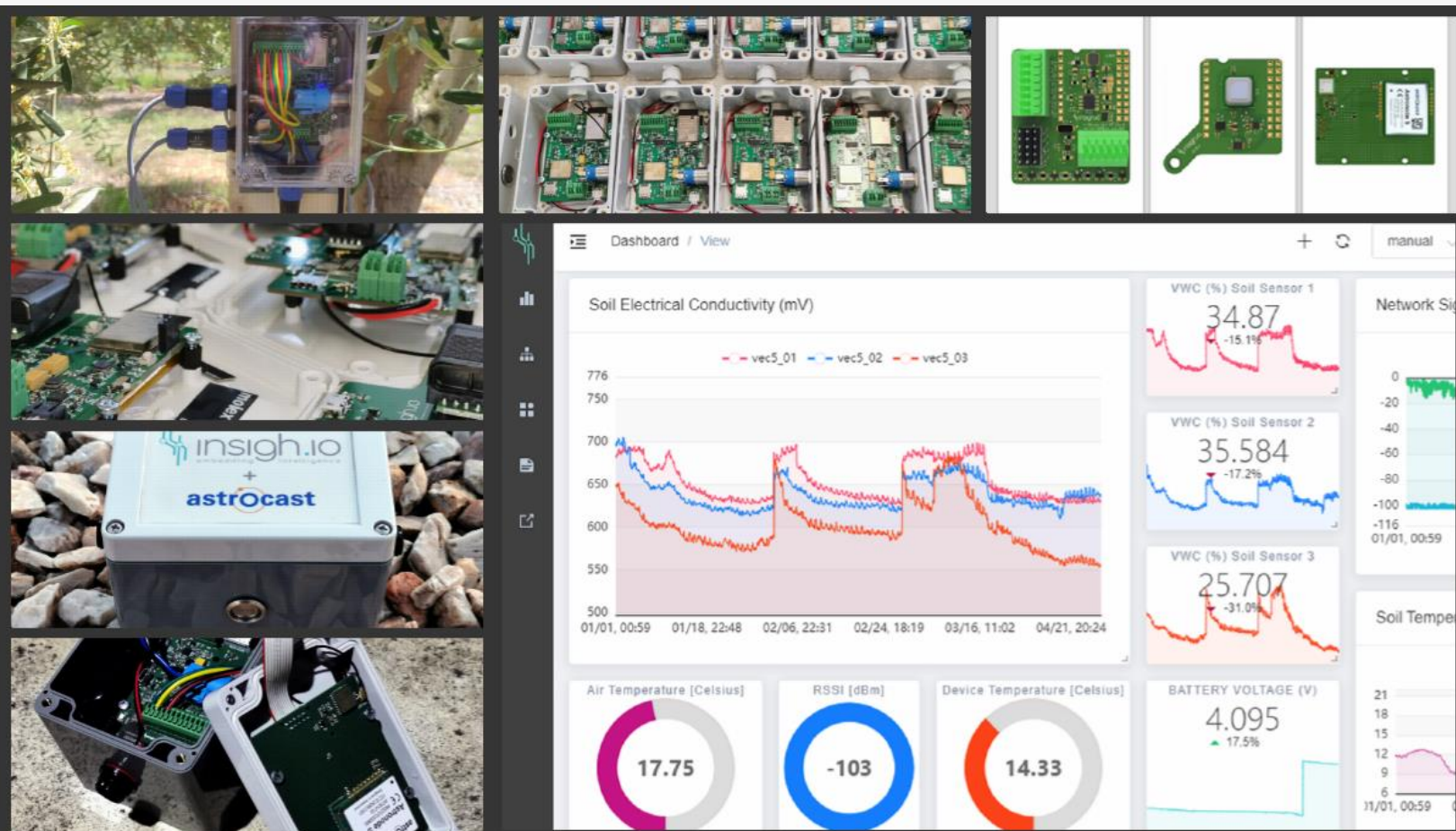




insigh.io  
embedding intelligence

**insigh.io** offers a quick and affordable way to develop and smoothly scale new IoT solutions from scratch:

- Start with a flexible and modular development board
- Pick and place an existing or design a new shield tailor-made to your application and sensors
- Optionally add a connectivity expansion shield when WiFi and Cellular are not enough
- Configure the devices with our open-source Micropython firmware
- Power on, connect to our Cloud Platform and check measurements
- Place the board to the provided outdoor enclosure, attach peripherals, deploy, scale, and forget
- Manage your deployment remotely, access and visualize data from your office



**insigh.io board** is a generic and affordable board for accelerating IoT adoption by companies, makers and non-experts.

