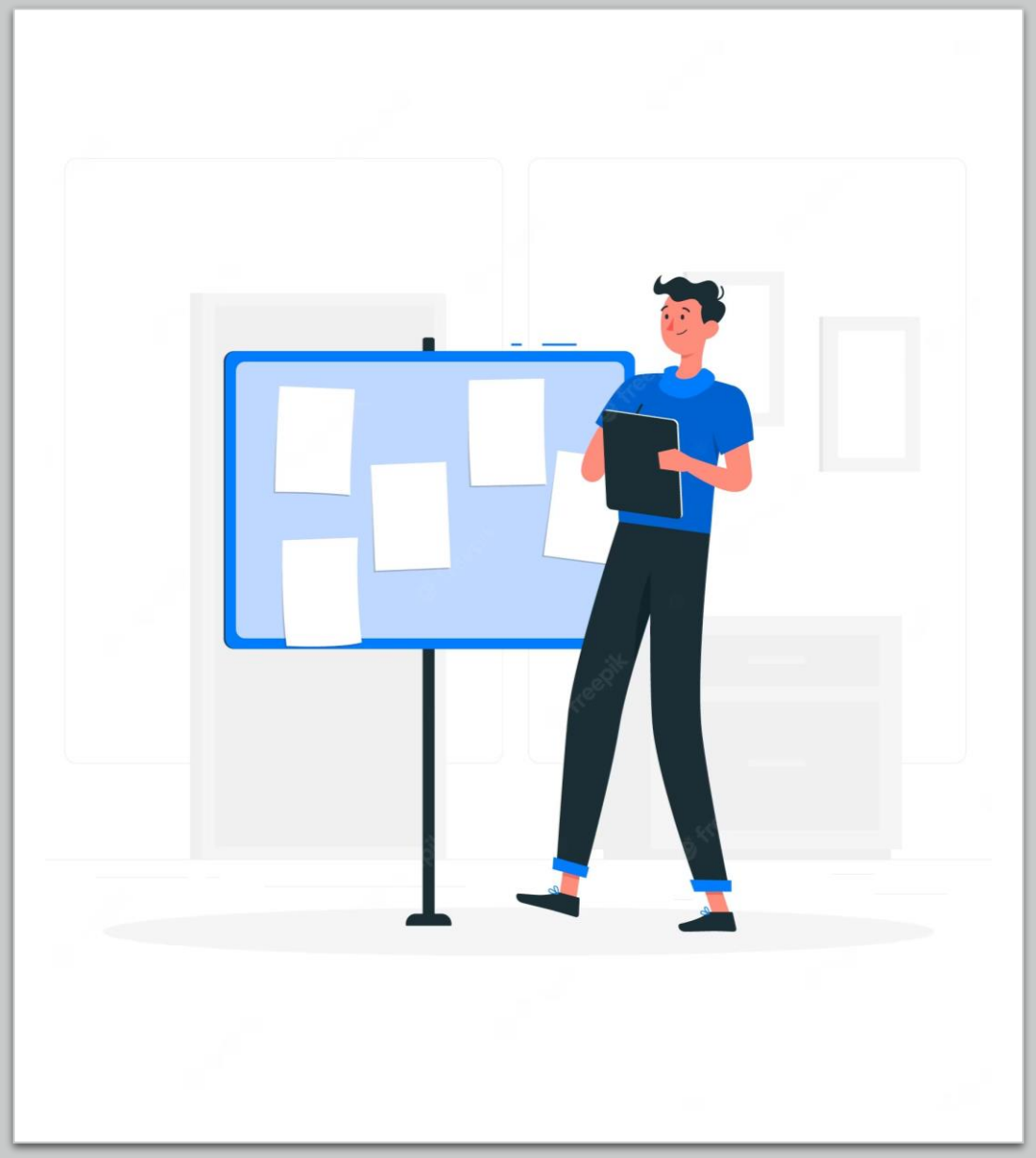
1. Commercial farmers
2. Small-scale & Urban farmers
3. Research institutions
4. Government organizations
5. Nurseries and garden centers
6. Educational institutions

Maquette Design



Hardware

- Hardware Overview
- Program Workflow

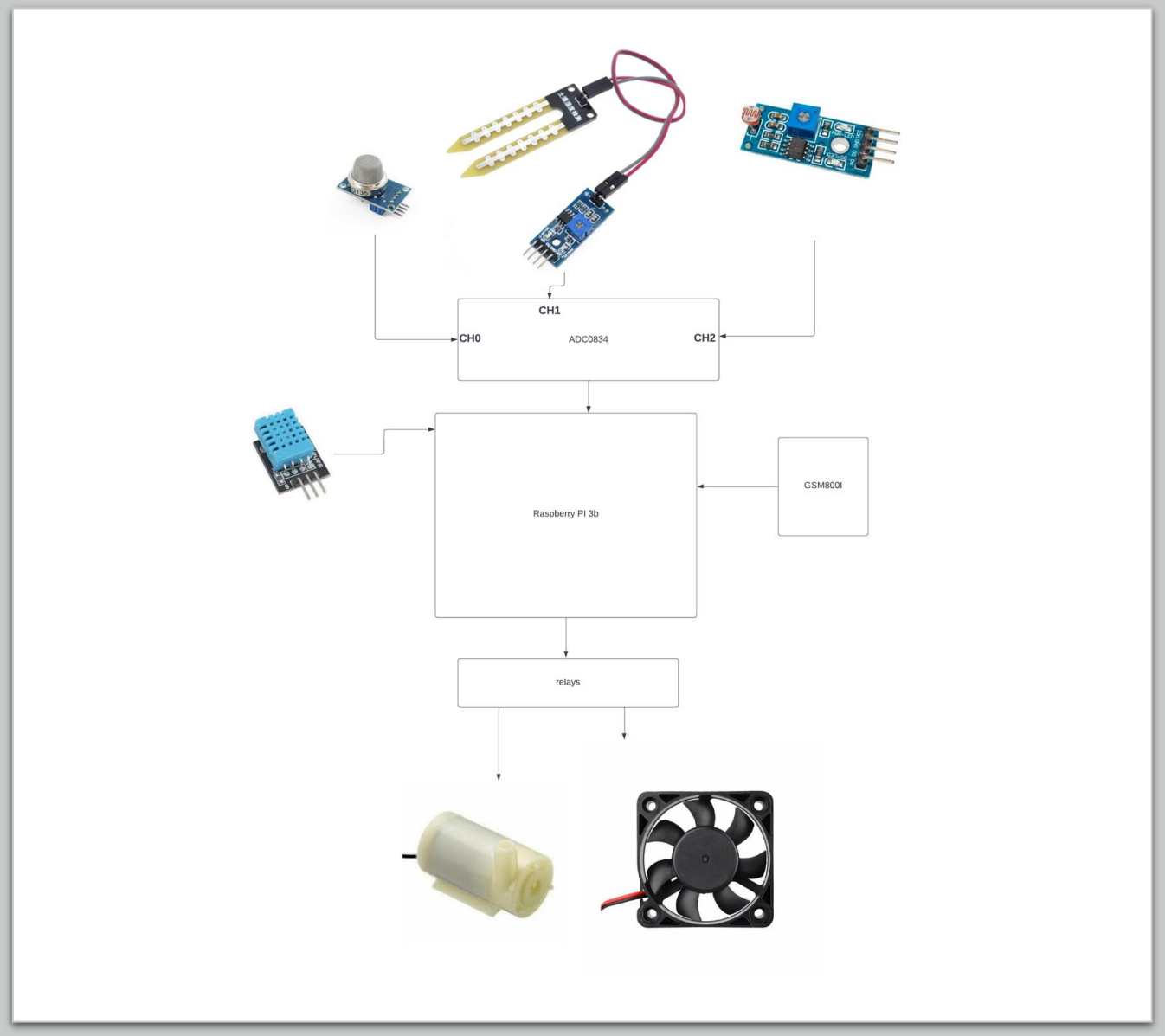


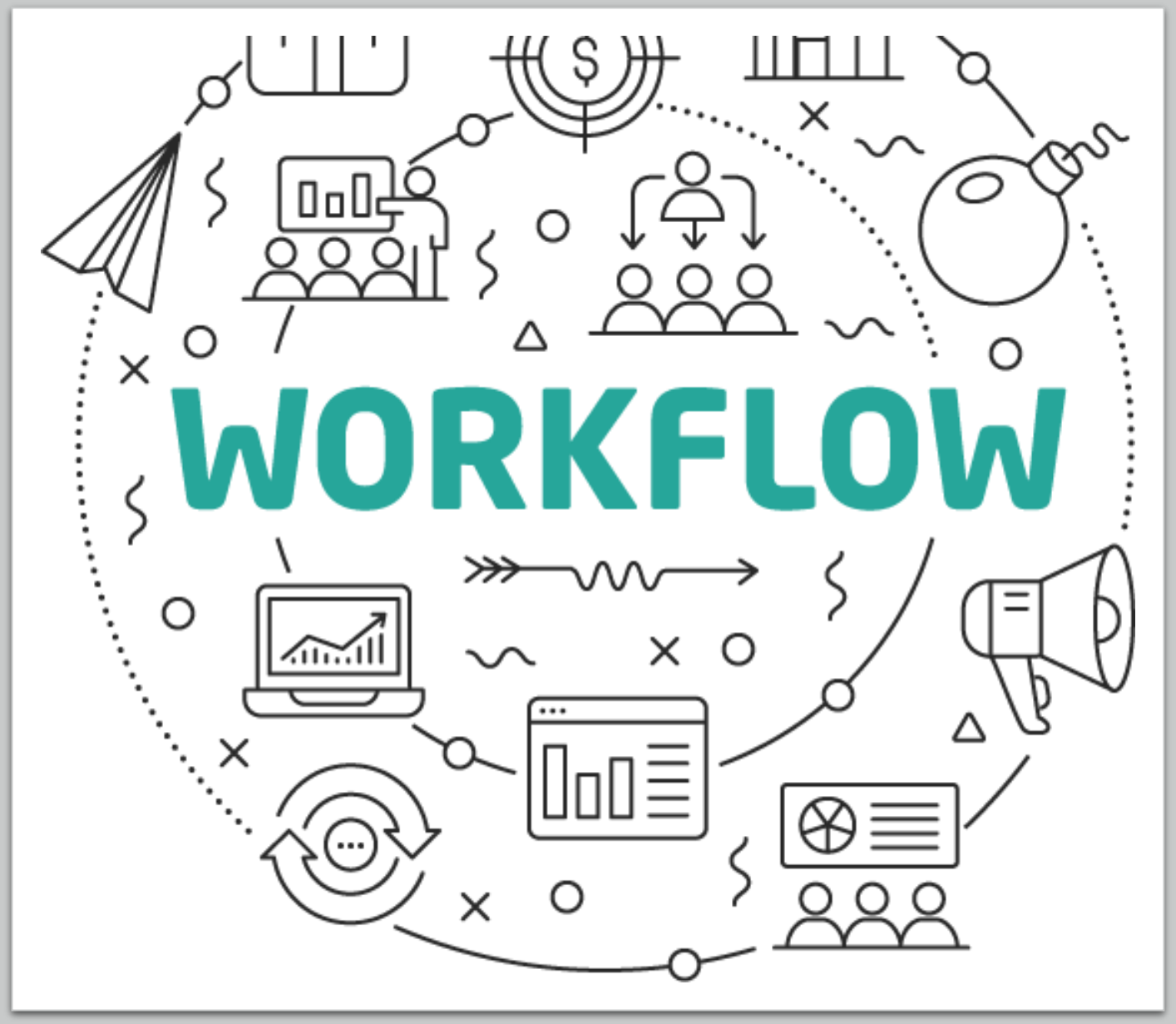
Overview

- Analog digital converter
- Analog Sensors
- Digital Sensor
- Actions

Overview

Hardware



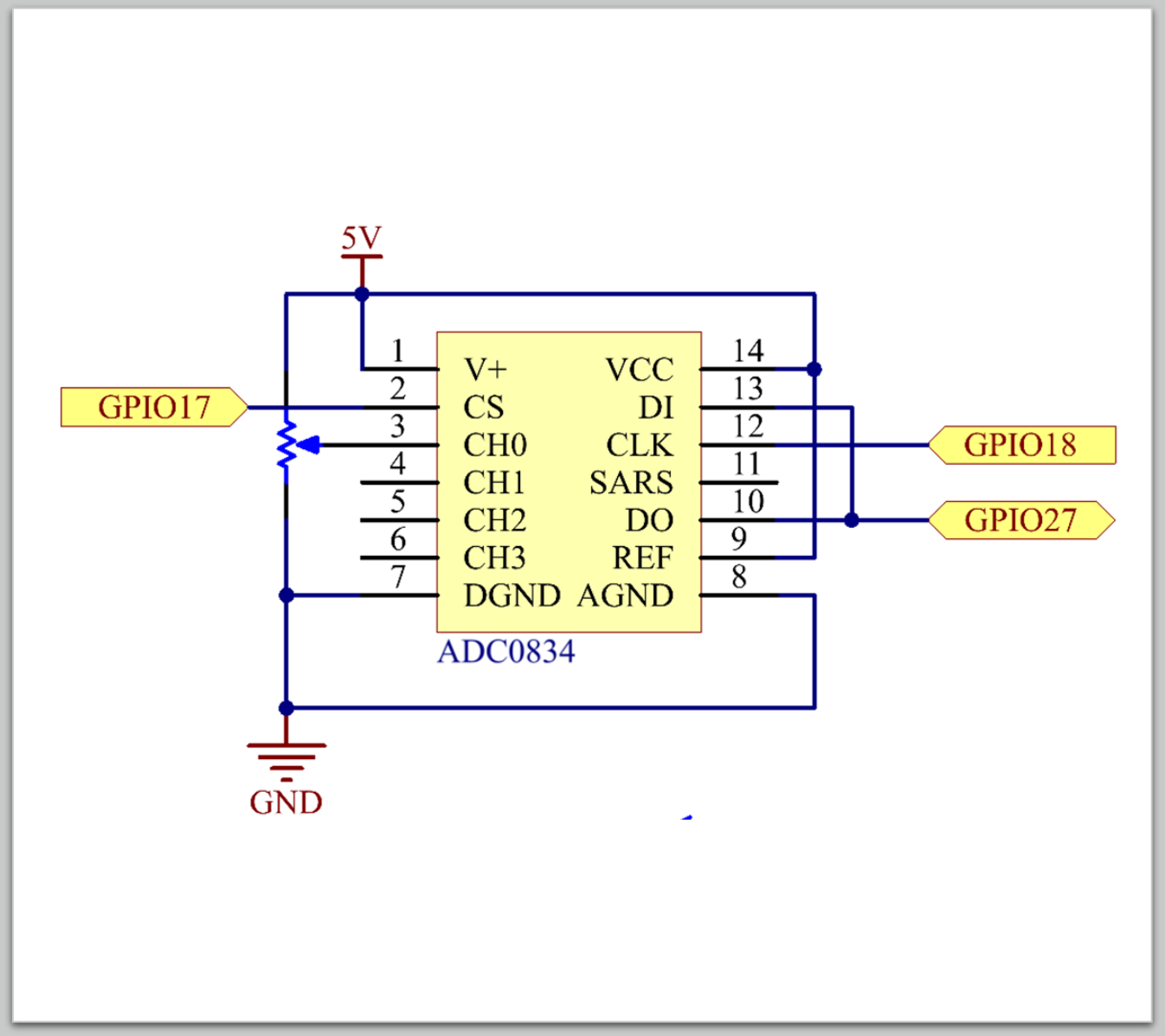


Program Workflow

- Polling is made over each sensor every 5 seconds to check alarm events.
- When alarm events occurs than enable the actuators.
- GSM Module send alarm messages to a default number.

