

User Guide

Model No. : SN0001A

Version 1.0

REVISION HISTORY

Version	Date	Note	Approver
1.0	20 Dec-2022	Release SN0001A	Mahendra Sondagar

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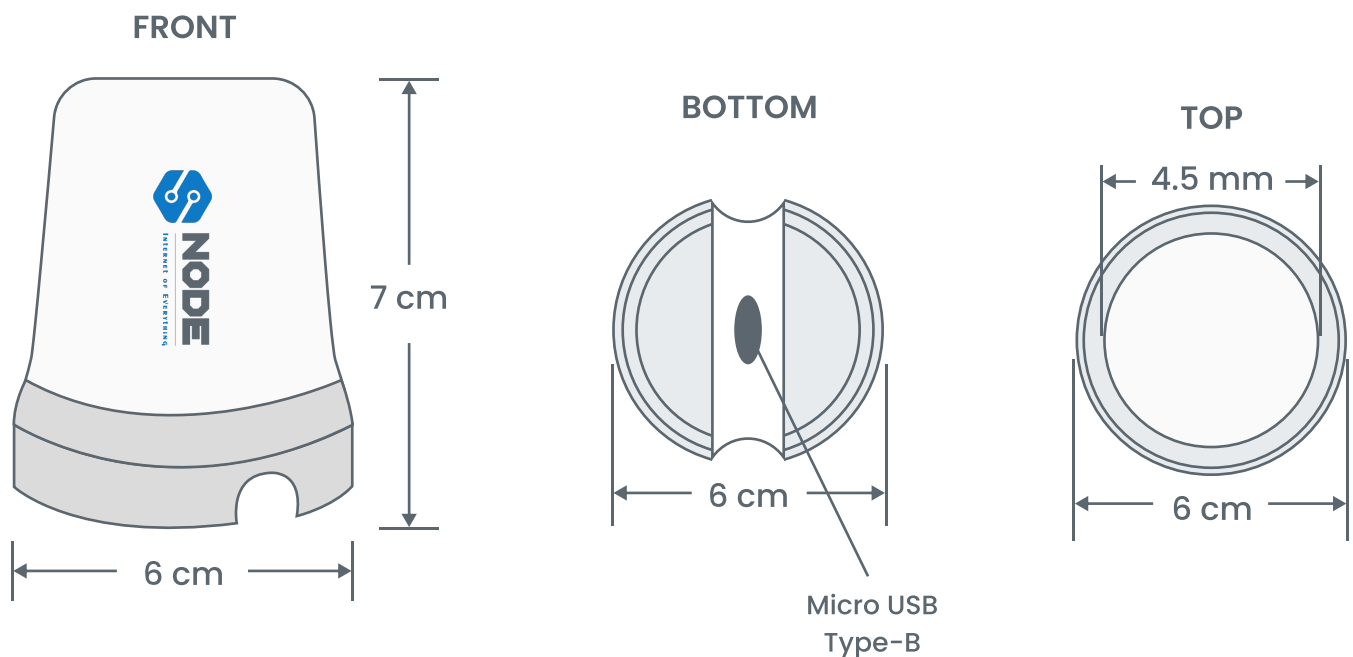
1 ABOUT THIS GUIDE

This manual describes how to configure the S-node and S-node Modular Gateway. It contains specifications and setup information for S-node and S-node modular gateways. Follow this manual exactly for a complete setup.

2 INTRODUCTION

2.1 Product Overview (S-Node)

- S-node is a tiny, truly plug-and-play sensor node designed to enable predictive maintenance at a fingertip.
- S-node is able to measure 3D vibration, accoustic emissions, gas emissions, RPM and IR thermal.
- S-node send data to the S-node modular gateway by using RF 2.4 GHz and Gateway send that data to the S-node cloud using MQTT protocol.
- A Highly scalable hardware architecture allows for plugging the sensors on a node as per the industrial requirement. Later on, machine learning algorithms will process data to estimate machine downtime and generate real-time notifications in the event of any unexpected situations, which will appear on the dashboard of the S-node.



2.2 Specification

Parameters	Specification
SoC/MCU	32-bit ARM® Cortex™ -M4 CPU, 64 MHz,
Connectivity Stack	OpenThread
Integrated Antenna	1.5 dBi MAX Gain
Onboard Storage Capacity	External FLASH-NOR Memory IC 32Mb (4M x8) SPI - Quad I/O 33MHz 8-WSON (6x5)
Enterprise-grade Security	Mbed TLS (AES-EBC, ECJ-PAKE, and SHA256)
Power Source	Li-Po Battery: 500mAh/3.7V, Charging Time is 2hours with 20% efficiency loss
	USB Supply: 5V/1A
	System Supply Voltage 2.5V
Dimensions	length 7cm, Diameter 6cm
Weight	250 Gram
Material Type	Polycarbonate, Aluminum Base
Mounting Type	Neodymium Magnet
User Interface	Web Application and Mobile Application
Operating Temperature Range	-40°C to 85°C
Operating %(RH)	80%
Storage Temperature	< 85°C (185°F) without battery
Shock Resistance	2 meter fall, 16 g continuous vibration
Certifications	FCC, CE, IP67, UL95VO
Battery Life	2 to 3 Years (Varies as per the applications and requirements)
Sensor Type	MEMS based sensors

3 CONNECTING THE HARDWARE

3.1 S-node Modular Gateway Configuration

S-node modular gateway is plug and play device. S-node modular gateway collects information from s-node and transmit the data to the cloud. S-node modular gateway is combination of two devices:

- A. Gateway Motherboard
- B. Gateway RF Frontend

A. Gateway Motherboard

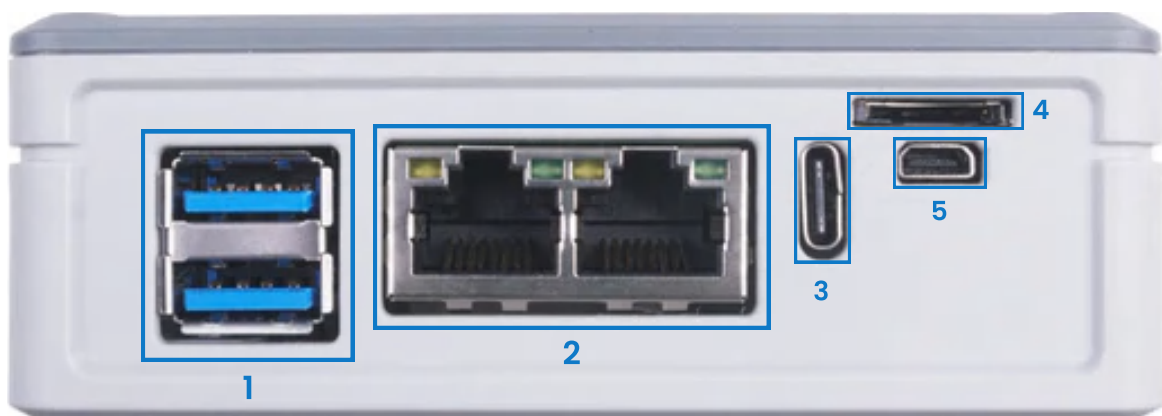
- The Gateway motherboard has dual Gigabit Ethernet connectors and dual USB 3.0 ports, which makes it suitable for soft router applications that require less hardware. It has 4 GB RAM and 32 GB eMMC storage allow for quick boot-up times and a seamless overall experience.
- The S-node Modular gateway includes a range of I/O peripherals such as MIPI CSI, MIPI DSI, micro-HDMI to connect displays/cameras, a standard 9-pin USB 3.0 header for additional USB expansion, and an FPC connector all packaged in a compact form factor.
- It has a PC/ABS case with an Aluminum alloy on top, which has a large sink to cool down at extreme loads. This enclosure provides better protection and is ideal for industrial applications. The case has long rubber feet for better stability when placed on a flat surface and mounted in two different methods. One is to use the keyhole slot wall mount and hang it on the wall in two different orientations or use the three mounting holes and mount it onto a DIN rail.



FRONT VIEW



BACK VIEW



SIDE VIEW

1. USB 3.0
2. Ethernet Port
3. USB Type-C Port
4. Micro-SD card slot
5. Micro HDMI

Wall Mount

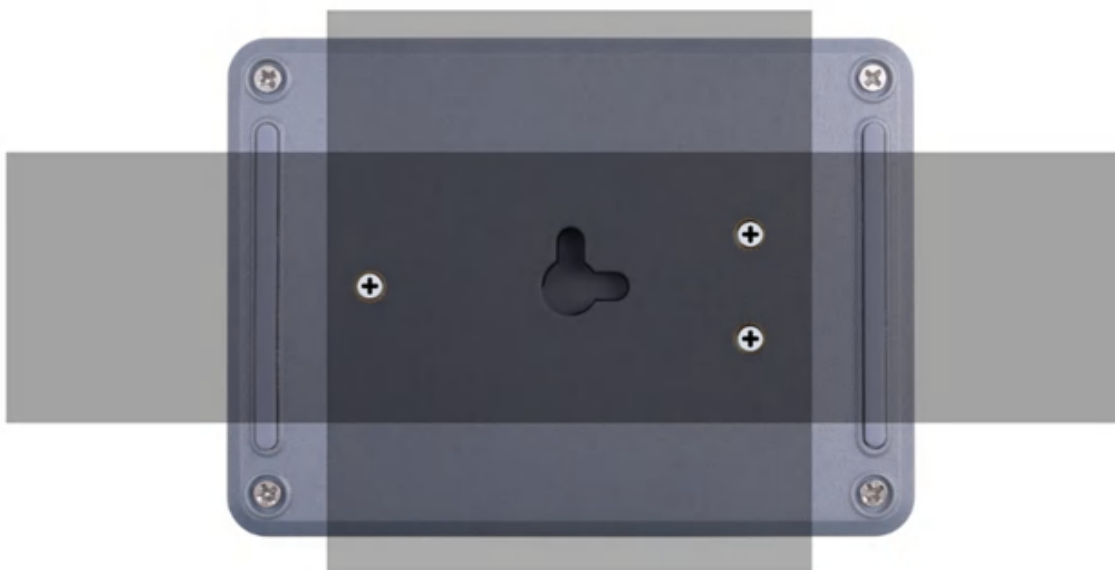


Horizontal



Vertical

DIN Rail



Specification

Specification	Details
Networking	Dual Gigabit Ethernet Connectors
Processor	Broadcom BCM2711 quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
Memory	4GB LPDDR4
Storage	32GB eMMC
Connectivity	2.4GHz and 5.0GHz IEEE 802.11b/g/n/ac Wi-Fi, Bluetooth 5.0, BLE with onboard and external antenna options
	Onboard Gigabit Ethernet PHY supporting IEEE1588
	1 × USB 2.0 interface
	PCIe Gen 2 x1 interface
	28 GPIO signals
	SD card interface for SD card or external eMMC
Operating temperature	0°C to 80°C
Ports	USB , Ethernet , Micro HDMI, Micro-SD card
Dimensions (LxH)	101mm x 73mm
Compliance	FCC , CE, EU DoC, UK DoC, RoHS

B. Gateway RF Frontend

Gateway RF frontend is one type of USB antenna which is convert data into RF. Also, Gateway RF Frontend is fully scalable and moveable device.

- There are some basic features of gateway RF frontend :

Specification	Details
Operating Frequency Range	2405 MHz to 2480 MHz
Antenna Model	PCB antenna
Antenna Gain	1.5 db
Antenna Type	B
Matching Network	Pi-network



For installation, you need to connect both devices first.

- To connect both device follow the steps :
 1. Set up the Gateway motherboard at appropriate place.
 2. Plug in Gateway RF Frontend into Gateway motherboard (Plug in into USB 3.0 port).

3.1.1 Connect to the Network

To use the S-node Modular Gateway, you must power up the S-node modular gateway and connect it to the network.

To connect S-node Modular Gateway to the Wi-Fi network, follow the steps which are below :

