Milestone 2: Outdoor single sensor

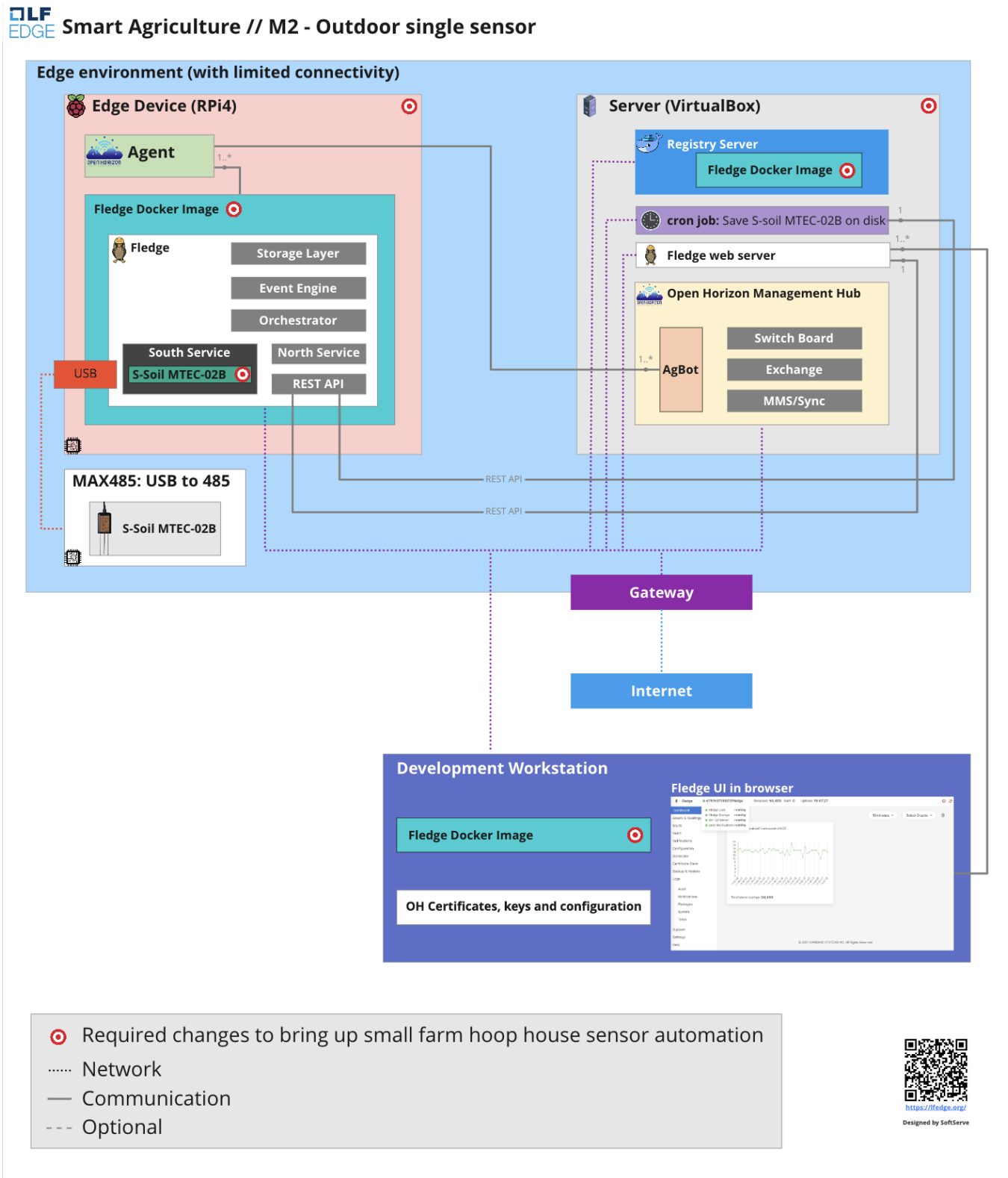
In addition to Milestone 1: Table Garden this Milestone demonstrates how to add a new sensor (we used Seeed's soil moisture and temperature sensor) to the Fledge service running in a docker container, managed by Open Horizon Agent.