Tools

Analog to digital converter



# of levels (quantization) = 2^8 =265
step size = (5v - 0v) /256 = 0.0195 v

5 volts — 255

1.5 volts → 1.5/(5/256) = 77

0 volts — 0

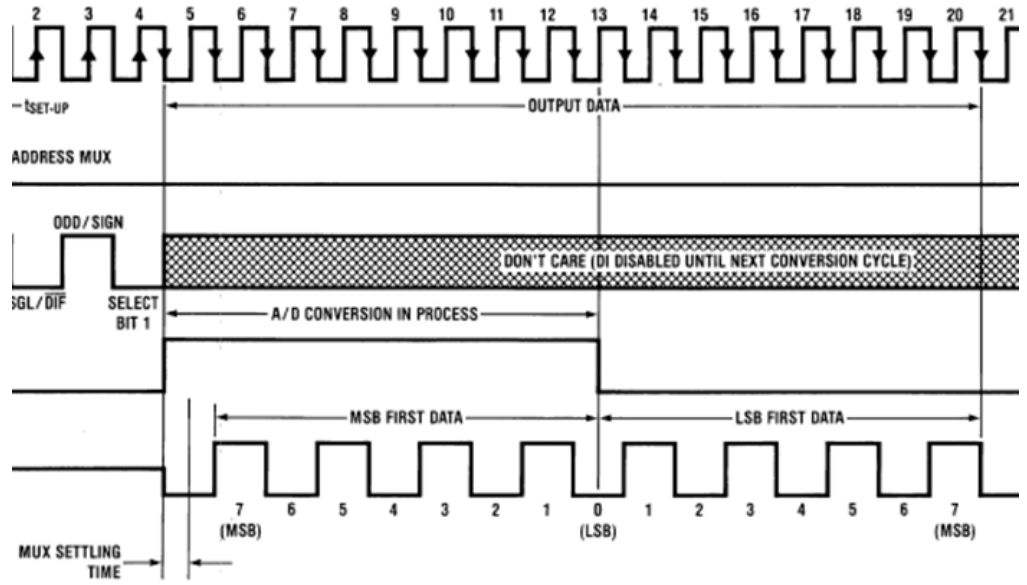


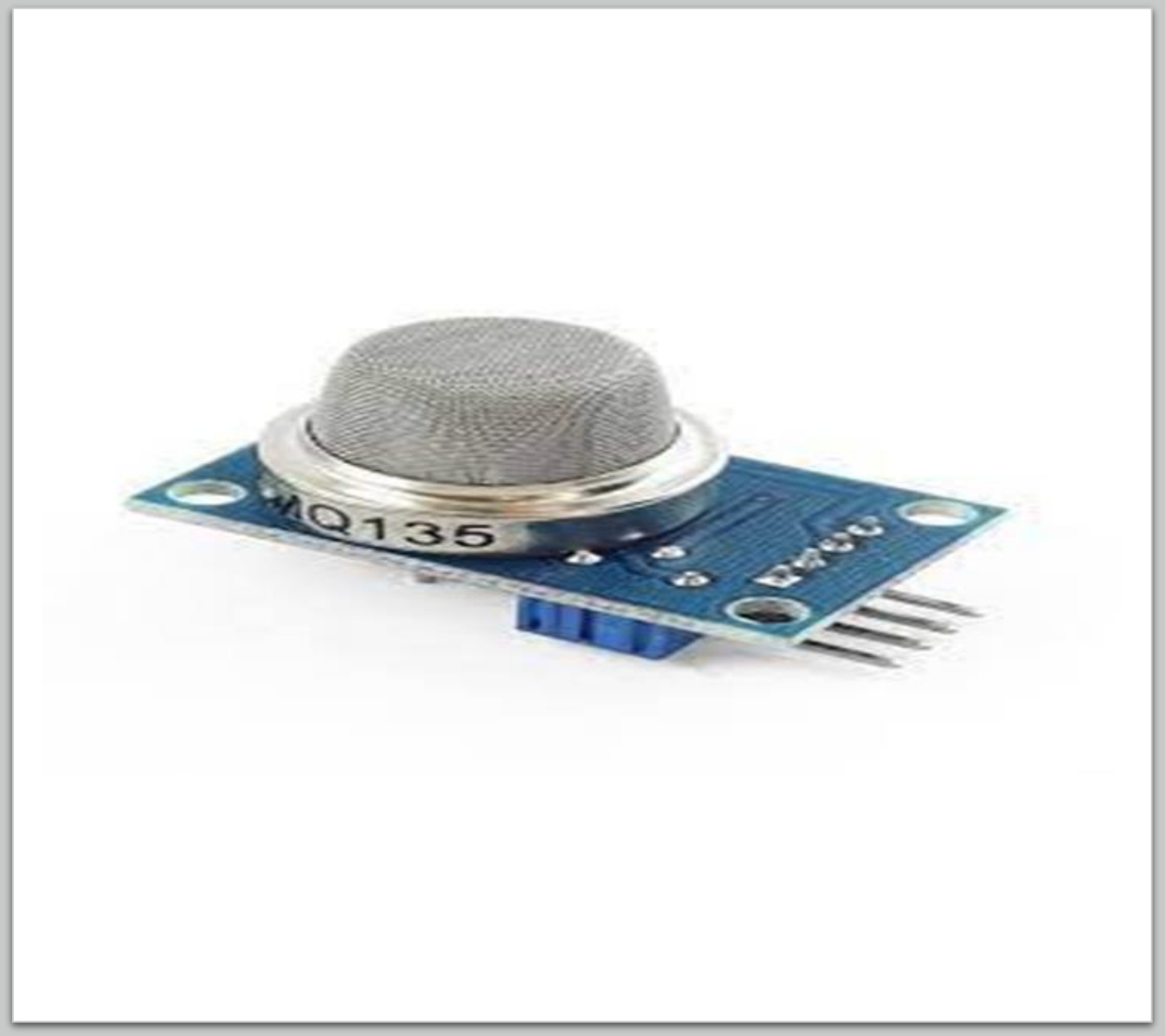
Figure 20. ADC0834-N Timing

Analog to digital converter

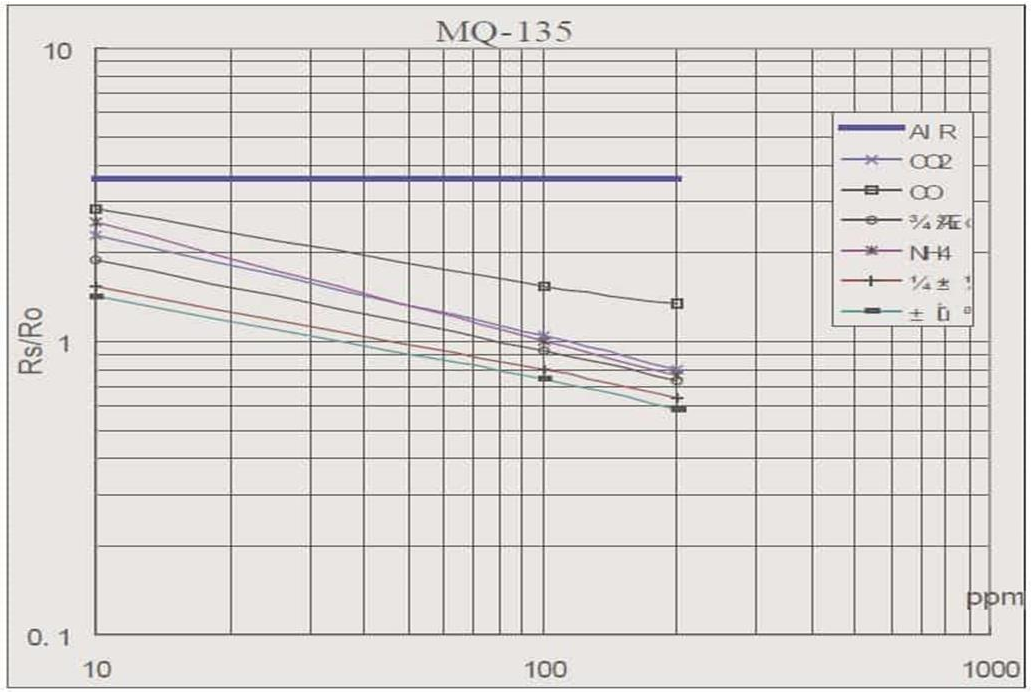
Sampling

Tools

Sensor

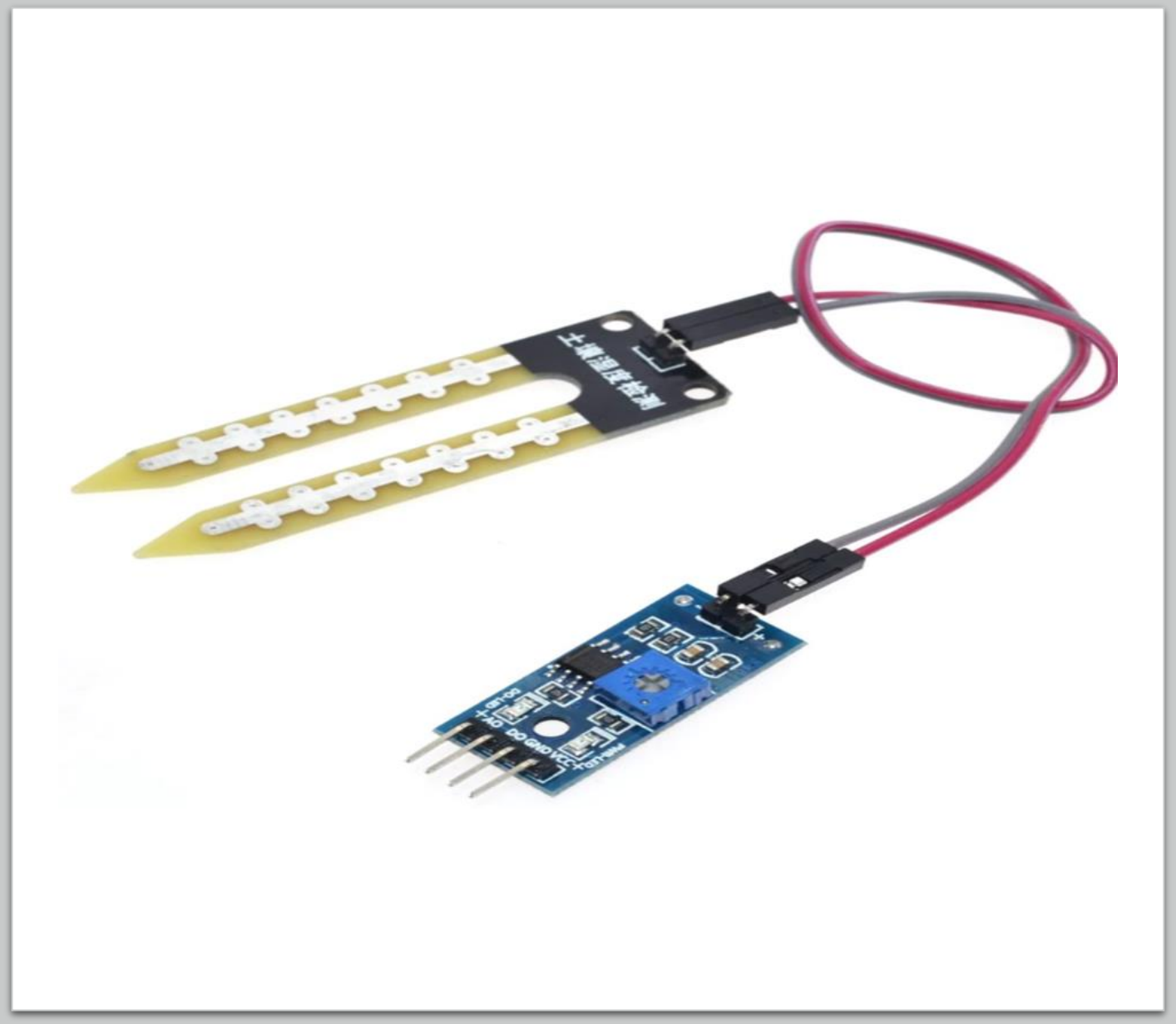


Sensor




```
def getResistance(self):
    #Get the resistance of the sensor, ie. the measurement value
    return ((1023/self.anal) - 1)*RLOAD


def get_ppm(self):
    # Get the ppm of CO2 sensed (assuming only CO2 in the air)
    return PARA * (self.getResistance()/RZERO)**(-PARB)
```