1. Initially, the S-node Modular Gateway is booted in hotspot mode, having "Border Router-AP" as the access point name.

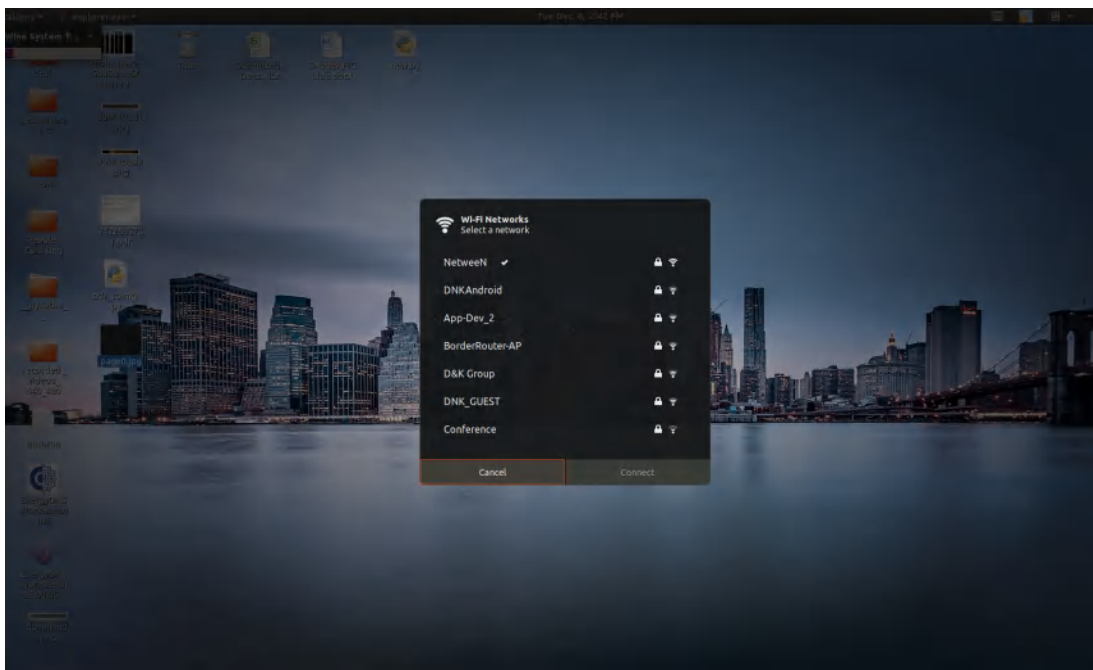


Figure 1.1 Scan Wi-Fi network.

2. Using a mobile/laptop, connect the Wi-Fi network to "BorderRouter-AP" with the password "12345678".

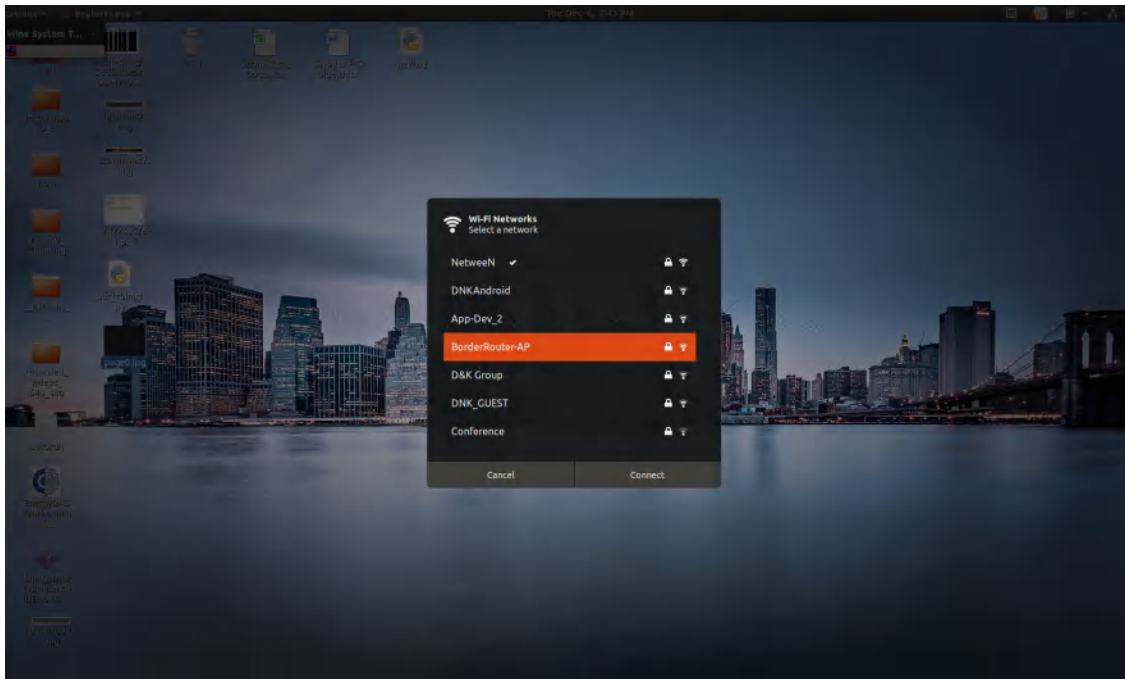


Figure 2.1 Connect with Wi-Fi.

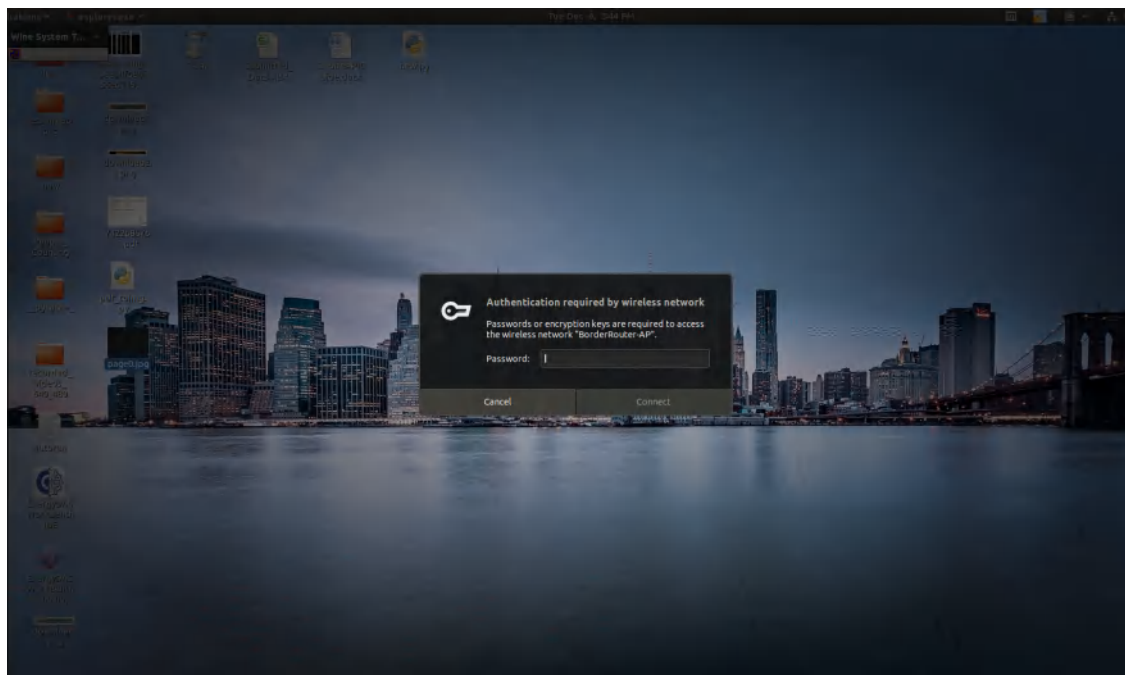


Figure 2.2 Enter your password.

3. Now, you can see that your S-node Modular Gateway is connected to the network.

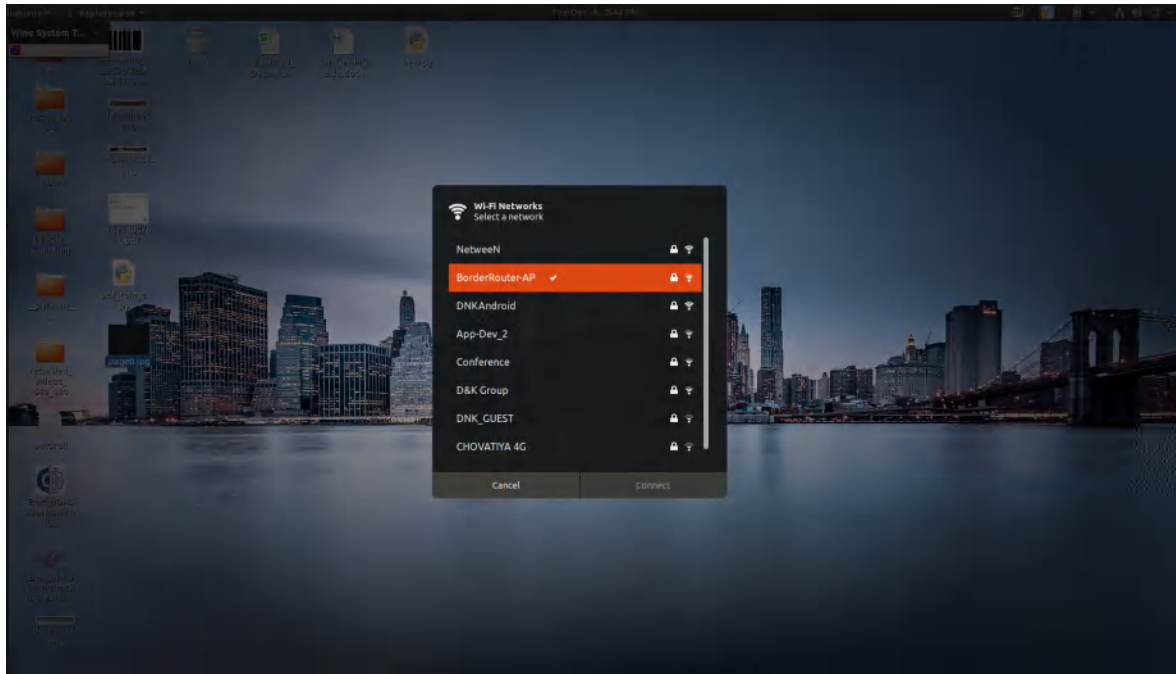


Figure 3.1 Connected to Border_RouterAP.

4. Open the "10.42.0.1:8080" address using any web browser, and open the S-Node Wi-Fi manager.

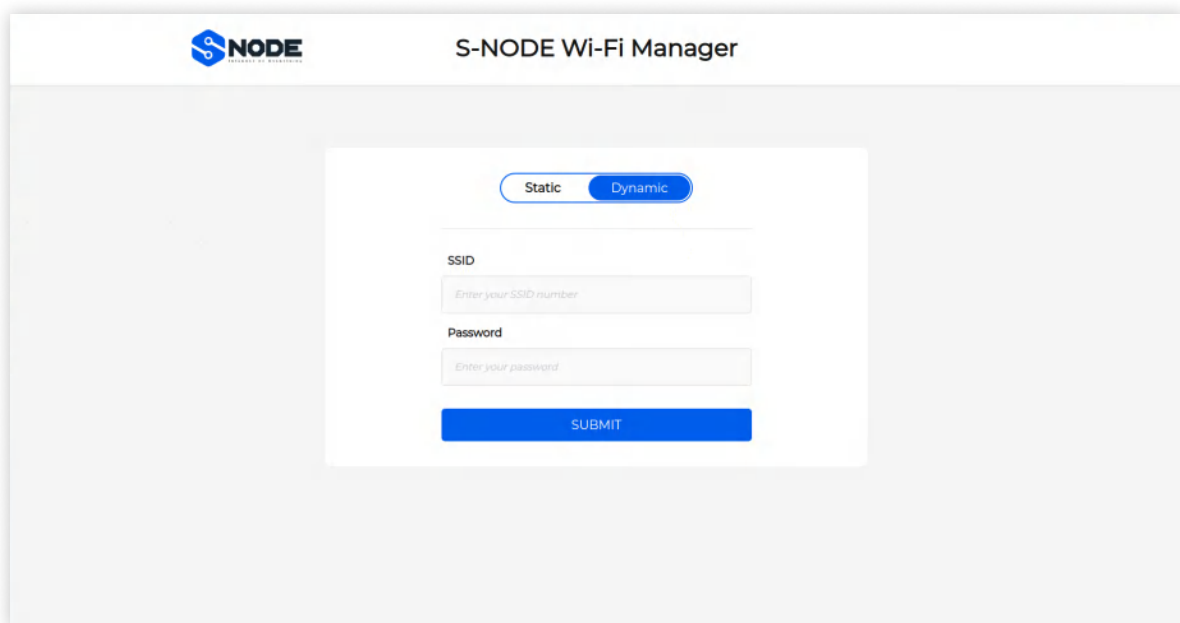


Figure 4.1 Opened S-Node Wi-Fi Manager.

5. In the S-Node Wi-Fi manager, connect the gateway to a known Wi-Fi network by entering the Wi-Fi SSID and password in the dynamic configuration tab.

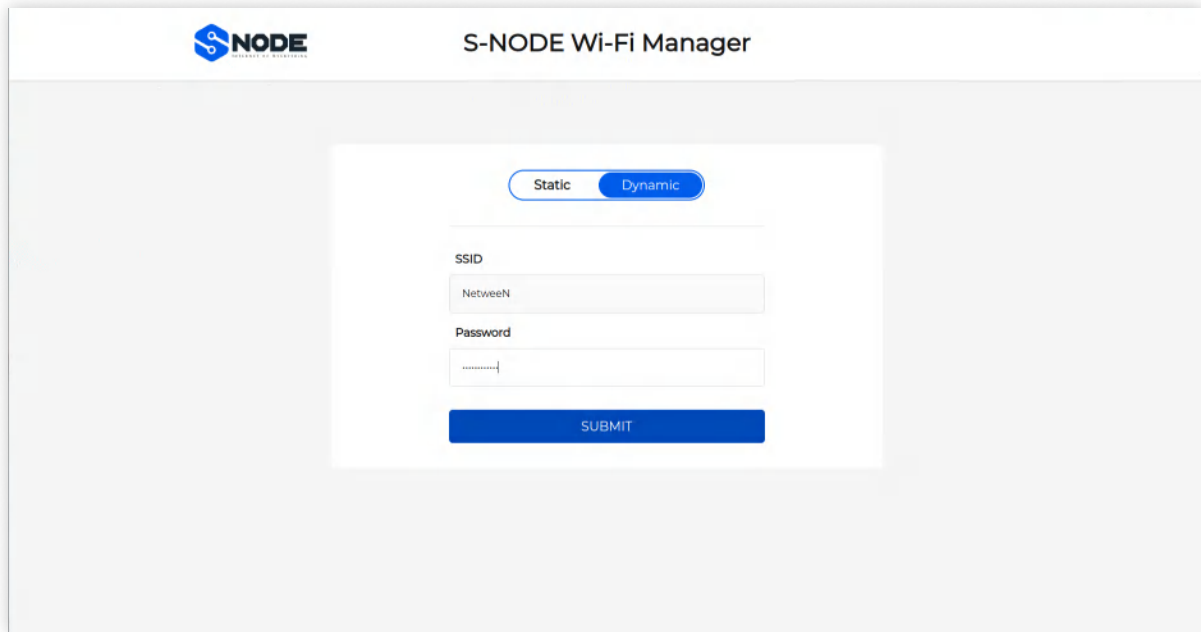


Figure 5.1 Enter SSID & Pass-word.

6. Once, Gateway motherboard is connected to network, the Wi-Fi disables the hotspot mode.
7. Now, visit to the S-node login panel (<https://snode.io/>) and enter the ID/Password for login.

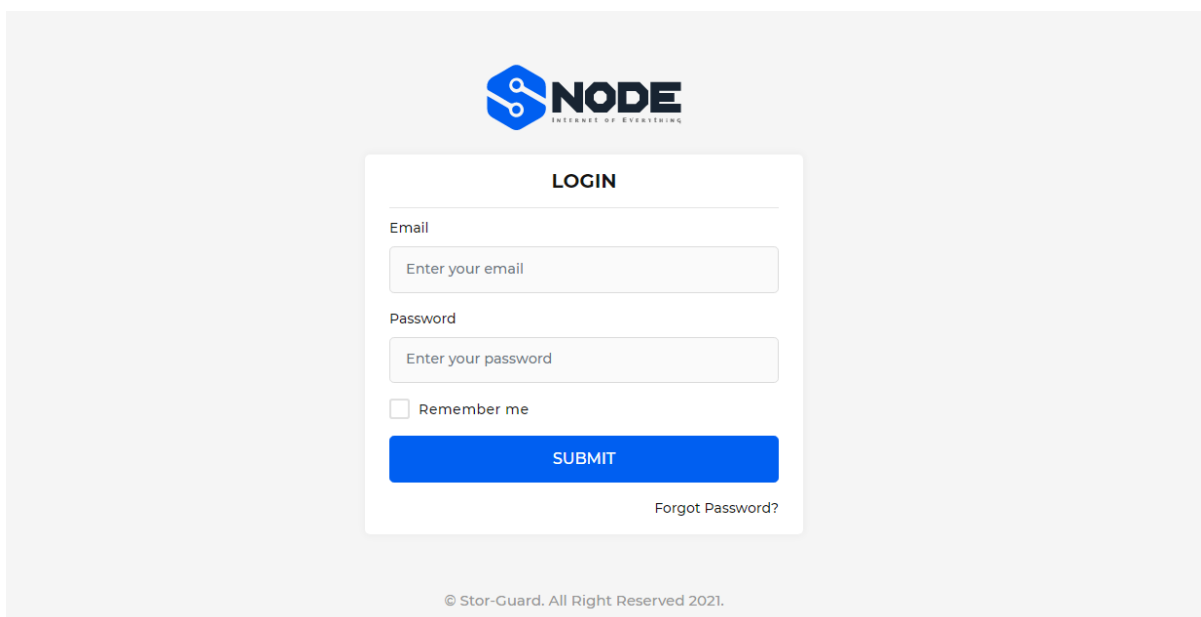


Figure 7.1 Login Panel

8. Now, click on the configuration and check the status of the gateway. It will be changed from offline to online.

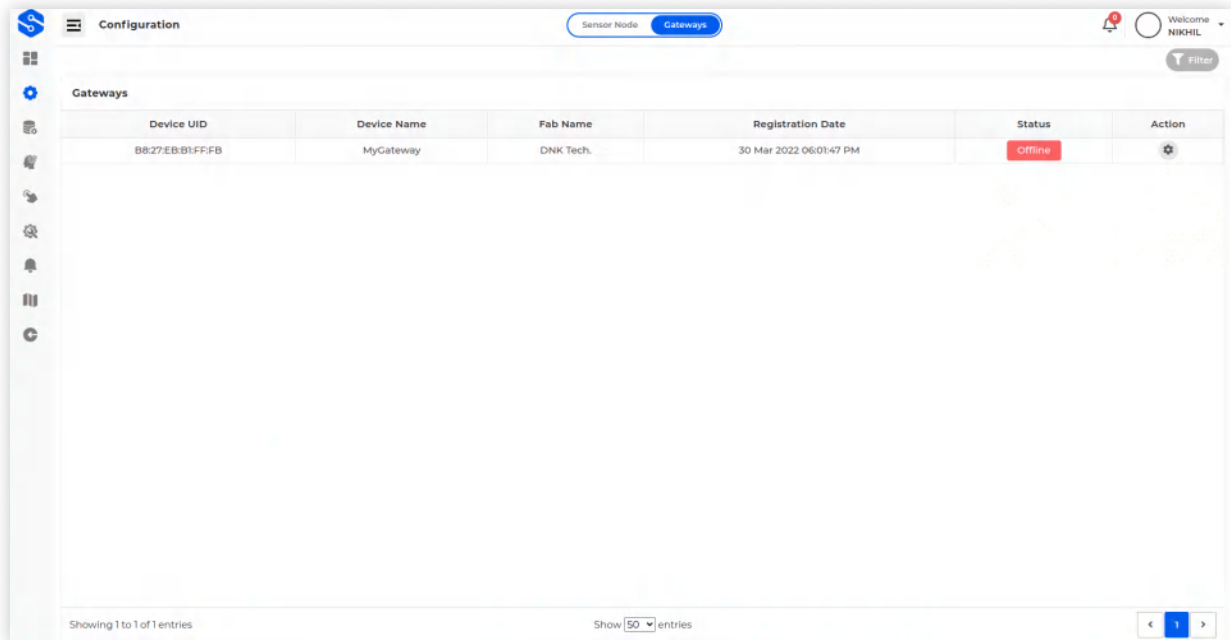


Figure 8.1 Gateway is offline.

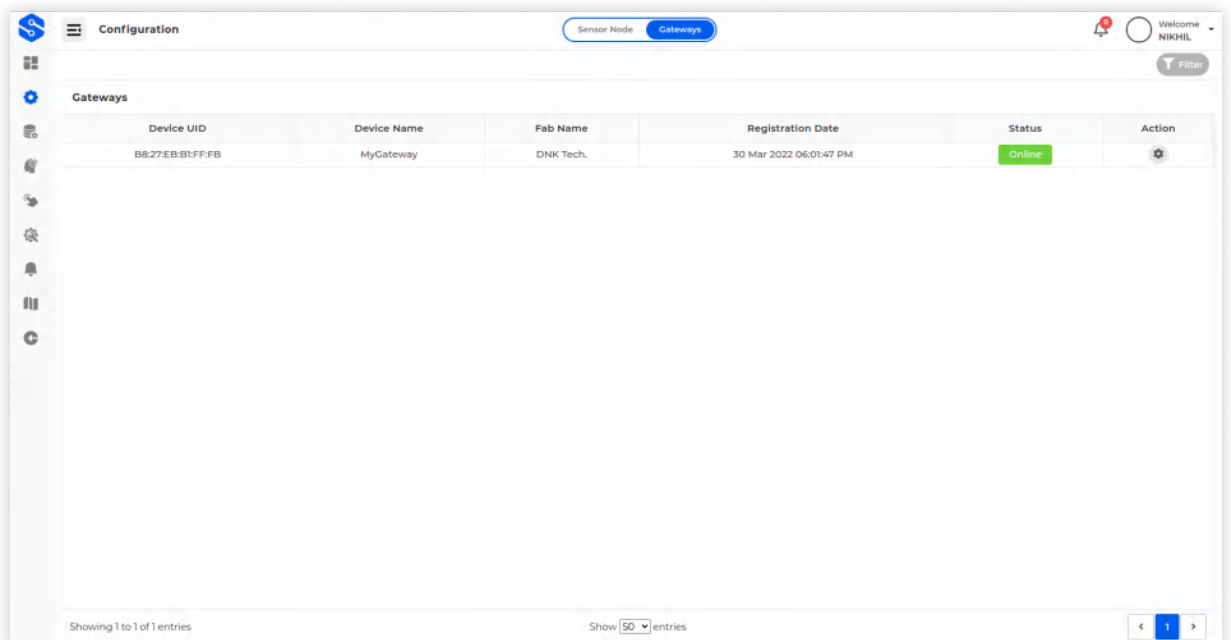


Figure 8.2 Gateway is online.

3.2 S-Node Configuration

Overview :

There is no particular skill or person required to install the S-node. Anyone can easily install it with the help of the user guide.

- 3.2.1. Power up the S-node.
- 3.2.2. Choose The Installation Surface.
- 3.2.3. Install the S-node.
- 3.2.4. Configure the S-node.



3.2.1. Power up the S-Node.

- A. First of all, remove the transparent cover from the S-node. Then, pull down the switch present on the left side of the S-node.



- B.** Initially, the blue LED will begin blinking at a rate of 500 milliseconds, indicating S-node auto-commissioning process is underway.
- C.** Once the node is commissioned successfully to the network, the blue led will stay on.
- D.** Lastly, cover up the sensor node using transparent layer which is exactly looks like picture.



Note :

Description of LED Indicator

Blue LED is off, it shows that S-node is not connected to the network or S-node is in sleep mode.

Blue LED Flashes, it means S-node is connecting to the network.

Blue LED is stable, it shows that S-node is connected to the network.

- E.** In the S-node user dashboard, the configured device status will be updated from Offline to Online state.

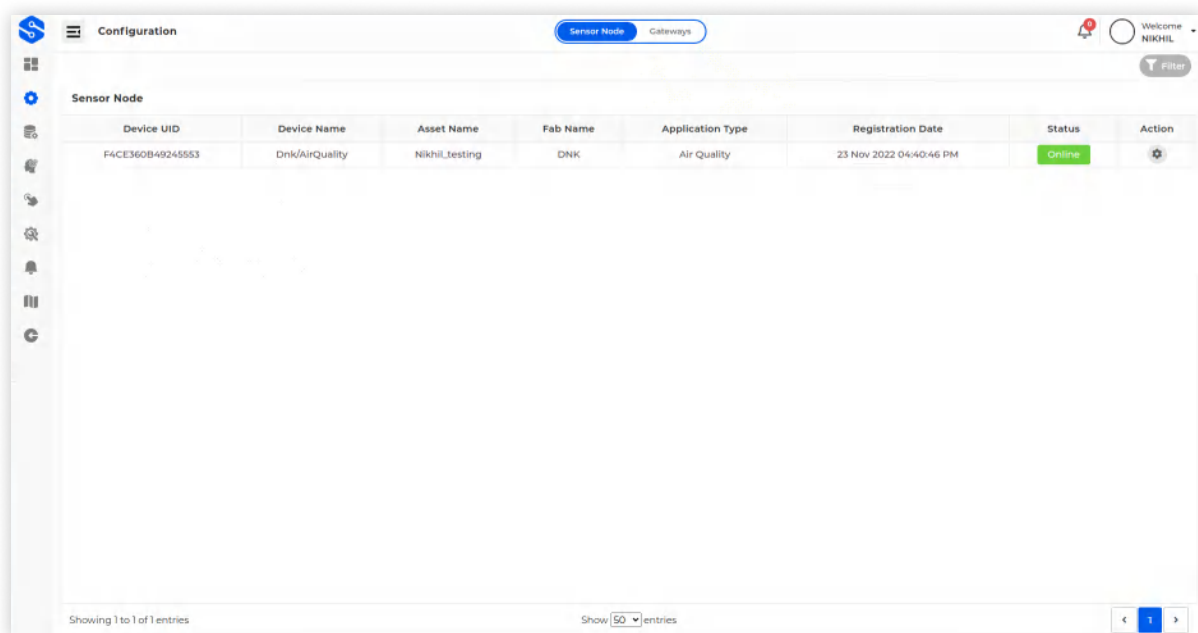
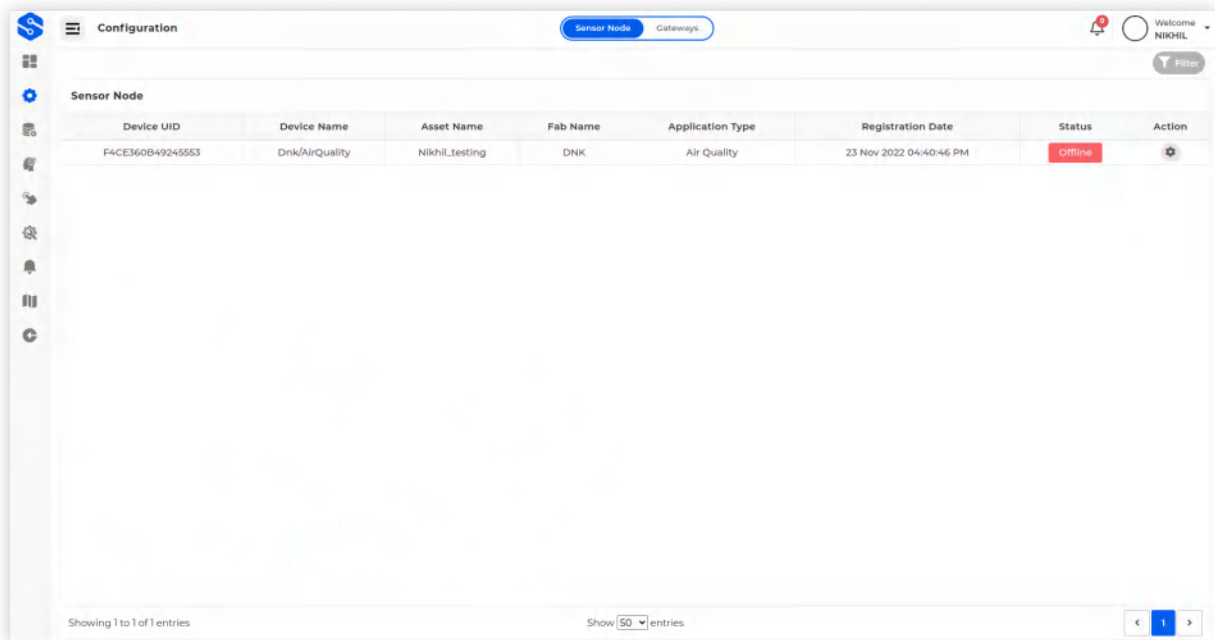


Figure : E.1 S-Node is Online.



The screenshot shows the 'Configuration' page with the 'Sensor Nodes' tab selected. A table lists one sensor node with the following details:

Device UID	Device Name	Asset Name	Fab Name	Application Type	Registration Date	Status	Action
F4CE360B49245553	Dnk/AirQuality	Nikhil_testing	DNK	Air Quality	23 Nov 2022 04:40:46 PM	Offline	

At the bottom of the table, it says 'Showing 1 to 1 of 1 entries' and 'Show 50 entries'.

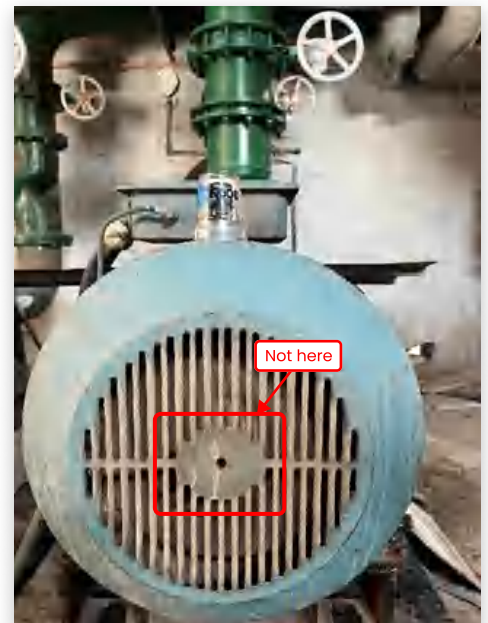
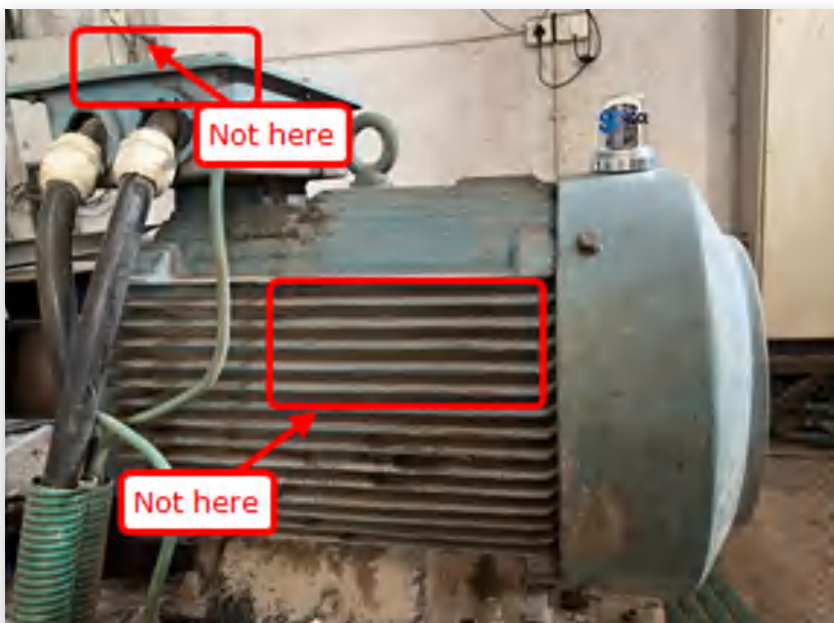
Figure: E.2 S-node is offline.

- Likewise, commission all the S-nodes.

Note: Please wear protective gloves, masks, and glasses before installation of the S-node.

3.2.2. Choose The Installation Surface.

- A. Before installation, find the right surface of the element or machine, where you can easily sense the data to predict the machine's health.



- B.** To clean the surface, use soap-water and microfiber.



3.2.3. Installation of The S-node.

- A.** Mount the S-node directly because the S-node has a magnet at the bottom.



- B.** If surface is not able to stick with magnet than use Epoxy for installation.
- C.** Mix the epoxy as per the guidelines. (Take epoxy and begin mixing it until it becomes soft. Check that it is not too hard or crumbly.)



- D.** Now, Roll the epoxy and apply on the bottom of S-node.



- E.** Install the S-node on the machine and press down firmly for 15-20 seconds.



