Tensar®

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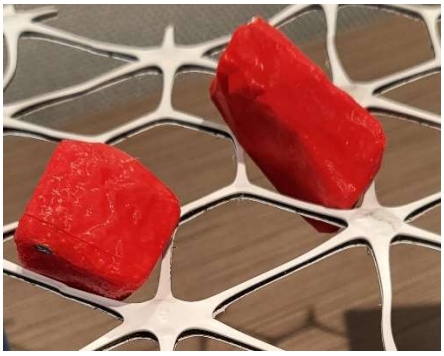

Tensar SP LT Users Guide

Document Revision: 7/1/2025

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FCC & Industry Canada (IC) Information

FCC

This device complies with part 15 of the FCC rules subject to the following two conditions:

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

FCC ID: 2BODE-SP-LT-01

Industry Canada (IC) Compliance Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

IC ID: 33740-SPLT01

Warning Statements

Modifications: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

Contact Information

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SP LT (Smart Pebble) Background

The Smart Pebble is a monitoring technology device designed to track the movement of stones in a geogrid over time. There are 3 different cases that the pebble can be used for; Movement Detection (MD), Design Verification (DV) and Lab/Experimental. Movement Detection is used to provide data for excessive movement in a structure. Design Verification is used to determine if the structure meets the criteria for design. Lab/Experimental provides data for lab experiments or short-term field tests. The Smart Pebble contains 2 different types of sensors. The first type is a 6-Axis Accelerometer and Gyroscope, and the second being a 3-Axis Magnetometer. The data created by the sensors in the Smart Pebble is sent to the gateway, so that it can be transmitted to the Monitoring Platform (cloud).

{**GENERAL TBD**: The Research/Lab use case needs additional setup and usage information on how the gateway is used to download the data (not the monitoring platform). This cannot be added until this version of the Pebble is completed, received by Tensar and tested}

Monitoring Platform

The Monitoring Platform is a software that provides options to change the device parameters and configurations. It conveys specific commands to change the setting for the Smart Pebble. When accessing the Monitoring Platform, the user can view and download the data collected by the pebbles. The cloud creates and sends the commands to the gateway, which sends a downlink signal to the Smart Pebble.

Parameters

{TBD Add an table with an explanation of each of the parameters of the pebble, what they do and the min/max ranges for each}

Name	Description	Units	Default	Min	Max
Reporting Interval	The interval at which the pebble sends summary reports of the data collected to the gateway	min.	1	1	1440
IMU Sampling Rate	How frequently the pebble will record data from sensors	Hz	*Note 1*	12.5	208
Accel Full Scale	The range of forces that the sensor can capture	g's	+/- 4	+/- 4	+/- 32
Gyro Full Scale	The range of orientation that the sensor can capture	dps	125	125	2000

Note 1: the default value is dependent on the use case. (MD - 12.5, DV - 208, L/E - 208)

Adding a Gateway

An onsite gateway is used which receives the data from the Pebbles and sends that information to the cloud-based monitoring platform. The gateway must be configured separately and then added to the

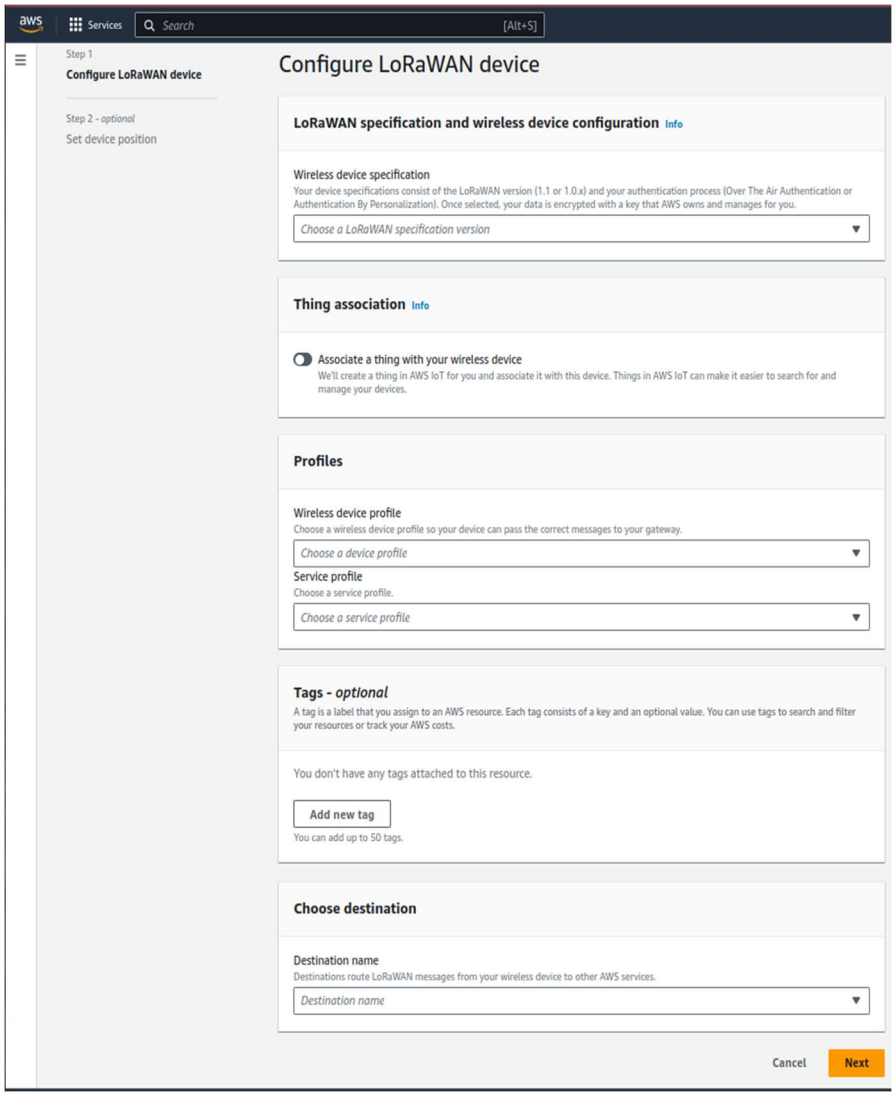
cloud-based monitoring platform. Contact Tensar for information on how to setup and add the gateway to the monitoring platform.

