Practical -9

Objective: Create program to connect Node MCU with the Google Firebase cloud and upload and download the sensor data to and from the Google Firebase cloud.

Introduction: Firebase is Google's mobile application development platform that includes many services to manage data from IOS, Android, or web applications. You'll create a Firebase project with a real-time database (RTDB), and you'll learn how to store and read values from the database with your ESP8266 board.

What is Firebase?

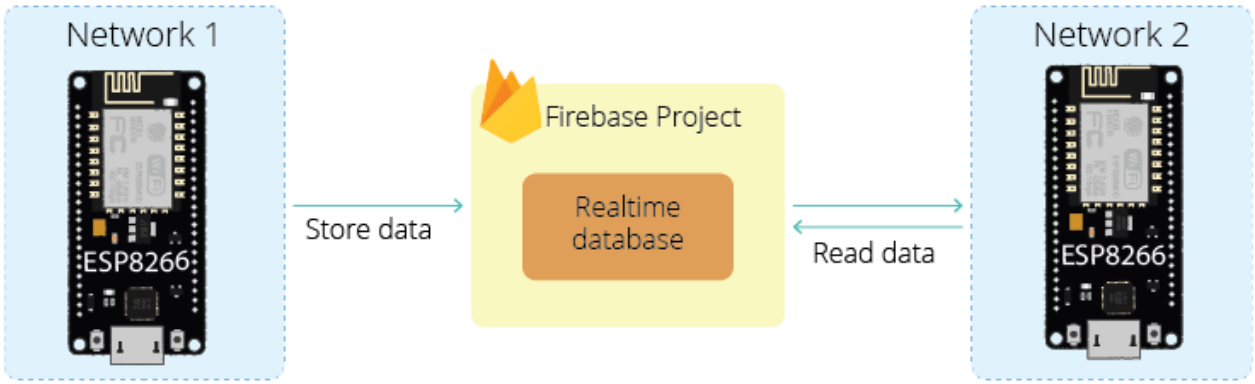
Firebase is Google's mobile application development platform that helps you build, improve, and grow your app. It has many services used to manage data from any android, IOS, or web application.

"*Firebase is a toolset to "build, improve, and grow your app", and the tools it gives you cover a large portion of the services that developers would normally have to build themselves but don't really want to build because they'd rather be focusing on the app experience itself. This includes things like analytics, authentication, databases, configuration, file storage, push messaging, and the list goes on. The services are hosted in the cloud and scale with little to no effort on the part of the developer*."

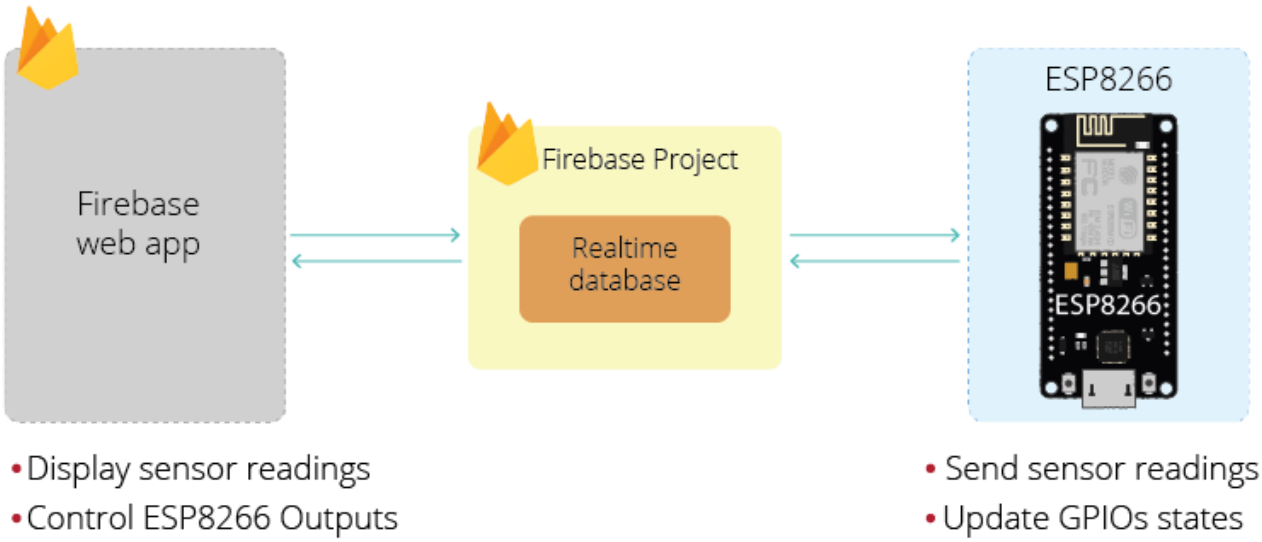
We can use the ESP8266 to connect and interact with our Firebase project, and we can create applications to control the ESP8266 via Firebase from anywhere in the world.

Now here, we'll create a Firebase project with a real-time database, and we'll use the ESP8266 to store and read data from the database. The ESP8266 can interact with the database from anywhere in the world as long as it is connected to the internet.

This means that we can have two ESP8266 boards in different networks, with one board storing data and the other board reading the most recent data, for example.



After, we'll create a web app using Firebase that will control the ESP8266 to display sensor readings or control outputs from anywhere in the world.

