

# Milestone 2: Outdoor single sensor

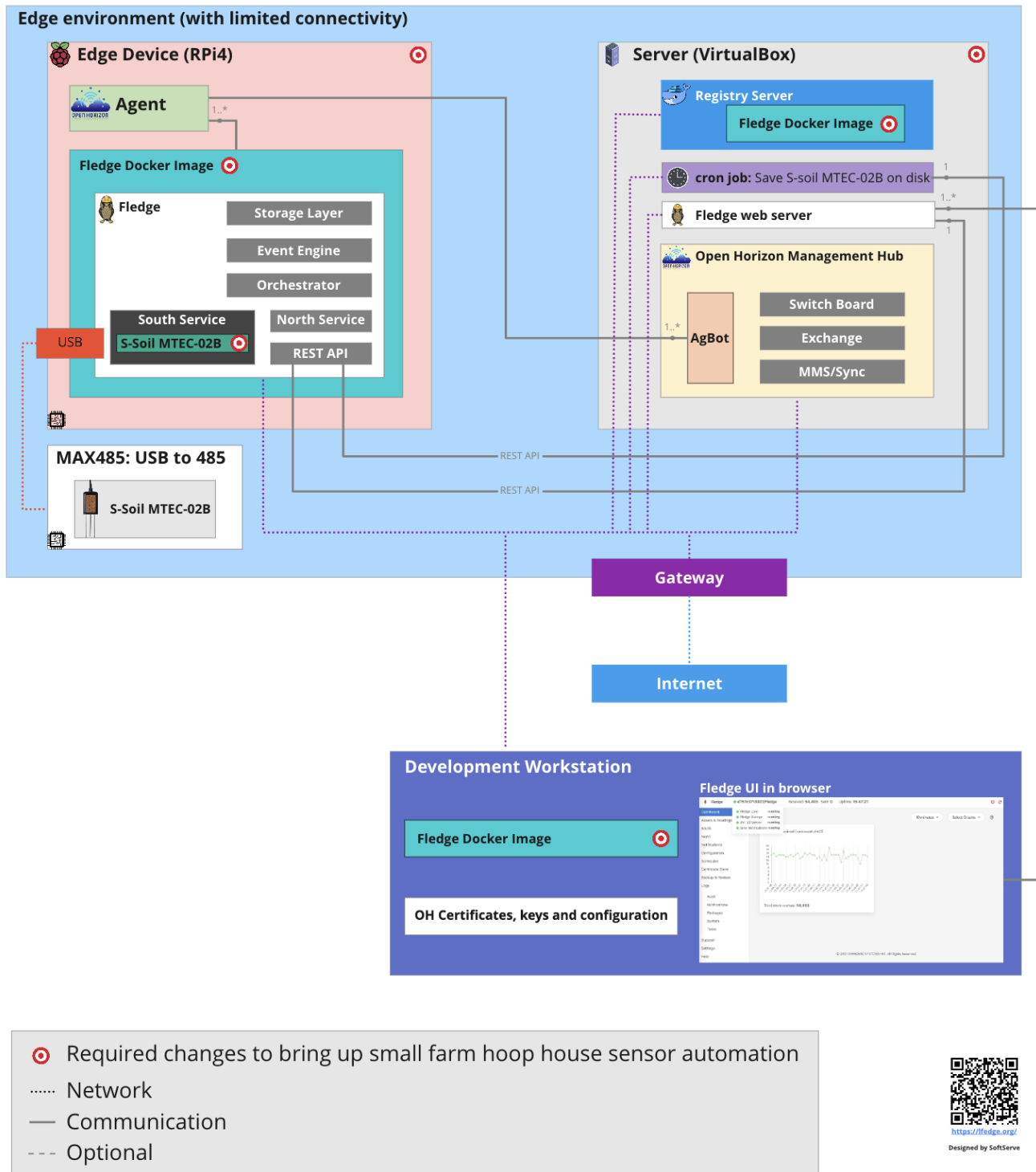
In addition to [Milestone 1: Table Garden](#) this Milestone demonstrates how to add a new sensor (we used [Seeed's soil moisture and temperature](#) sensor) to the [Fledge](#) service running in a docker container, managed by Open Horizon Agent.