Adding a Smart Pebble to the monitoring platform

After the gateway is setup, Smart Pebbles can be added to the gateway & monitoring platform. Note that the configuration and setup of the Pebbles is performed entirely using the cloud platform (the gate will receive and pass the information through to the Pebbles). Use the following steps to add the Smart Pebbles:

- Pebble does NOT need to be on

1) Open the link https://us-east-1.console.aws.amazon.com/iot/home?region=us-east-1#/wireless/devices
2) Login using valid credentials
3) Click on the button labels “Add wireless device” and fill in the form with the following details:
    a. Choose **Wireless device specification** as **OTAA v1.0.x**
    b. Fill **DevEUI** which pasted in the device
    c. Fill **AppKey** as 2B7E151628AED2A6ABF7158809CF4F3C
    d. Fill **AppEUI** as 0101010101010101
    e. Fill optional device name for identifying the devices
    f. Choose **Wireless device profile** as **OTAA**
    g. Choose **Service profile** as **otaa**
    h. Choose **Destination name** as **process**
4) Click on the **“Next”** button and a page with additional details will be displayed. Click on the “Add device” button to complete the onboarding process.



Configuring and Accessing the Pebble (Monitoring Platform)

The monitoring platform is a separate application which can be accessed by a web browser. The monitoring platform can be used to display information about the Smart Pebbles, Start & Stop the Smart Pebbles data collection, make changes to the Smart Pebble parameters, and view/download the data (for the Design verification and Movement Detection use cases only). The following paragraphs provide information on how to login and use the monitoring platform:

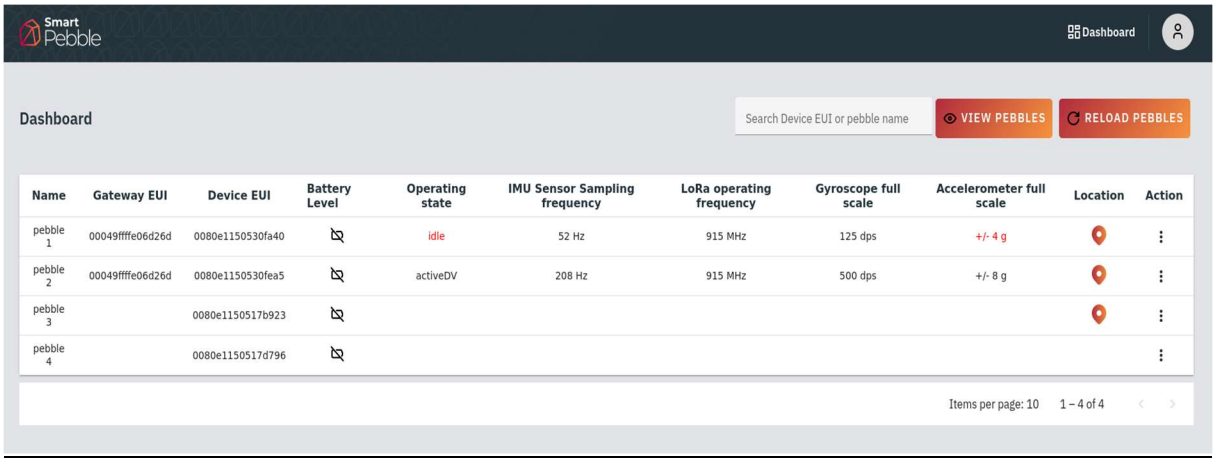
Login

In order to login to the monitoring platform, use a web browser and navigate to the dashboard URL (obtained from Tensar)