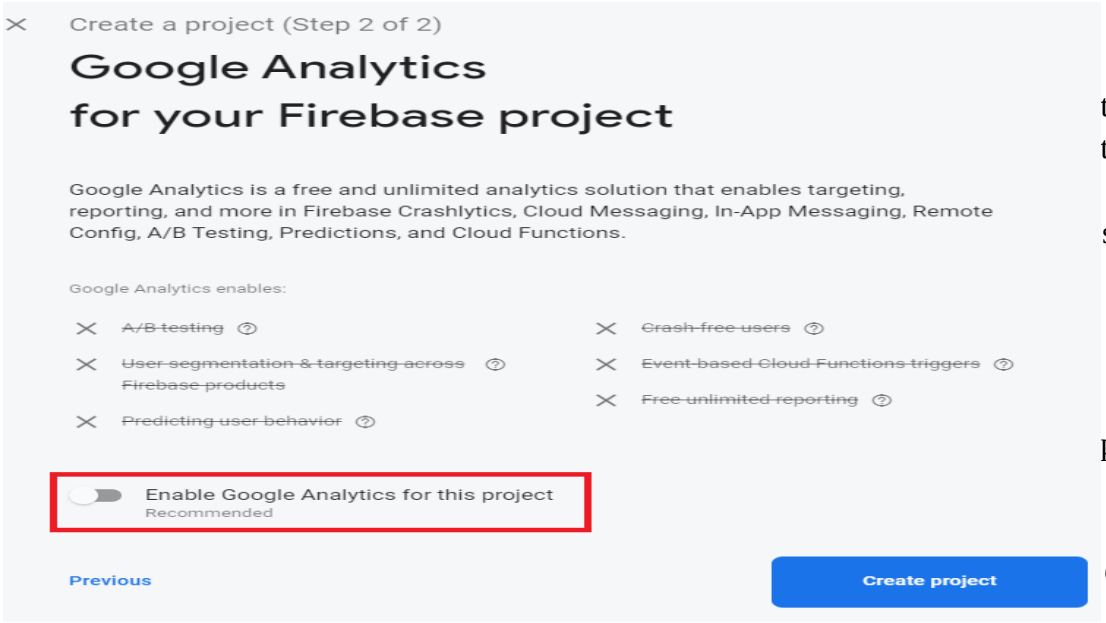


This tutorial is divided into three sections:
1.Create a Firebase Project
2.ESP8266: Store data to the Firebase Realtime Database
3.ESP8266: Read data from the Firebase Realtime Database

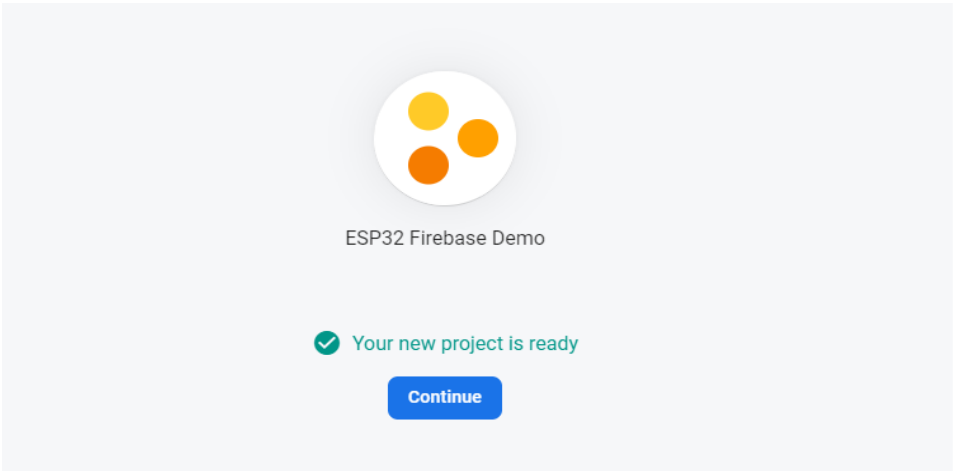
1.Create a Firebase Project:
Follow the next instructions to create a new project on Firebase.

a) Go to Firebase and sign in using a Google Account.
b) Click *Get Started*, and then *Add project* to create a new project.
c) Give a name to your project, for example: *ESP Firebase Demo*.

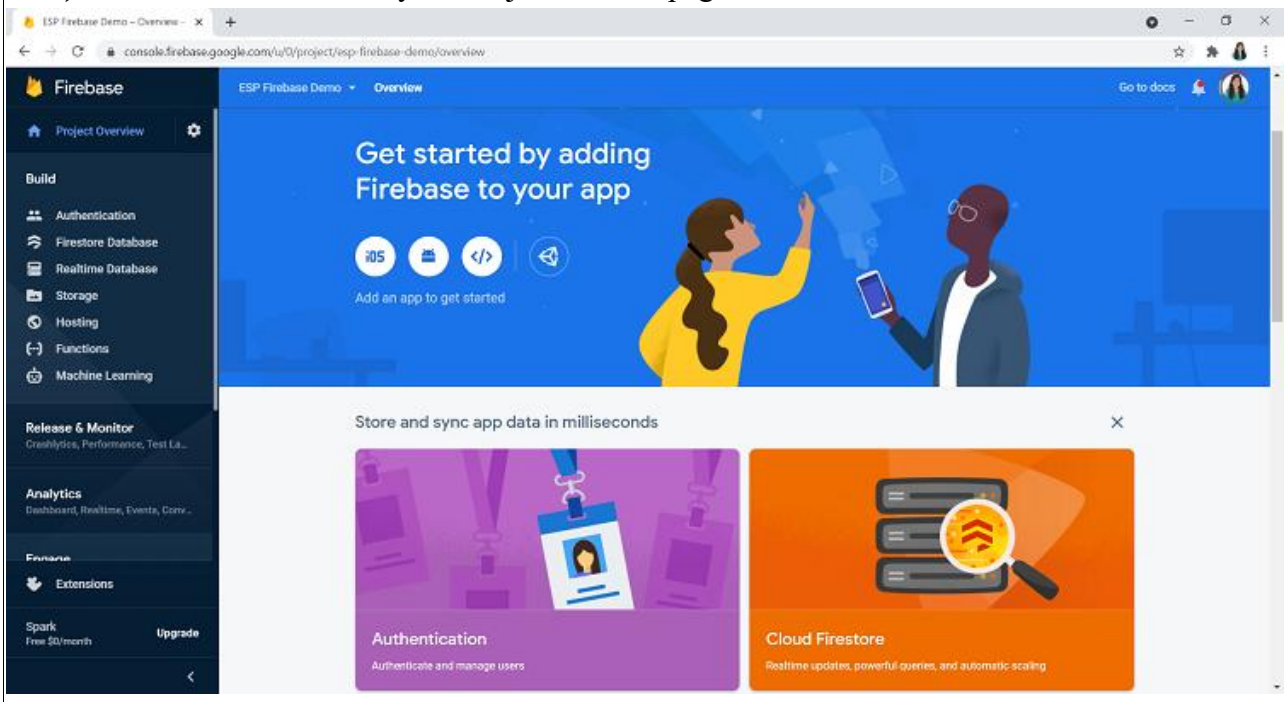
d) Disable the option *Enable Google Analytics* for this project as it is not needed and click *Create project*.



e) It will take a few seconds setting up your project. Then, click *Continue* when it's ready.