- F.** Make sure that, S-node is mount perfectly on machine as shown in the picture.



3.2.4. Configure the S-node.

- A.** Open the dashboard of S-node using credential and you can see that S-node is in online mode.

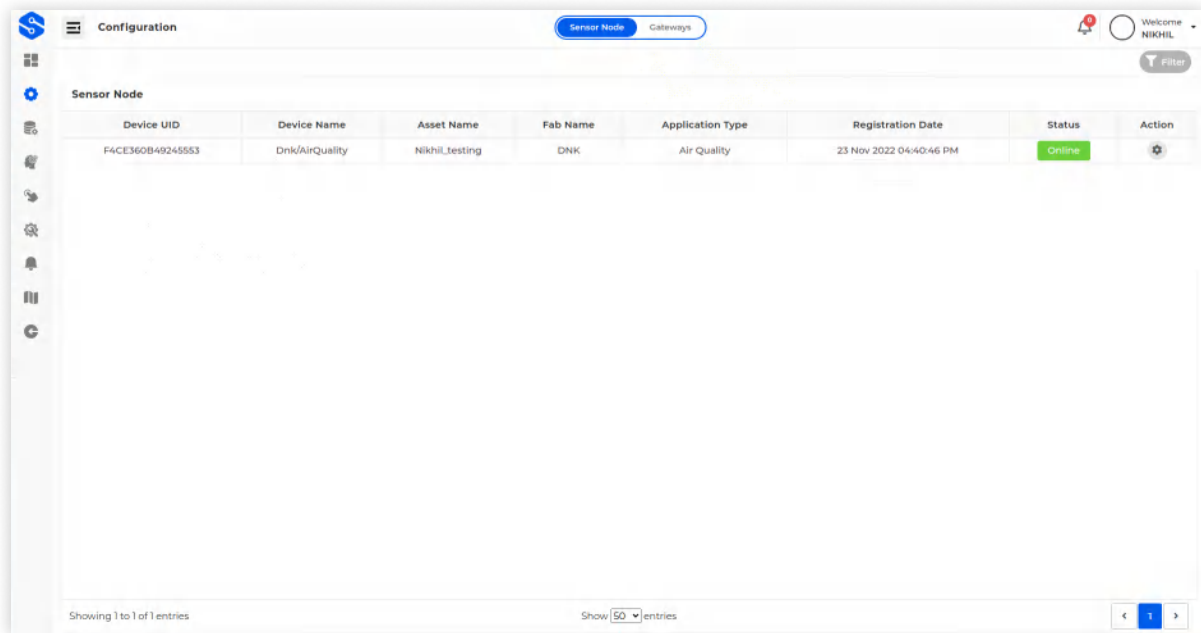


Figure: A.1 S-node is online.

- B.** Click on action. (You can see the two options in it 1. General settings & 2. Events)

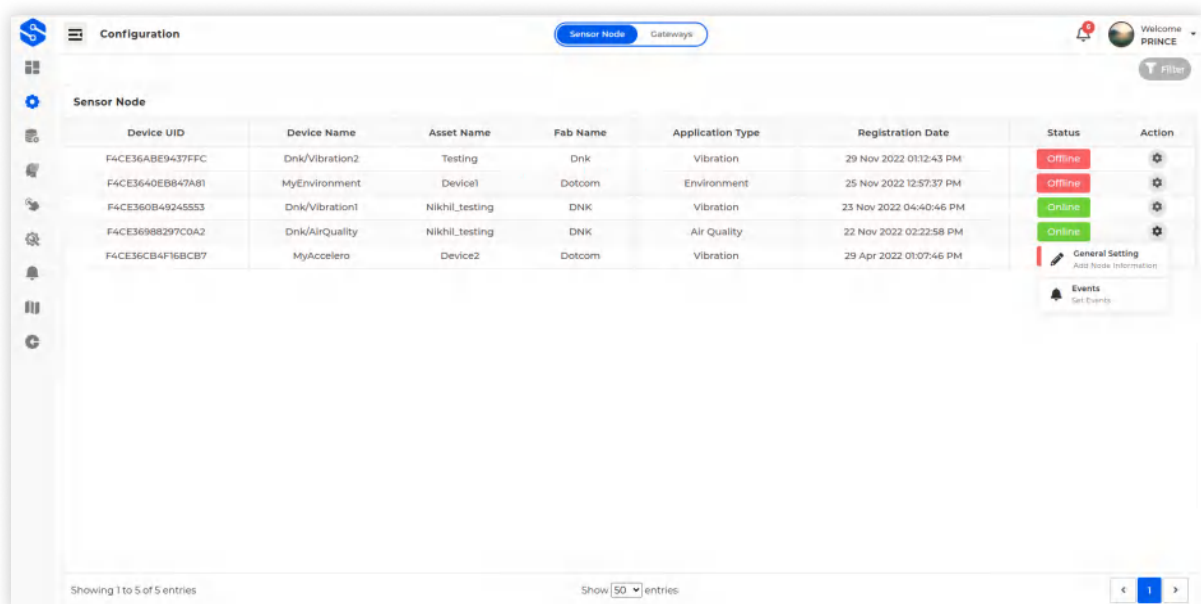


Figure: B.1 Action Screen.

- C. Click on general settings and fill the all values for set up the S-node.

SENSOR NODE [F4CE36988297C0A2]

Device Name *
Dnk/AirQuality

Fab Name *
DNK

Asset Name *
Nikhil_testing

Application Type *
Air Quality

Latitude *
21.236389389044266

Longitude *
72.87571712480963

SAVE

Figure: C.1 General settings.

- D. Click on the events and set the notification and events as per your requirements.

SENSOR NODE [F4CE36988297C0A2]

Application Type: Air Quality

Measure: IAQ

IAQ

Severity	From	To	Unit
INFO	0	100	aqi
WARNING	100	300	aqi
CRITICAL	300	400	aqi
ALARM	400	500	aqi

Temperature

Severity	From	To	Unit
INFO	20	28	°c
WARNING	28	35	°c
CRITICAL	35	40	°c
ALARM	40	60	°c

SAVE

Figure: D.1 set up the events.

- Likewise, commission all the S-node simultaneously. Now, S-node is ready for predict the maintenance.

FCC Compliance Statement (USA)

FCC ID: 2A9OQ-SN0001A

Compliance Statements :

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including, an interference that may cause undesired operation.

Caution Statements :

1. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment...
2. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

RF Declaration

- S-node is working on the top of the RF protocol called OpenThread having 2.4Ghz frequencies, IEEE 802.15.4
- Bluetooth/Bluetooth Low Energy and NFC is disabled via software.