Dashboard

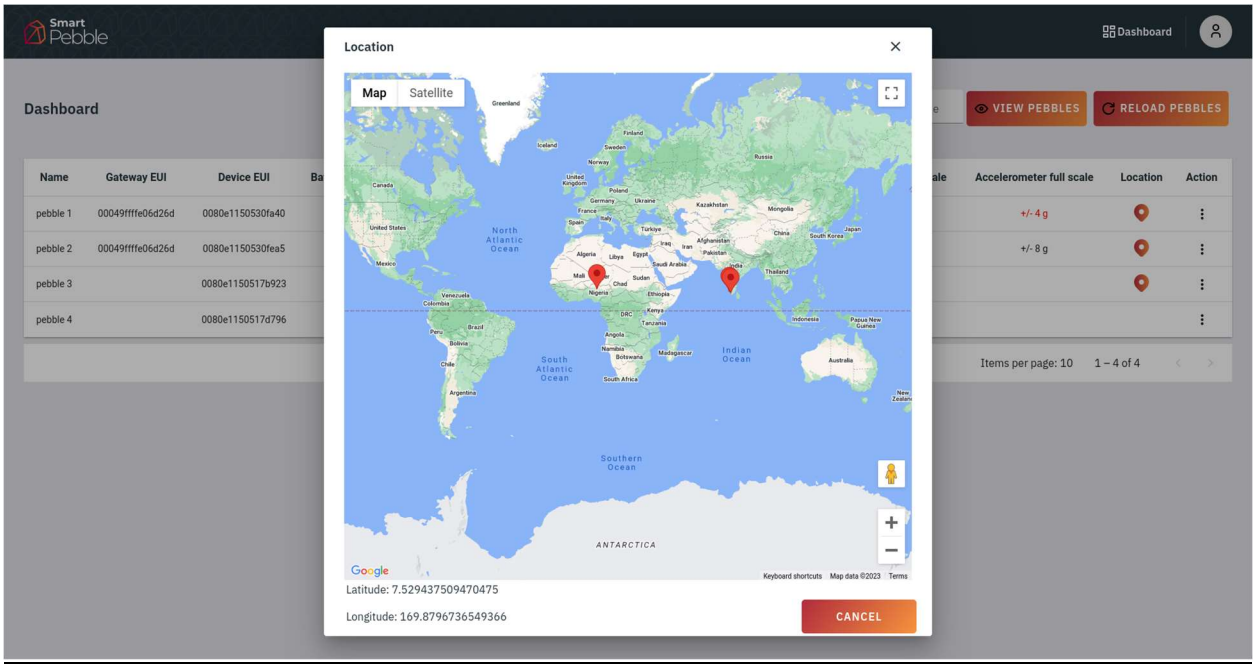
After the user logs in, the Dashboard will be displayed. The screenshot below shows the appearance of the dashboard, where you can see the pebbles added to the monitoring platform. Once

you onboard the pebble into AWS, it won't be reflected here immediately. To load pebbles onboarded in AWS to the monitoring platform, you have to click on the '**Reload Pebbles**' button. The '**View Pebbles**' option allows you to view the pebbles on the map if you configure the location details.



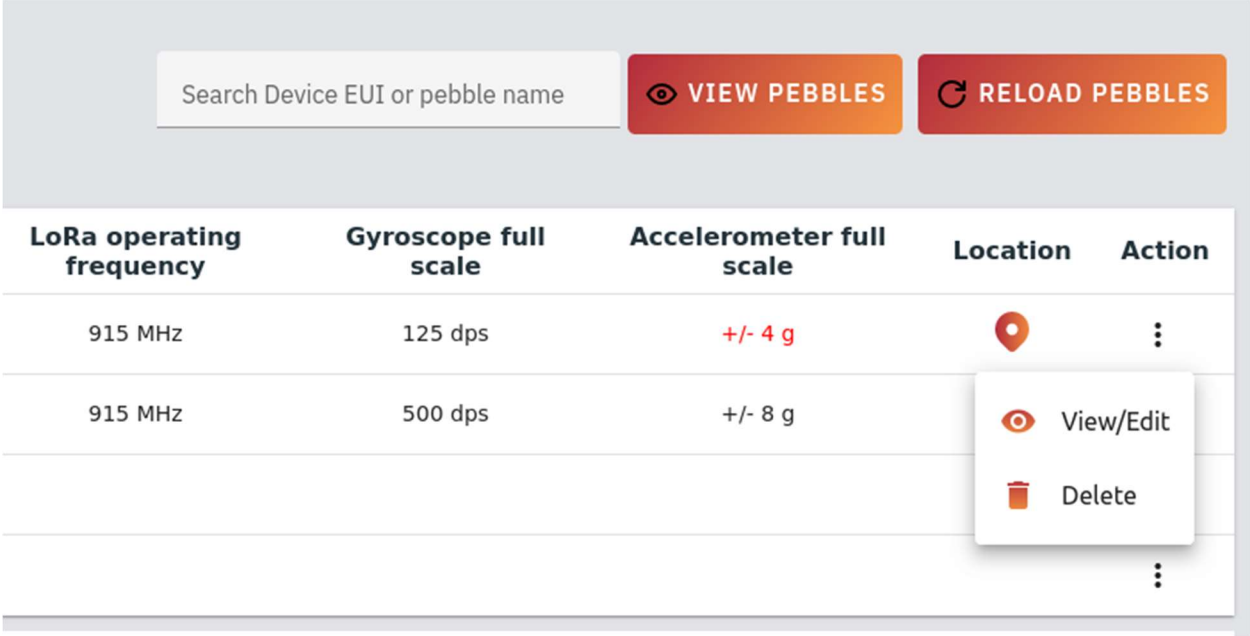
Viewing Pebble Details

Upon clicking the "View Pebble" button, users can visualize the pebble's location within a map. To exit this pop-up window, there is a cancel button or a cross option available.