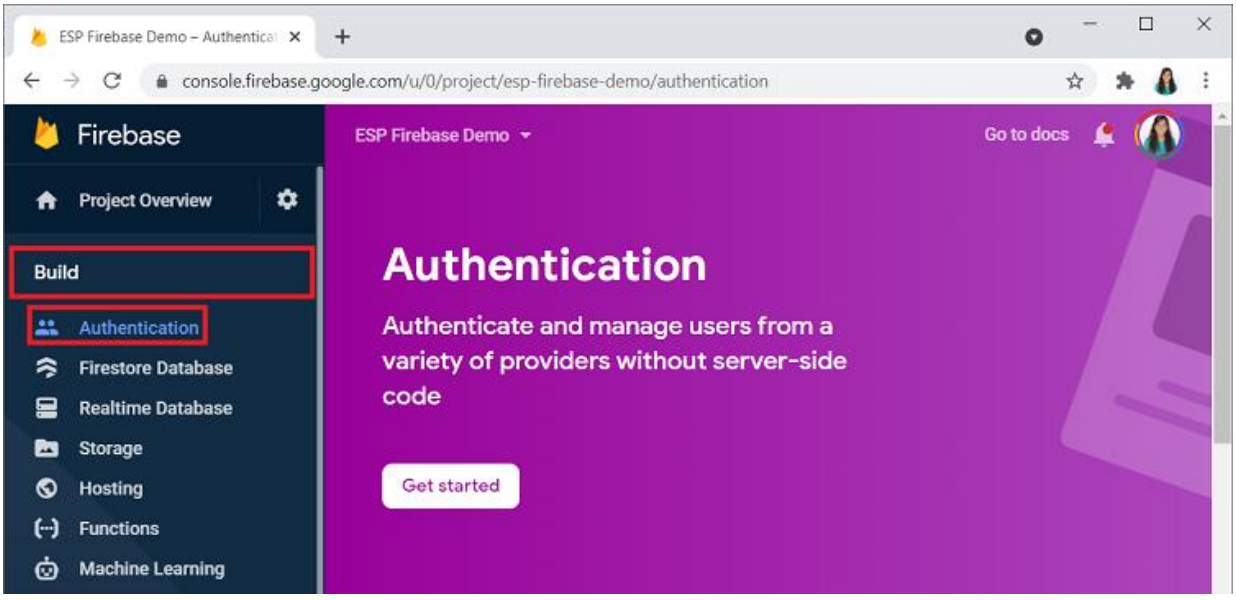
f) You'll be redirected to your Project console page.



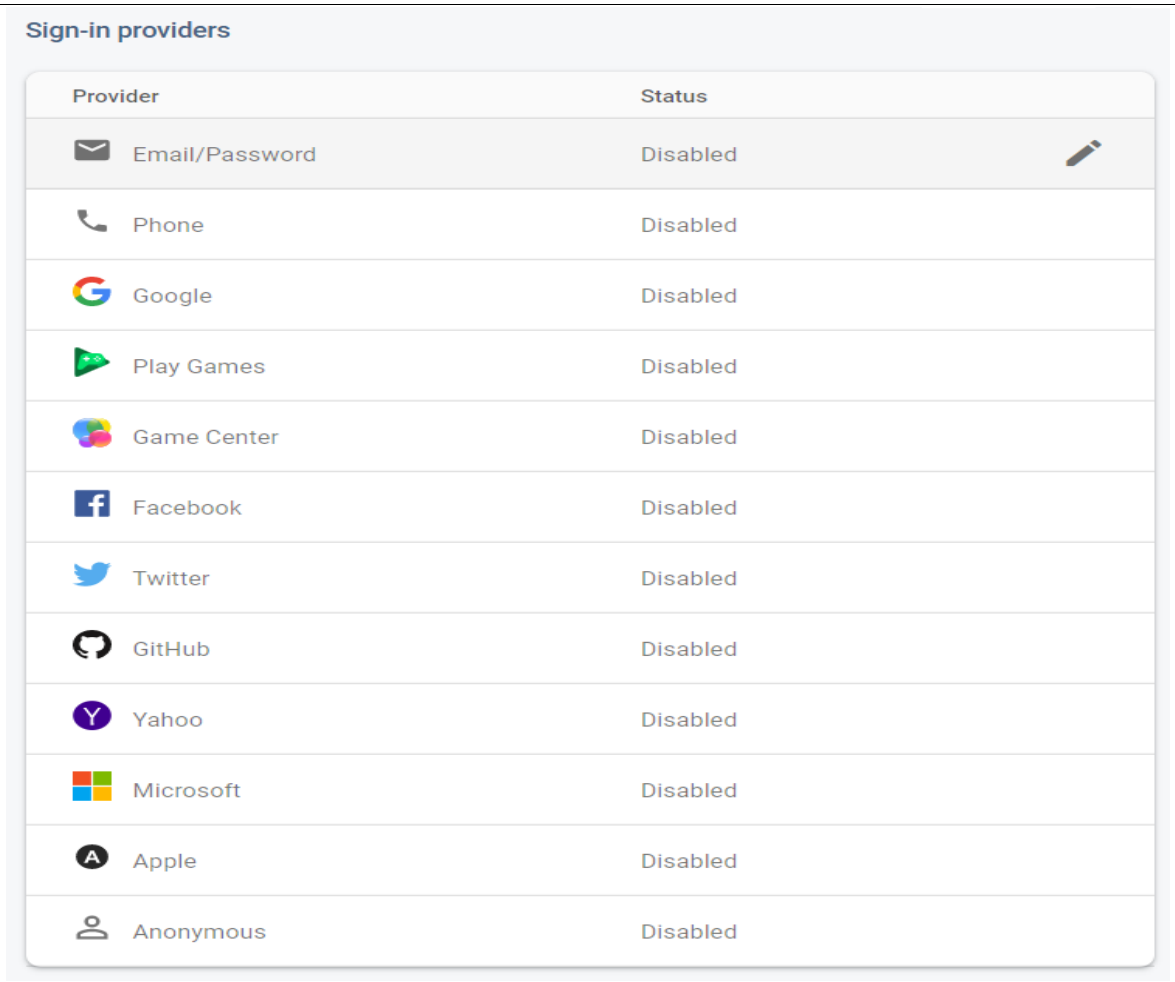
2. Set Authentication Methods:

"Most apps need to know the identity of a user. In other words, it takes care of logging in and identify the users (in this case, the ESP8266). Knowing a user's identity allows an app to securely save user data in the cloud and provide the same personalized experience across all of the user's devices."

