NOISE POLLUTION MONITORING

Introduction:

The main objective of IOT based air and noise pollution monitoring system is that the air pollution is a rising issue these days. As a human we need fresh air to survive. Air is most important factor in humans life. If there is any kind of air pollution it's harmful for human. Air pollution kill more than seven million people worldwide every year. Pollution is very harmful for those people who have any kind of internal diseases on this type of people pollution affect very fastly. In atmosphere is the full of air which contain monoxide, smoke, alcohol, benzene, methane etc. Between this gas some are good and some are harmful for environment for certain level some gases are good for human, animals, plants but beyond certain level these created problem for services to overcome these problem system is useful because of this we can analyse the air and noise pollution means how many pollution level in atmosphere in three different levels. We use Internet Of Things (IOT). In this we use things peak we can analyse previous data also using this platform in graphical form.

Project Definition:

we will build an **IoT decibel meter** to measure sound in a particular place and record the value in a graph using IoT. A device like this will be useful in places like hospitals and schools to track and monitor the sound levels. A **sound level meter** is employed for acoustic (sound that travels through the air) measurements. The simplest sort of microphone for sound level meters is the capacitor microphone, which mixes precision with stability and reliability. The diaphragm of the microphone responds to changes in air pressure caused by sound waves. That's why the instrument is usually mentioned as a **sound pressure level (SPL) Meter**. Sound level meters are commonly utilized in sound pollution studies for the quantification of various sorts of noise, especially for industrial, environmental, mining, and aircraft noise. Here we are going to make an **IoT based decibel meter** that will **measure the sound in decibels(dB)** using a sound sensor and display it to the LCD display along with that, it will also be pushing the readings to the **Blynk IoT platform** making it accessible from across the world.

Problem Definition:

Monitoring noise pollution using IoT (Internet of Things) devices can bring significant benefits, but it also raises several security and privacy concerns:

Security Issues:

- Data Breaches: IoT devices collect and transmit data to central servers. If these devices are not adequately secured, they can become targets for hackers, leading to data breaches that expose sensitive information.
- Unauthorized Access: Weak or default device passwords can be exploited by unauthorized individuals, allowing them to gain control over the IoT sensors and manipulate data or disrupt the monitoring process.
- Audio Data Privacy: IoT noise sensors capture audio data from their surroundings. If not properly anonymized or encrypted, this audio data can potentially record private conversations or activities, violating privacy rights.

Design Thinking:

1. Project objective:

- Noise monitoring is crucial for several reasons. First and foremost, it safeguards human health. Prolonged exposure to high levels of noise can lead to hearing loss and various physiological and psychological disorders, such as stress, sleep disturbances, and reduced productivity.

- Additionally, noise monitoring helps ensure compliance with legal regulations and standards set by authorities to protect workers' well-being. Monitoring also identifies areas of concern, enabling proactive implementation of noise control measures to mitigate risks, improve working conditions, and maintain a harmonious environment for employees.

- Furthermore, noise monitoring contributes to good community relations, as industries that proactively manage noise pollution demonstrate their commitment to environmental responsibility and social welfare.

2.Iot Sensor Design:

Components Required

- ESP8266 NodeMCU Board
- Microphone sensor
- 16*2 LCD Module
- Breadboard
- Connecting wires

Over Come The Security And Privacy Issues:

Secure Your IoT Network

To avoid interceptions from rogue devices or other potentially harmful cyber attacks, we need to protect and secure the network that's connecting various IoT devices. This is one of the most straightforward on the list as it just touches on security measures that everyone *hopefully* already follows online.