Goals

1. Connect **S-Soil MTEC-02B** and get data
2. Add a south plugin into Fledge service for **S-Soil MTEC-02B**
3. Store all **S-Soil MTEC-02B** data in persistent storage on a local drive.
4. Deploy and test in the field (with Bill Rowley).

TBD: Milestone video presentation

System Diagram



Prerequisites

Hardware

1. Raspberry Pi4 model B 4GB+ RAM
2. Industrial Soil Moisture & Temperature & EC Sensor MODBUS-RTU RS485 (S-Soil MTEC-02B)
3. 32+ GB micro SD Card

4. Power supply for Raspberry Pi 4
5. SD card reader
6. x64 PC (laptop or dedicated server)
7. USB to RS485 converter (or similar like USB-RS485-WE-1800-BT)

Software

If you are looking for advanced configuration steps without preinstalled images and want to set up everything from scratch consider using this manual.

1. Download and install Virtual Box on the server (it could be a laptop or dedicated server where Open Horizon Management Hub will be running)
2. Download and install Raspberry Pi imager

Environment

The wifi with the stable signal is required to be in the range where RPi4 is used.

During setup and configuration Internet connection is mandatory.

Steps to configure

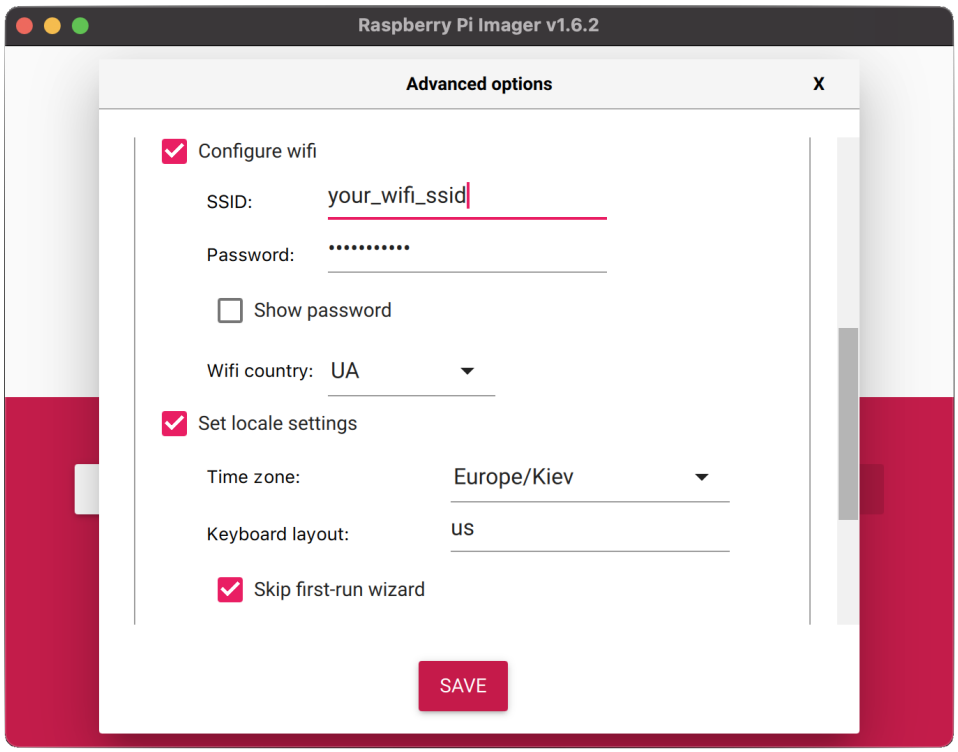
1. Download **EdgeDevice** image with preinstalled software (for **RPi4**) - OpenHorizon_SmartAg_EdgeDevice_RPi4.img (8G)

2. Download **EdgeServer** image with preinstalled software (for EdgeServer running in **Virtual Box)** - OpenHorizon_SmartAg_EdgeServer.ova (5.3G)

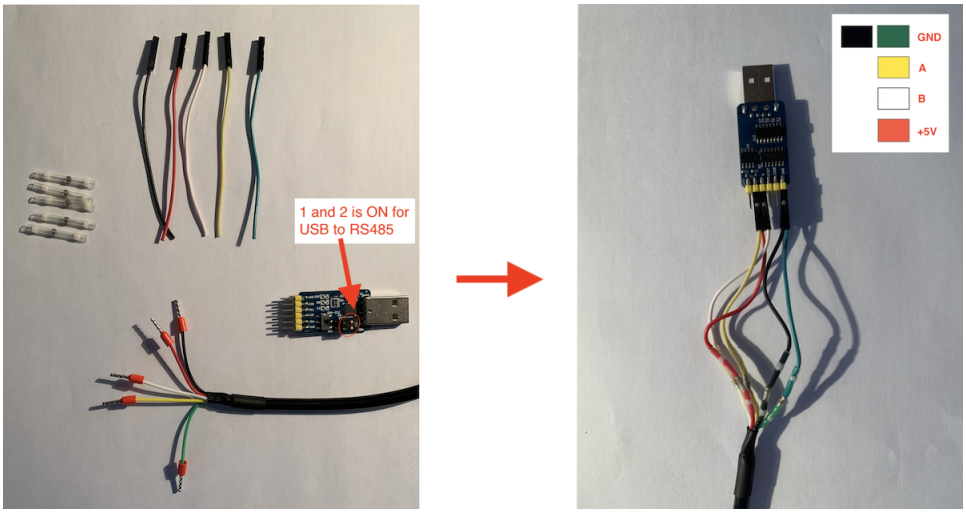
3. Insert SD card in your host

4. Open Raspberry Pi Imager
   Select custom image - use **OpenHorizon_SmartAg_EdgeDevice_RPi4.img**
   Select target drive newly inserted SD card

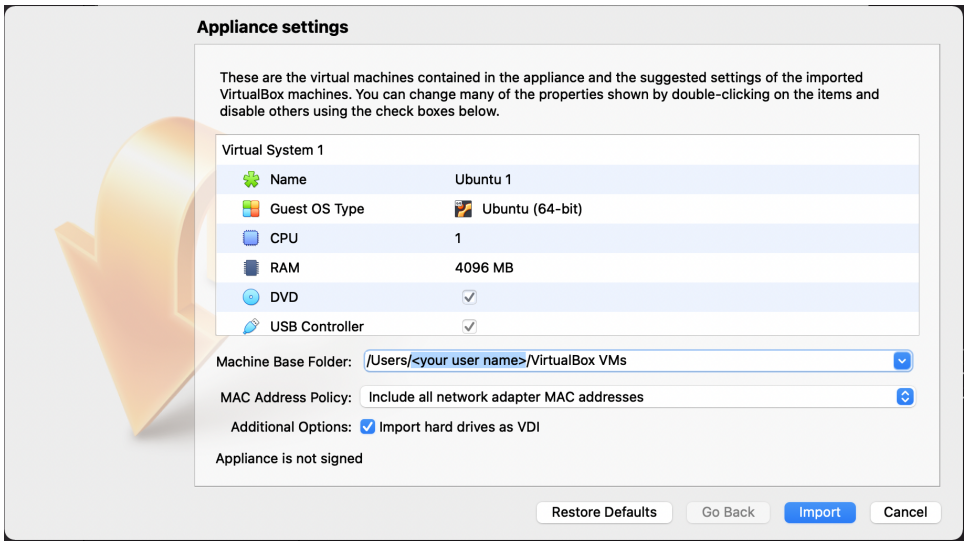
5. Configure Raspberry Board
   Press **CTRL+SHIFT+X**
   - enable **SSH**
   - configure wifi **SSID network** name and **password**
   - setup locale and time
   - select "**Skip first-run wizard**"
   - **SAVE** and **WRITE** new image
   (proceed with other steps while the OS image is burning)



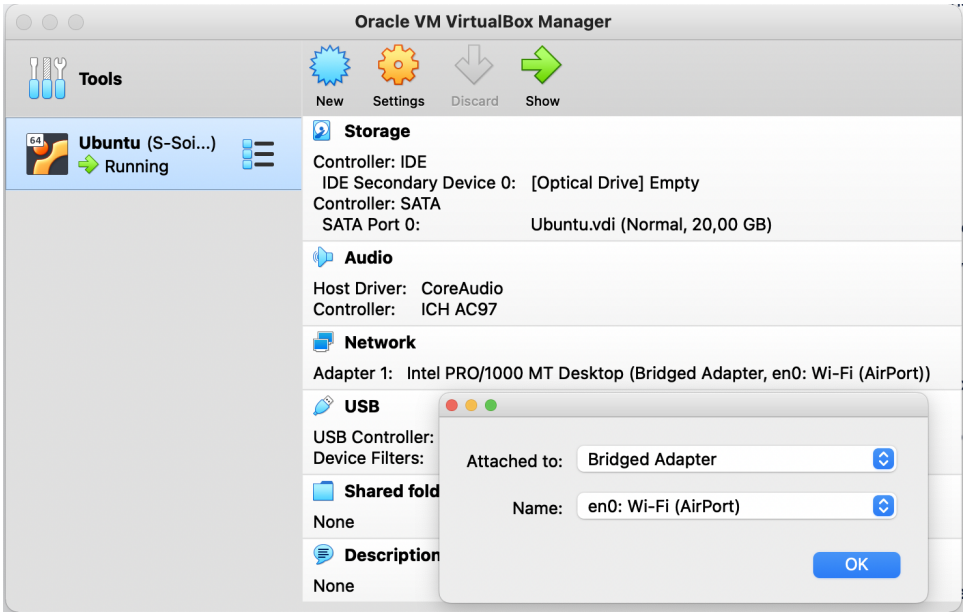
6. Connect **Industrial Soil Moisture & Temperature & EC Sensor MODBUS-RTU RS485 (S-Soil MTEC-02B)** wires to **USB to RS485 converter:**



7. Open and run **Virtual Box** image **OpenHorizon_SmartAg_EdgeServer.ova**



Make sure you selected "Bridged Adapter", this is required to get a separate IP address for Edge Server running in Virtual Box.



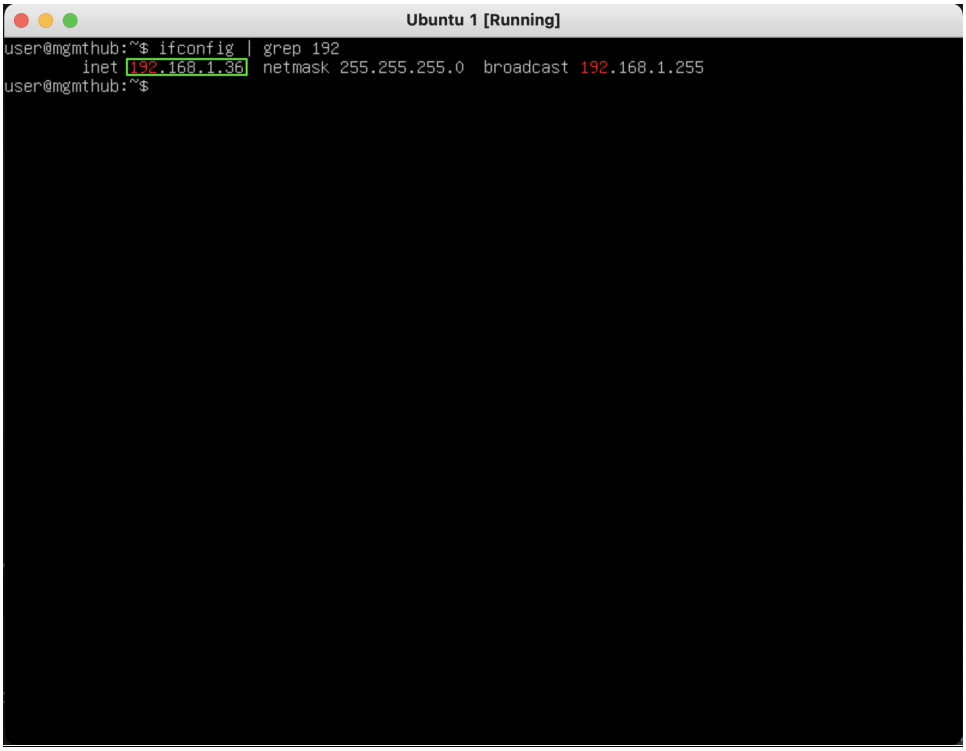
8. Wait for the Raspberry Pi image written on SD card, insert SD card into a raspberry board and connect the power cable to start the board. Raspberry should connect to Wifi on start, as configured in step 5.

9. Login into **Edge Device** (RPi4 board), check if it is up and running.
   - [from **Development Workstation**] find IP address for RPi4 board by running ***sudo nmap -sn 192.168.1.0/24 | awk '/^Nmap/{ip=$NF}/DC:A6:32/{print ip}'***
   - [from **Development Workstation**] connect via ssh to the RPi4 board (password is **openhorizon**):
     ssh pi@<IP address from the previous command>
   - [from **ssh session to Edge Device**] change the default password by running ***passwd***

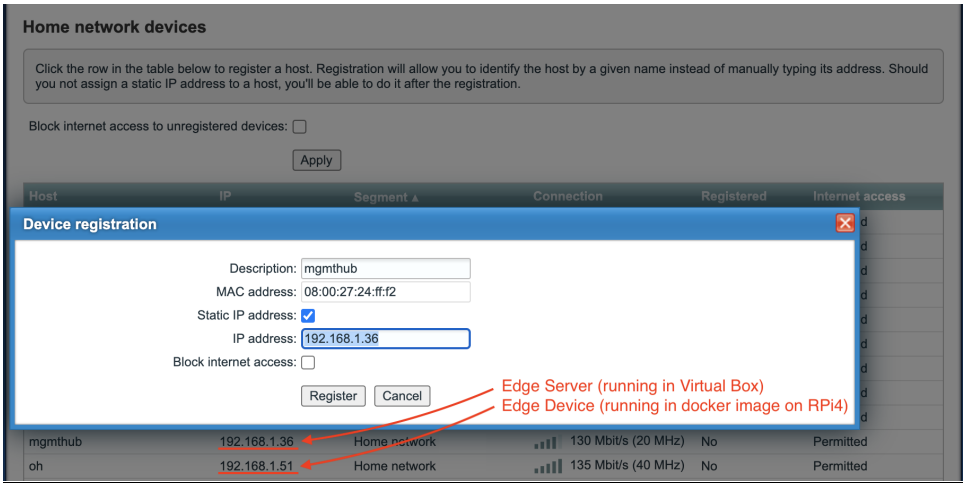
10. Login to Edge Server it should be running after step 7
    - [from Virtual Box console] with the user: **user** and password: **user**
    - [from Virtual Box console] make sure you changed the default password on the first login with ***passwd***

11. Configure IP addresses for **Edge Server** and **Edge Device**

    IMPORTANT: It is recommended to use **192.168.1.36** for your **Edge Server** and **192.168.1.51** for **Edge Device** to avoid any further configuration
    To check IP addresses for **Edge Server** [from **Development Workstation**] run ***ifconfig | grep 192*** command.



    Use command ***ip route | awk '/default/ { print $3 }'*** to get IP address of default router.
    To configure your IP address for **Edge Server** (**mgmthub**) and **Edge Device RPi4** (**oh**) open your wifi router settings in the browser by IP address of the default router.

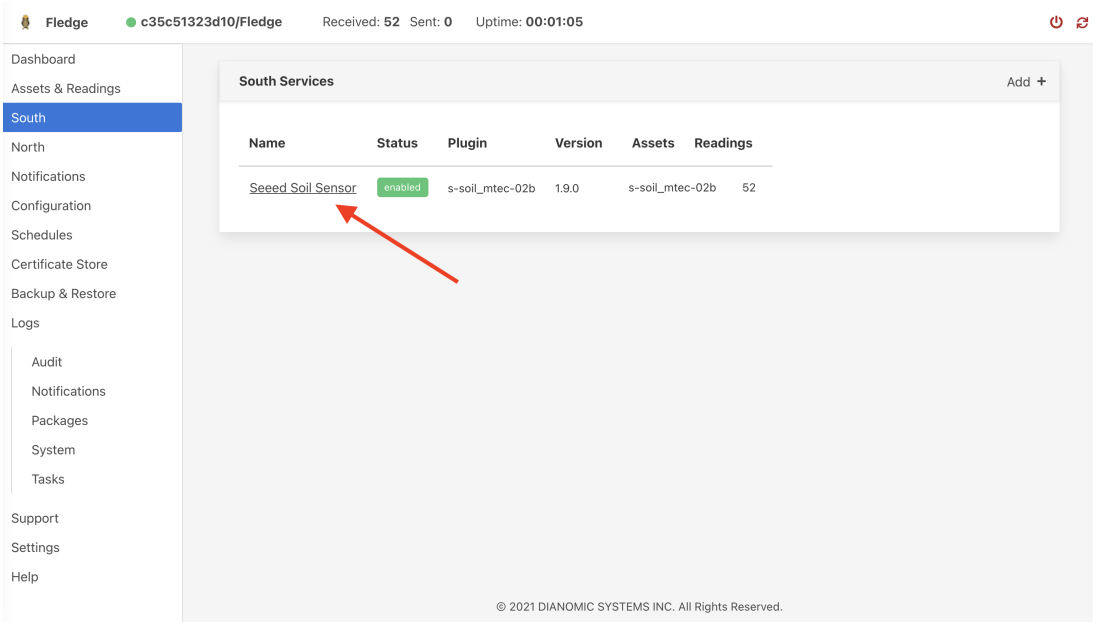


    Set static IP addresses for **mgmthub** (Edge Server) to **192.168.1.36** and **oh** (Edge Device) to **192.168.1.51**

12. Insert **S-Soil MTEC-02B** in soil and in USB and connect the power cable to the **Edge Device RPi4 (oh)** board:

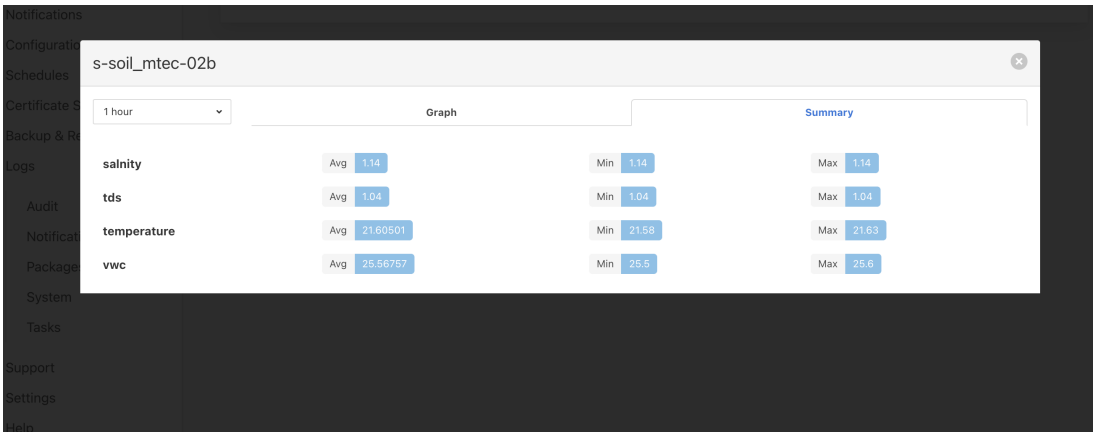
Use Web UI to Get Sensors Data

After **Edge Server** (**mgmthub**) and **Edge Device RPi4** (**oh**) are up and running you should see "Seeed Soil Sensor" in the browser **http://192.168.1.36/#/south** from the host connected to the same wifi.

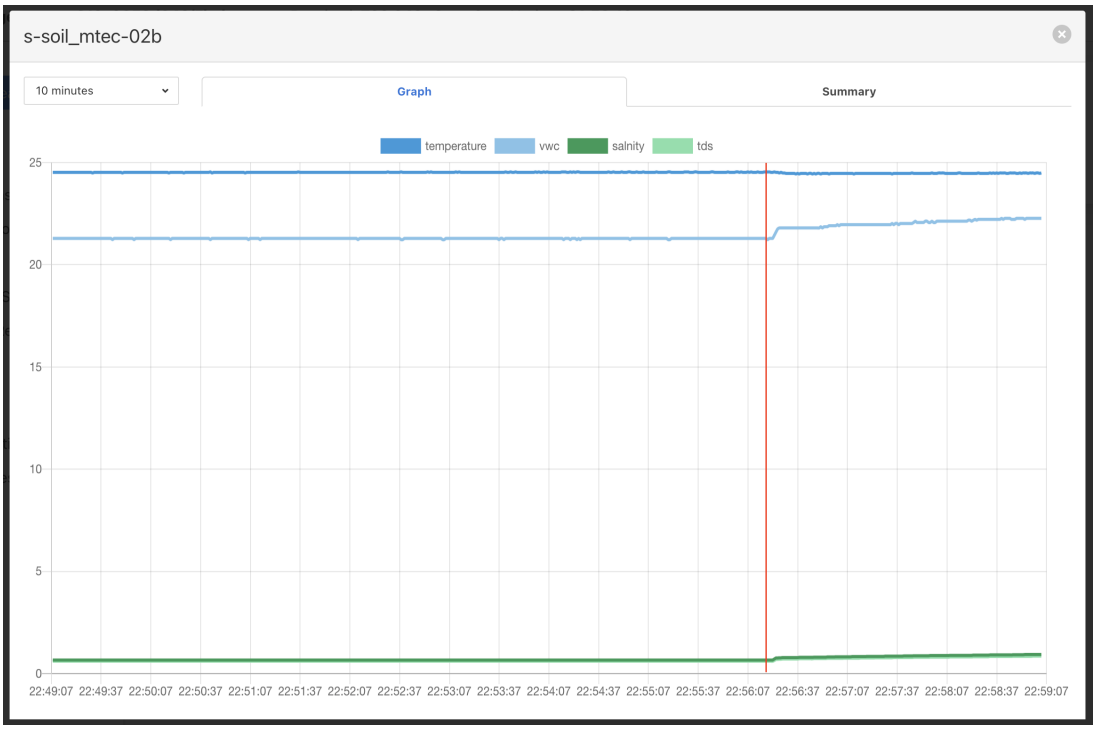


Now you should get continuously updating sensors data:

- **Salinity** (0-20000mg/L)
- **Volumetric Water Content** (0-100%)
- **Total Dissolved Solids** (0-20000mg/L)
- **Temperature** (-4000-8000 corresponds to range -40.00-80.00)



Note: To get data readings please open **Assets & Readings** Tab.



Additionally every hour sensors data stored in **/var/opt/fledgedata/** on **mgmthub** (Edge Server)