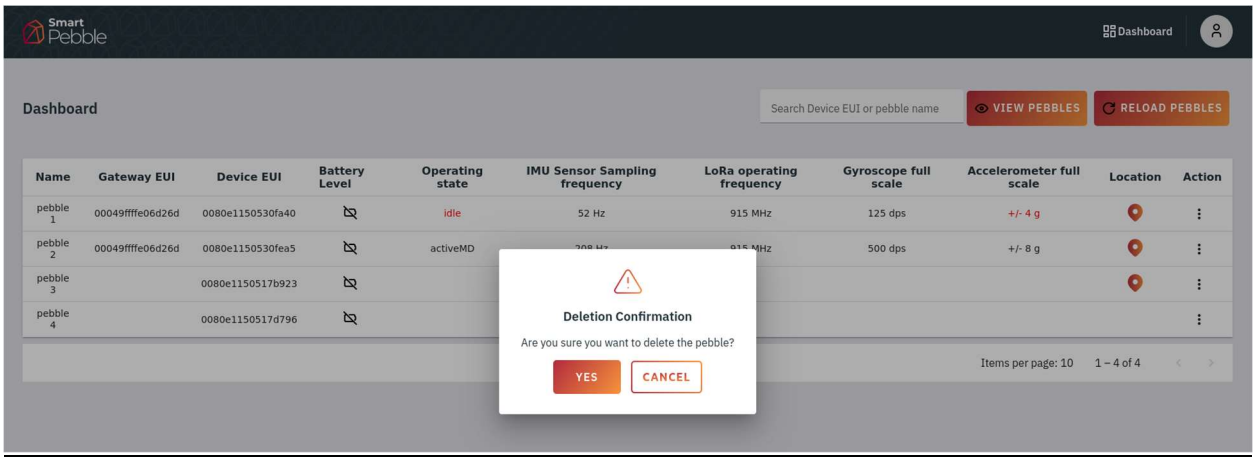
Editing and Deleting

Under the "Action" section, there is a three-dot icon. Clicking on these dots triggers a pop-up where users can choose to either delete or edit the Pebble.



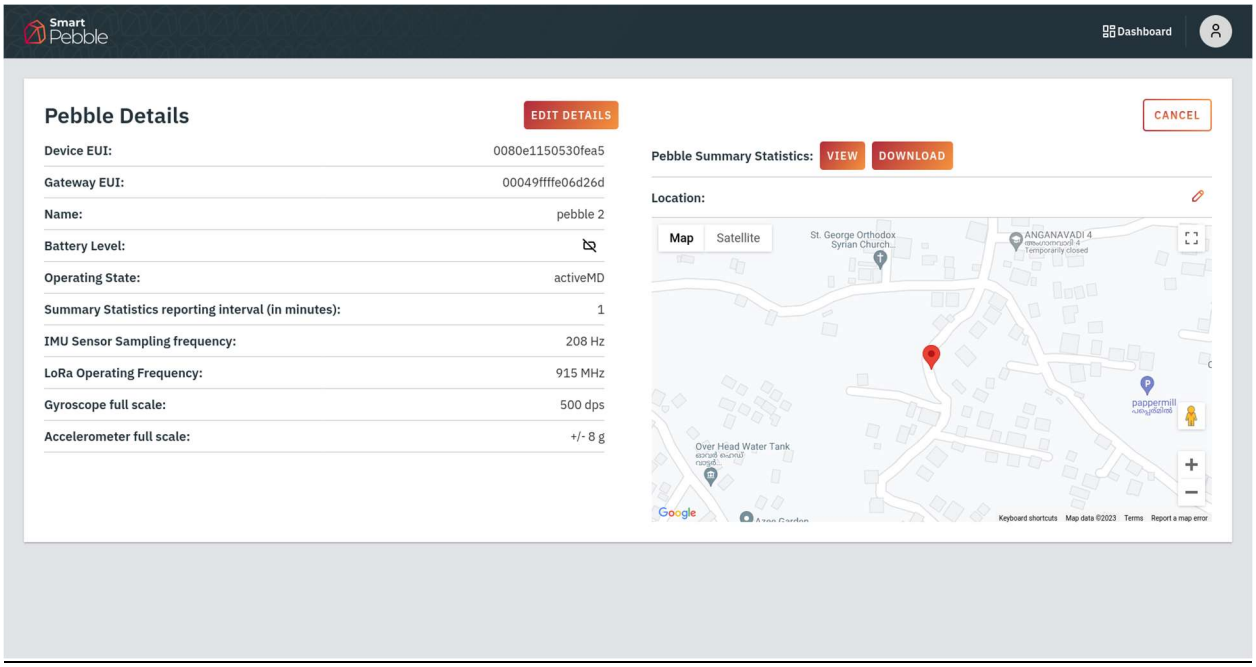
Deleting a Pebble

If you choose the Delete button, a confirmation pop-up will appear, giving the user the choice to either confirm the deletion or cancel the action. Note that the Pebble is not recoverable once it has been deleted.



Editing a Pebble

Users can modify Pebble configuration by selecting "Edit Details." They can access Pebble summary statistics by clicking the "View" button, and for downloading purposes, users need to click on the "Download" button.