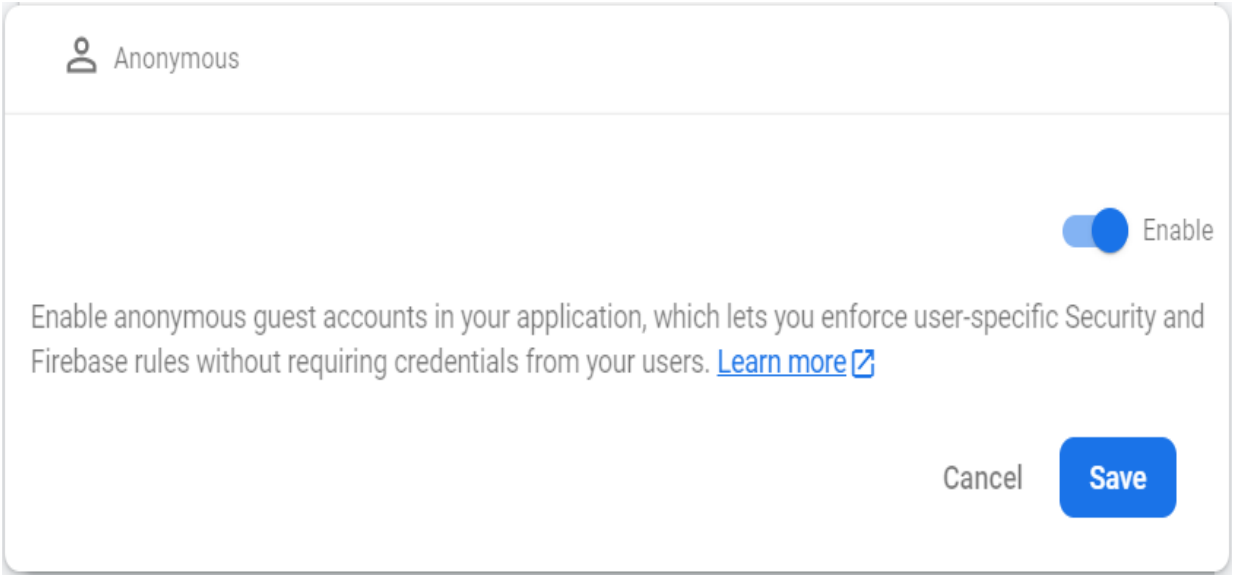
I. On the left sidebar, click on *Authentication* and then on *Get started*.



II. There are several authentication methods like email and password, Google Account, Facebook account, and others.

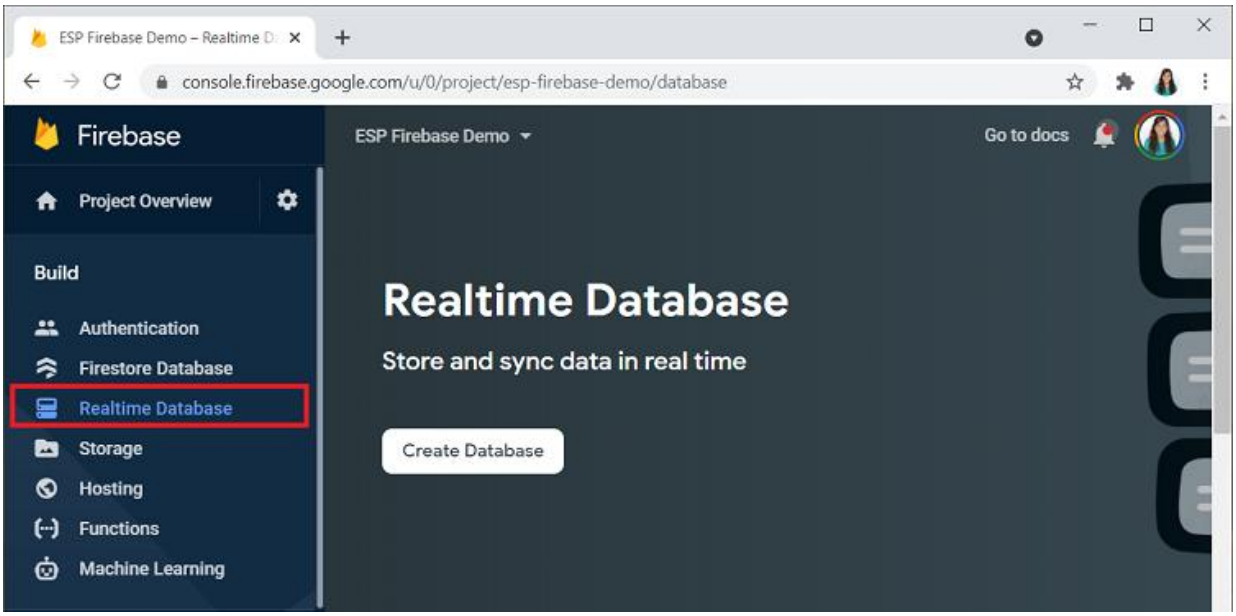


III. For testing purposes, we can select the *Anonymous* user (require authentication without requiring users to sign in first by creating temporary anonymous accounts). Enable that option and click *Save*.