- Antivirus
- Anti-malware
- Firewalls

Use IoT Data Encryption

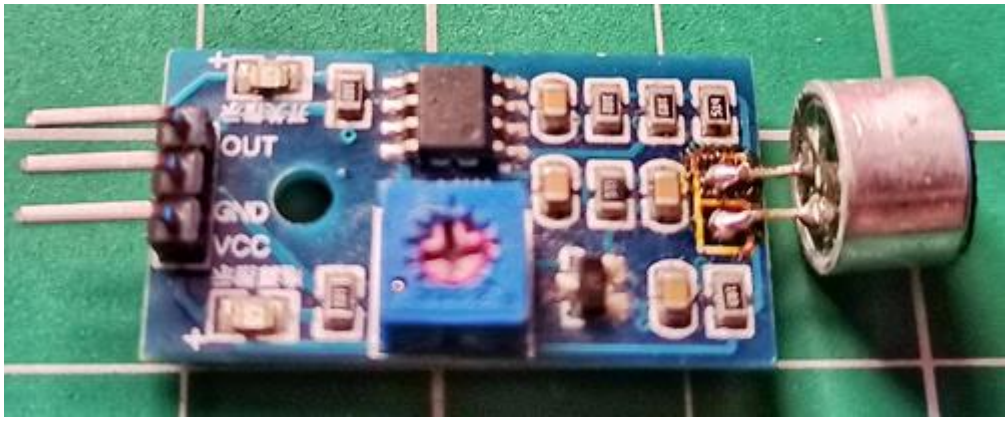
If we want to protecting the privacy of users and preventing data breaches, we need to encrypt the data at both rest and in-transit between IoT devices.

This can be done by using IoT encryption Algorithms. Whether the keys you use are symmetric or asymmetric, this is an important step in protecting users.

How does Microphone Module Work?

The microphone based sound sensor is used to detect sound. It gives a measurement of how loud a sound is. The sound sensor module is a small board that mixes a microphone (50Hz-10kHz) and a few processing circuitry to convert sound waves into electrical signals. This electrical signal is fed to on-board **LM393 High Precision Comparator** to digitize it and is made available at the OUT pin.

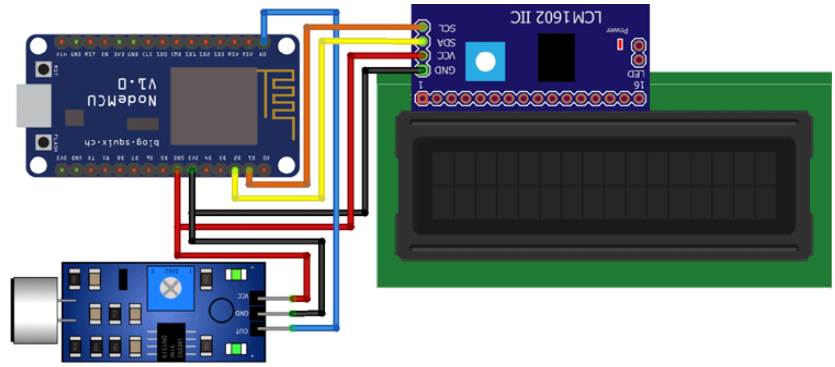
The module features a built-in potentiometer for sensitivity adjustment of the OUT signal. We will set a threshold by employing a potentiometer. So that when the amplitude of the sound exceeds the edge value, the module will output LOW, otherwise, HIGH. Apart from this, the module has two LEDs. The facility LED will illuminate when the module is powered. The Status LED will illuminate when the digital output goes LOW.

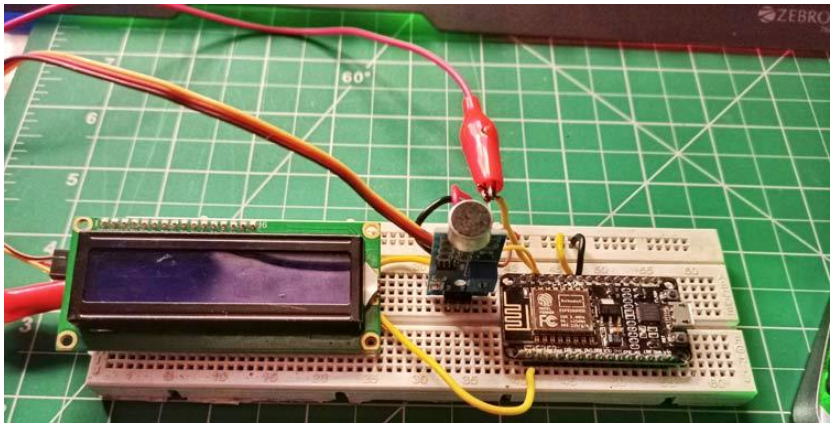


The sound sensor only has three pins: VCC, GND & OUT. VCC pin supplies power for the sensor & works on 3.3V to 5V. OUT pin outputs HIGH when conditions are quiet and goes LOW when sound is detected.

Circuit Diagram For IoT Sound Meter

The connections are pretty simple, we just have to connect the sound sensor to one of the Analog pin and the LCD to the I2C pins.





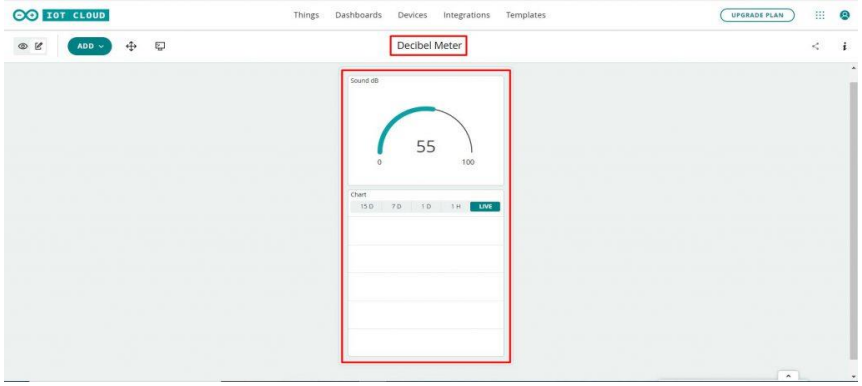
In the above diagram, we have connected the power pins of the sound sensor and LCD display to 3v3 and GND pin of NodeMCU. Along with that, we have also connected the SCL and SDA pins of the module to D1 and D2 respectively, and the OUT pin of the sound sensor to A0 pin.

3.Noise Pollution Information Platform:

Design Web and Mobile Dashboard

Go to the dashboard. Here we need to build a Web dashboard and Mobile app dashboard for monitoring live data from anywhere in the world. You can also provide a name to the dashboard. I am giving ***Decibel Meter*** as a dashboard name.

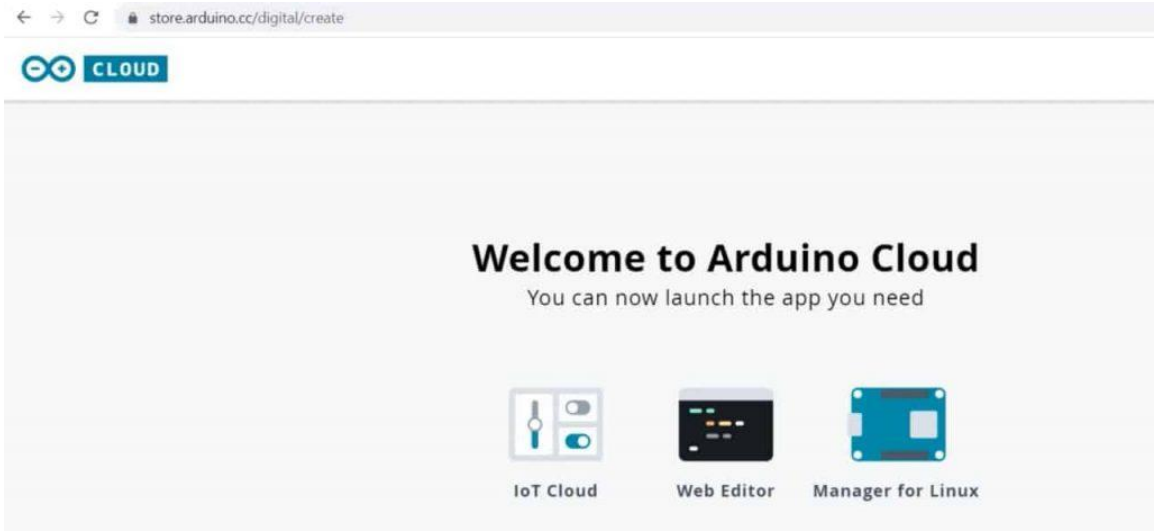
Now click on the add button. Then scroll down to select **Gauge**. Give it a name Sound dB. Then link a "***db***" variable that we have created earlier. Click on Done. Similarly, add a chart widget and link the same variable. You can arrange and resize the widget as per your requirements.



So finally, we are done with the IoT dashboard setup.

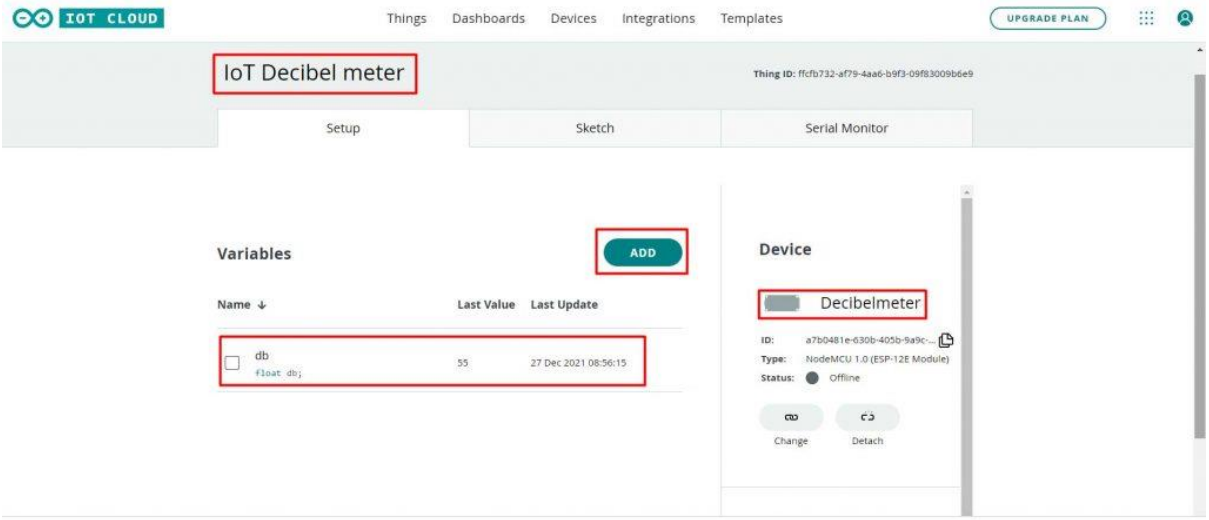
4.Integration approach:

Setting Up Arduino IoT Cloud

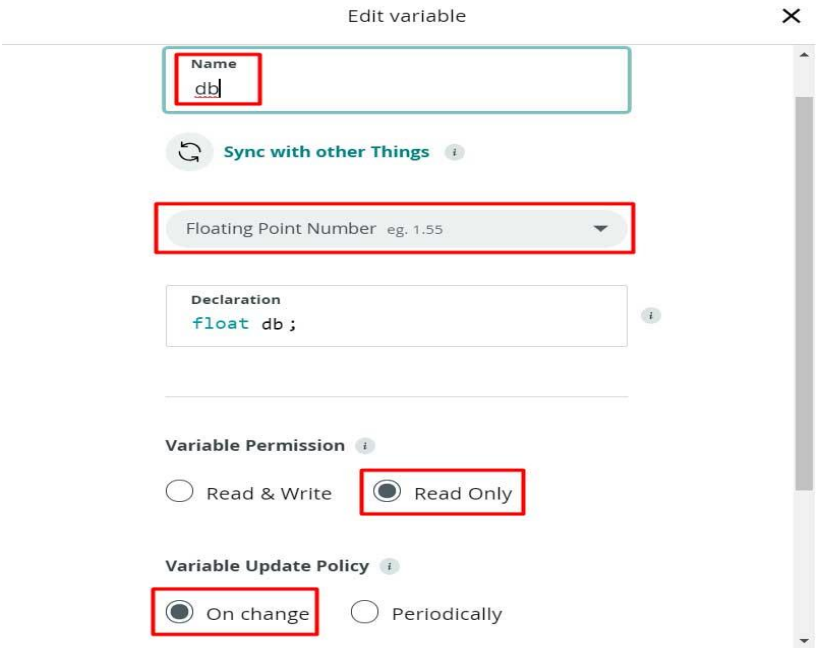


Now it's time to set up the Arduino IoT Cloud Dashboard. So, go to the Arduino Store. Click on IoT Cloud. Then you need to create a Thing first. Click on create Thing and Give it a name anything like IoT Decibel

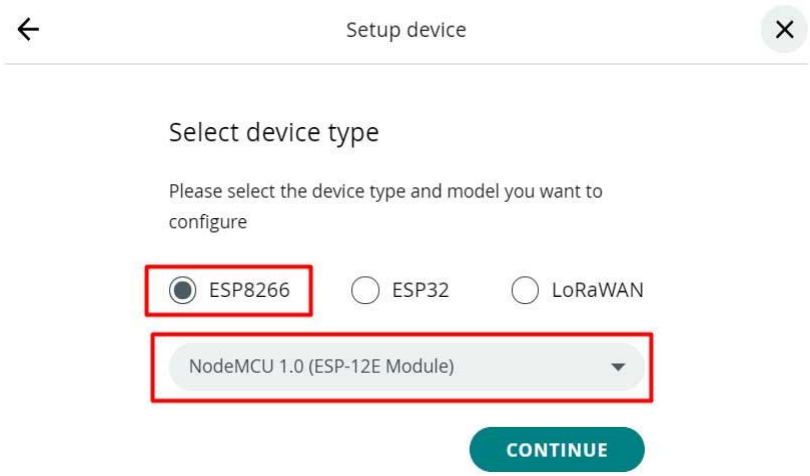
Meter.



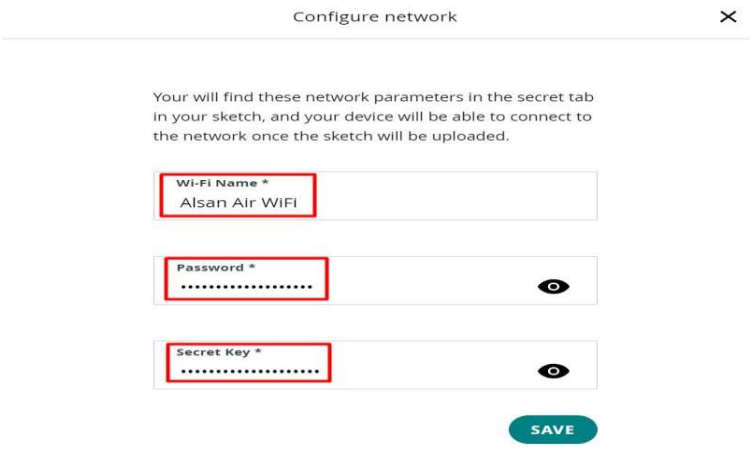
Now we need to create a variable. For that, click on add variable.



Name the variable anything like db. In the variable type, select Floating Point Number. So an automatic declaration of variables will be done. Now set the variable permission to Read-only. Then click on the Add variable button to create the first variable. Now, we need to configure a device as well. For that, select the device option. From the list, select a 3rd party device. Then select ESP8266. From this list, select NodeMCU 1.0 ESP-12E Module



Click to continue and give any name to the device. Give any name like “Decibelmeter” Then click next. So device ID & Secret Key is created here. Save this device ID for the coding part. Or simply download this PDF File which has the information of Secret Key. Then click on continue.



Now again, you need to set up the Network Credentials. So input your SSID, Password, and Secret Key that you created earlier. Finally, everything is set now.