# 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

# EDGE Smart Agriculture // M2 - Outdoor single sensor



# 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)

•••	Raspberry Pi Imager v1.6.2	
	Advanced options	x
	Configure wifi	
	SSID: your_wifi_ssid	
	Password:	
	Show password	
	Wifi country: UA 🗸	
	Set locale settings	
	Time zone: Europe/Kiev -	
	Keyboard layout: US	
	🖌 Skip first-run wizard	
	SAVE	

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

	These are the virtual machines VirtualBox machines. You can o disable others using the check	contained in the appliance and the suggested settings of the import change many of the properties shown by double-clicking on the items boxes below.	ed s and
	Virtual System 1		
	操 Name	Ubuntu 1	
	Guest OS Type	🜠 Ubuntu (64-bit)	
	CPU	1	
	RAM	4096 MB	
	<ul> <li>DVD</li> </ul>	$\checkmark$	
	USB Controller	$\checkmark$	
	Machine Base Folder: /Users/	<your name="" user="">/VirtualBox VMs</your>	<b>~</b>
/	MAC Address Policy: Include	all network adapter MAC addresses	٢
	Additional Options: 🗹 Impor	rt hard drives as VDI	
	Appliance is not signed		

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.

Home network d	evices							
Click the row in the table below to register a host. Registration will allow you to identify the host by a given name instead of manually typing its address. Should you not assign a static IP address to a host, you'll be able to do it after the registration.								
Block internet access t	o unregistered devices:							
	Ар	oply						
Host					Internet access			
Device registration					d d			
	Description: m MAC address: 06 Static IP address: IP address: Block internet access: F	gmthub 8:00:27:24:ff:f2 92.168.1.36 92.Register Cancel	Edge Server (running in Edge Device (running in d	/irtual Box) docker image o	d d d d d d d d d d d d d d d d d d d			
mgmthub	192.168.1.36	Home potwork	130 Mbit/s (20 MHz)	No	Permitted			
oh	<u>192.168.1.51</u> <del>+</del>	Home network	135 Mbit/s (40 MHz)	No	Permitted			

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.

8	Fledge	c35c51323d10/Fledge	Received: 52	Sent: 0	Uptime: 00:01:05
		• • • • • • • • • • • • • • • • • • • •			

ard						
Readings	South Services					
	Name	Status	Plugin	Version	Assets Readings	
ons	Seeed Soil Sensor	enabled	s-soil mtec-02b	190	s-soil mtec-02b 52	
ration						
es						
e Store						
Restore			•			
t						
cations						
ages						
m						
s						

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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					
Configuratio Schedules	s-soil_mtec-02b				8
Certificate S	1 hour 👻	Graph		Summary	
Backup & Re	salnity	Avg 1.14	Min 1.14	Max 1.14	
Audit	tds	Avg 1.04	Min 1.04	Max 1.04	
Notificati	temperature	Avg 21.60501	Min 21.58	Max 21.63	
Package	vwc	Avg 25.56757	Min 25.5	Max 25.6	
System					
Tasks					
Support					
Settings					
Help					

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



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