Edit Details

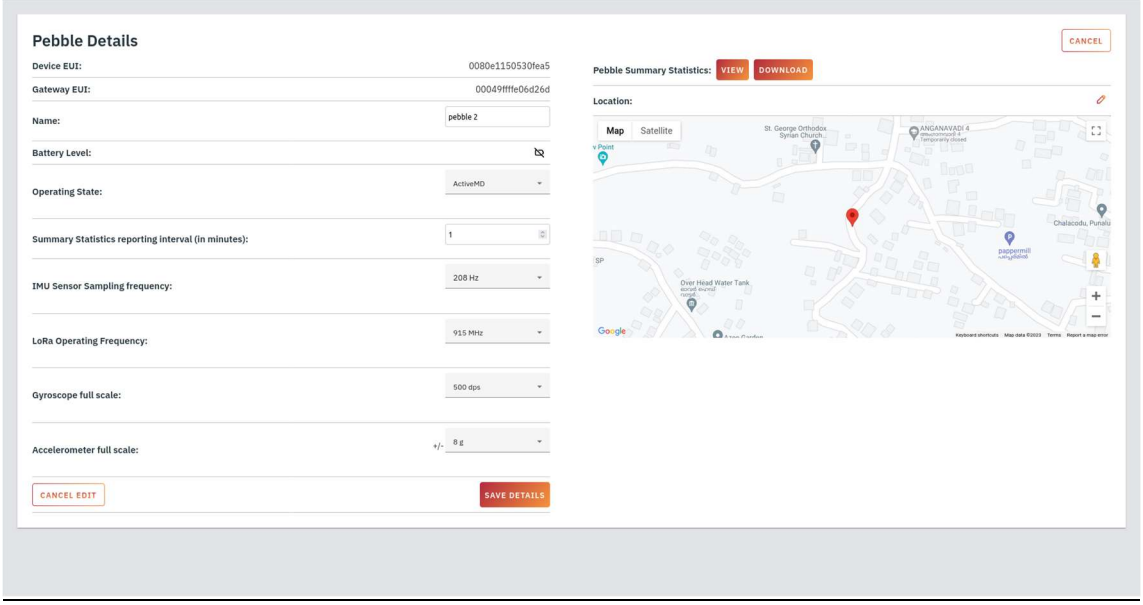
Upon clicking the "Edit Details" button, users can modify configurations except for Device EUI and Gateway EUI. After making the desired changes, users will need to click the "Save Details" button to apply the edits. To cancel editing the configuration, the user can click on the "Cancel Edit" button.

NOTE: Make sure to switch to the “Idle” Operation State before and after testing.

DISCLAIMER:

- The time it takes to send and update the parameters is influenced by many different factors. One of them is dependent on the connection between the cloud and the gateway.
- The average time it takes the pebble to receive the parameters and update is from

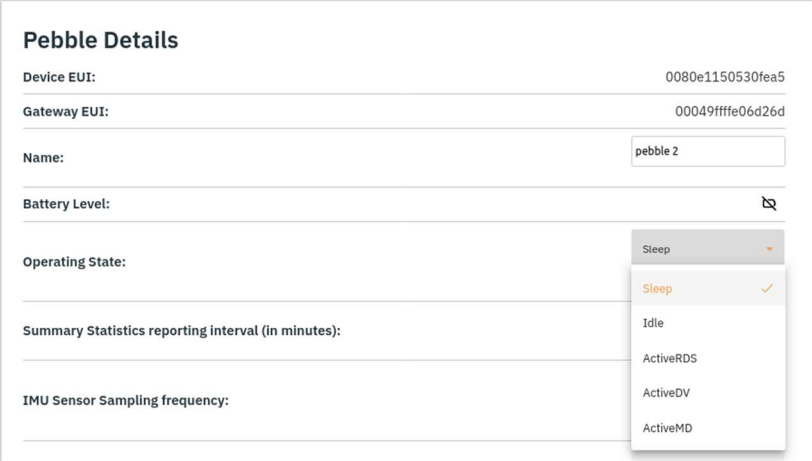
2-5 minutes



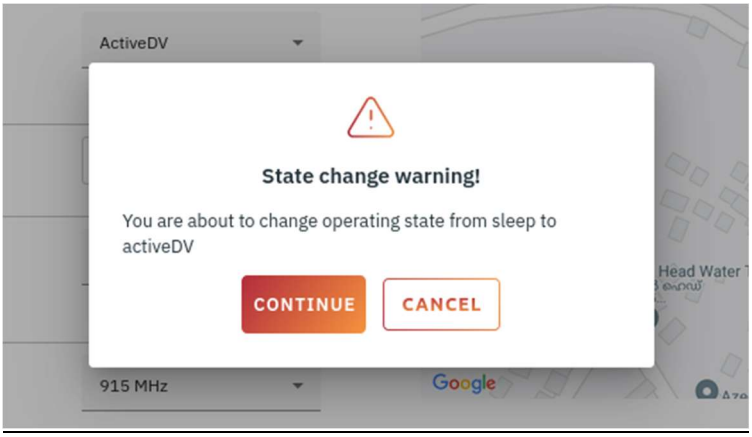
Note that the operating state can take 3 different values as noted in the user cases from the introductory paragraph earlier. The use cases are Design Verification (DV), Movement Detection (MD) and Research/Design (RDS). DV & MD use cases use the 915 Mhz frequency for the Pebbles to communicate with the gateway, while RDS using the 2.4 Ghz frequency for the Pebbles to communicate. When changing the operating state to either ActiveDV or ActiveMD, a pop-up will appear seeking confirmation. Clicking the "Continue" button prompts another pop-up requesting the user's password. The user is required to enter their password and click on "Confirm Password" to proceed. This is to ensure the user does not accidentally change the operating state.

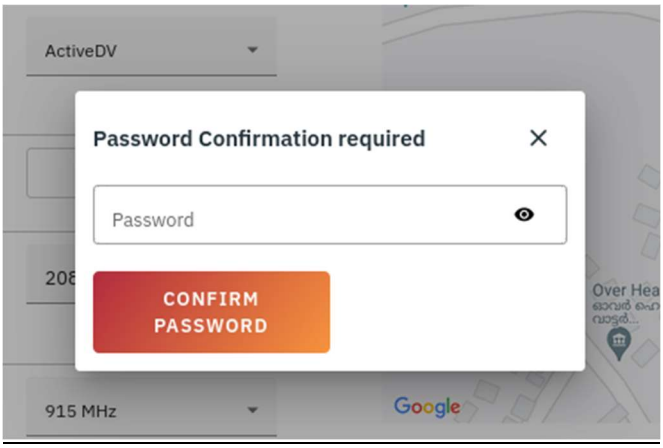
NOTE: Make sure to switch to the “Idle” Operation State before and after testing.