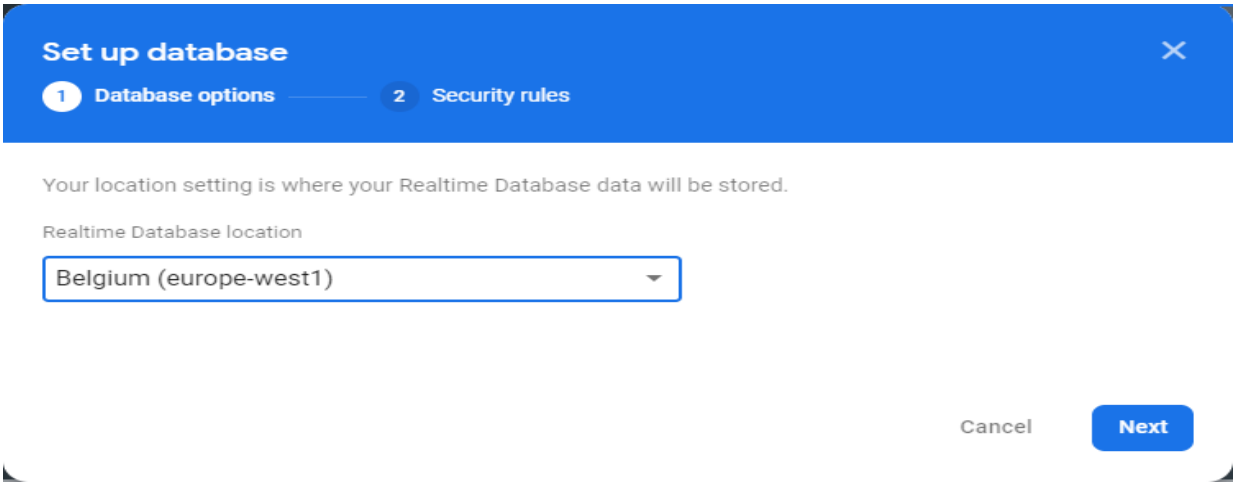


3. Creating a Realtime Database: The next step is creating a Realtime Database for your project. Follow the next steps to create the database.

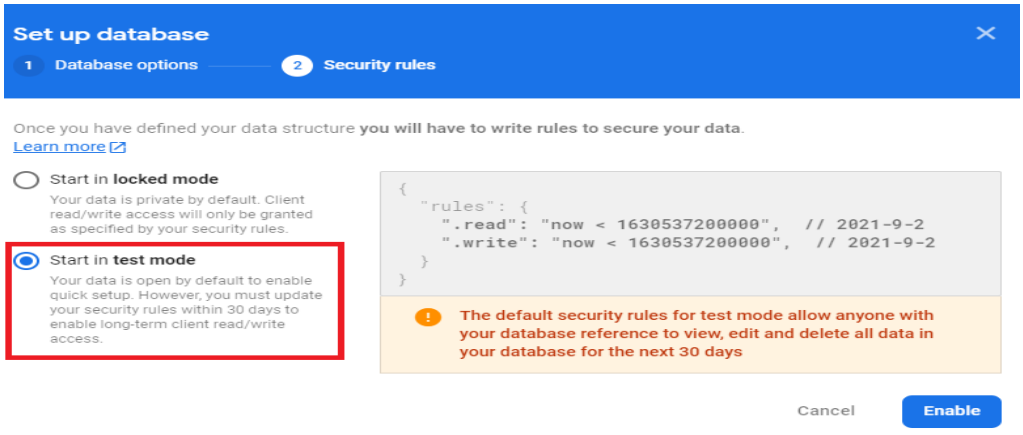
I. On the left sidebar click on *Realtime Database* and then, click on *Create Database*.



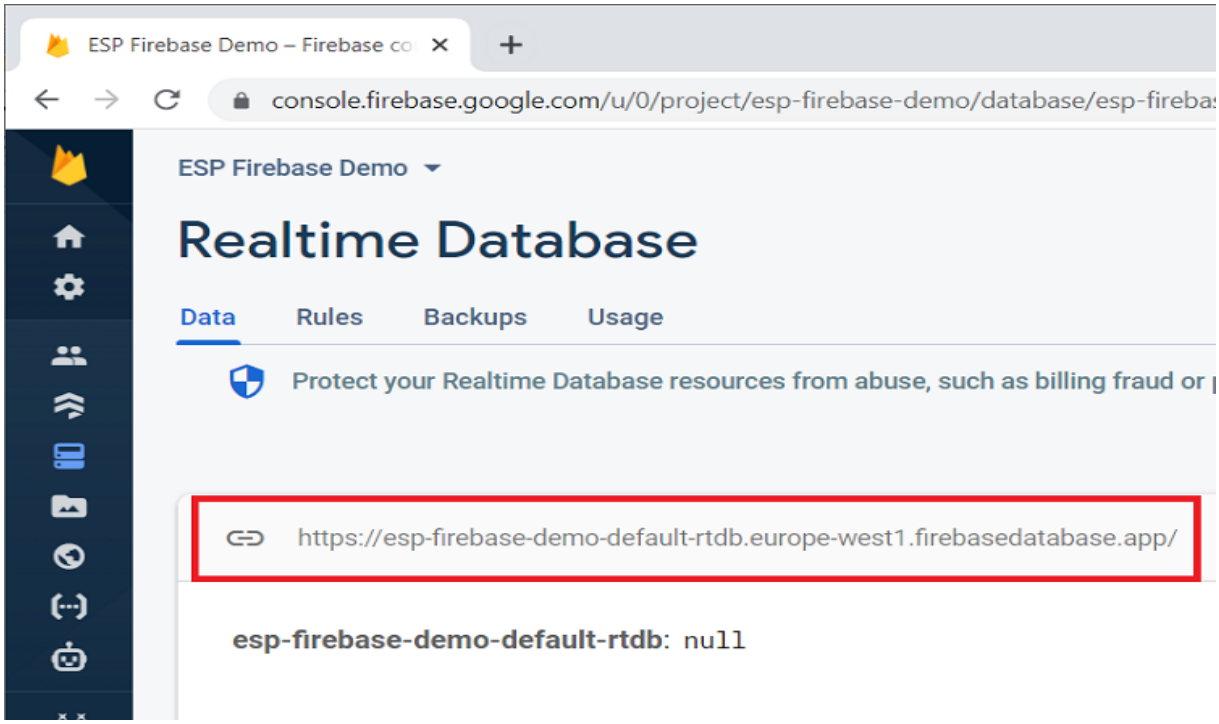
II. Select your database location. It should be the closest to your location.



III. Set up security rules for your database. For testing purposes, select *Start in test mode*. In later tutorials you'll learn how to secure your database using database rules.



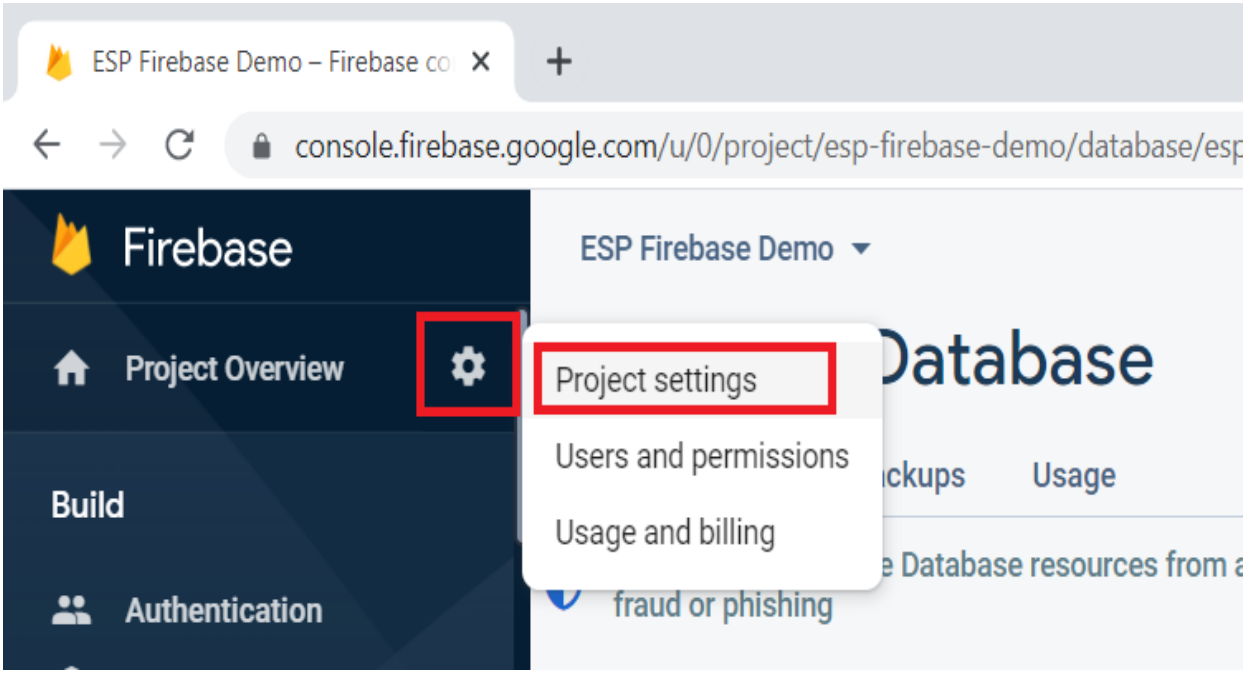
IV. Your database is now created. You need to copy and save the database URL—highlighted in the following image—because you'll need it later in your ESP8266 code.



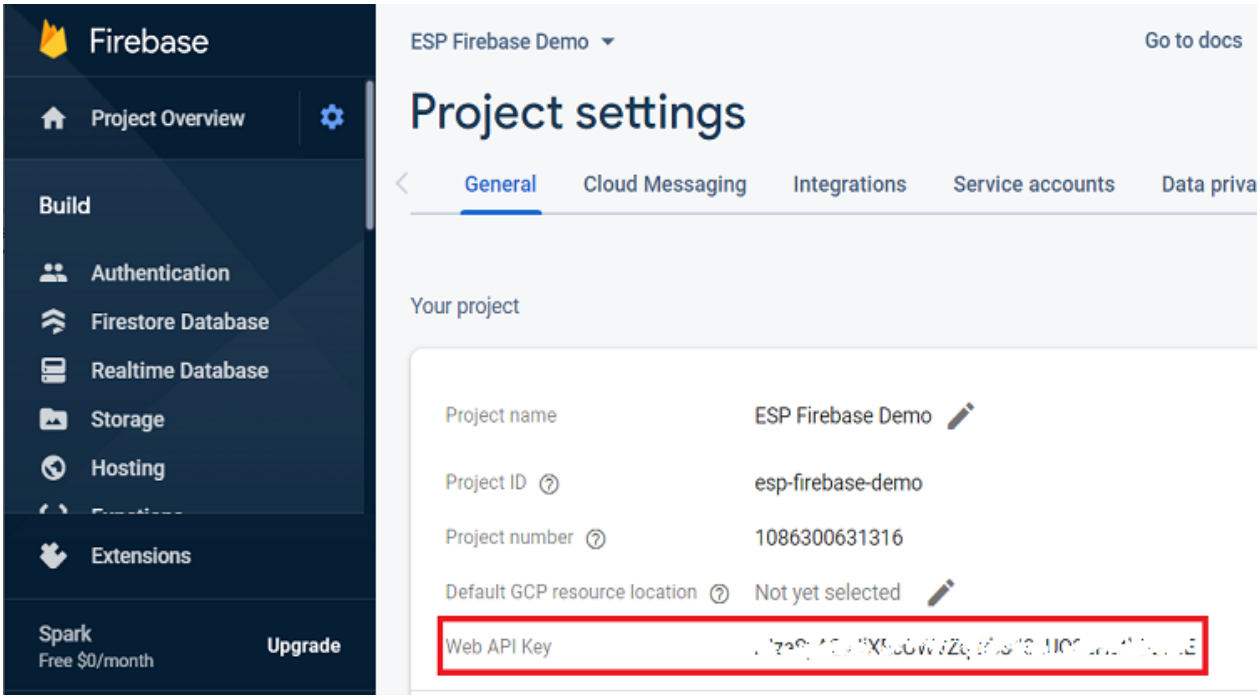
The Realtime Database is all set. Now, you also need to get your project API key.

4. Get Project API Key:

I. To get your project's API key, on the left sidebar click on *Project Settings*.



II. Copy the API Key to a safe place because you'll need it later.

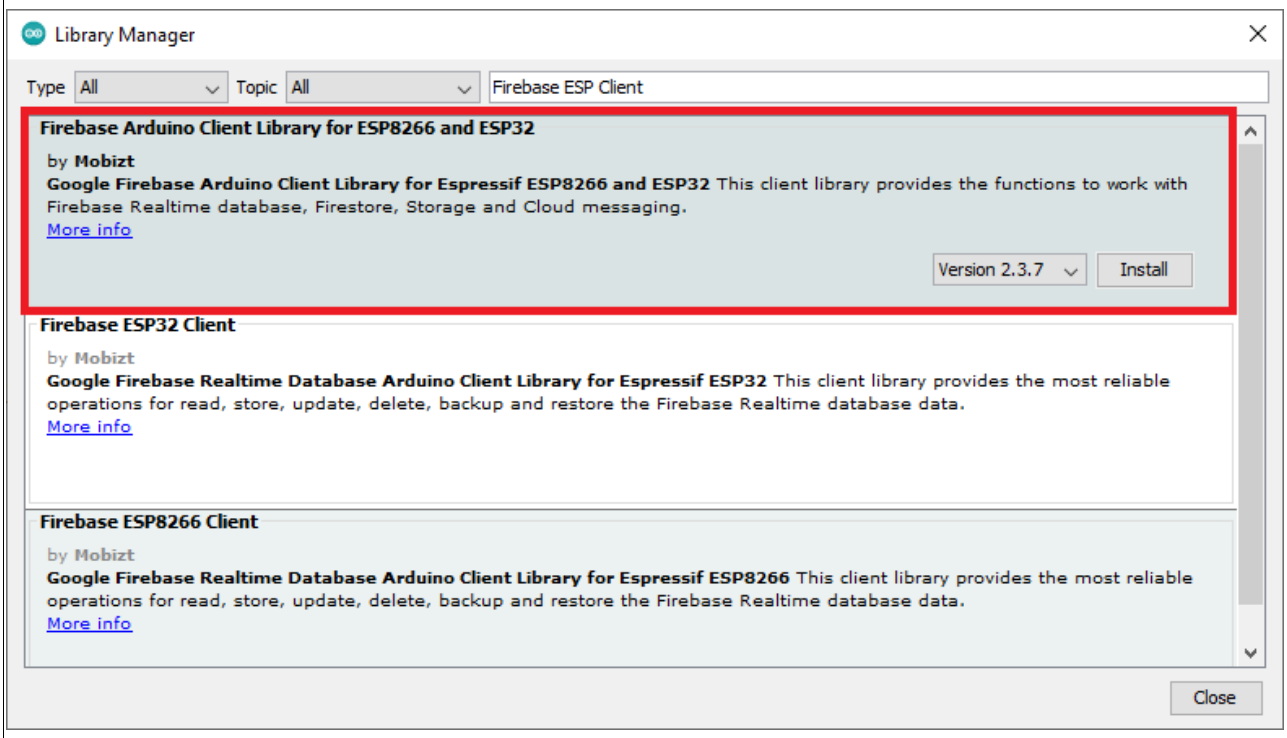


Program the ESP8266 to Interface with Firebase:

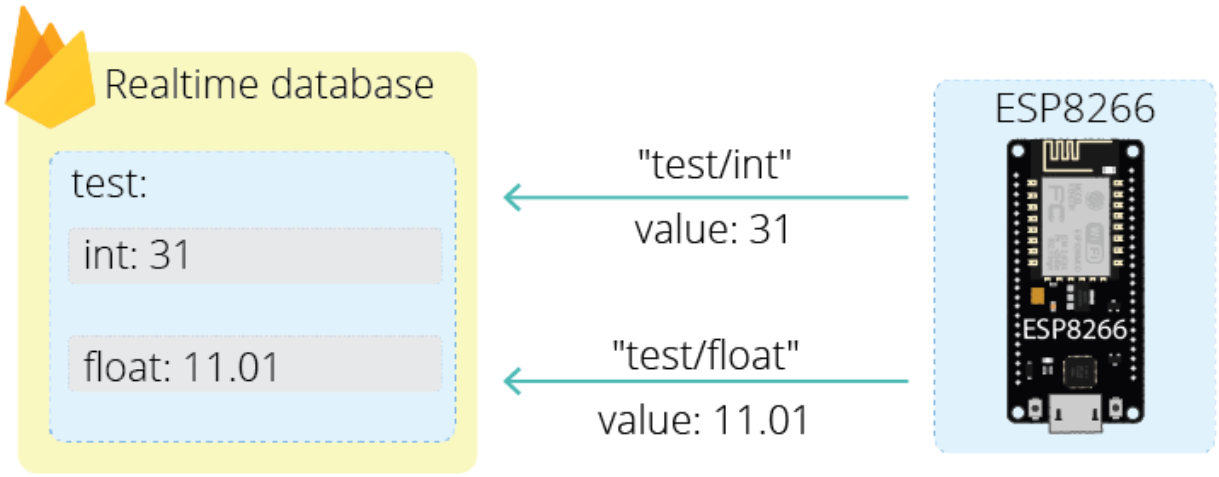
Installation – Arduino IDE

If you're using Arduino IDE, follow the next steps to install the library.

1. Go to **Sketch** > **Include Library** > **Manage Libraries**
2. Search for *Firebase ESP Client* and install the *Firebase Arduino Client Library for ESP8266 and ESP32* by Mobitz.

