Hand On with ESP32

1. My Introduction:

Hello everyone I'm **Rohan Mondal. I'm an 2nd year CSE (**Computer Science and Engineering) **un**dergrad from NITSIKKIM(National Institute Of Technology Sikkim), Currently I'm just complete my 3rd semester. I did this small project during my winter vacation.

This is all about myself, Now let's talk about **What is IOT…?**

2. What is IOT?

The Internet of Things (IoT) describes the 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. These devices range from ordinary household objects to sophisticated industrial tools. For More information You can visit this link.

As a fresher 'IOT', 'Cloud', 'Micro Controller', 'Micro Processor' these fancy words are quite fascinating for Me. So, during my winter brake I created this small project with help of mentors.

3. Tech I Used to Complete This Project:

Physical Component:

1. ESP32 Board.
2. Micro USB Cable.

Programing Language:

1. C++

Software:

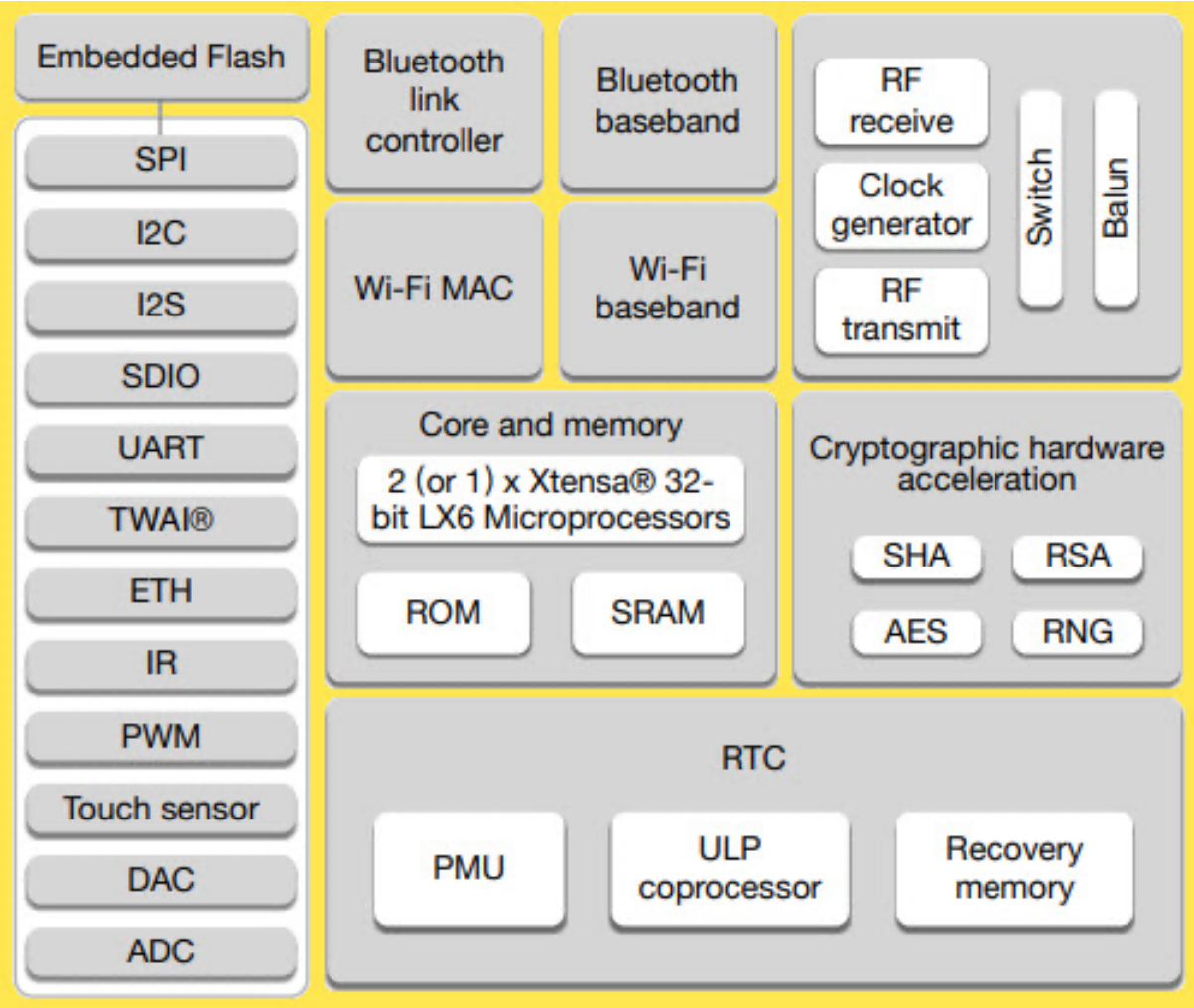
1. Arduino IDE 2
2. CP201x Driver
3. Vs Code

Website:

1. 000webhost
2. phpMyAdmin

4. Details of ESP 32

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espressif Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Tensilica's 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth.

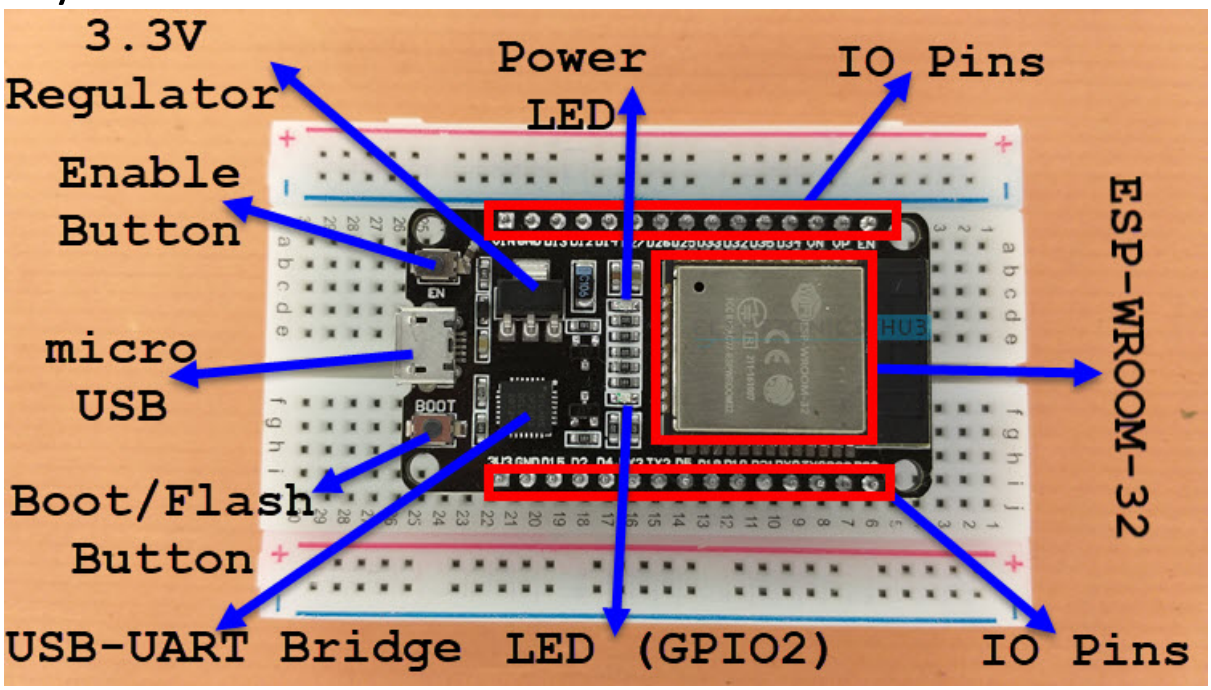


Technical Specification:

ESP32 has a lot more features than ESP8266 and it is difficult to include all the specifications in this Getting Started with ESP32 guide. So, I made a list of some of the important specifications of ESP32 here. But for complete set of specifications, I strongly suggest you to refer to the Datasheet.

- Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240 MHz.
- 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
- Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150 Mbps.
- Support for both Classic Bluetooth v4.2 and BLE specifications.
- 34 Programmable GPIOs.
- Up to 18 channels of 12-bit SAR ADC and 2 channels of 8-bit DAC
- Serial Connectivity include 4 x SPI, 2 x I^2C, 2 x I^2S, 3 x UART.
- Ethernet MAC for physical LAN Communication (requires external PHY).
- 1 Host controller for SD/SDIO/MMC and 1 Slave controller for SDIO/SPI.
- Motor PWM and up to 16-channels of LED PWM.
- Secure Boot and Flash Encryption.
- Cryptographic Hardware Acceleration for AES, Hash (SHA-2), RSA, ECC and RNG.

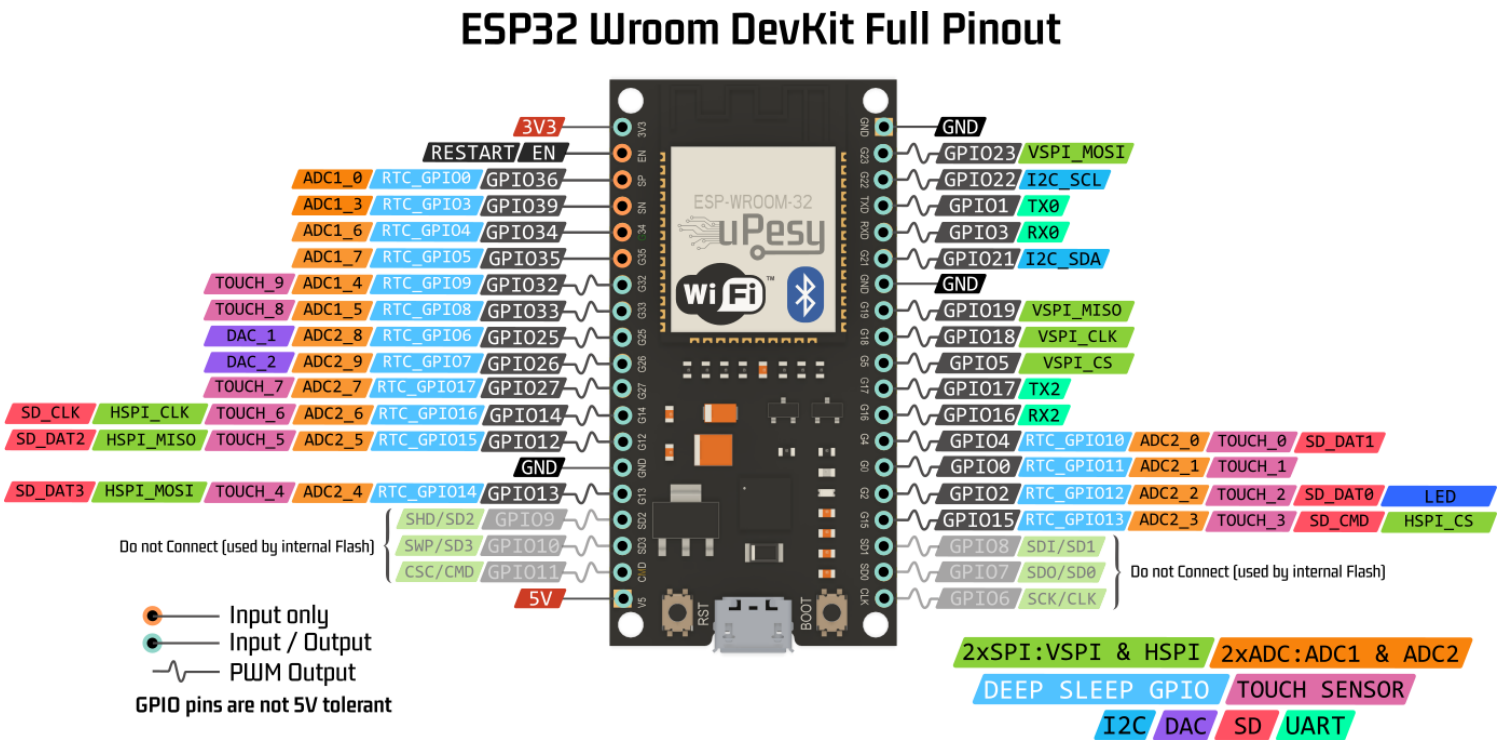
Layout:



As you can see from the image, the ESP32 Board consists of the following:

- ESP-WROOM-32 Module
- Two rows of IO Pins (with 15 pins on each side)
- CP2012 USB – UART Bridge IC
- micro–USB Connector (for power and programming)
- AMS1117 3.3V Regulator IC
- Enable Button (for Reset)
- Boot Button (for flashing)
- Power LED (Red)
- User LED (Blue – connected to GPIO2)
- Some passive components

Pinout of ESP32 Board



For more Info Please visit the [link.]

5. Project Details

About the Project:

In this Project I created a data base in a cloud server and connected the ESP32 with that cloud server. In this project I used Nodemcu 32s version.

Objective:

My objective Is to establish the connection between the Web Server, and control it from the web site. By completing this Project I'm able to learn the basic functioning of the IOT devices, how devices are connected, what is database, Why do we need database, how database was created and manage, how to code for any micro controller, understanding the functioning of the server etc and many more basic concepts.

6. Step By Step Process

Step 1:

1. At first download the Aurdion IDE(I use IDE 2.0.3) and setup the Ide.
2. Open the ide, go to Files >> Preferences >> Additional Board Manager URL
   Then pest the link https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json then >> ok
3. Then Tools >> Boards >> Board Manager >> search ESP32 in the search box >> INSTALL
4. Then again Tools >> Boards >> Board Manager >> ESP32 Arduino >> ESP32 Dev Module
5. Select Board >> DOIT ESP32 DEVKIT V1

Step 2: This board has a FTDI programmer IC, so we can program it. And for pregaming it we need to install the driver.

In my ESP32 board there is CP2102 drive, so I need to download the CP210x driver.

1. Search CP210x Driver by Silicon Labs(URL: https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads)
   In the Download section chose the download file >> A zip file will download.
   Extract the file.
2. Connect your ESP32 with you system
   Start >> Device Manger >> Other Devices >> Chose the connected board >> right click >> Properties >> Update Driver >> Browse My computer for Drivers >> Pest that Extracted file path or Browse >> Next >> Close

Now let's check we are able to program the ESP32 bord or not. For that we run a simple Python program.

```
int LED = 2;
void setup()
{
pinMode(LED, OUTPUT);
}
void loop() {
digitalWrite(LED, HIGH);
 delay(1000);
 digitalWrite(LED, LOW);
delay(1000);
}
```

Note* Make sure your system must install Python.

STEP 2:

Now we move forward, we are going create a hosting server. I use 000webhost.com it's a platform to create hosting server for free of cost.

1. Go to website >> Sign In >> Manage Website >> Tools >> Database Manager >> New Database

Now we need to create a new database

1. Fill the database name , Database username and Password then create the data base. It take some time, then
   Manage >> PhpMyAdmin
2. Now we create a table of data,
   On the left there is your DB Name id_ some number_that name >> create table >> enter table name >> Number of Colum >> Go

Here I Give name as LED_p1 and No of Colum 2
A data sheet created with 2 Colum now we have to fill it
1st Colum Name = id
2nd Colum Name = status

1st & 2nd Colum Type = Int
1st & 2nd Colum Length / Values = 11
1st Colum Null Index = Primary
1st & 2nd Colum A_I check Box = Tick, Rest things was as it is.
The Database was created.

Now we open the Arduino ide

Sketch >> Include Library >> Add .ZIP Library >> Chose the HTTP and WIFI file one by one the library file will open

Then Update the Wi-Fi name and the Wi-Fi Password with your current wi-fi name and password. Then in line no. 66 pest the your website link in the http.bigin().

Download the arduino code(link at the end of this report). Now change the ssid with your Wi-Fi network name, and password with your Wi-Fi password.

Now we have to upload our code and some other file to our server. For that we have to come again to the Manage Website page

Manage Website >> Tools >> File Manager >> Upload File >> SELECT FILES >> choose the files >> UPLOAD

For the Website function perfectly we need to upload some file,

1. Website file Which Include files important for functioning the website. In this file there is a index file, in that file we need to do some changes.
   A. dbUsername
   B. dbPassword
   C. dbName

      These info you get from the 000webhost website.

      Also make sure that the table name of your data base must be same as name in this index file. Or if you change it Don't Forget to change the name in the code.

Now it's almost done, After uploading all the files, now we back to the home page of 000webhost. There is a website link open it, before that upload the Arduino code to the board. When the connecting shows in the terminal press the boot button till the uploading starts. Now we can successfully able to control theESP32 bord from the website. Because it's free that's why it take some time to function.

7. Problem I face

1st problem I face that's without downloading the driver I try to upload the code to the board, but continually give me error 'port not selected'. I tried various method, and try to figure out what's the issue but was not able to do that.

So, I contact my Instructor Mr. Behtrein he told me I have to Download and setup the driver for CP210x, and also guide me how to setup it.

2nd problem I face while setup the website. The website gives me error. After analyzing the error finally find out that my Database table name and the Database table name in the provided code is not same. So, I Correct it.

8. Mentor Credit

I did this small project under the mentorship of Mr. Debojyoti Lahiri. Debojyoti sir guide me and provide me resources required for this project. Also take help form my senior Mr. Behtrein Ahmed Biswas. During the project Behtrein sir solved my all-small doubts and help me to complete my project.

Websites :

https://electronoobs.com/eng_arduino_tut172.php

Arduino code:

https://electronoobs.com/images/Arduino/tut_172/ESP32_IOT.zip

HTTPClint File:

https://electronoobs.com/eng_arduino_httpclient.php

Wi-Fi File:

https://electronoobs.com/eng_arduino_wifi.php