The "Summary Statistics reporting interval (in minutes)" field can be edited only when the operating state is switched to ActiveMD or ActiveDV.



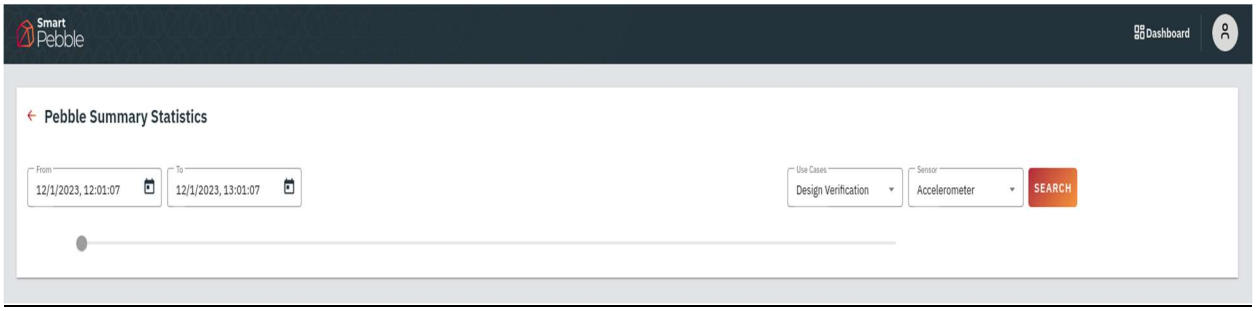
To switch to 2.4 GHz, please select **ActiveRDS** as the operating state.

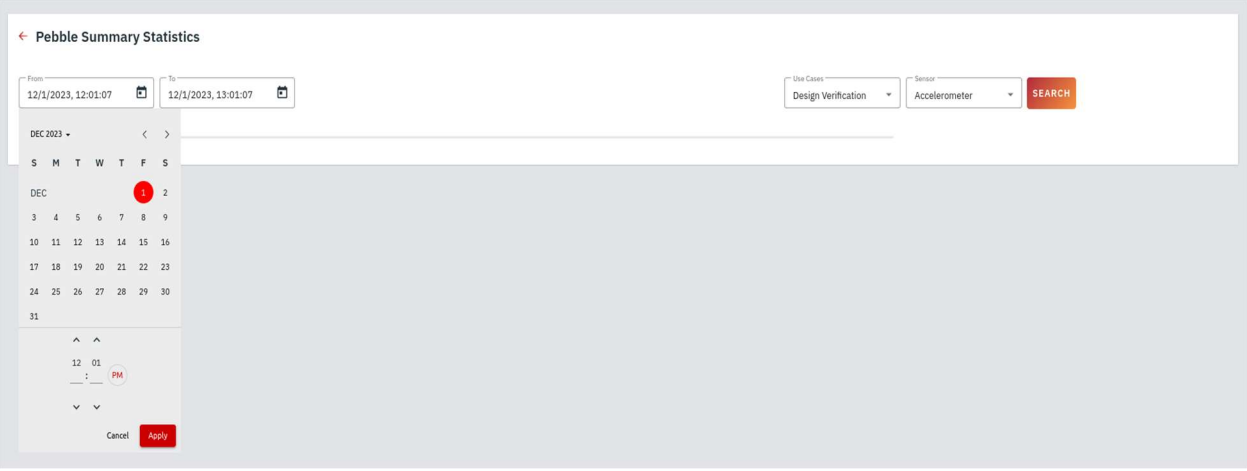


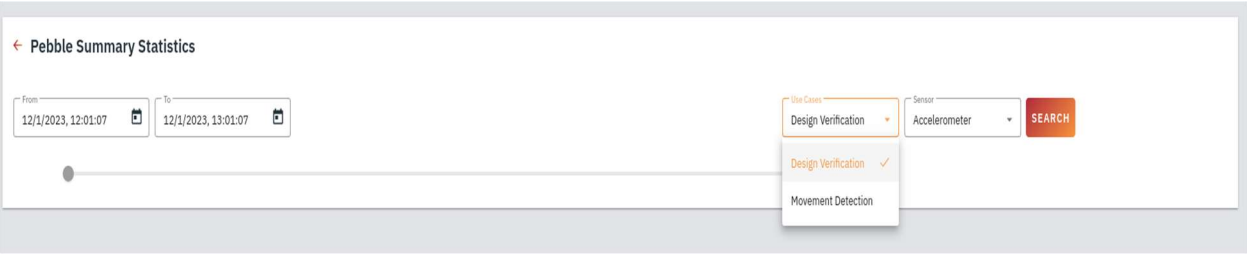


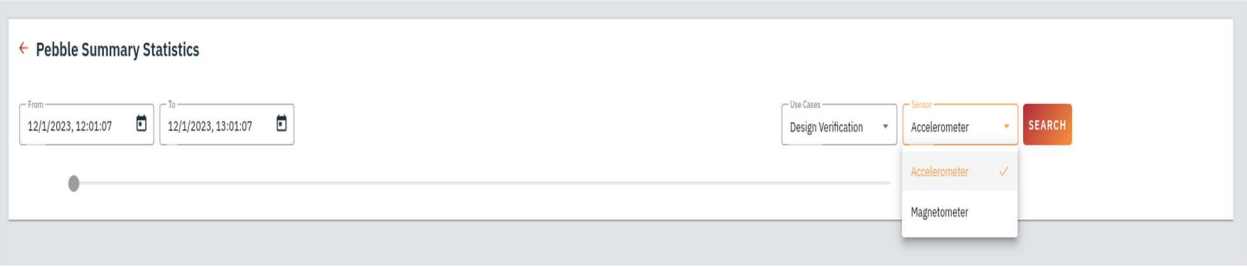
View Summary Statistics

For either the DV or MD modes summary statistics can be viewed. On the Pebble Summary Statistics page, to search for detailed statistical information, users must select the Date range "from" and "to," choose Use Cases and Sensors, and subsequently click the Search button. Then user can view pebble summary statistics details.