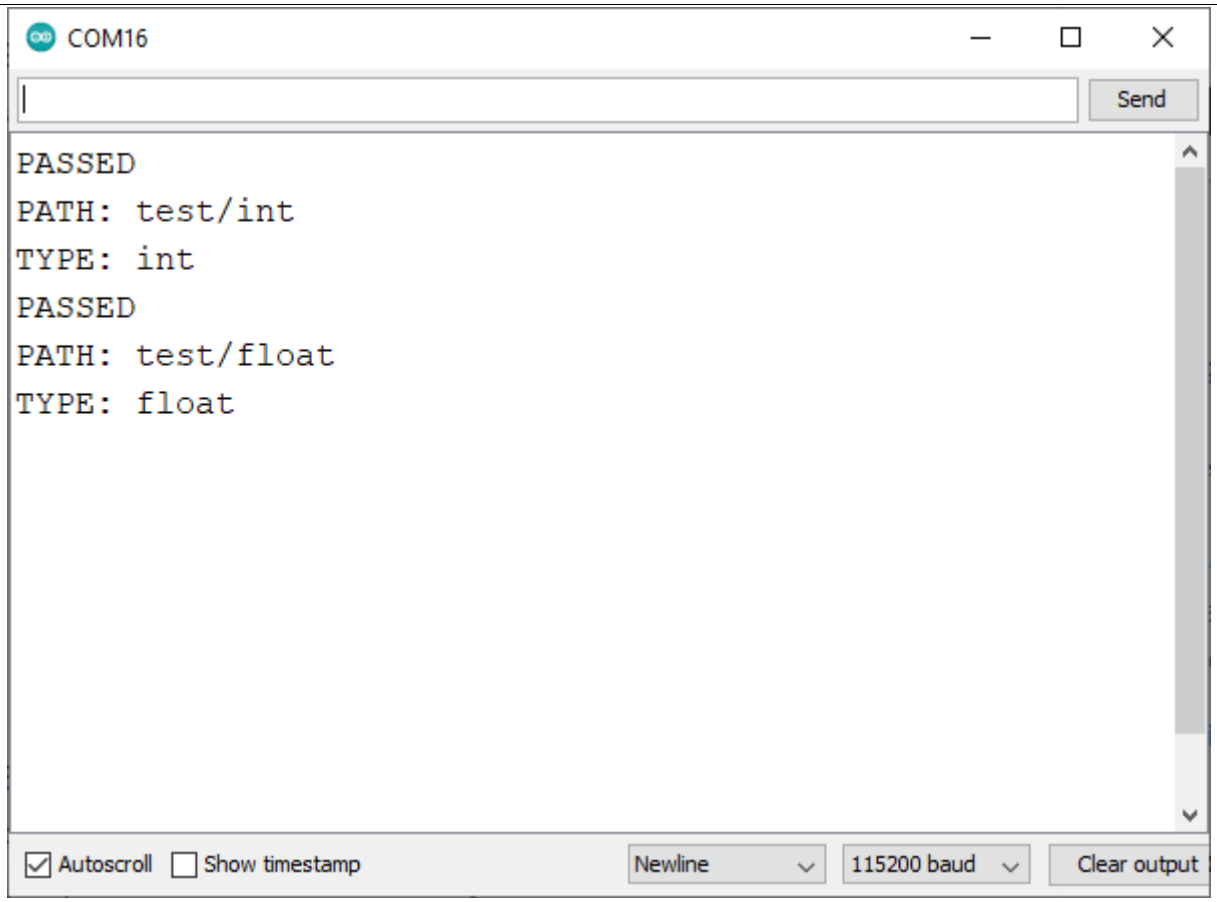


ESP8266 Store Data to Firebase Database:




```
#include <Arduino.h>
#if defined(ESP32)
  #include <WiFi.h>
#elif defined(ESP8266)
  #include <ESP8266WiFi.h>
#endif
#include <Firebase_ESP_Client.h>

//Provide the token generation process info.
#include "addons/TokenHelper.h"
//Provide the RTDB payload printing info and other helper functions.
#include "addons/RTDBHelper.h"

// Insert your network credentials
#define WIFI_SSID "REPLACE_WITH_YOUR_SSID"
#define WIFI_PASSWORD "REPLACE_WITH_YOUR_PASSWORD"

// Insert Firebase project API Key
#define API_KEY "REPLACE_WITH_YOUR_FIREBASE_PROJECT_API_KEY"

// Insert RTDB URLefine the RTDB URL */
#define DATABASE_URL "REPLACE_WITH_YOUR_FIREBASE_DATABASE_URL"

//Define Firebase Data object
FirebaseData fbdo;

FirebaseAuth auth;
FirebaseConfig config;

unsigned long sendDataPrevMillis = 0;
int count = 0;
bool signupOK = false;

void setup(){
```

```
  Serial.begin(115200);
  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  Serial.print("Connecting to Wi-Fi");
  while (WiFi.status() != WL_CONNECTED){
    Serial.print(".");
    delay(300);
  }
  Serial.println();
  Serial.print("Connected with IP: ");
  Serial.println(WiFi.localIP());
  Serial.println();
  /* Assign the api key (required) */
  config.api_key = API_KEY;
  /* Assign the RTDB URL (required) */
  config.database_url = DATABASE_URL;
  /* Sign up */
  if (Firebase.signUp(&config, &auth, "", "")){
    Serial.println("ok");
    signupOK = true;
  }
  else{
    Serial.printf("%s\n", config.signer.signupError.message.c_str());
  }
  /* Assign the callback function for the long running token generation task */
  config.token_status_callback = tokenStatusCallback; //see addons/TokenHelper.h
  Firebase.begin(&config, &auth);
  Firebase.reconnectWiFi(true);
}

void loop(){
  if (Firebase.ready() && signupOK && (millis() - sendDataPrevMillis > 15000 || sendDataPrevMillis == 0)){
    sendDataPrevMillis = millis();
    // Write an Int number on the database path test/int
    if (Firebase.RTDB.setInt(&fbdo, "test/int", count)){
      Serial.println("PASSED");
      Serial.println("PATH: " + fbdo.dataPath());
      Serial.println("TYPE: " + fbdo.dataType());
    }
    else {
      Serial.println("FAILED");
      Serial.println("REASON: " + fbdo.errorReason());
    }
    count++;
    // Write an Float number on the database path test/float
    if (Firebase.RTDB.setFloat(&fbdo, "test/float", 0.01 + random(0,100))){
      Serial.println("PASSED");
   }
}}
```


COM16
Send
PASSED
PATH: test/int
TYPE: int
PASSED
PATH: test/float
TYPE: float
Autoscroll
Show timestamp
Newline
115200 baud
Clear output