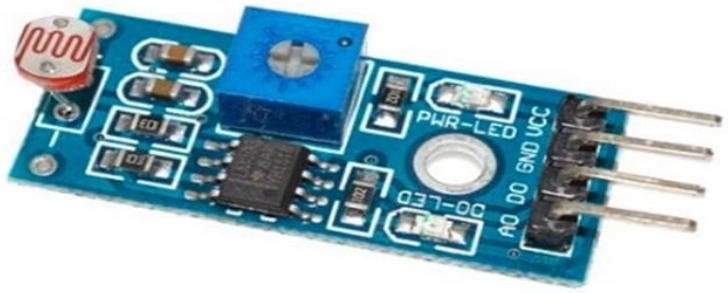


Sensor

Moisture Sensor

Sensor

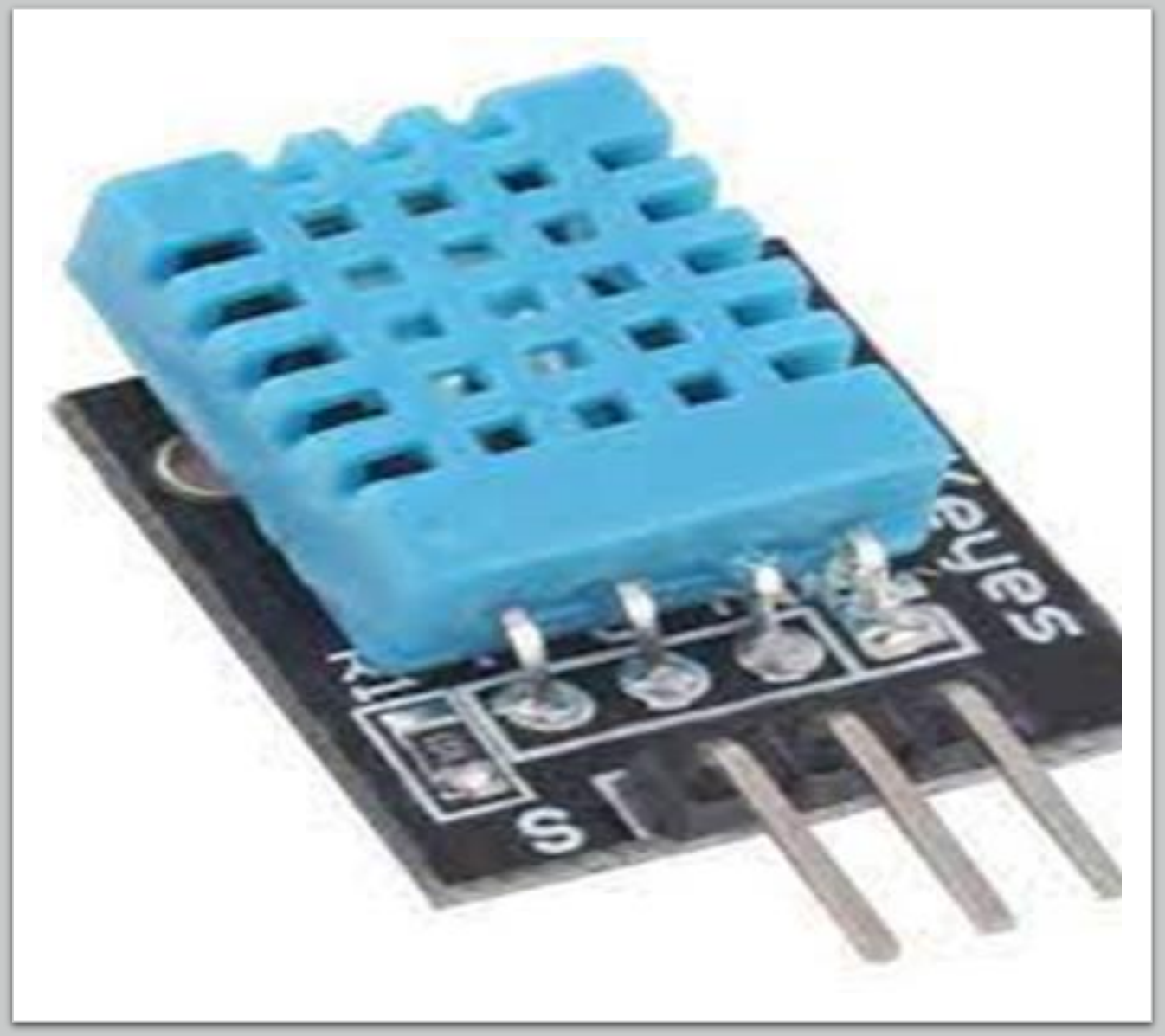
- Light sensor




```
gas = mq135(ADC0834.getResult(0))
gas_mesurement = gas.get_ppm()
humid, temp = Adafruit_DHT.read_retry (temp_sensor,
dht11_pin)
moist = ADC0834.getResult(1)
Brightness = ADC0834.getResult(2)
```

Sensor

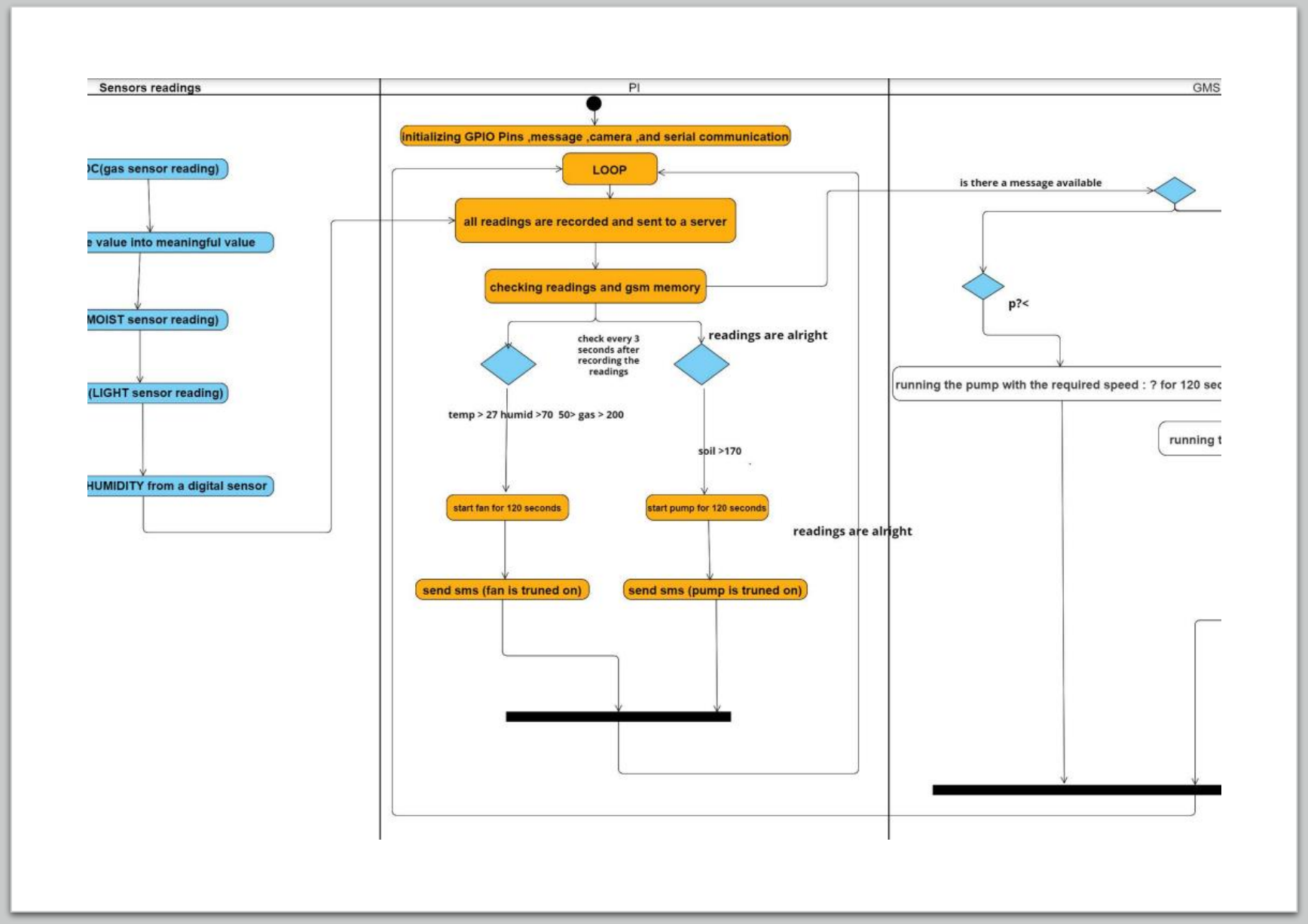
Temperature sensor



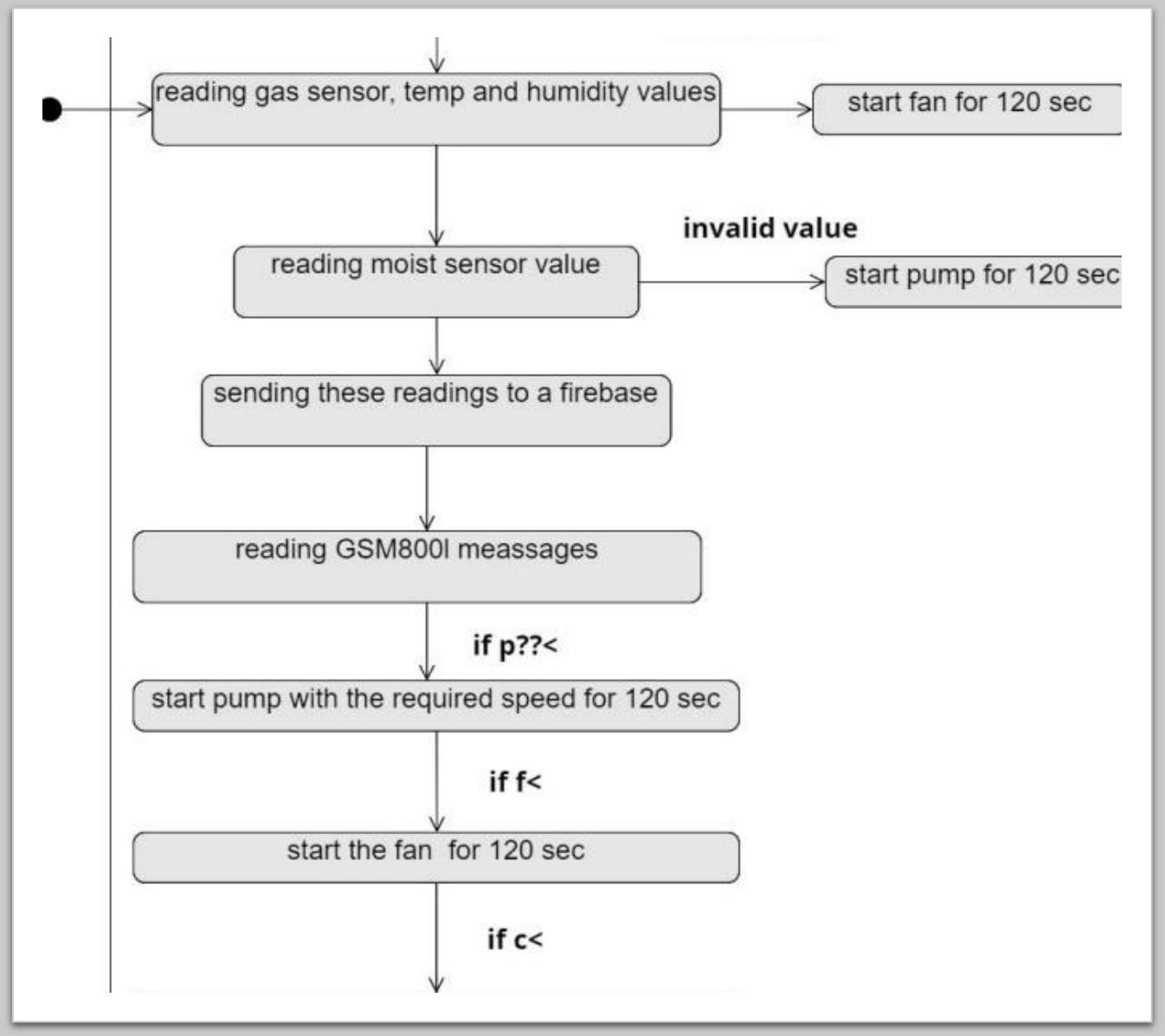
Output Stage

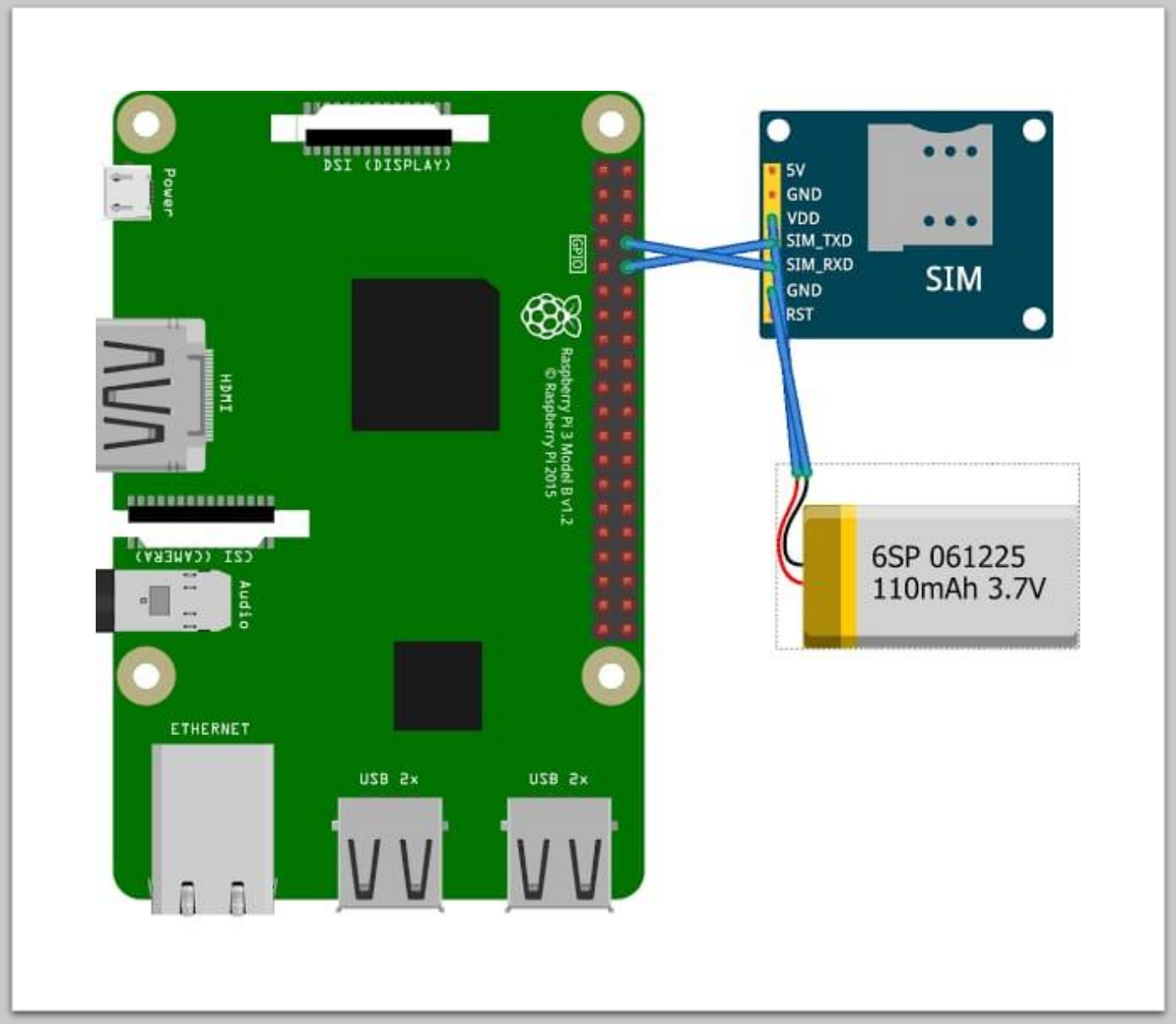
- **Actions considering the output**
- **1.fan: when the gas sensor readings is above 200ppm or below 50ppm or the temp was > 27 degree Celsius or the humid was larger than 70 2 actions are taken:**
- **a. fan works for 120 sec**
- **b. a message is sent to the default number with text:**
- **the fan is turned on due to: temp:{0}\n humid:{1}\n gas:{2}\n flag is {3}**
- **2. pump: when the moist level is > 200 2 actions are taken:**
- **a. pump works for 120 sec**
- **b. the pump is turned on due to moist:{0}\n flag is {1}**

Program Workflow



State Machine Diagram

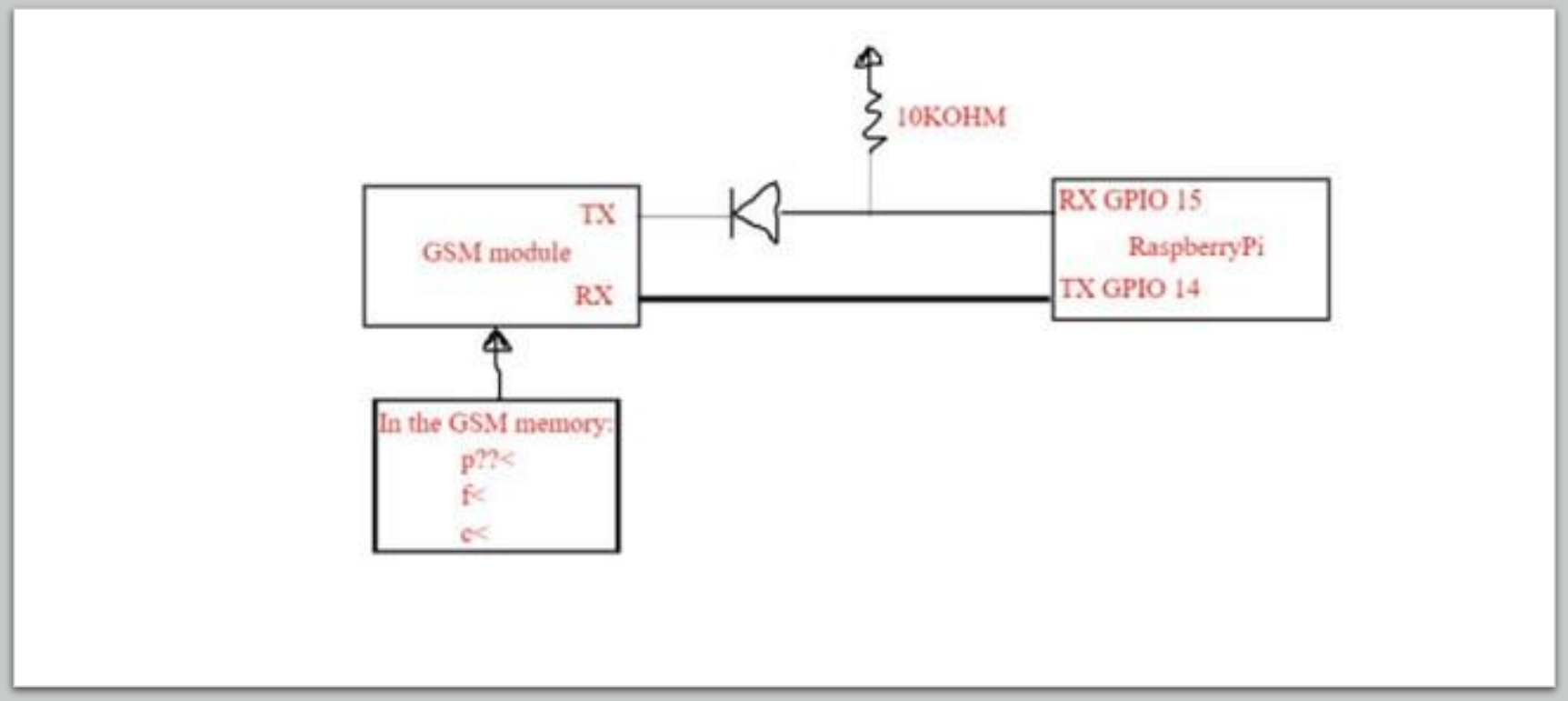




Raspberry pi and GSM connection

Communication Protocols

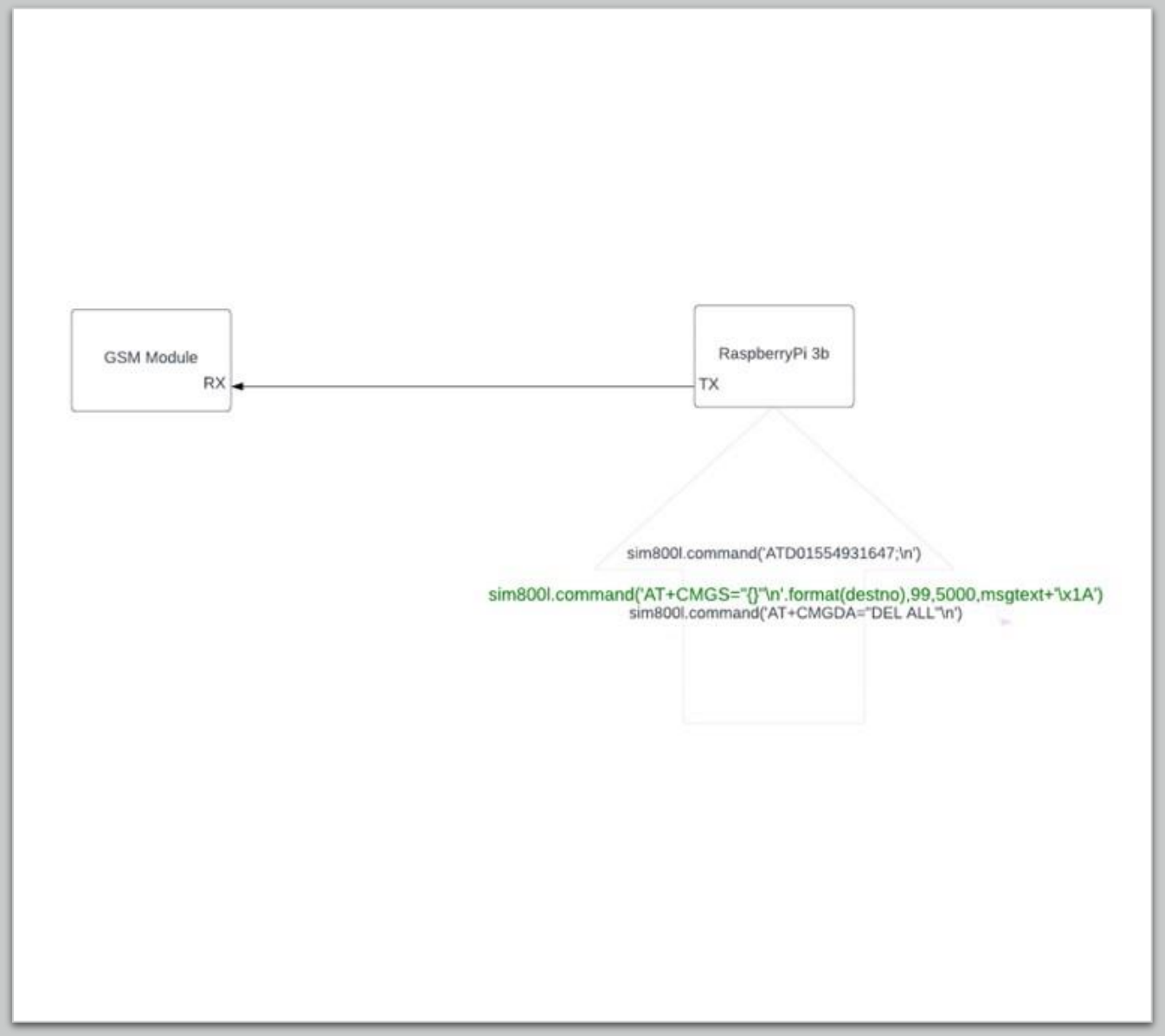
1. GSM Module
2. Functions
3. Commands



GSM Module

- GSM Module and Pi diode are connected with 10 Kohm as level shifter.
- GSM Module has inside a SIM with a specific number to send messages.
- communication protocol: mini UART (Universal Asynchronous RX TX that uses start and end bits every time it RX and Tx)

Functions

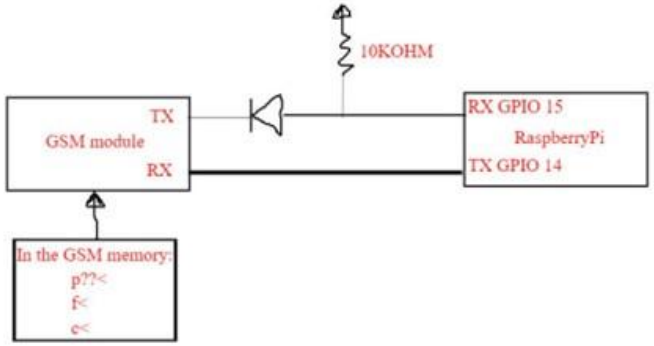

GSM Module
RX
RaspberryPi 3b
TX
sim800l.command('ATD01554931647;\n')
sim800l.command('AT+CMGS="{}"\n'.format(destno),99,5000,msgtext+'\x1A')
sim800l.command('AT+CMGDA="DEL ALL"\n')

Commands

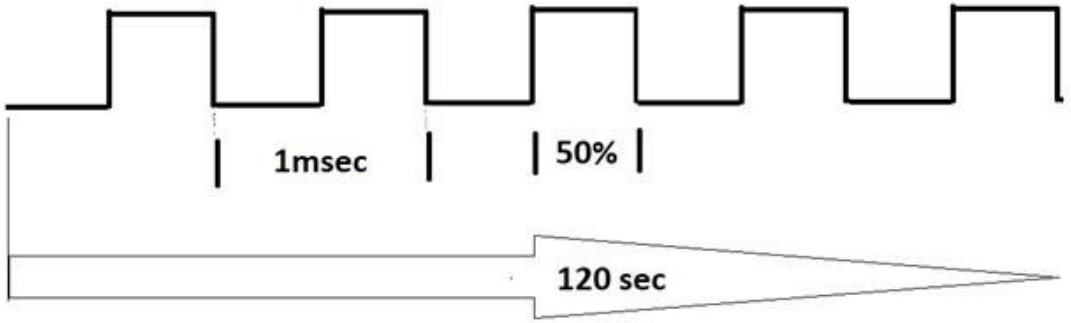
Command	Description
AT+CMGD	DELETE SMS MESSAGE
AT+CMGF	SELECT SMS MESSAGE FORMAT
AT+CMGL	LIST SMS MESSAGES FROM PREFERRED STORE
AT+CMGR	READ SMS MESSAGE
AT+CMGS	SEND SMS MESSAGE
AT+CMGW	WRITE SMS MESSAGE TO MEMORY
AT+CMSS	SEND SMS MESSAGE FROM STORAGE
AT+CMGC	SEND SMS COMMAND
AT+CNMI	NEW SMS MESSAGE INDICATIONS
AT+CPMS	PREFERRED SMS MESSAGE STORAGE
AT+CRES	RESTORE SMS SETTINGS
AT+CSAS	SAVE SMS SETTINGS
AT+CSCA	SMS SERVICE CENTER ADDRESS
AT+CSCB	SELECT CELL BROADCAST SMS MESSAGES
AT+CSDH	SHOW SMS TEXT MODE PARAMETERS
AT+CSMP	SET SMS TEXT MODE PARAMETERS
AT+CSMS	SELECT MESSAGE SERVICE

GSM Module

- GSM Module and Pi diode are connected with 10 Kohm as level shifter.
- GSM Module has inside a SIM with a specific number to send messages.
- communication protocol: mini UART (Universal Asynchronous RX TX that uses start and end bits every time it RX and Tx)



- p50< : p10<
- f<
- c<



MobileApp

1. Why Flutter?
2. App Flow

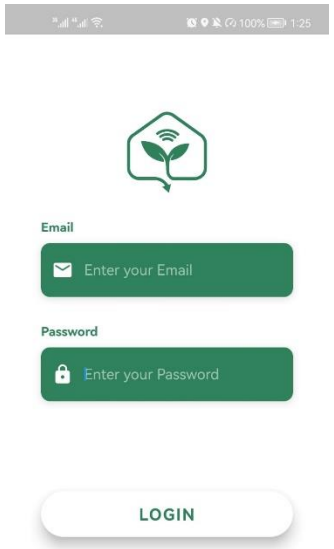
Why Flutter?

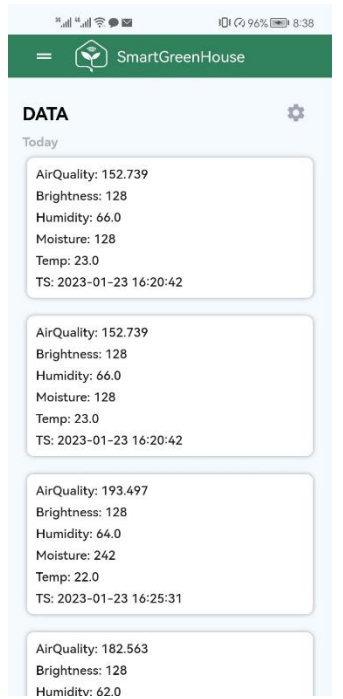
- Flutter Can work in any platform such as Android and IOS

- Same UI and Business Logic in All Platforms.
- Reduced Code Development Time.
- Increased Time-to-Market Speed.
- Similar to Native App Performance.
- Custom, Animated UI of Any Complexity Available.

Dart

App Flow


Email
Enter your Email
Password
Enter your Password
LOGIN


SmartGreenHouse
DATA
Today
AirQuality: 152.739
Brightness: 128
Humidity: 66.0
Moisture: 128
Temp: 23.0
TS: 2023-01-23 16:20:42
AirQuality: 152.739
Brightness: 128
Humidity: 66.0
Moisture: 128
Temp: 23.0
TS: 2023-01-23 16:20:42
AirQuality: 193.497
Brightness: 128
Humidity: 64.0
Moisture: 242
Temp: 22.0
TS: 2023-01-23 16:25:31
AirQuality: 182.563
Brightness: 128

Website

1. Why WordPress?
2. The purpose of the website & Website Content
3. Dashboard Configuration
4. Tools

Why Wordpress?

What is wordpress?

Benefits of Using WordPress for Business Website

The purpose of the website & website content

Present our brand

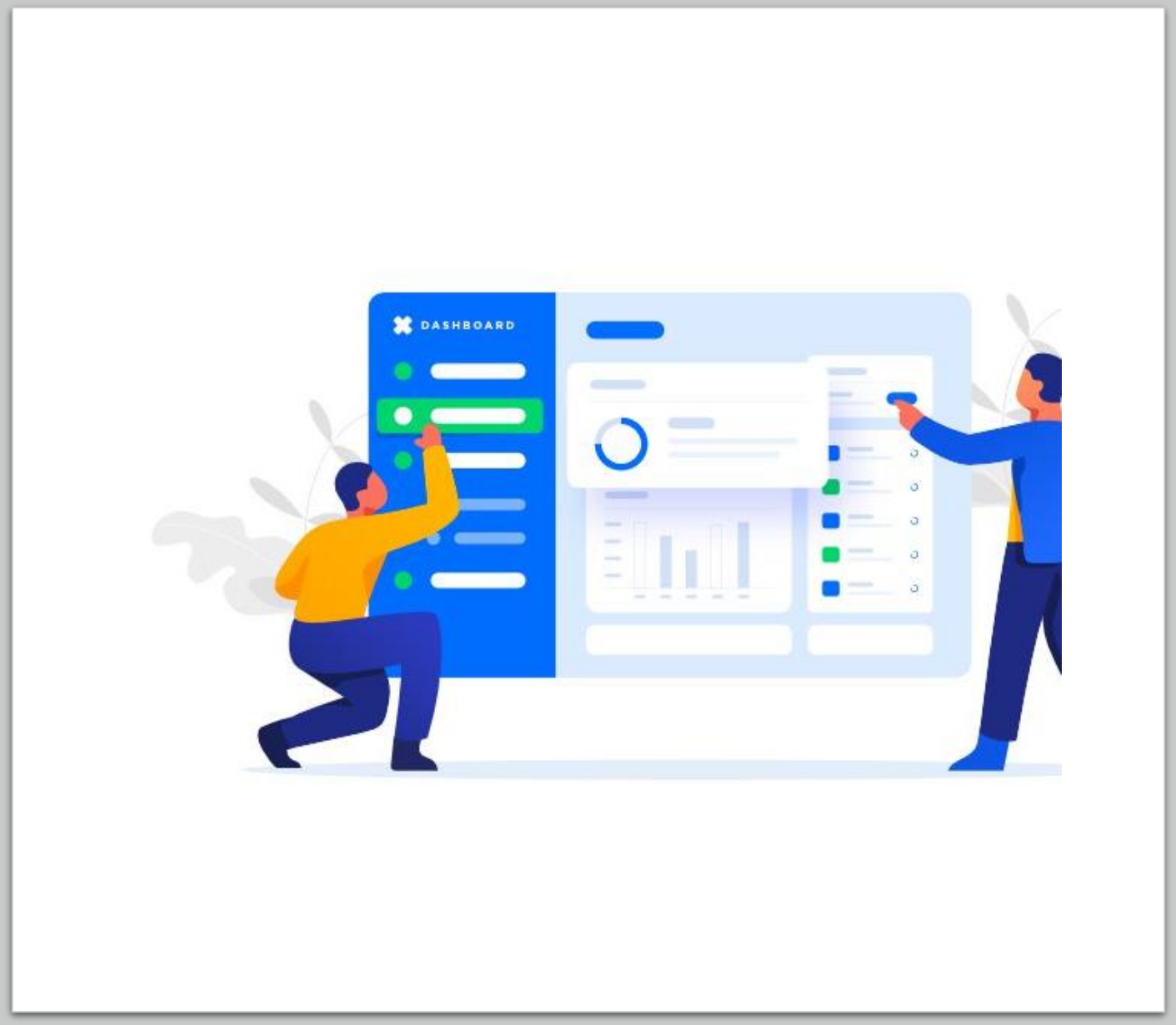
Let the users know about us

Let the users access their dashboard

Website Content

Dashboard Configuration

- Power BI
- Access



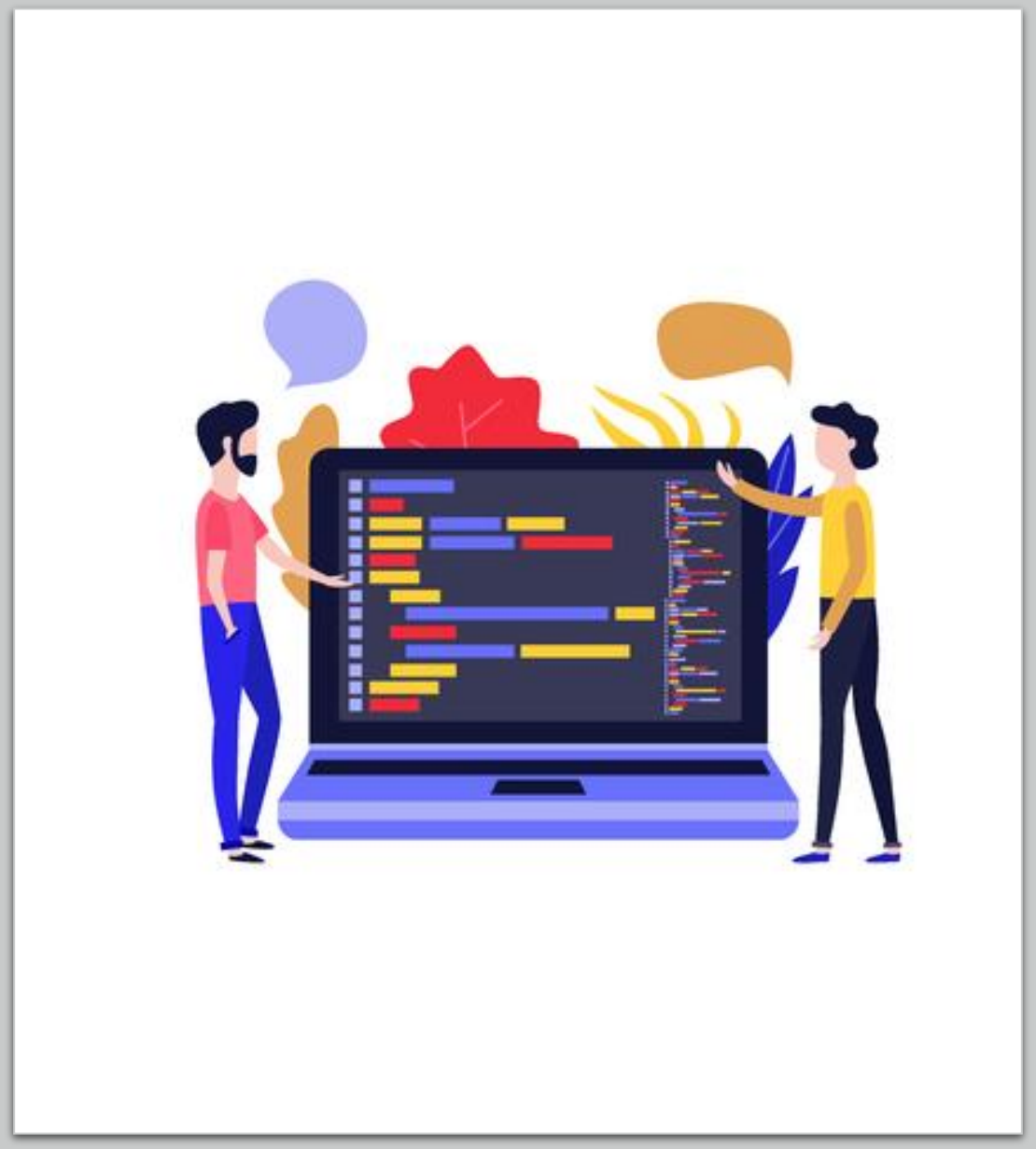
Tools

Wordpress

Custom CSS

JavaScript

Back-end (PHP)



Security

1. Web Application
2. Mobile Application

Web Application

- WordPress website up-to-date version [6.1.1]
- No 0days exploits
- Enumerating the website plugins using a wordlist
- It turns out the website has 4 Plugins
  - elementor
  - contact-form
  - Mailchimp
  - Siteorigin-panels

Vulnerabilities

- Vulnerable to CVE-2017-5487 (the REST API implementation in WordPress doesn't properly restrict listings of post authors, which allows remote attackers to obtain sensitive information via a wp-json/wp/v2/users request.)
- Vulnerable endpoint :
  - https://green-house.website/?rest_route=/wp/v2/users/

Vulnerability

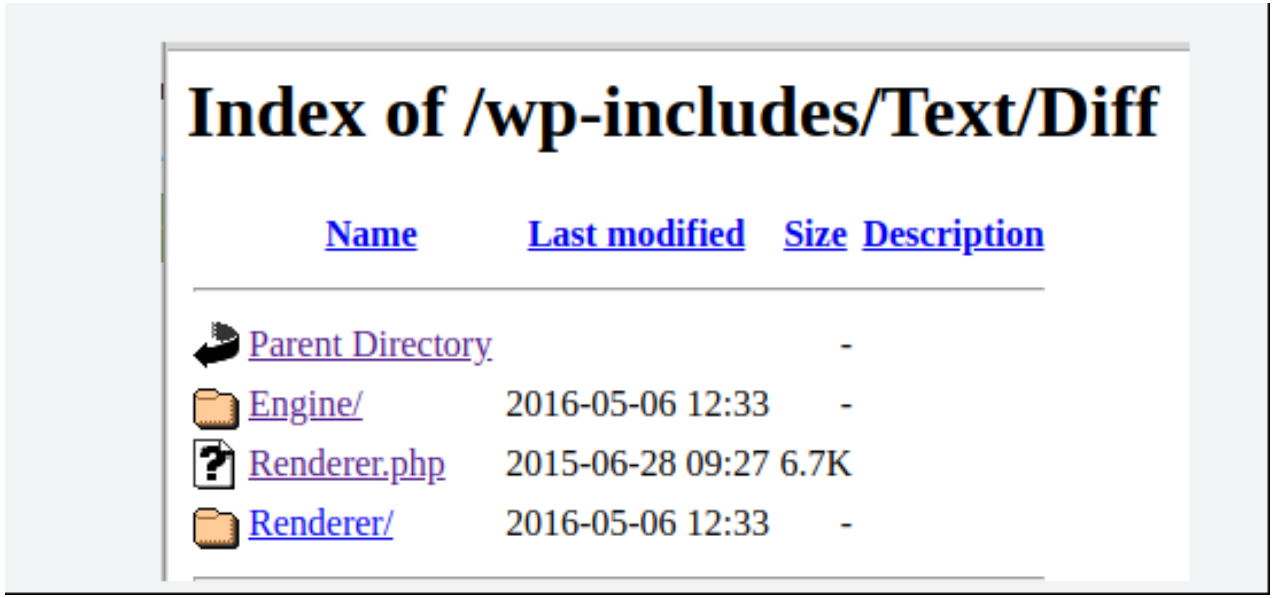

```
[{"id":1,"name":"abdallahabdelsalam12@gmail.com","url":"http:\/\/green-
house.website","description":"","link":"https:\/\/green-house.website\/?
author=1","slug":"abdallahabdelsalam12gmail-com","avatar_urls":
{"24":"https:\/\/secure.gravatar.com\/avatar\/267f5c2db6df5dfcb19bcef37778828a?
s=24&d=mm&r=g","48":"https:\/\/secure.gravatar.com\/avatar\/267f5c2db6df5dfcb19bcef3777
```


After Fix


```
{"code":"rest_login_required","message":"REST API restricted to authenticated users.","data":{"status":401}}
```

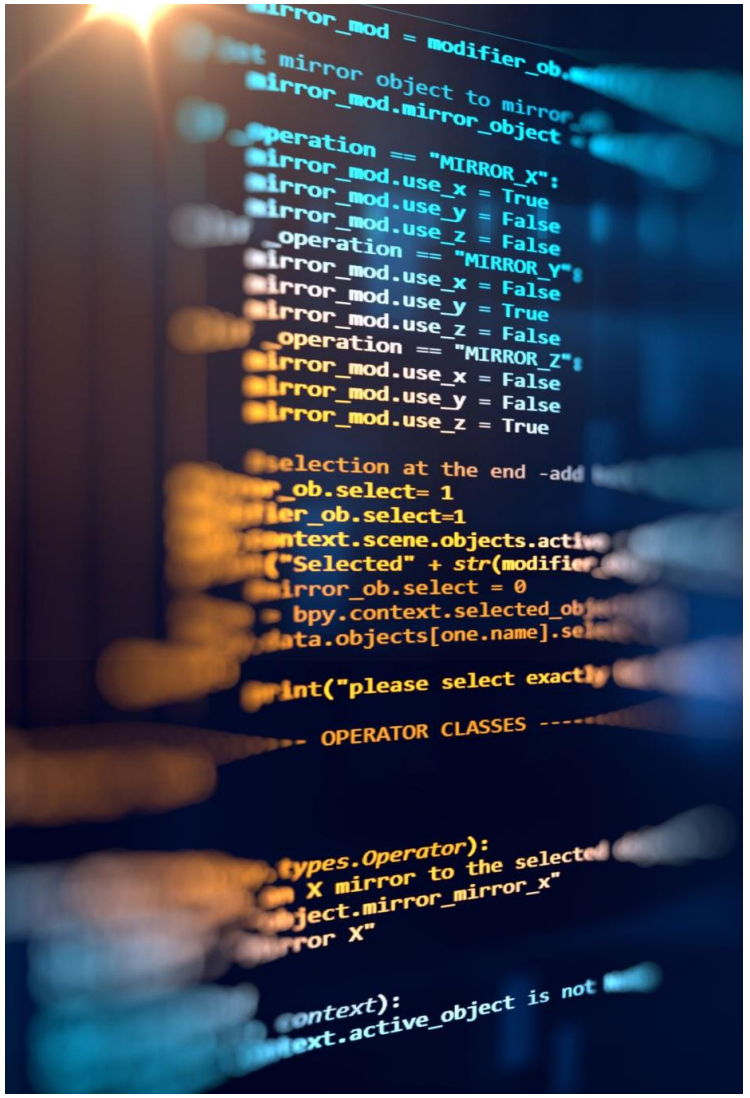
Defenses

- Disable User Enumeration
- Limited Access to the wp-admin area
  - Change the Login Page location (default: /wp-admin) changed to a random path that cannot be brute-forced eg (https://green-house.website/?admin-0nly)
- Remove Wordpress Version Number (To Avoid Targeted attacks based on the version number)
  - **Remove WordPress Meta Generator Tag**
  - **Remove Slider Revolution Meta Generator Tag**
- Server Hardening
  - **Hide Directory Listing of WP includes**
  - Example of Directory Listing



Mobile Application

- Static Analysis
  - Analyzing software code or other data without executing
  - Hardcoded API Keys - Passwords - URLs
- Dynamic Analysis
  - Analyzing software by executing it and observing its behavior. In the context of mobile apps
  - API Testing



Static Analysis Outcomes

- Extracting the URLs in the apk resulted in
  - https://app.powerbi.com/reportEmbed?reportId=0caf4f22-abd5-40a8-969d-919e0cc5f24d&autoAuth=true&ctid=5fcc9d9b-e3d3-4e19-ac0c-90aacae677cf
  - https:// api.flutter.dev
  - https:// console.firebase.google.com
  - https://github.com
  - https://flutter.dev/docs/release/breaking-changes/network-policy-ios-android.
  - https://greenhouse-bcd96-default-rtdb.firebaseio.com

Exploiting Firebase

- https://greenhouse-bcd96-default-rtdb.firebaseio.com/.json
- Due to insufficient authorization, anyone has public read, and write access to database

Public Access


```
{"-NMoO8E79Fht9MpksF4v":{"AirQuality":348.0711117583883,"Brightness":128,"Humidity":54.0,"Moisture":255,"Tempreture":22.0,"TimeStamp":"2023-01-27
18:01:25"},"-NMoOBSqioWkmDm0C51j":
{"AirQuality":348.0711117583883,"Brightness":128,"Humidity":54.0,"Moisture":255,"Tempreture":23.0,"TimeStamp":"2023-01-27 18:01:50"},"-
NMoOEgdlZ0mPaT9X67m":{"AirQuality":348.0711117583883,"Brightness":128,"Humidity":53.0,"Moisture":255,"Tempreture":23.0,"TimeStamp":"2023-01-27
18:02:04"},"-NMoOHvOpInEyCky2CiA":
{"AirQuality":341.19229324392353,"Brightness":128,"Humidity":53.0,"Moisture":255,"Tempreture":23.0,"TimeStamp":"2023-01-27 18:02:17"},"-
NMoOL9JD1PqZx4xOmvn":{"AirQuality":348.0711117583883,"Brightness":128,"Humidity":53.0,"Moisture":255,"Tempreture":23.0,"TimeStamp":"2023-01-27
18:02:30"},"-NMoOP-ZcqUtP9AKT2ly":
{"AirQuality":0.28548823487567515,"Brightness":128,"Humidity":52.0,"Moisture":255,"Tempreture":23.0,"TimeStamp":"2023-01-27 18:02:46"},"-NMoOSF-sr
kkDP6hPQ":{"AirQuality":0.28548823487567515,"Brightness":128,"Humidity":154.0,"Moisture":255,"Tempreture":11.0,"TimeStamp":"2023-01-27 18:02:59"},
NMoOVTmG62FAQZAiJ28":{"AirQuality":0.28548823487567515,"Brightness":128,"Humidity":52.0,"Moisture":255,"Tempreture":23.0,"TimeStamp":"2023-01-27
18:03:12"},"-NMoOYhc1gL-QtKyV4uA":
```

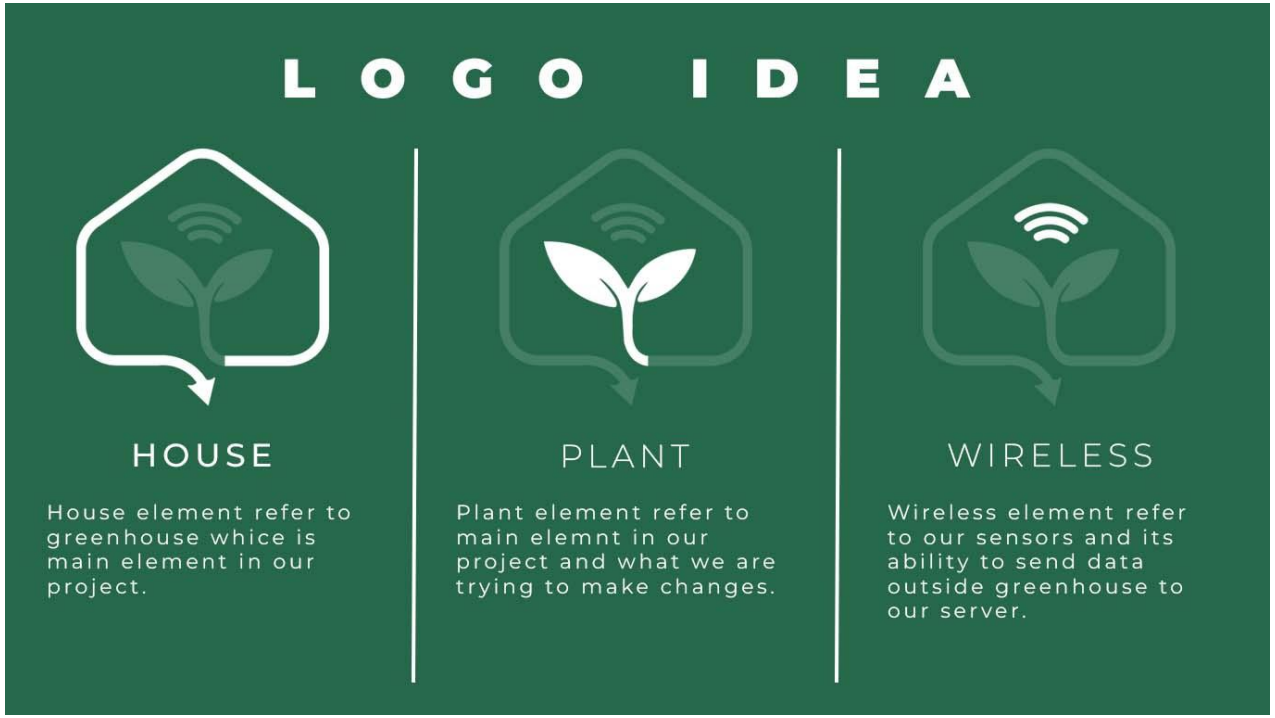
- Attacker can use curl -X PUT -d '{"data": "value"}' 'https://greenhouse-bcd96-default-rtdb.firebaseio.com/.json' to remove and override all the data and write his own content

Brand Identity

- It refers to the visual and verbal elements that make up the brand's image and reputation
- Company logo, color scheme and letters
- Create a unique corporate identity and differentiate it from competitors

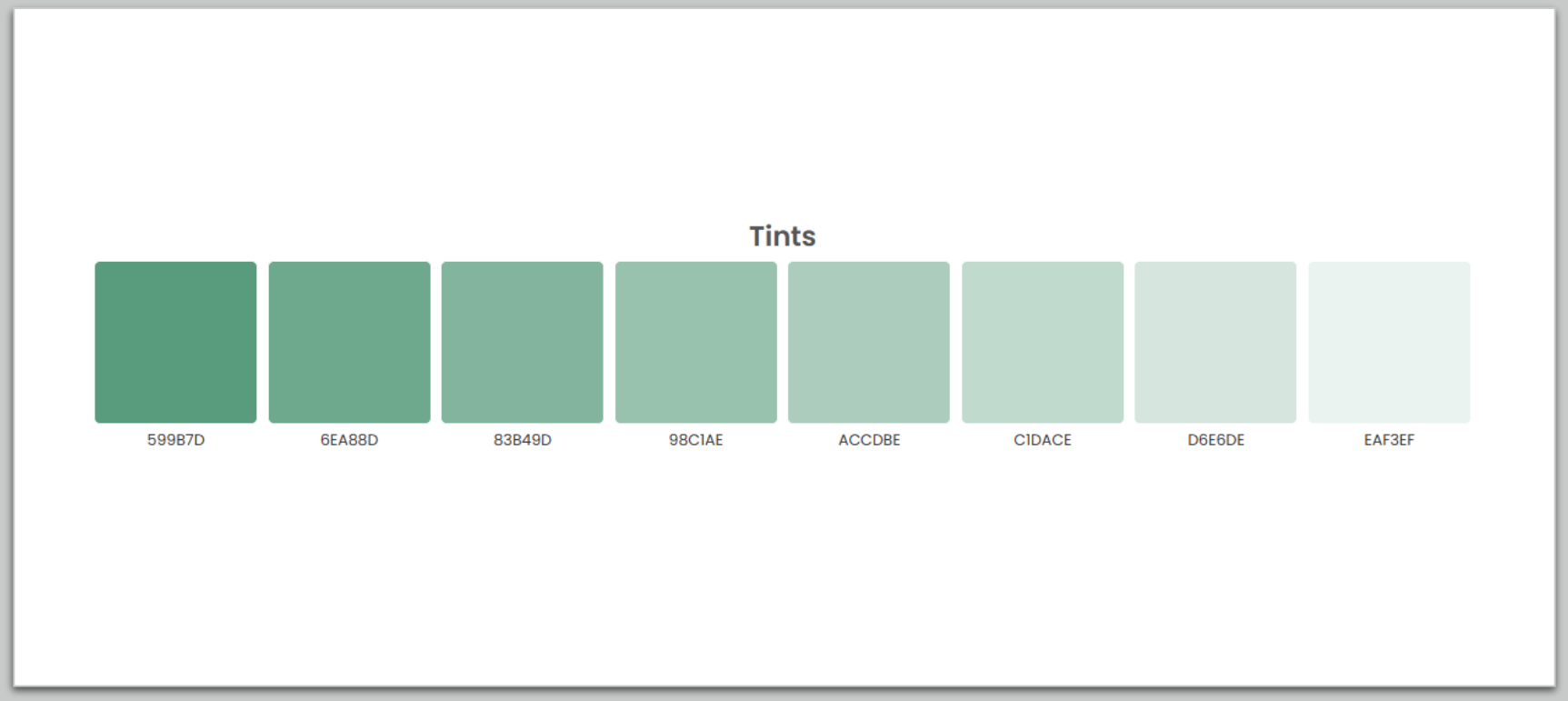
The Logo

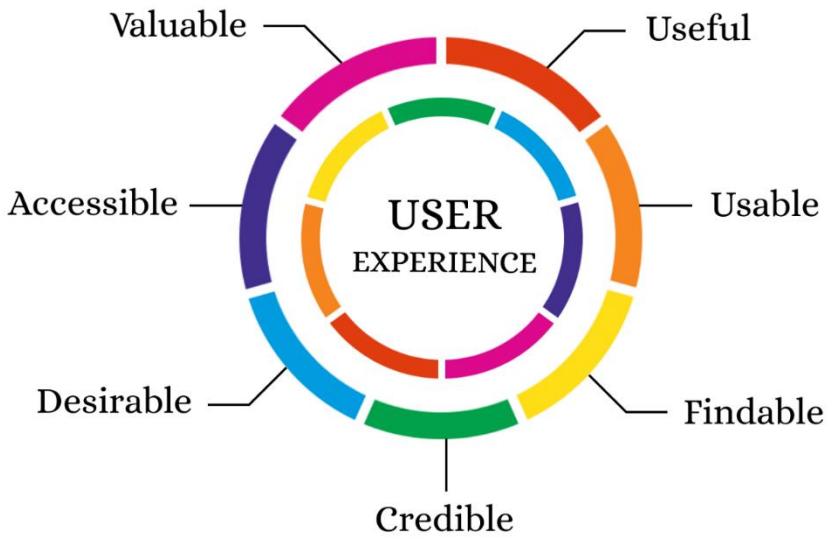
- Agricultural greenhouse: provides suitable conditions for the plant
- Plant: has all our attention
- The wireless: The data coming out of the sensor is transmitted over the Internet



The typeface & colors

- You will tell me the name of the font and we will show it ==> After a lot of rotation and coordination, she chose the font (nasalization).
- We will talk about colors ==> The two main colors were SEA GREEN and WHITE.



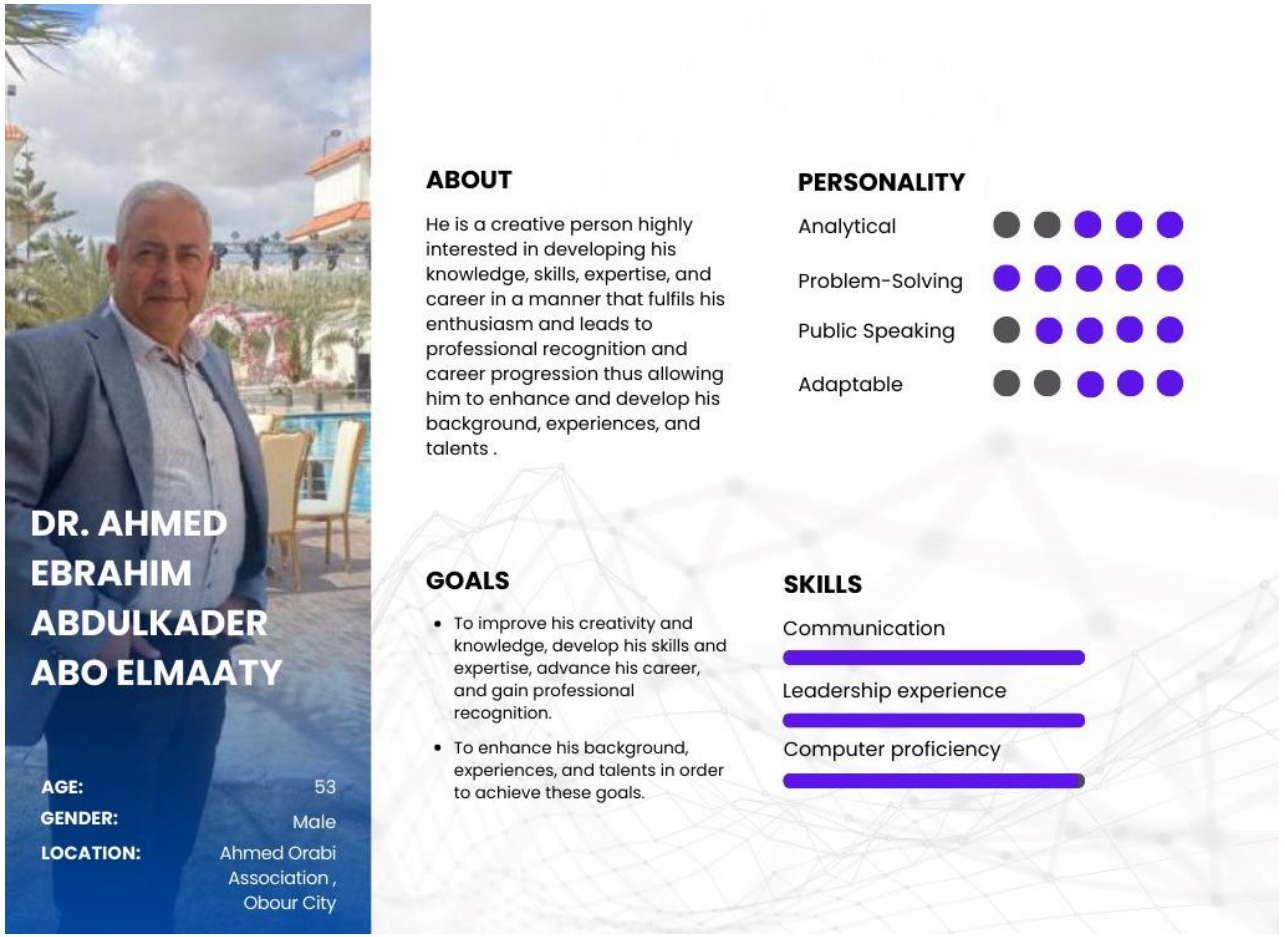


What is the user experience?

- we use is the basis for solving problems that users encounter in using our products.
- It is the process of designing and developing products or services that provide a positive and enjoyable experience for users.
- It involves understanding users' needs, wants, and motivations, and using that understanding to create products or services that meet or exceed their expectations.

User Persona

1. Research: This includes gathering information about users and their needs, in addition to the context in which the product or service will be used. This may include user interviews, surveys, focus groups, and other methods for collecting user feedback.



- We conducted many interviews with users interested in the field of greenhouse farming, organic and biodynamic agriculture

1. Dr. Ahmed Abu Al-Maati, 53 years old, graduated from the Faculty of Electronics Engineering in 1990 and holds a PhD in organic agriculture. He was focused on using new technology in the field of agriculture and reducing chemical fertilizers.

- We conducted many interviews with users interested in the field of greenhouse farming, organic and biodynamic agriculture

2. Ibrahim Hassan Khafagy, 38, director of the Future Agricultural Investment Company, a graduate in agricultural engineering and interested in agricultural greenhouses.

User Persona

2. Design: This includes creating initial models, wireframes, and other design elements that will be used to build the final product or service. The goal is to create a user-friendly, easy-to-use, and visually pleasing design.

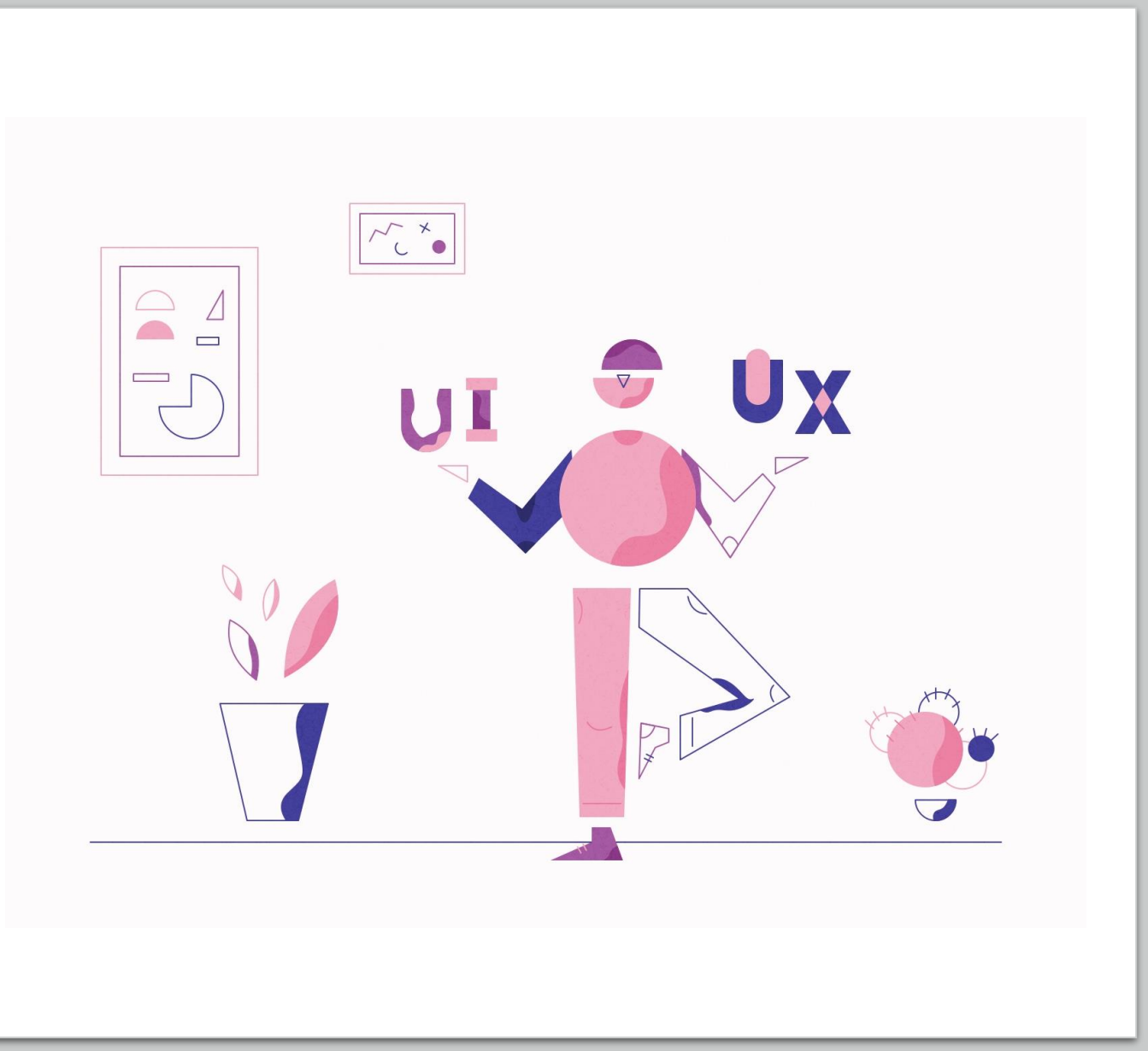
3. Testing: This includes testing the product or service with users to gather feedback and make improvements. This can include usability testing, where users are asked to perform specific tasks with the product or service, and acceptance testing, where users are asked to evaluate their overall experience using the product or service.

4. Implementation: This includes building the final product or service based on the design, and making any necessary changes based on feedback collected during testing.

5. "Evaluation" includes collecting feedback from users after the release of the product or service , and using this feedback to make ongoing improvements to the user experience.

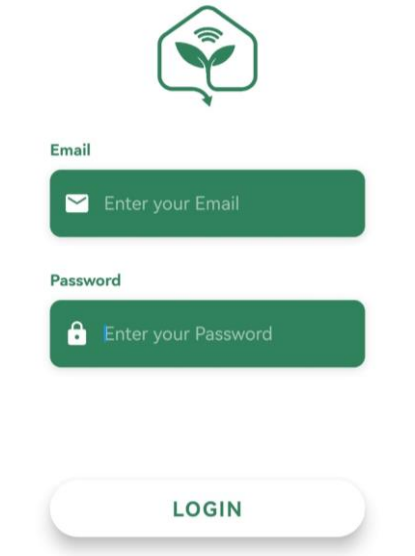
UI

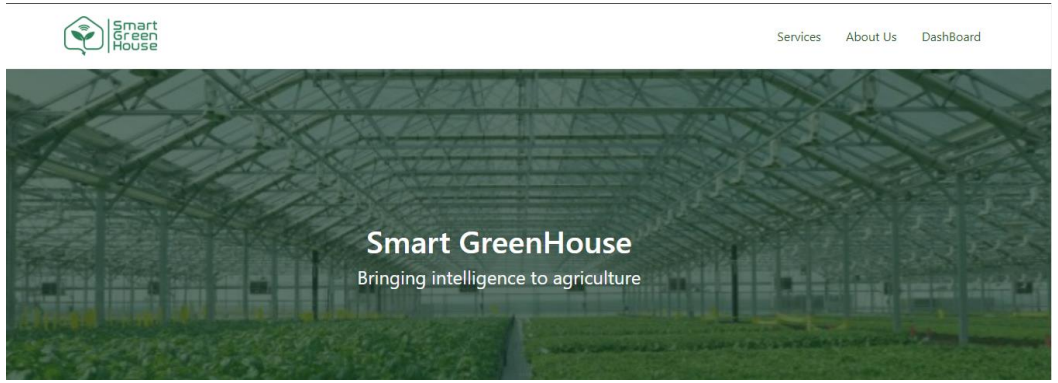
- What is UI?
- Expected users' goals.



Design Implementation

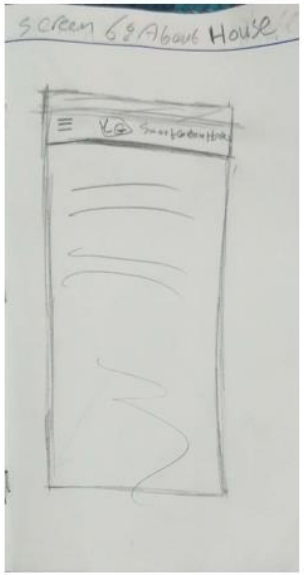
- Wireframes
- Figma



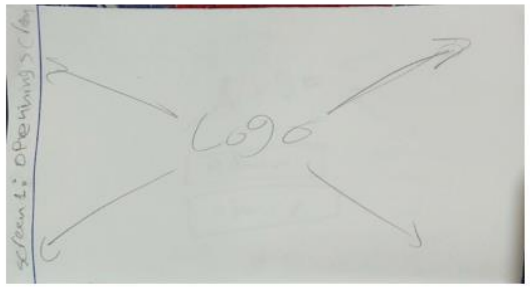


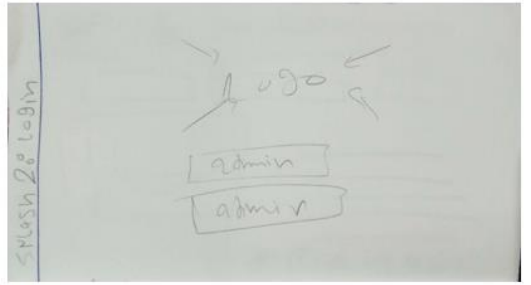
Wire-Framing

- I started to do some search to take some inspiration then started to draw wireframes to application as hand drawn sketches.



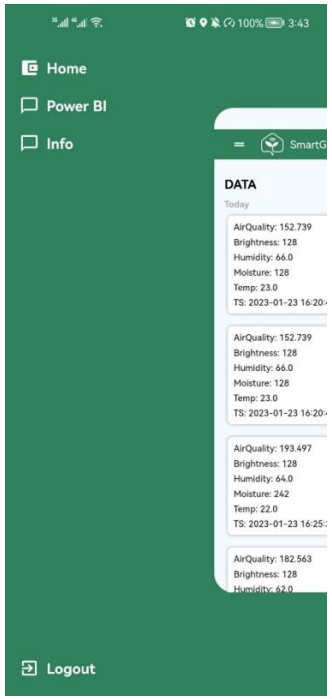
Wireframes For Web App:

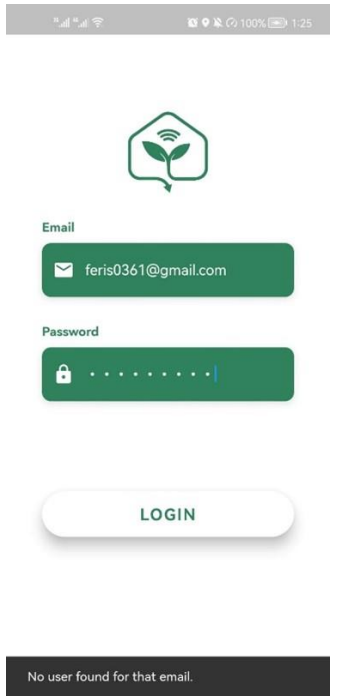




Low-Fidelity

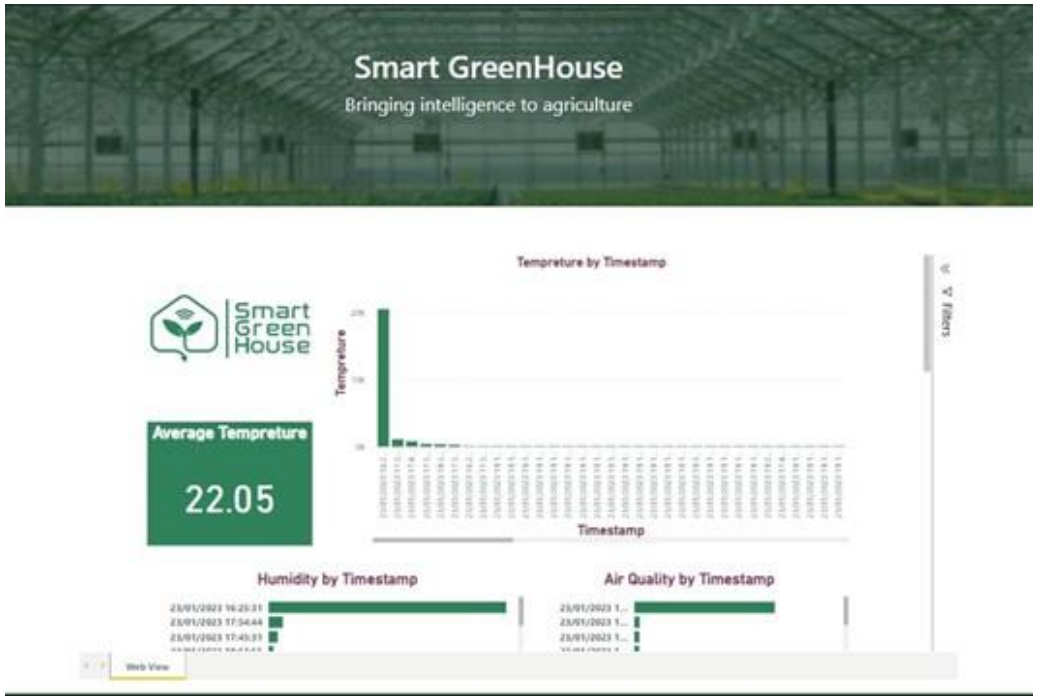
- At Low-Fidelity design, at this processes we use adobe XD to draw everything but without choose main content to app from photos or colors.

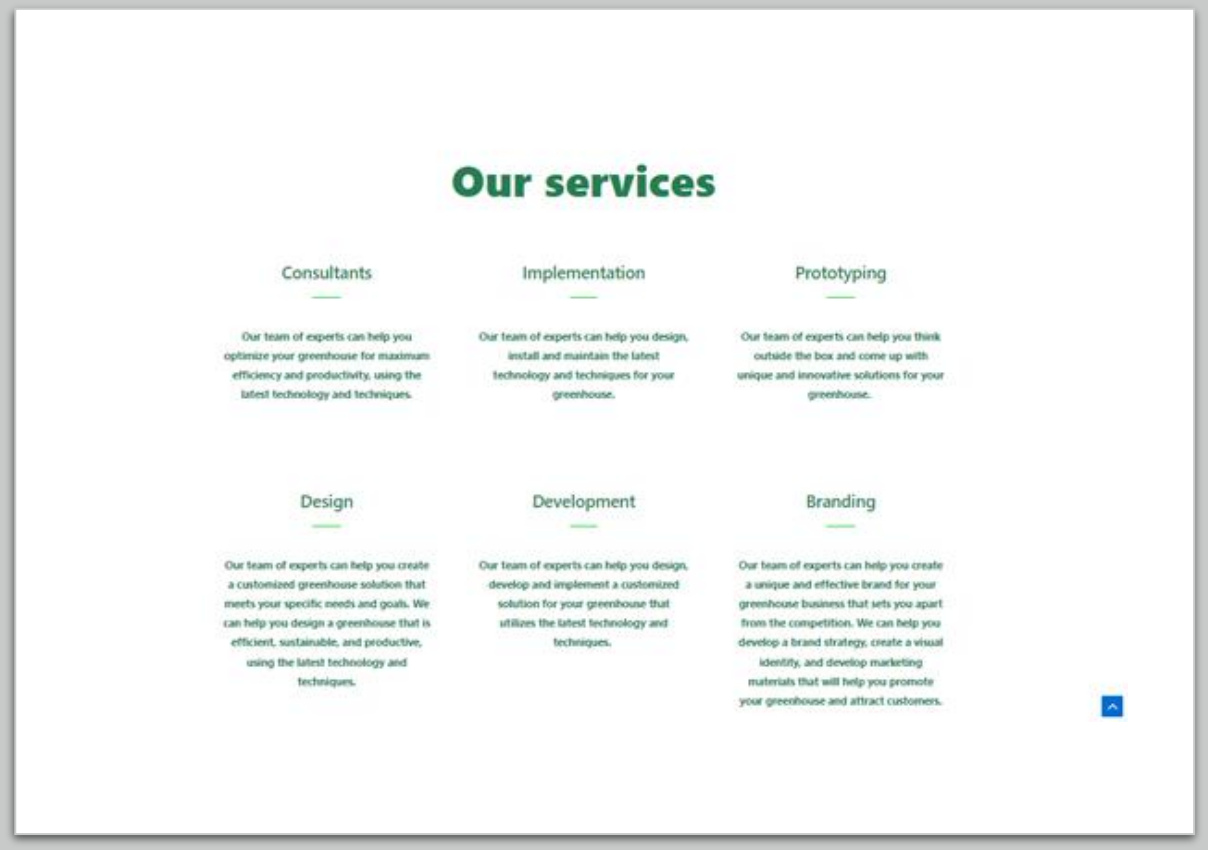




High-Fidelity

- we reached to last step in my work its called high-fidelity design at this step we put our final touch to the project so we choose suitable photos and suitable colors to project.

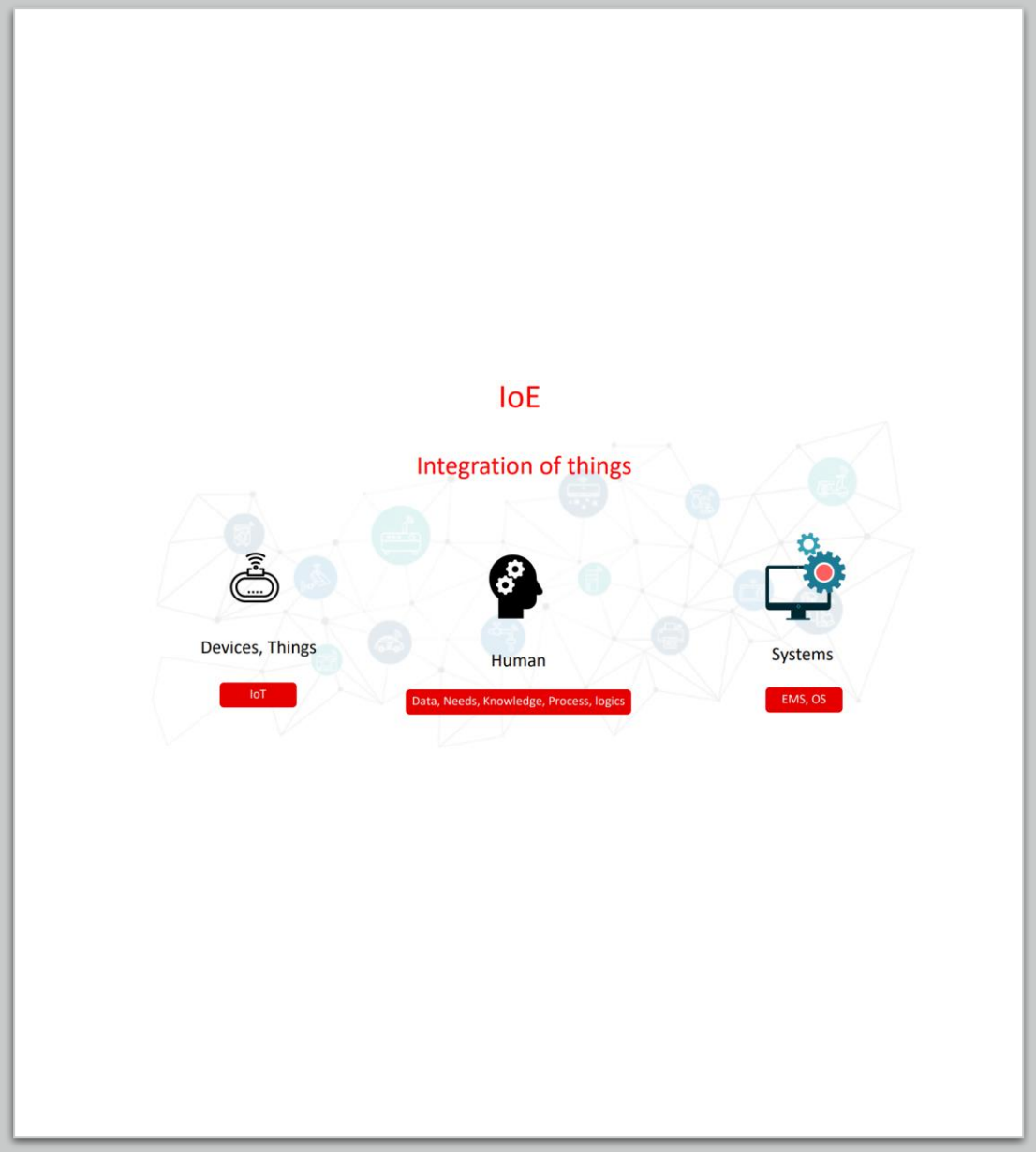




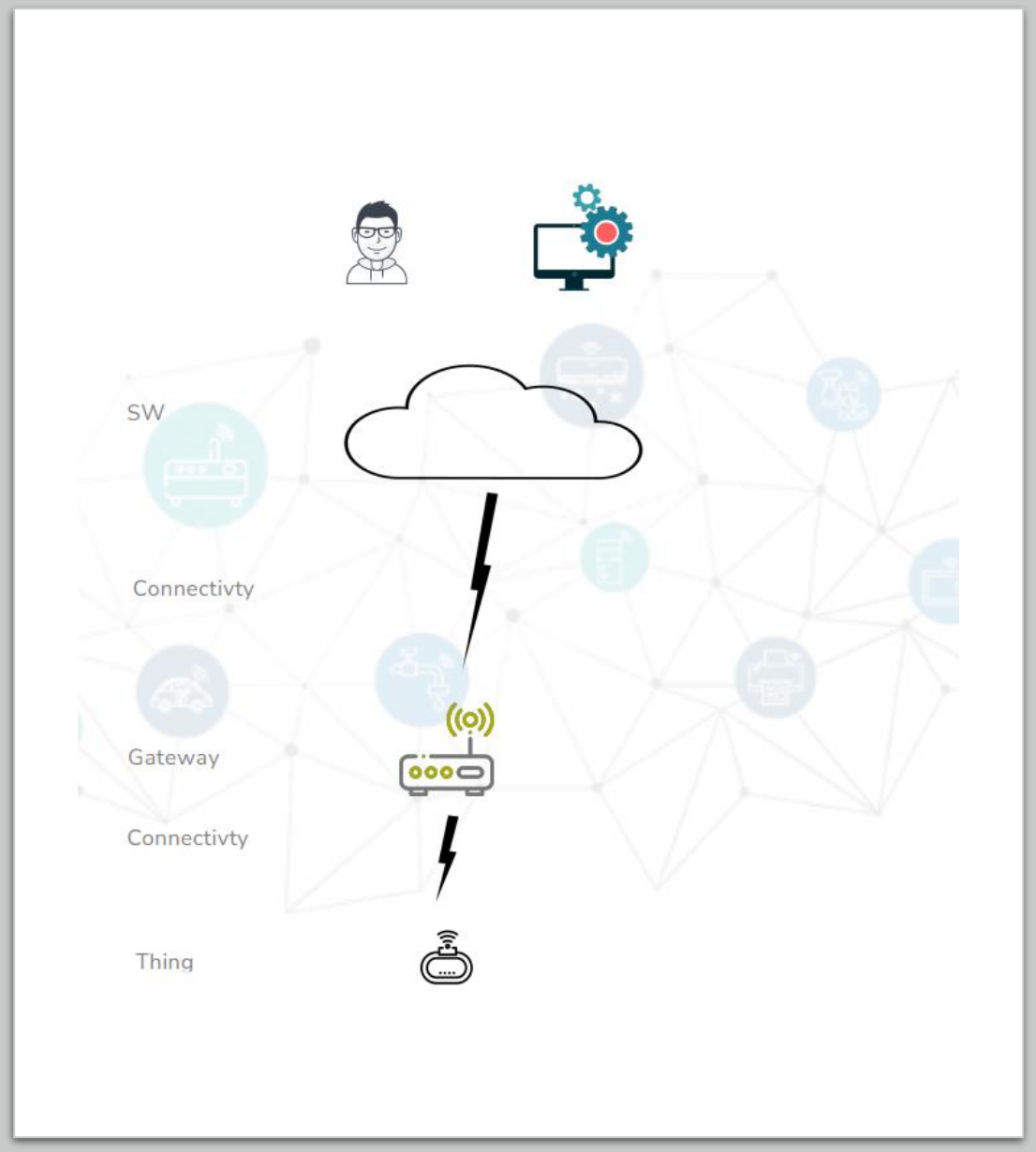
What is IOT?

network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet to monitor and manage devices creating value

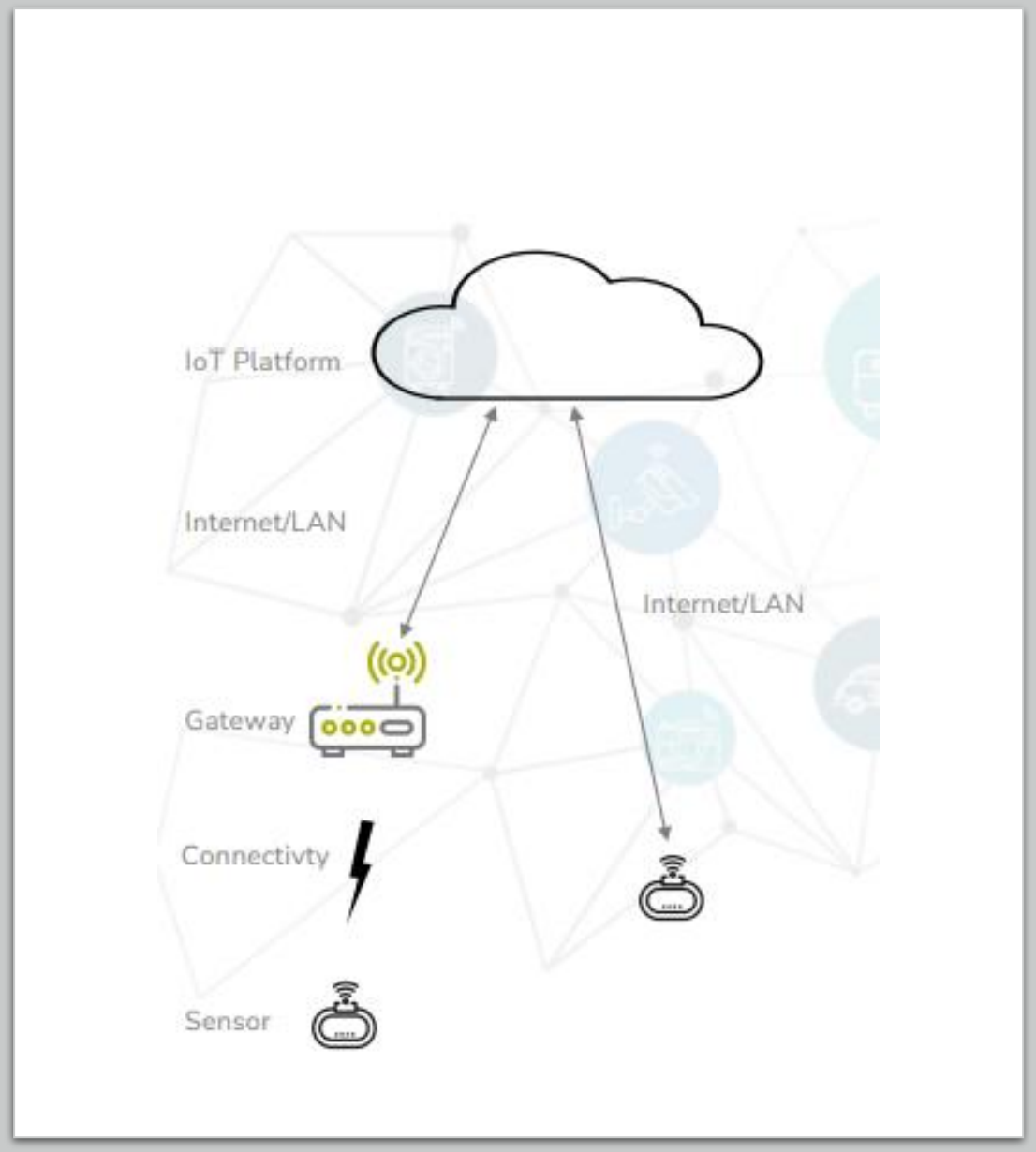
Data Sources



How is IoT working?



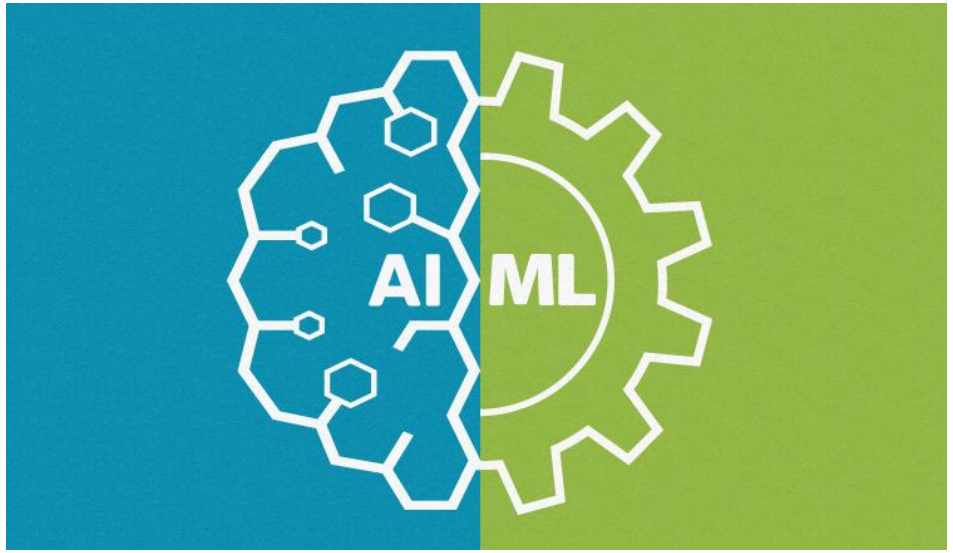
IoT Connectivity



Future Work

- **Add AI models & Machine Learning Models (Diseases classification, Location security like face recognition).**

- **Add Sensors for fertilizers, specifically for Nitrogen-Phosphorus-Potassium (NPK) are devices that measure the levels of these essential plant nutrients in the soil.**



The Team

Eslam El-Saied El-Shafie

Marc Atef Habeeb

Faris Ali Mohamed

Mahmood Farahat Ali

Omar Khaled Amin

Rawan Emad El-Ghali

Zeinab Tharwat Shouman

Hams Ahmed Zahran

Aya Moustafa Abo Essa

Heba Adel Bahy Eldien

Questions

Thank You