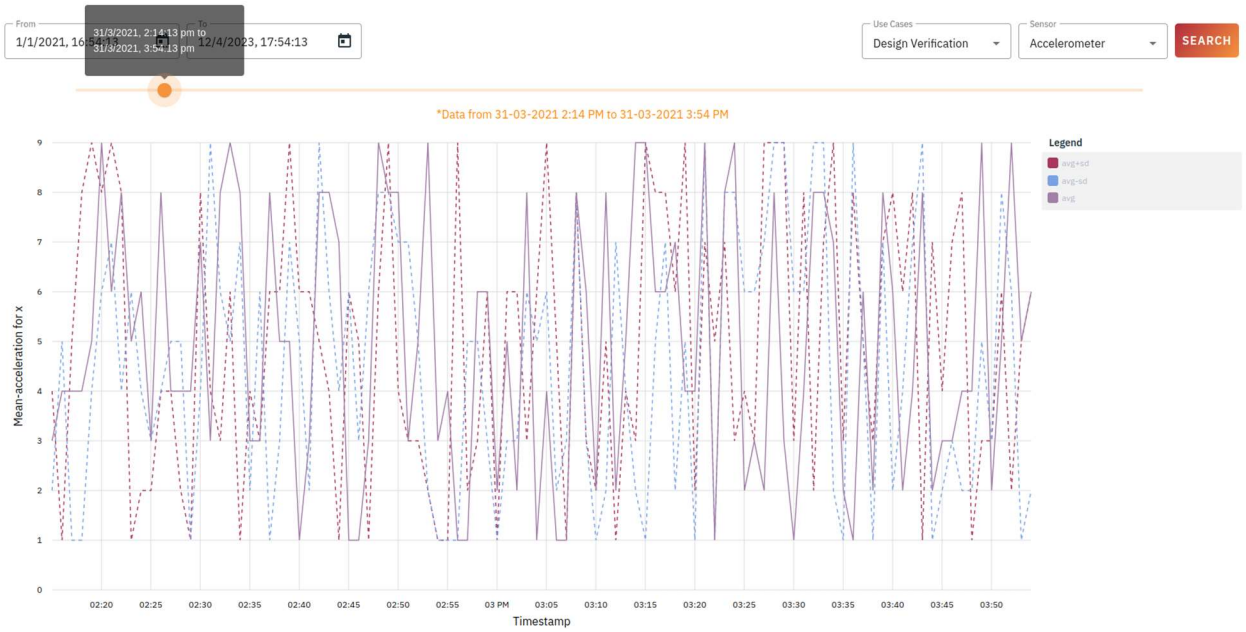




The Slider below the datetime picker and selectors is used to retrieve 100 or less than 100 data points at a time from the range given in the date time picker. The slider range also goes from the start date to end

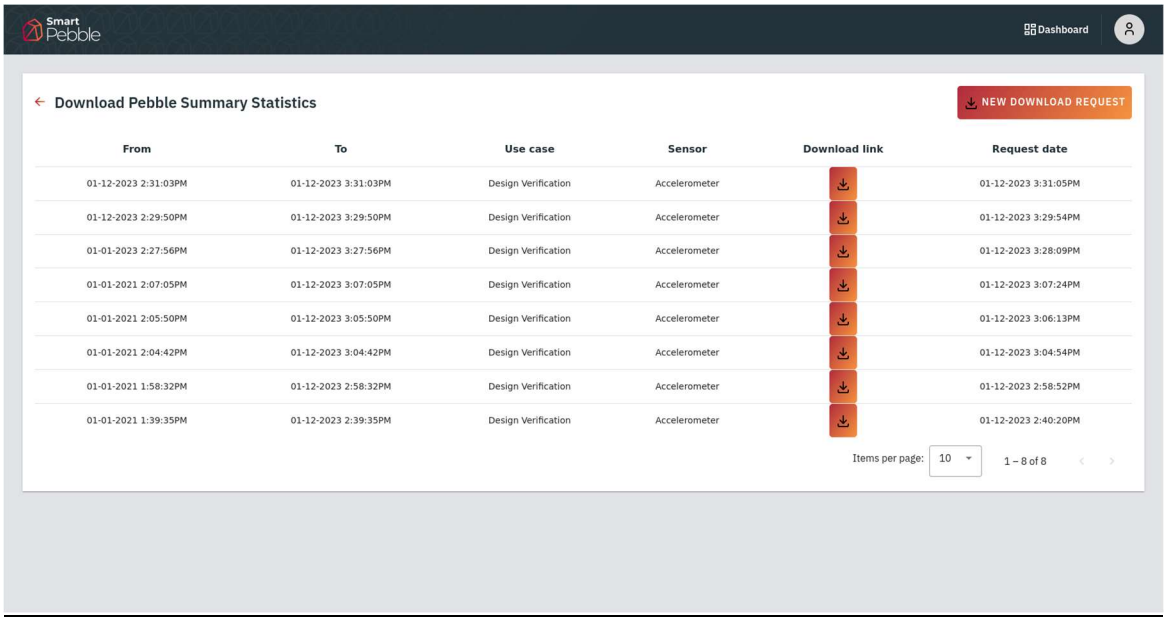
date. The drag and drop mechanism of the slider triggers the retrieval of data corresponding to the point at which the slider thumb lies at the end

