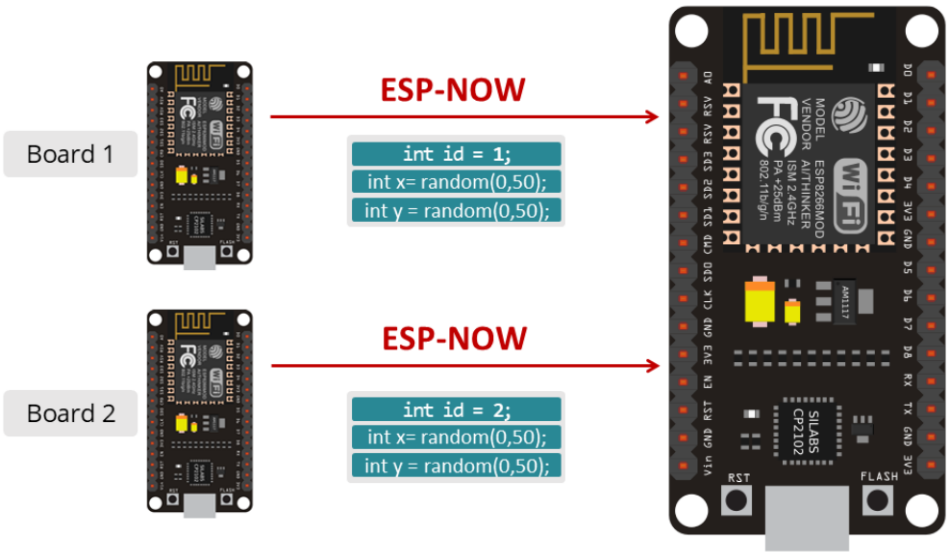
IoT Network Implementation for the Dustbins

Our first task was to create a local network of the dustbins to know the relevant information about each dustbins.

As shown in the figure ,there is one central server which will receive data from all the other ESP8266 nodes (Dustbins).
We have used ESP-Now Protocol instead of wifi.



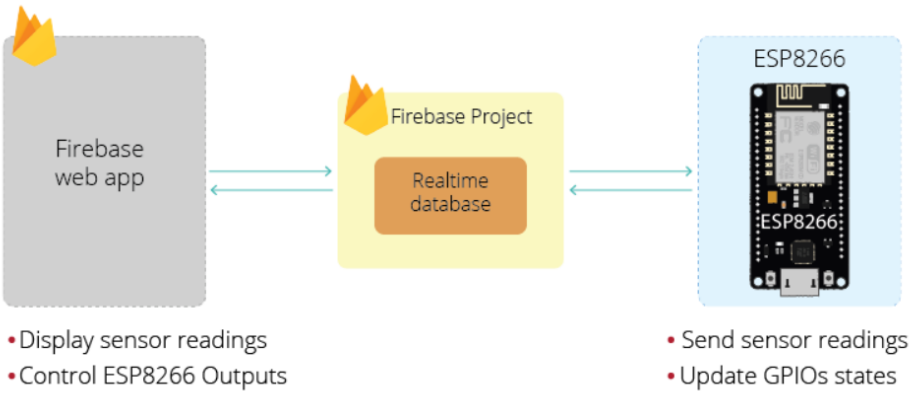
Working of the system:

- Here each dustbin (ESP8266) is programmed to operate in station mode and the central server is programmed to operate in access point mode.
- Each node (Dustbin) is connected to multiple sensors like GPS ,temperature ,Ultrasonic sensor and collecting data in real time.
- We are sending this data from each node to the central server using the mac address of the server.
- For identifying each dustbins,we sending unique Id from each dustbins along the sensor readings to the central server.

Benefits of using ESP-Now protocol over traditional wifi protocol:(this is novel in our implementation)

- System will be fault tolerant
- Dustbins are using the MAC-address of the server to send the data ,so communication is fast as there is no 3-way handshaking each time.
- We are getting three times the range as compared to my wifi.
- Line of sight range of ESP -Now protocol is 480 meters.
- Because of this large range ,we do not need to create a mesh network of the dustbins ,and we can use star topology to connect the dustbins to the central server.

Now ,once the local network is created ,we need to send the data to the internet for processing and other analytics. For this we need to connect our server to the internet.



To achieve internet communication of the central server ,we have programmed it to operate in Access point mode as well as station mode.

Once our server is connected to the internet ,it will start sending data to the firebase database ,and data will be updated after a specified interval in our cloud in real time.

Unique Point about this implementation:

- We can create a large local network of dustbins ,since we can achieve a range of almost 0.5 KM using ESP -Now communication protocol.

- If we have some geographic location ,where internet connectivity is an issue ,we can route this data to the nearest neighbor server using very few intermediary nodes ,since each server is acting in station mode as well as access point mode.