## 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](#)

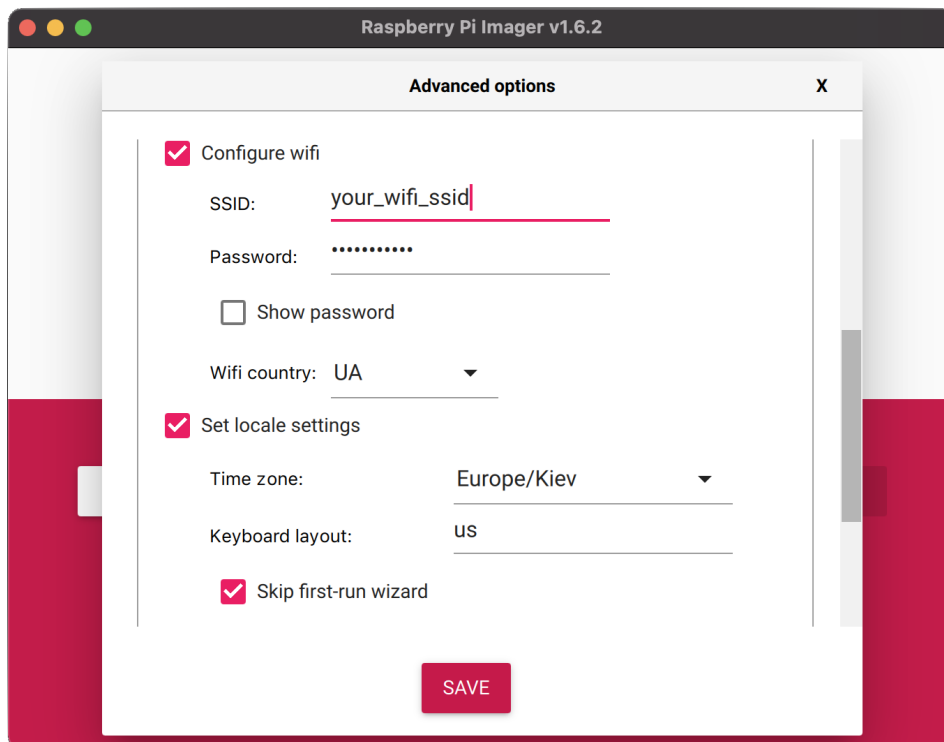
## Environment

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

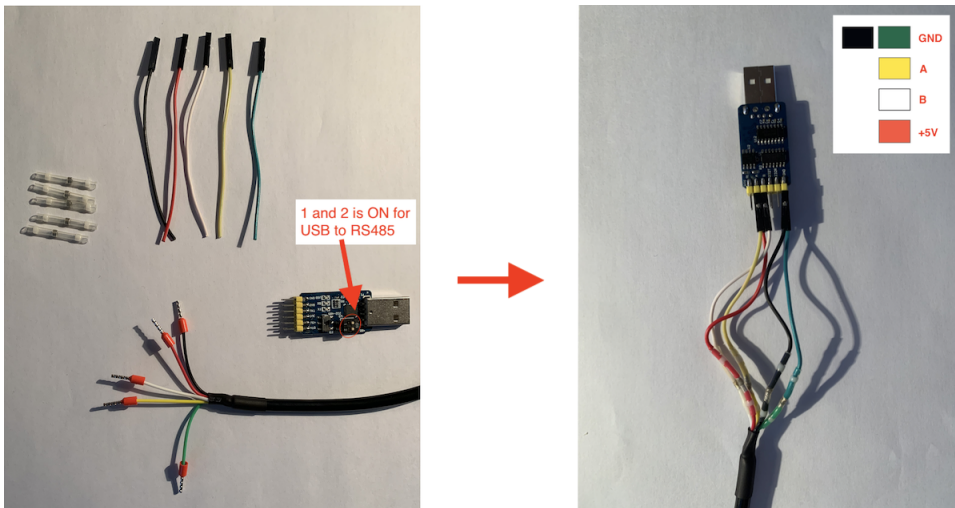
During setup and configuration Internet connection is mandatory.

## Steps to configure

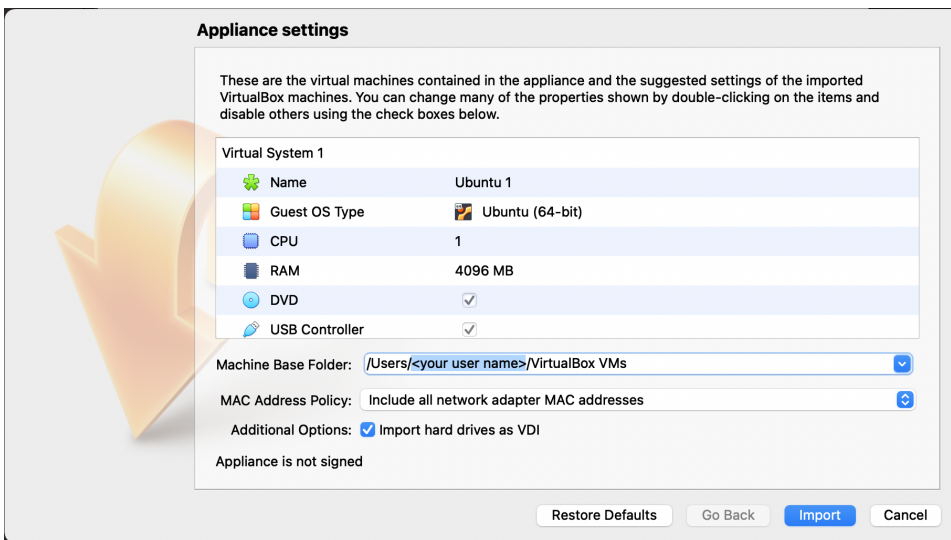
1. Download **EdgeDevice** image with preinstalled software (for **RPi4**) - [OpenHorizon\\_SmartAg\\_EdgeDevice\\_RPi4.img](#) (8G)
2. Download **EdgeServer** image with preinstalled software (for EdgeServer running in **Virtual Box**) - [OpenHorizon\\_SmartAg\\_EdgeServer.ova](#) (5.3G)
3. Insert SD 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)



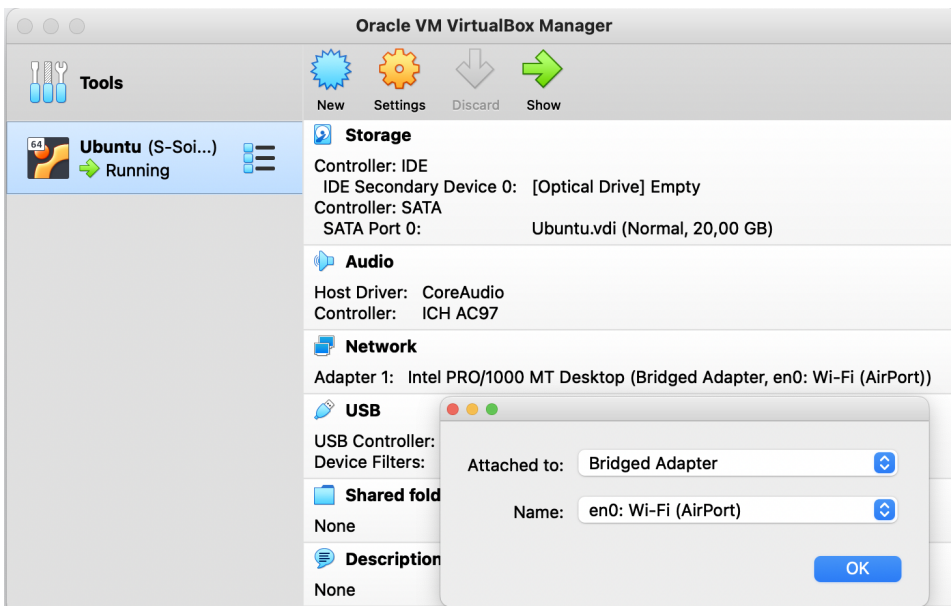
6. Connect **Industrial Soil Moisture & Temperature & EC Sensor MODBUS-RTU RS485 (S-Soil MTEC-02B)** wires to **USB to RS485 converter**:



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.



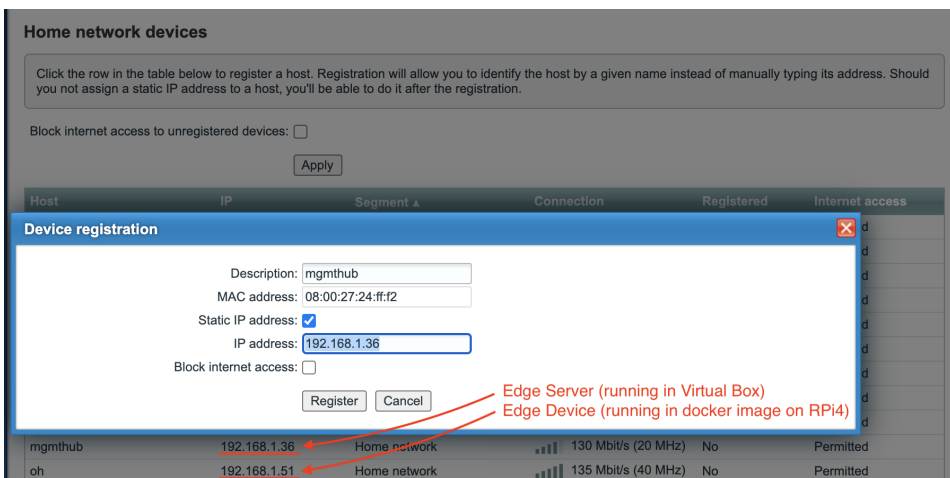
8. Wait for the Raspberry Pi image written on SD card, insert SD card into a raspberry board and connect the power cable to start the board. Raspberry should connect to Wifi on start, as configured in step 5.
9. Login into **Edge Device** (RPi4 board), check if it is up and running.
  - [from **Development 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.

```

user@mgmthub:~$ ifconfig | grep 192
    inet 192.168.1.36 netmask 255.255.255.0 broadcast 192.168.1.255
user@mgmthub:~$
  
```

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.

 **Fledge**

● **c35c51323d10/Fledge**

Received: **52** Sent: **0** Uptime: **00:01:05**

Dashboard

Assets & Readings

**South**

North

Notifications

Configuration

Schedules

Certificate Store

Backup & Restore

Logs

Audit

Notifications

Packages

System

Tasks

Support

Settings

Help

**South Services** Add +

Name	Status	Plugin	Version	Assets	Readings
<u><a href="#">Seed Soil Sensor</a></u>	<span>enabled</span>	s-soil_mtec-02b	1.9.0	s-soil_mtec-02b	52

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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 )

Notifications

Configuration

Schedules

Certificate S

Backup & R

Logs

Audit

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System

Tasks

Support

Settings

Help

s-soil\_mtec-02b

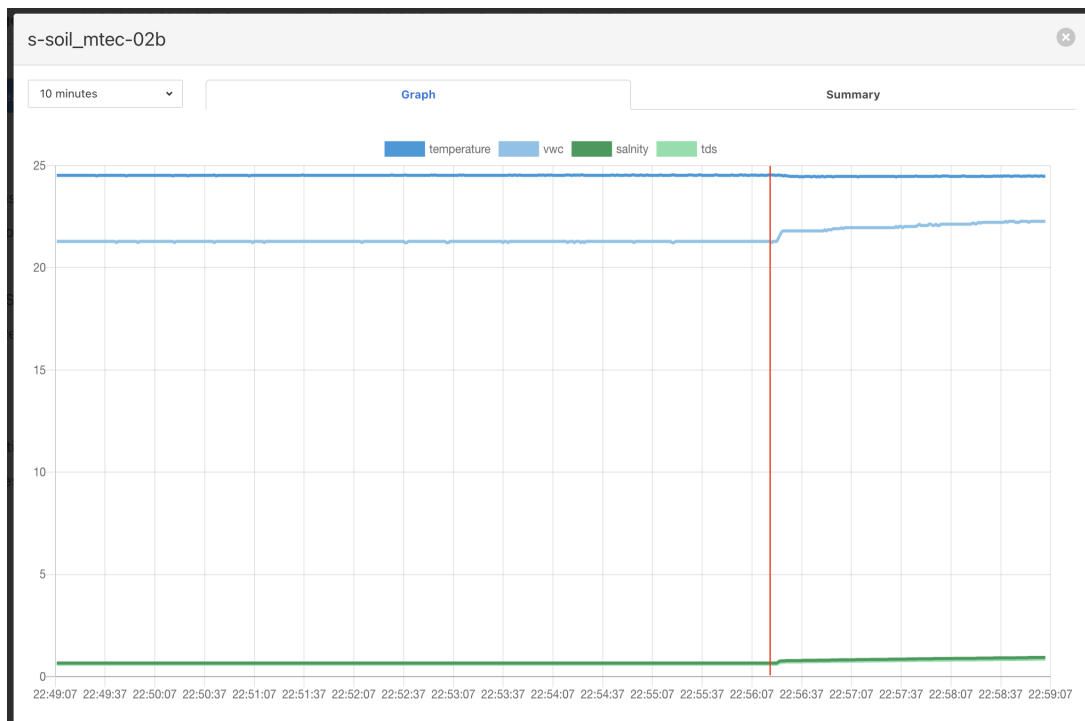
1 hour

Graph

Summary

salinity	Avg <span>1.14</span>	Min <span>1.14</span>	Max <span>1.14</span>
tds	Avg <span>1.04</span>	Min <span>1.04</span>	Max <span>1.04</span>
temperature	Avg <span>21.60501</span>	Min <span>21.68</span>	Max <span>21.63</span>
vwc	Avg <span>25.56757</span>	Min <span>25.5</span>	Max <span>25.6</span>

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



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

```
user@mgmthub:~$ ls /var/opt/fledgedata/
19-10-21_15-00-00.csv 19-10-21_16-00-00.csv
user@mgmthub:~$
```