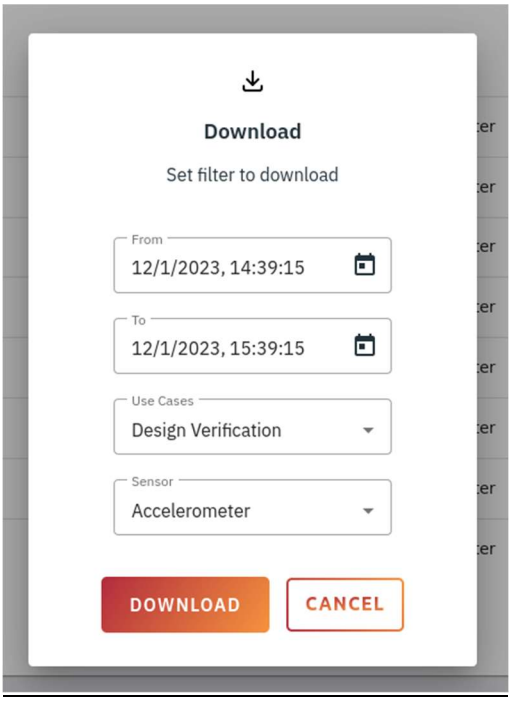
- Note: For first few updates of test, leftover data may be visible.



Download Data

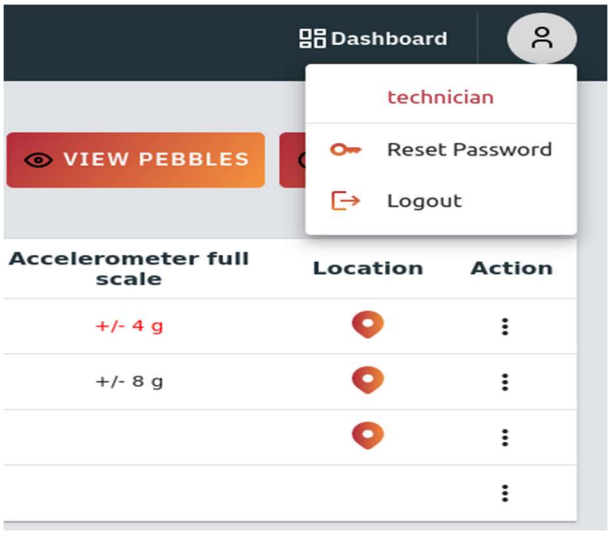
On the "Download Pebble Summary Statistics" page, users have the ability to see a list of downloads. The "New Download Request" button facilitates the download of fresh data.Upon clicking the "New Download Request" button, a pop-up window is activated. This pop-up includes search fields for "From" and "To" dates, as well as options for "Use case" and "Sensor." After selecting these details, users can proceed by clicking the download button to initiate the download process, or they can opt to cancel by clicking the "Cancel" button.



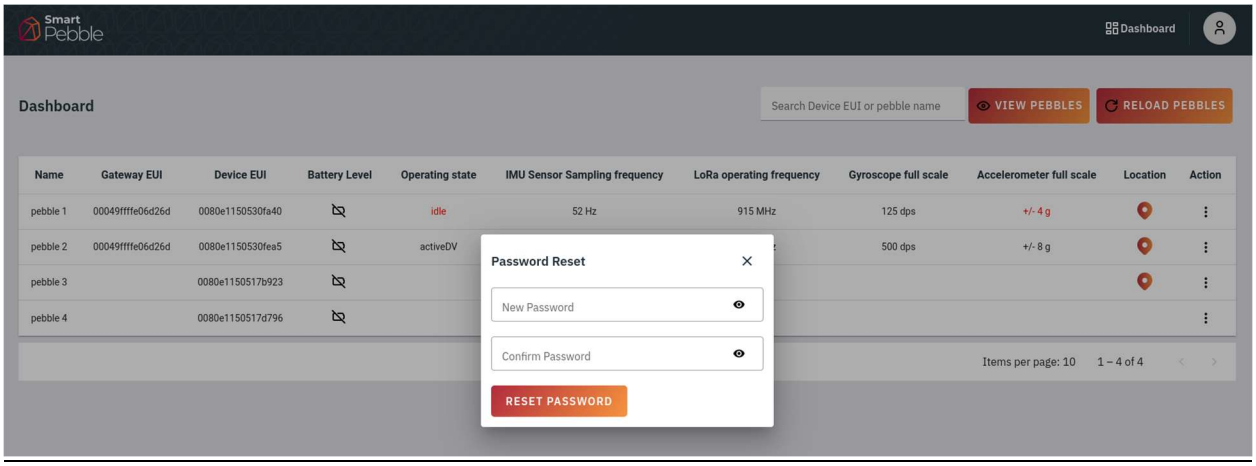


User Profile Setup & password management

In the Dashboard interface (positioned at the upper right-hand corner), there exists a button that enables users to either reset their password or log out from the platform.



For changing password, the user enters a new password along with its confirmation before clicking on the "Reset Password" button.



Methods: