	DEPT OF COMPUTER AND COMMUNICATION ENGINEERING **Internet of Things: Foundations and Applications Lab** **MMH: ITFL316064E**

Group:
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Bùi Tuấn Đạt - 19119039

1. HTML (tag, features), CSS (style), Javascript [1]

Tags name, feature	Heading, Head

Sample code	`<!DOCTYPE html>`
	`<html>`
	`<body>`
	`<h1>`
	`WELCOME TO HCMUTE IOT LAB !`
	`</h1>`
	`<h2>`
	`The list of our Group`
	`</h2>`
	`</body>`
	`</html>`

Results	**WELCOME TO HCMUTE IOT LAB !** **The list of our Group**

Tags name, feature	Paragraphs
Sample code	<!DOCTYPE html> <html> <body> Trần Phan Bảo Khang - 19119059 Bùi Tuấn Đạt - 19119039 123 456 nay trời mưa My name is BKdragon. What is CSS? CSS stands for Cascading Style Sheets; CSS describes how HTML elements are to be displayed on screen, paper, or in other media; What is HTML? HTML stands for Hyper Text Markup Language; HTML is the standard markup language for creating Web pages; HTML describes the structure of a Web page; HTML consists of a series of elements; HTML elements tell the browser how to display the content; HTML elements label pieces of content such as "this is a heading" "this is a paragraph", "this is a link", etc. </body> </html>
Results	In HTML, spaces and new lines are ignored: Trần Phan Bảo Khang - 19119059 Bùi Tuấn Đạt - 19119039 123 456 nay trời mưa My name is BKdragon. What is CSS? CSS stands for Cascading Style Sheets; CSS describes how HTML elements are to be displayed on screen, paper, or in other media; What is HTML? HTML stands for Hyper Text Markup Language; HTML is the standard markup language for creating Web pages; HTML describes the structure of a Web page; HTML consists of a series of elements; HTML elements tell the browser how to display the content; HTML elements label pieces of content such as "this is a heading" "this is a paragraph", "this is a link", etc.

Tags name, feature	Style
Sample code	<!DOCTYPE html> <html> <body style="background-color: black;"> <h1 style="background-color: powderblue; color: purple; font-family: 'Times New Roman'; font-size: large; text-align:center"> WELCOME TO HCMUTE IOT LAB ! </h1> <h2 style="background-color: peru;color: purple; font-family: 'Times New Roman'; font-size: medium; text-align:center" > The list of our Group </h2> Trần Phan Bảo Khang - 19119059 Bùi Tuấn Đạt - 19119039 </body> </html>
Results	

Tags name, feature	color
Sample code	<!DOCTYPE html> <html> <body style="color: black;"> <h1 style="background-color: powderblue; color: darkslategrey; font-family: 'Times New Roman'; font-size: large; text-align:center"> WELCOME TO HCMUTE IOT LAB ! </h1> <h2 style="background-color: peru;color: slategray; font-family: 'Times New Roman'; font-size: medium; text-align:center" > The list of our Group </h2> Trần Phan Bảo Khang - 19119059 Bùi Tuấn Đạt - 19119039 </body> </html>
Results	WELCOME TO HCMUTE IOT LAB ! The list of our Group Trần Phan Bảo Khang - 19119059 Bùi Tuấn Đạt - 19119039

Tags name, feature	CSS

Sample code	<!DOCTYPE html>
	<html>
	<head>
	<style>
	body {
	background-color: powderblue;
	}
	h1 {
	background-color: powderblue; color: darkslategrey; font-family: 'Times New Roman'; font-size: large; text-align:center
	}
	h2 {
	background-color: peru;color: slategray; font-family: 'Times New Roman'; font-size: medium; text-align:center}
	p {background-color: papayawhip;color:blueviolet; font-family:Cambria; font-size: medium; text-align:center}
	</style>
	</head>
	<body >
	<h1>
	WELCOME TO HCMUTE IOT LAB ! </h1>
	<h2 >The list of our Group </h2>
	 Trần Phan Bảo Khang - 19119059
	 Bùi Tuấn Đạt - 19119039
	</body>
	</html>

Results	

Tags name, feature	External CSS

Sample code	<!DOCTYPE html>
	<html>
	<head>
	  <link rel="stylesheet" href="style.css">
	</head>
	  <body >
	  <h1>
	  WELCOME TO HCMUTE IOT LAB !
	  </h1>
	  <h2 >
	  The list of our Group
	  </h2>
	  <p style="color: green;
	  font-family: verdana;
	  font-size: 100%;
	  border: 2px solid MidnightBlue;
	  padding: 20px;" >Trần Phan Bảo Khang - 19119059
	  Bùi Tuấn Đạt - 19119039
	  </body>
	</html>

Results	

Tags name, feature	Link
Sample code	<!DOCTYPE html> <html> <head> </head> <body> <p ">trang online trường đại học sư phạm kĩ thuật Online HCMUTE TRANG ONLINE TAB MỚI! Absolute URLs Online Absolute HCMUTE RELATIVE URLs RELATIVE HCMUTE Image as a Link <img src=" https://toplist.vn/images/800px/dong-hoc-phi-day-du-dung-thoi-han-182063.jpg " alt="" style="width:42px;height:42px;"> link mail URLs Send email Button as a Links Click the button to go to the online hcmute. <button onclick="document.location='https://online.hcmute.edu.vn/'">Online HCMUTE</button> The title will go to page. Visit our online hcmute </body> </html>

Results	trang online trường đại học sư phạm kĩ thuật Online HCMUTE TRANG ONLINE TAB MỚI! **Absolute URLs** Online Absolute HCMUTE **RELATIVE URLs** RELATIVE HCMUTE **Image as a Link**  **link mail URLs** Send email **Button as a Links** Click the button to go to the online hcmute. Online HCMUTE The title will go to page. Visit our online hcmute

Tags name, feature	form
Sample code	<!DOCTYPE html> <html> <head> </head> <body <input type="checkbox" />male ? Name:<input type="text" /> Age:<input type="number" /> <select> <option>red</option> <option>blue</option> <option>green</option> </select> </body> </html>
Results	male ? Name: Age: red

Tags name, feature	Audio
Sample code	<!DOCTYPE html> <html> <body> <audio controls autoplay> <source src="https://www.mobilesringtones.com/static/p/ringtones/2015/02/12/5946/5946.mp3?title=5946_download_nokia_tune_original_ringtone.mp3;" type="audio/ogg"> Your browser does not support the audio element. </audio> </body> </html>
Results	

Tags name, feature	Video
Sample code	<!DOCTYPE html> <html> <body> The video element <video width="320" height="240" controls> <source src="http://www.w3schools.com/tags/movie.mp4" type="video/mp4" > Your browser does not support the video tag. </video> </body> </html>
Results	

Tags name, feature	Geolocation

Sample code	<!DOCTYPE html>
	<html>
	<body>
	
	 Click the button to get your coordinates.
	
	<button onclick="getLocation()">Try It</button>
	
	<script>
	var x = document.getElementById("demo");
	
	function getLocation() {
	if (navigator.geolocation) {
	navigator.geolocation.getCurrentPosition(showPosition);
	} else {
	x.innerHTML = "Geolocation is not supported by this browser.";
	}
	}
	
	function showPosition(position) {
	x.innerHTML = "Latitude: " + position.coords.latitude +
	"
	Longitude: " + position.coords.longitude;
	}
	</script>
	
	</body>
	</html>

Results	Click the button to get your coordinates. Try It Latitude: 10.7765 Longitude: 106.7009

2. WEB APP (GOOGLE FIREBASE)

What is the function of Firebase?

Firebase is a platform that provides a lot of different services to its users. But when it comes to this platform, people still think of some outstanding services such as:

- Realtime database

- Authentication

- Firebase Analytics

- Query to Firebase Database

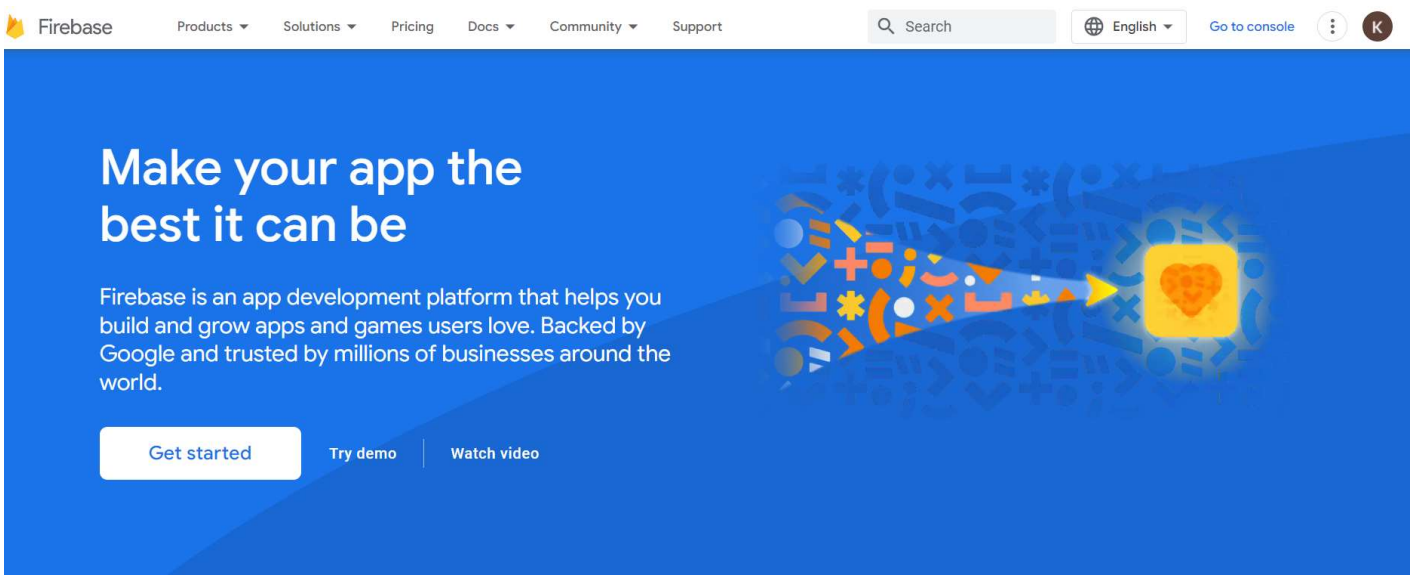
- Remote Config

What exactly is Firebase?

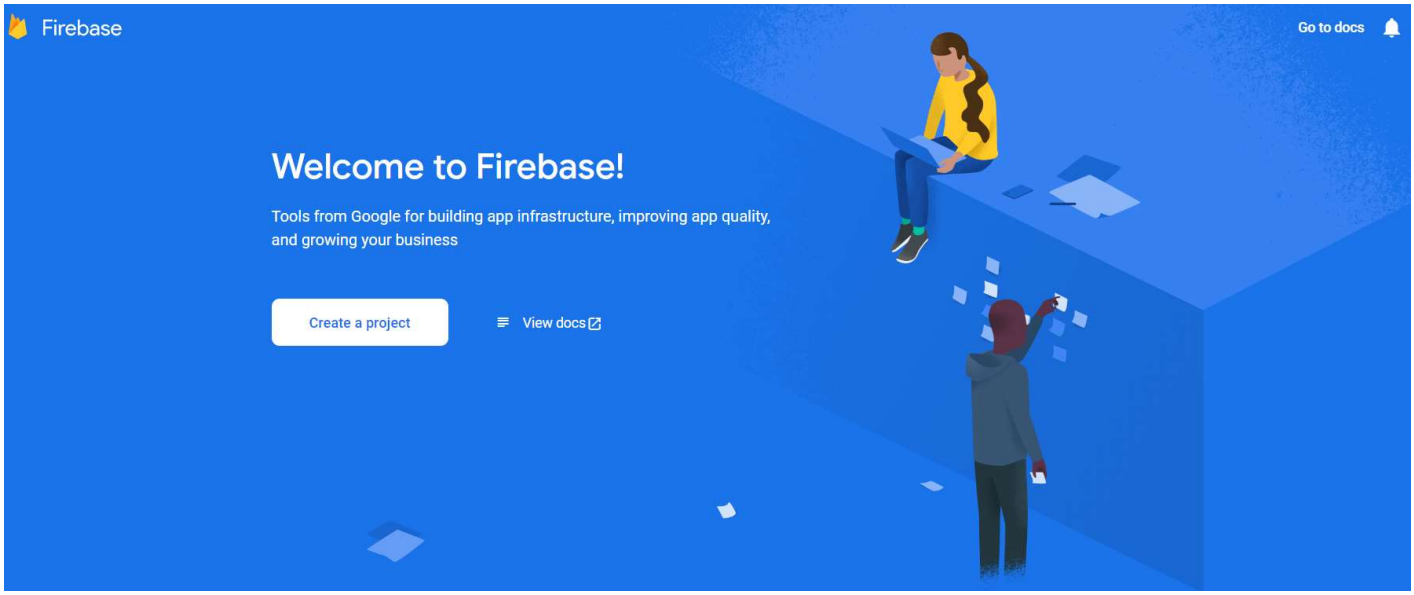
Firebase is a database service that runs on a cloud platform (Cloud). It includes Google's advanced server system. The system's main role is to assist users in programming applications by simplifying database processes.

Step 1: we have to creat a account google such as mail

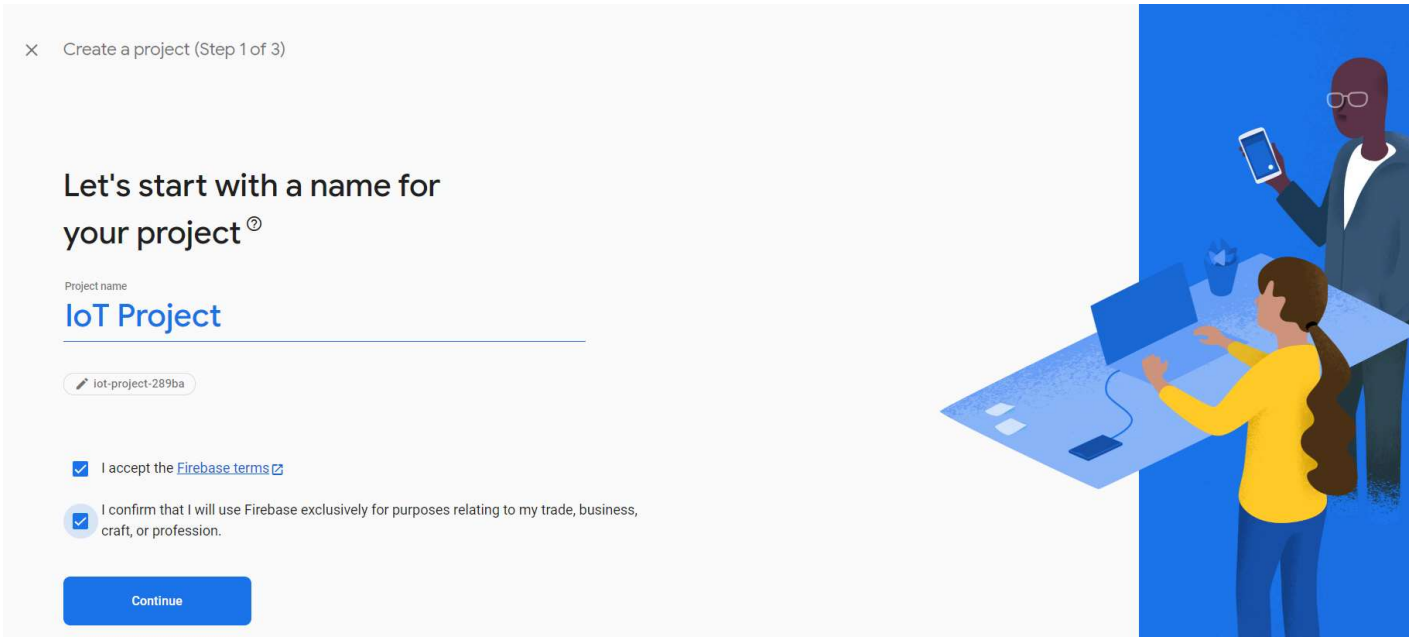
Step 2 : Login a website: https://firebase.google.com/ to register account have create.

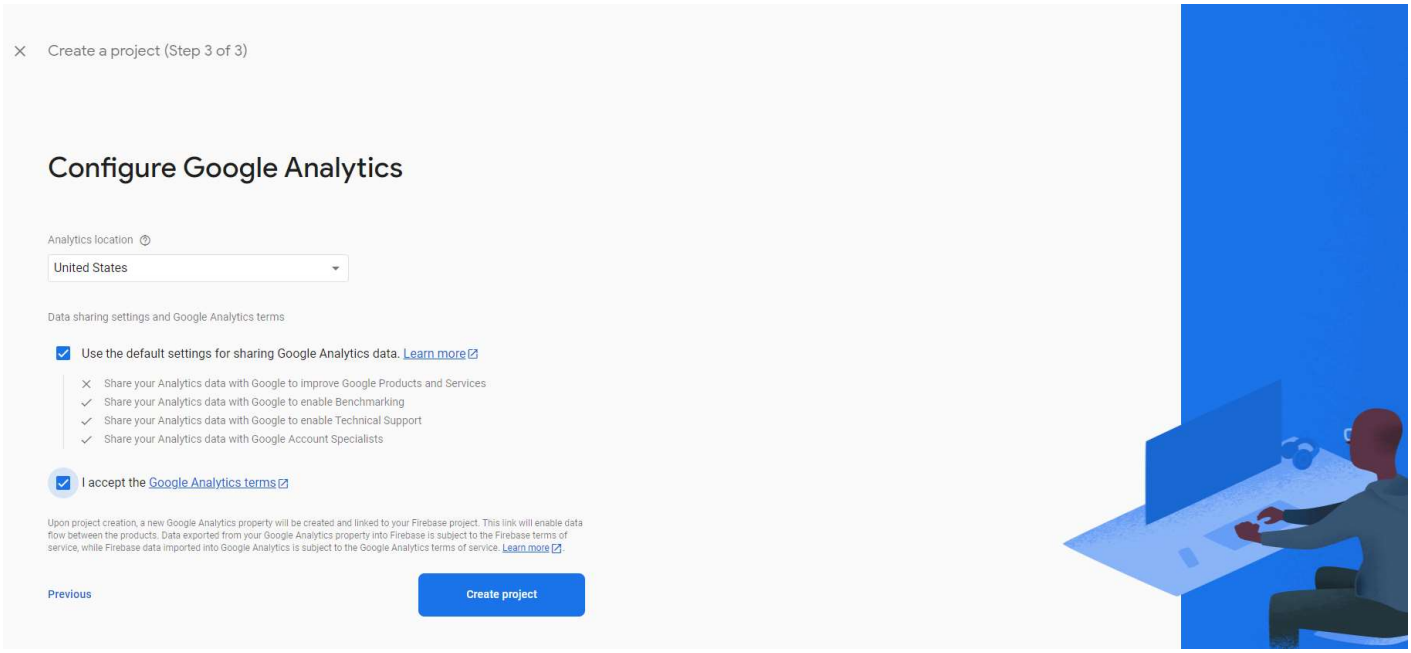


Step 3: We go to console and click “Create a project” to Create a new project.

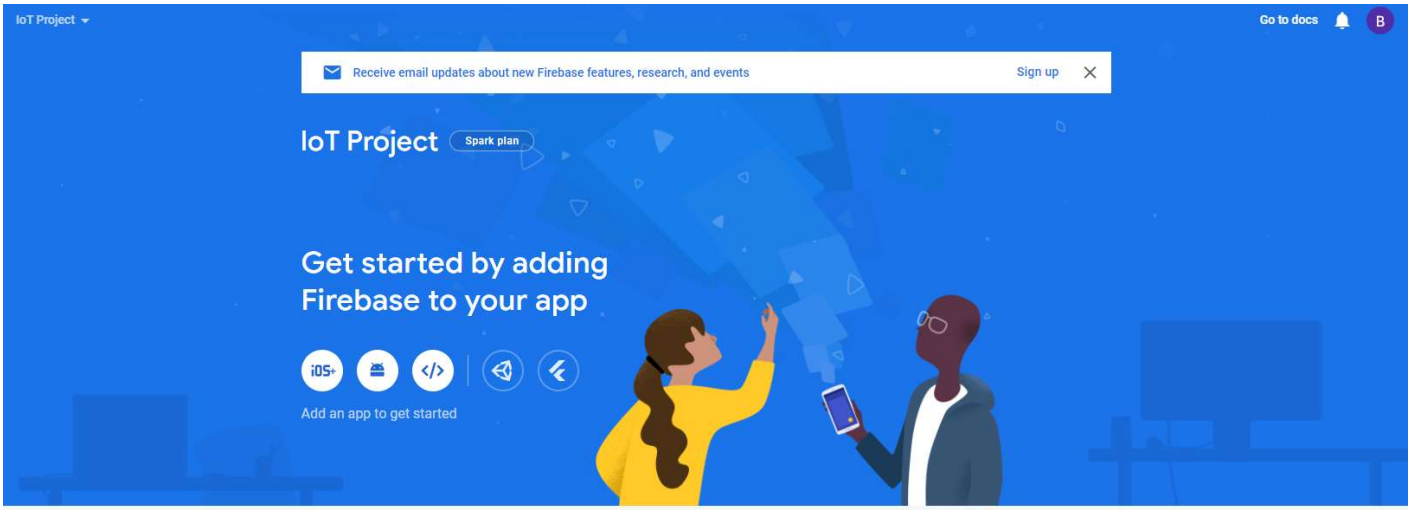


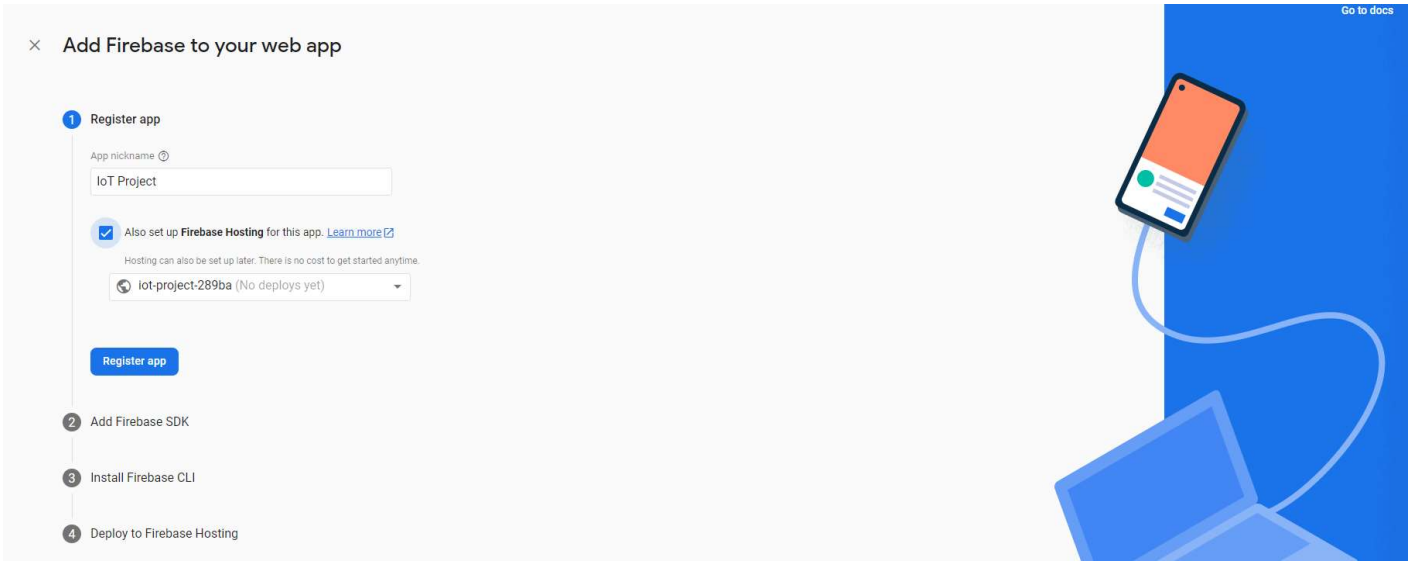
Step 4: Initialize “Name of the project”.

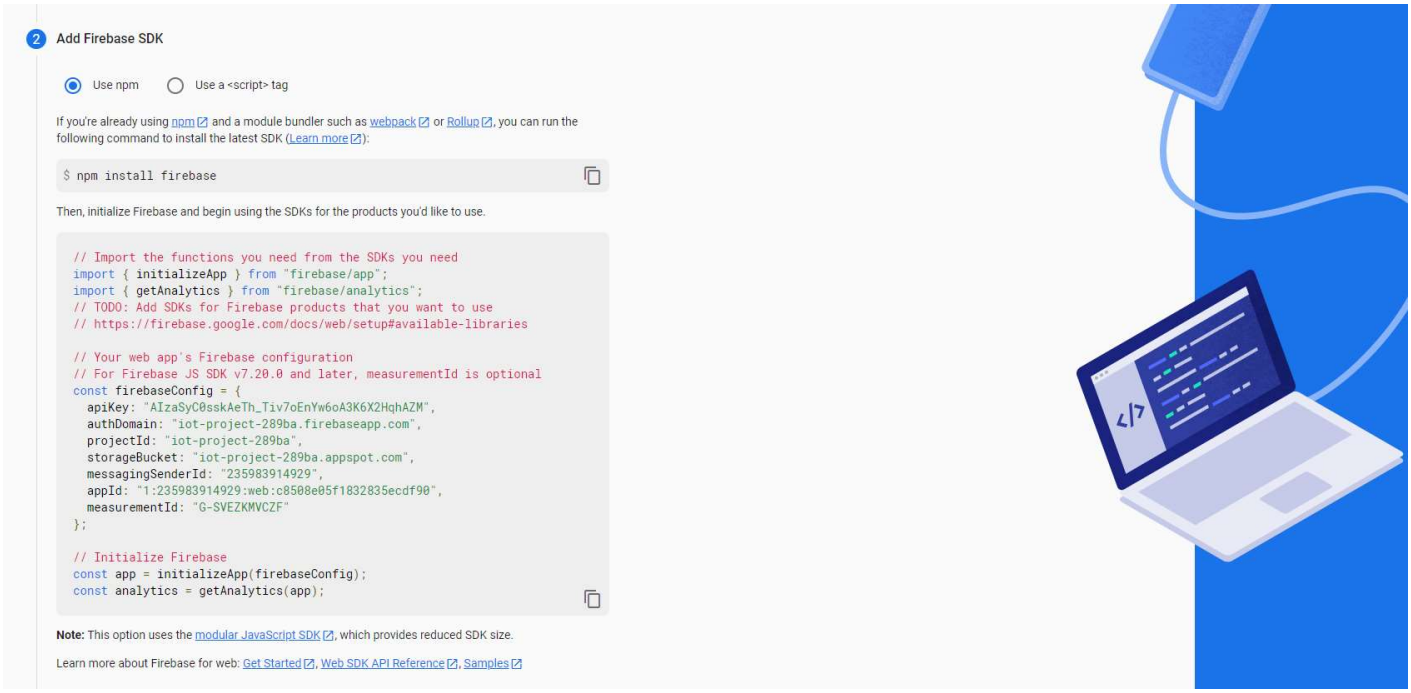




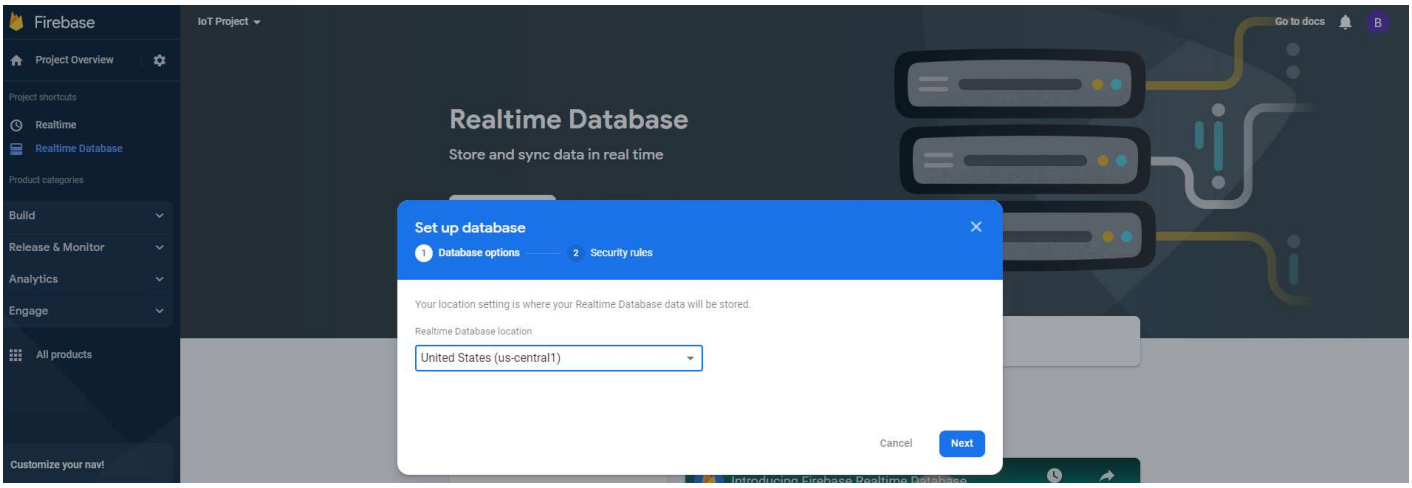
Step 5: Choose “IoT Project” choose your app is web.

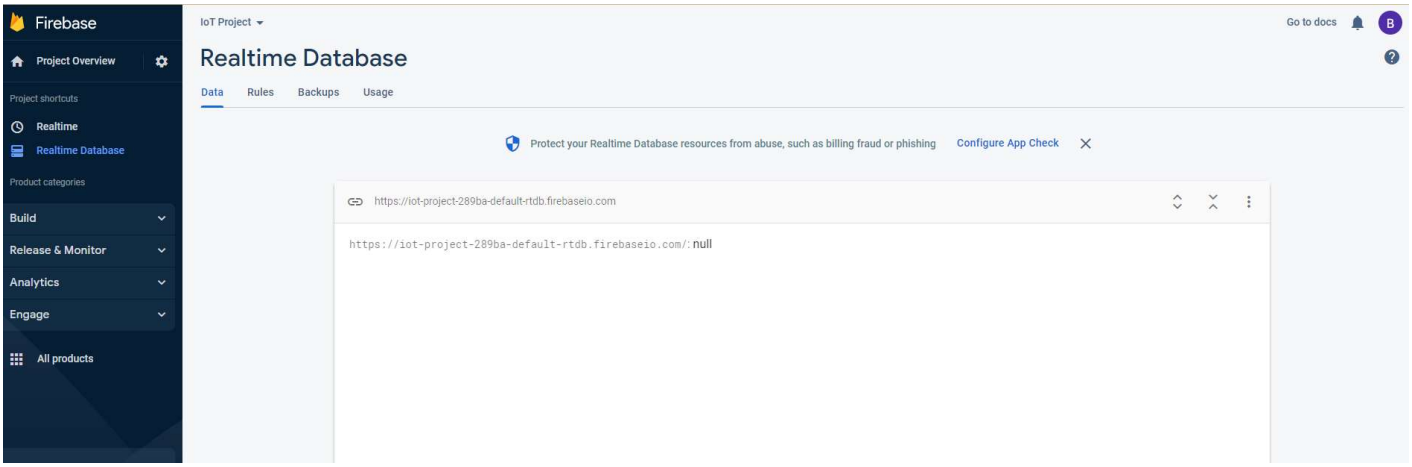






Step 6 : Build → Realtime →Database Realtime Database resources.





3. MY WEBSITE

3.1. Introduction

Theme content is only used in the following scope:

- The problem is that our knowledge of IoT system design in the bedroom with DHT11 and water level is only designed at the model level and has not been applied in practice.

- The smart irrigation system at this project allows you to observe the temperature, humidity, water level.

3.2. Hardware:

The system hardware consists of the following components:

- Test board to connect the pins of components
- 1 ESP32 MCU to read and write values and connect Google Firebase via WiFi
- 1 Water level sensor measures water value
- 1 DHT11 sensor reads the temperature and humidity of the environment
- 1 LED for display
- 1 buzzer
- 1 Relay DC 5V
- 1 DC 5V Fan

Values from 2 sensors are read by ESP32 and sent to Google Firebase continuously and displayed on Website, Website controls buttons to activate or stop the device through Google Firebase

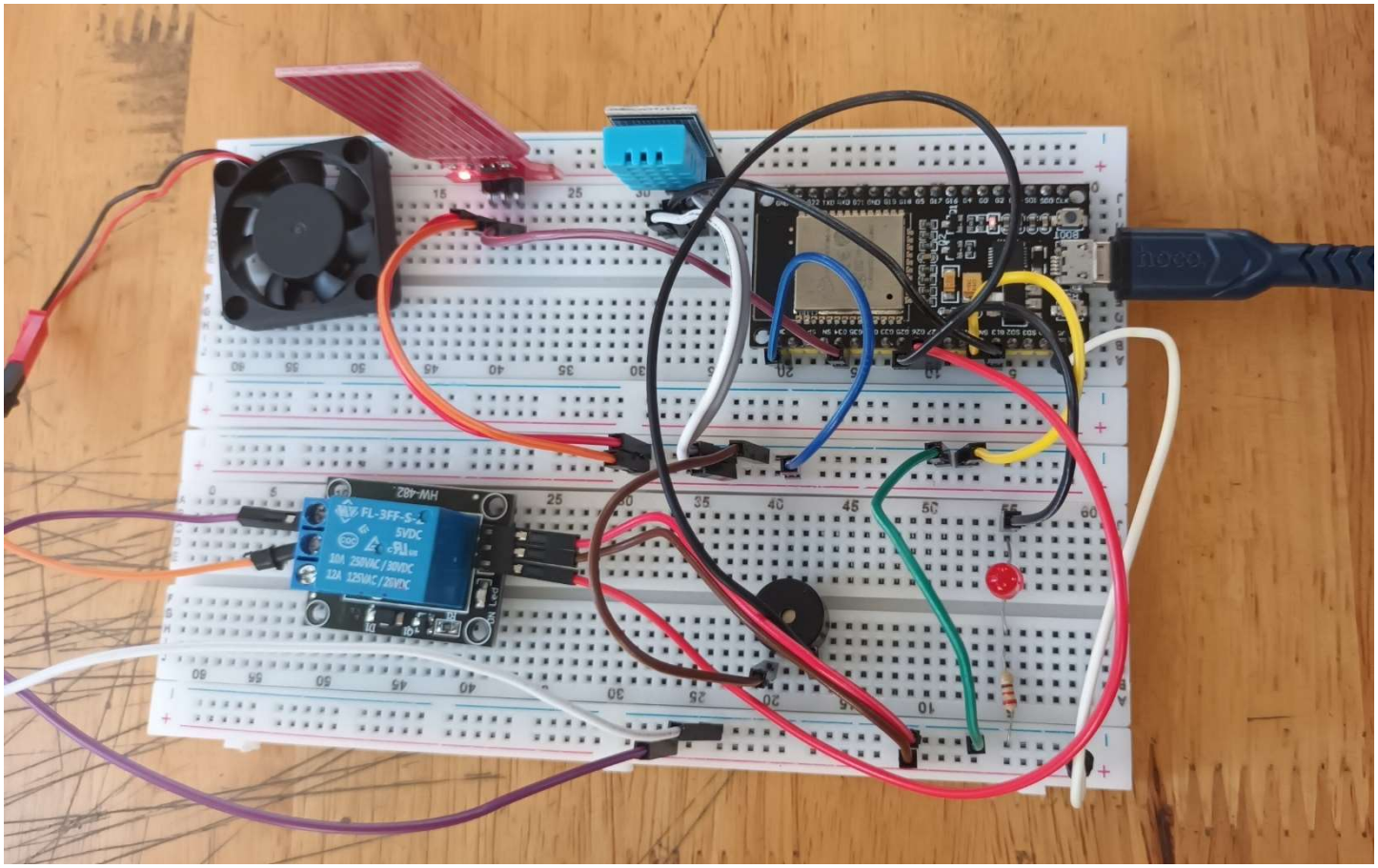


Figure 1. Hardware of system

a. ESP-32

ESP32 is a system on a chip that integrates the following features:

- Wi-Fi (2.4 GHz band)
- Bluetooth
- Dual high performance Xtensa® 32-bit LX6 CPU cores
- Ultra Low Power co-processor
- Multiple peripherals

Powered by 40 nm technology, ESP32 provides a robust, highly integrated platform, which helps meet the continuous demands for efficient power usage, compact design, security, high performance, and reliability.

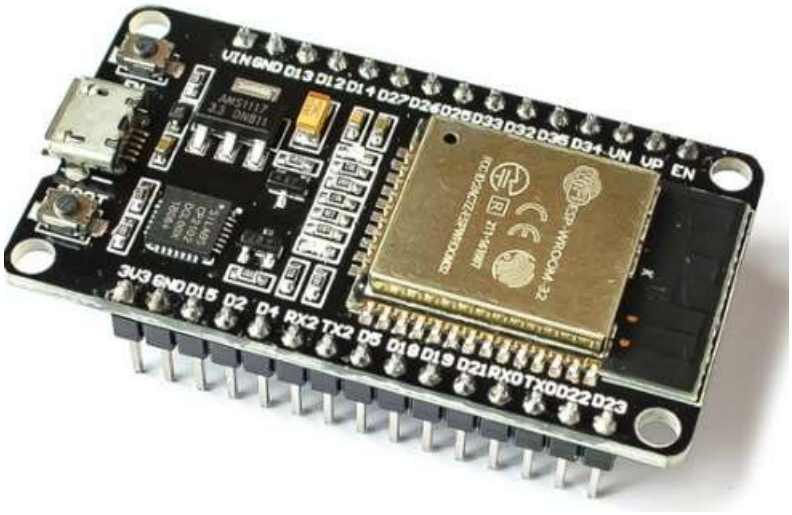


Figure 2. ESP32

b. DHT11 Temperature Humidity Sensor

DHT11 Temperature Humidity Sensor [5] is a simple and inexpensive digital temperature and humidity sensor. It measures the ambient air with a capacitive humidity sensor and a thermistor and outputs a digital signal on the data pin (no analog input pins needed). It's quite straightforward to operate, but data collection requires precise timing. This sensor can simply interfaced with any microcontroller, such as Arduino, Raspberry Pi, and so on, to detect humidity and temperature in real time.

Figure 3. DHT11

c. Water Level Sensor

Water Level Sensor is an easy-to-use, cost-effective high level/drop identification sensor that is obtained by measuring droplets/water volume with a sequence of parallel wires exposed traces. Water yield and analog conversion are completed, and the output value is applied to your own function. It

consumes less power and has a high sensitivity. Water to analog signal conversion is simple, and the output analog values may be read directly by the Arduino development board to provide the level warning effect.

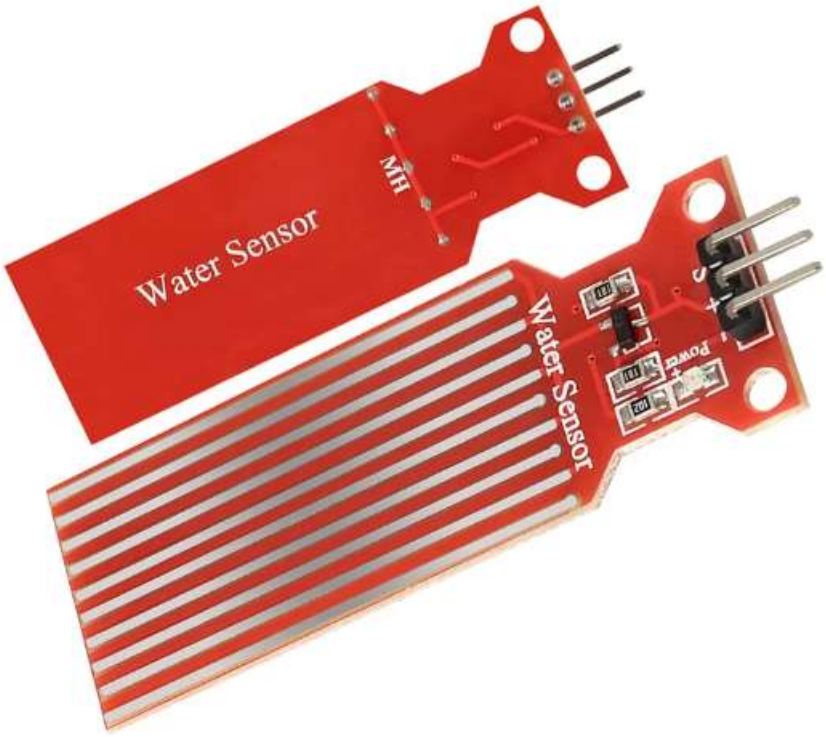


Figure 4. Water Level sensor

d. LED

LED lighting offers many advantages over traditional light sources, opening new ways to use light that weren't possible before. As the technology continues to revolutionize the lighting industry, it's important to understand how an LED light source works.

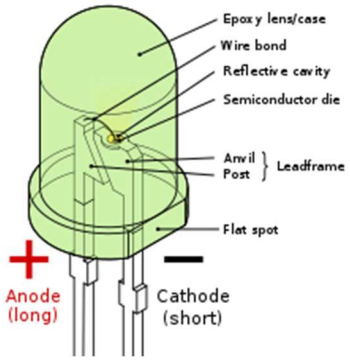


Figure 5. LED

e. 5V Single-Channel Relay Module

Relay [7] is an electromechanical device that opens or closes the contacts of a switch using an electric current. The single-channel relay module is more than just a relay; it includes components that facilitate switching and connecting as well as indicators that show if the module is powered and whether the relay is active or not.

Figure 6. Relay

f. Buzzer 5VDC

Buzzer 5VDC [8] has long life, stable performance, compactly manufactured, suitable for design with compact buzzer circuits, alarm circuits.

Figure 7. Buzzer

3.3. Diagram

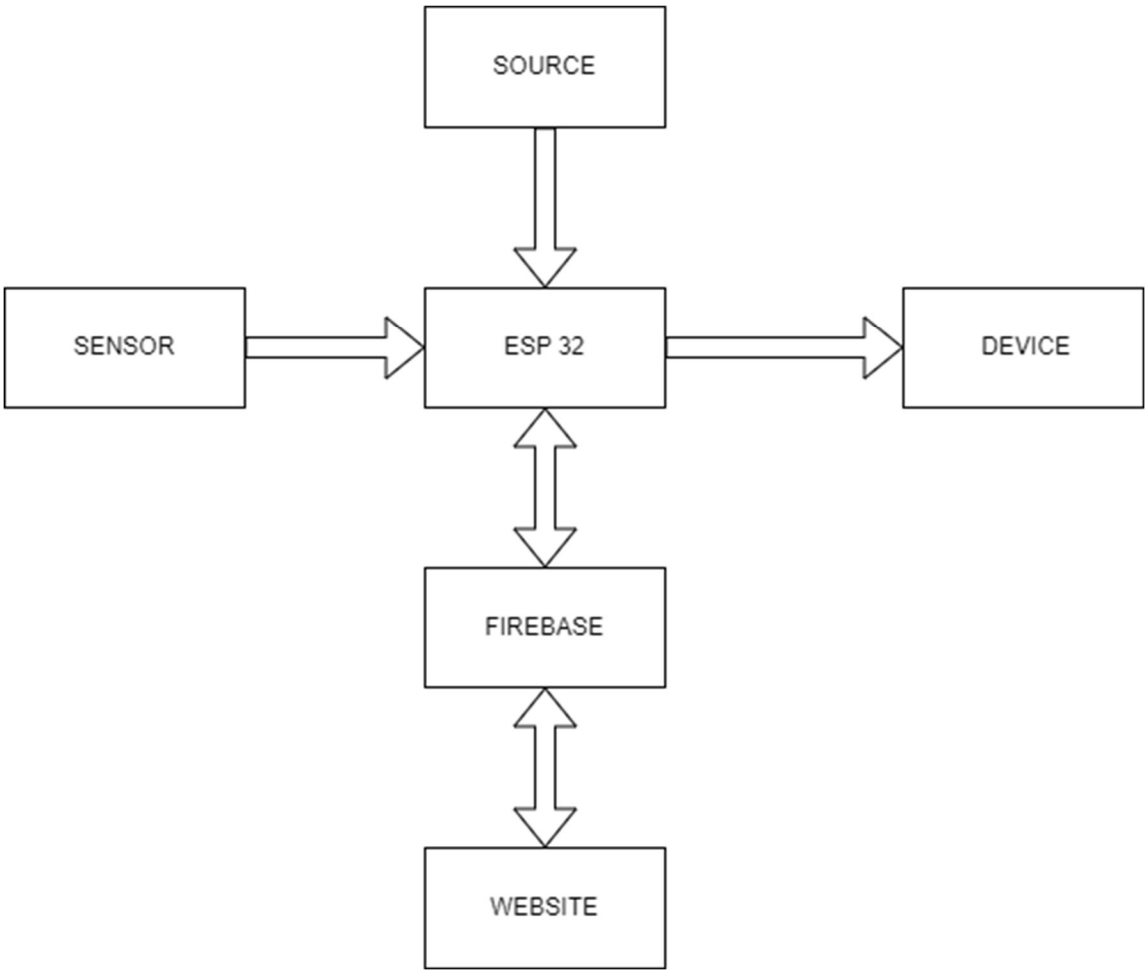


Figure 8. Diagram

Source: Provides power for ESP32

Device: LED, FAN, BUZZER

Sensor:

- Temperature humidity sensor DHT11: Used to measure the temperature and humidity of the environment and transmit it to the central processor through the Digital input.

- Water level sensor: Used to measure the rain level and transmit it to the central processor through the Analog input.

GG Firebase: Firebase gives developers access to a complete range of fully managed services including analytics, authentication and Realtime Database.

Website: Display the user's interface.

3.4. Website interface and functionally

3.4.1. Interface user

Below are the results of the web that allows users to perform basic operations with google firebase

- The header includes the subject name and the subject name

- The value display frame includes 3 values of Temperature, Rainfall, and Humidity that are updated continuously with the corresponding category when clicking on the navigation bar

- The control frame consists of 3 items: Fan, Sound, Light controlled by clicking and the toggle button right below, the image icon above shows the current state of the device.

- Clock shows time corresponding to real time

- The Member frame shows the image and information of the author of the topic

- The footer section displays the owner's contact information

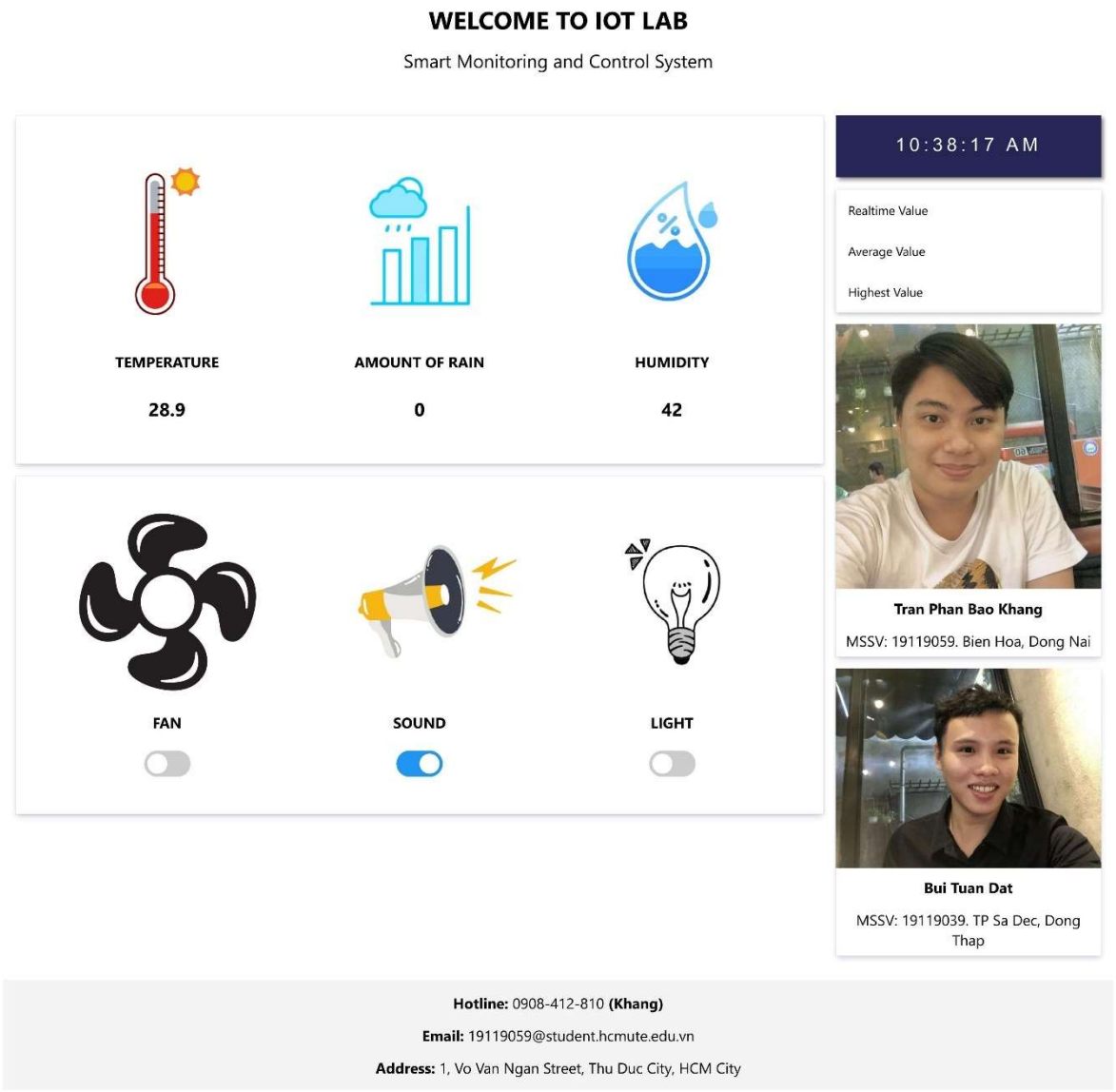


Figure 9. User's interface

Layout

The website is designed in 3 parts as shown below, including:

- Header

- Content

- Footer

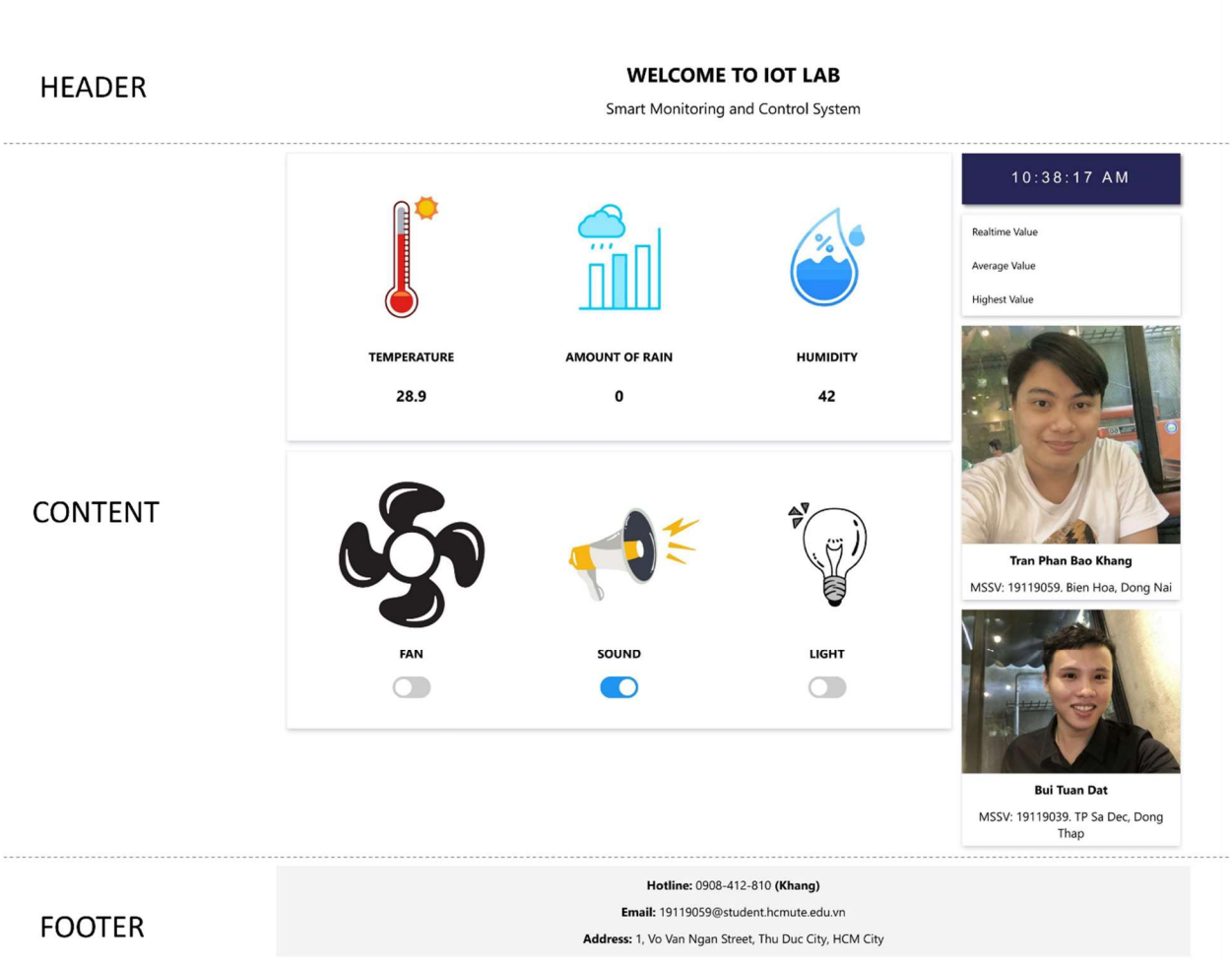


Figure 10. Main layout of user's interface

Header

Figure 11. Header with layout

```
<div class="header">
    <h1 class="subject">WELCOME TO IOT LAB</h1>
    <p class="title">Smart Monitoring and Control System</p>
</div>
```

Content

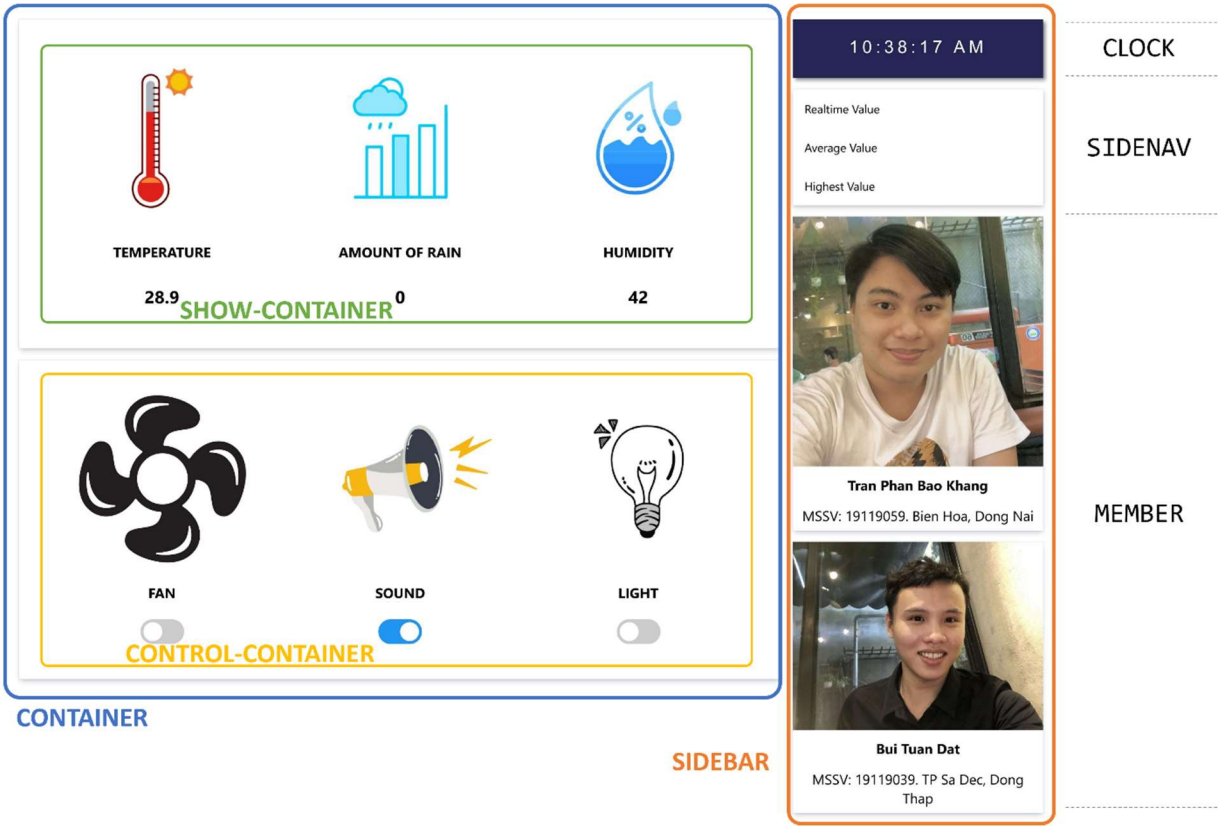


Figure 12. Content with layout

```
<div class="content">
    <div class="container">
        <!-- Define container for LEFT content -->
        <div class="show-container">
            <!-- Display Block -->
            <div class="show-item">
                <img src="img/temp.png" alt="temp">
                <p>TEMPERATURE</p>
                <p class="display-value" id="temp">0</p>
            </div>
            <div class="show-item">
                <img src="img/rain.png" alt="rain">
                <p>AMOUNT OF RAIN</p>
                <p class="display-value" id="rain">0</p>
            </div>
            <div class="show-item">
                <img src="img/humd.png" alt="humd">
                <p>HUMIDITY</p>
                <p class="display-value" id="humd">0</p>
            </div>
        </div>
```

```
            <div class="control-container">
                <!-- Control Block -->
                <div class="control-item" id="fanControl">
                    <img src="img/fanoff.png" alt="fan">
                    <p>FAN</p>
                    <label class="switch">
                        <input type="checkbox">
                        <span class="slider round"></span>
                    </label>
                </div>
                <!--  -->
                <div class="control-item" id="soundControl">
                    <img src="img/soundoff.png" alt="sound">
                    <p>SOUND</p>
                    <label class="switch">
                        <input type="checkbox">
                        <span class="slider round"></span>
                    </label>
                </div>
                <!--  -->
                <div class="control-item" id="lightControl">
                    <img src="img/ledoff.png" alt="led">
                    <p>LIGHT</p>
                    <label class="switch">
                        <input type="checkbox">
                        <span class="slider round"></span>
                    </label>
                </div>

            </div>

        </div>

        <div class="sidebar">
            <!-- Define container for RIGHT content -->
            <div class="clock">
                <div class="display"></div>
            </div>
            <div class="sidenav">
                <a href="#RealTime" onclick="binding('RealTime')">Realtime
Value</a>
```

```
                <a href="#Average" onclick="binding('Average')">Average
Value</a>
                <a href="#Highest" onclick="binding('Highest')">Highest
Value</a>
            </div>

            <div class="member">
                <img src="img/khang.jpg" alt="">
                <p class="name">Tran Phan Bao Khang</p>
                <p class="info">MSSV: 19119059. Bien Hoa, Dong Nai</p>
            </div>

            <div class="member">
                <img src="img/dat.jpg" alt="">
                <p class="name">Bui Tuan Dat</p>
                <p class="info">MSSV: 19119039. TP Sa Dec, Dong Thap</p>
            </div>
        </div>

    </div>
```

Footer

Figure 13. Footer with layout

```
    <div class="footer">
        <p><strong>Hotline:</strong> 0908-412-810
<strong>(Khang)</strong></p>
        <p><strong>Email:</strong> 19119059@student.hcmute.edu.vn</p>
        <p><strong>Address:</strong> 1, Vo Van Ngan Street, Thu Duc City,
HCM City</p>

    </div>
```

3.4.2. Function

Firebase connect

```
      <script src="https://www.gstatic.com/firebasejs/8.2.10/firebase-
app.js"></script>
```

```
    <script src="https://www.gstatic.com/firebasejs/8.2.10/firebase-
database.js"></script>
    <!-- TODO: Add SDKs for Firebase products that you want to use
     https://firebase.google.com/docs/web/setup#available-libraries -->
    <script src="https://www.gstatic.com/firebasejs/8.2.10/firebase-
analytics.js"></script>
    <script>
        const firebaseConfig = {
            apiKey: "AIzaSyA6PC-kCy-a7sRMff8UpdsZm-Pkl_nLnxQ",
            authDomain: "iotproject-10806.firebaseapp.com",
            databaseURL: "https://iotproject-10806-default-
rtdb.firebaseio.com",
            projectId: "iotproject-10806",
            storageBucket: "iotproject-10806.appspot.com",
            messagingSenderId: "946309166582",
            appId: "1:946309166582:web:dc364853919a5497e1c3d7",
            measurementId: "G-WKPRQCS4PM"
        };

        firebase.initializeApp(firebaseConfig);
        var database = firebase.database();

    </script>
```

Load web

```
function loadWeb() {
  offStateFireBase(SOUND_PATH);
  offStateFireBase(LIGHT_PATH);
  offStateFireBase(FAN_PATH);
  binding('RealTime');
}
```

Button Toggle

```
fanCheckBox.addEventListener('click', function () {
  if (this.checked) {
    fan.querySelector('img').src = IMG_FAN_ON;
    onStateFireBase(FAN_PATH);
  }
  else {
    fan.querySelector('img').src = IMG_FAN_OFF;
    offStateFireBase(FAN_PATH);
  }
```

```
})

soundCheckBox.addEventListener('click', function () {
  if (this.checked) {
    sound.querySelector('img').src = IMG_SOUND_ON;
    onStateFireBase(SOUND_PATH);
  }
  else {
    sound.querySelector('img').src = IMG_SOUND_OFF;
    offStateFireBase(SOUND_PATH);
  }
})
lightCheckBox.addEventListener('click', function () {
  if (this.checked) {
    light.querySelector('img').src = IMG_LED_ON;
    onStateFireBase(LIGHT_PATH);
  }
  else {
    light.querySelector('img').src = IMG_LED_OFF;
    offStateFireBase(LIGHT_PATH);
  }
})
```

Navigation

- Usage

```
   <div class="sidenav">
       <a href="#RealTime" onclick="binding('RealTime')">Realtime Value</a>
       <a href="#Average" onclick="binding('Average')">Average Value</a>
       <a href="#Highest" onclick="binding('Highest')">Highest Value</a>
   </div>
```

- Define function

```
function binding(elementGroup) {
  database.ref(elementGroup).on("value", function (snapshot) {
    TEMP.innerText = snapshot.val()['Temp'] + " °C";
    HUMD.innerText = snapshot.val()['Humd'] + " %";
    RAIN.innerText = snapshot.val()['Rain'] + " mm";
  })
}
```

Clock

```
setInterval(function () {
  const clock = document.querySelector(".display");
  let time = new Date();
  let sec = time.getSeconds();
  let min = time.getMinutes();
  let hours = time.getHours();
  let day = 'AM';
  if (hours > 12) {
    day = 'PM';
    hours = hours - 12;
  }
  if (hours == 0) {
    hours = 12;
  }
  if (sec < 10) {
    sec = '0' + sec;
  }
  if (min < 10) {
    min = '0' + min;
  }
  if (hours < 10) {
    hours = '0' + hours;
  }
  clock.textContent = hours + ':' + min + ':' + sec + " " + day;
});
```

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