### Out of the box features:

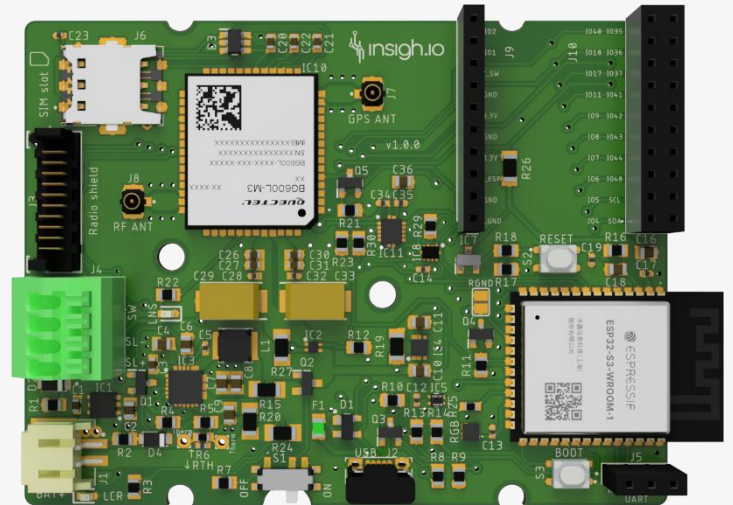
- programmable microprocessor
- multiple power supply options
- on-board temp/hum sensor
- embedded GPS
- device access via USB/Serial port
- configurable via WiFi and Web UI
- ready to fit in IP-rated enclosure

### Build to last for years:

- ultra-low power design
- energy consumption profiling
- automatic power management

### One product - infinite applications:

- exposed IOs for breadboard tests
- tailor-made sensor shields
- additional connectivity shields
- open-source firmware
- cloud-platform ready



#### Connectivity

- WiFi/Bluetooth
- Cellular
- LoRa
- Satellite IoT

#### Energy sources

- Battery
- Solar Power harvesting
- USB

#### Sensors

- Analog
- Digital
- Industrial Protocols

#### Scenarios

- Agriculture
- Smart Cities
- Smart Offices
- Industries

## Main Board Specifications

General Information		Operating Conditions	
Dimensions (L x W x H)	77.47 x 57.15 x 13 mm	Operational Temperature	0 – 60°C
Weight	25 g	Charging Current Limit	500 mA
Enclosure	IP65/67	Maximum Drawn Current (sensors)	500 mA
		Charging Temperature	0 – 60°C

Power Supply						
USB	Port	Input Voltage				
	Micro USB	Min.	Typ.	Max.	Units	
		4.5	5	5.5	V	
Battery	Port	Nominal Characteristics				
	JST PH 2.0	1 x Rechargeable LiPo 1S1C 3.7-4.2 V				
Solar Panel	Port	Input Voltage				
	Fixed Terminal Block with push-in connection (no tools required)	Min.	Typ.	Max.	Units	
		5.5	6	6.5	V	

Connectivity	
Wireless protocol	WiFi, Bluetooth, Cellular IoT & GPRS fallback, LoRaWAN & Sattelite IoT (external)
IP-based protocols	TCP/UDP over IPv4/IPv6, MQTT, CoAP

Switches	
S1	Controls power supply to the micro-controller (the battery charging process is not affected)
S2	Tactile switch for rebooting the micro-controller
S3	Tactile switch for activating the micro-controller's bootloader (needed only for fw upgrade)
J4	Port for connecting external switch (disables S1)

On-board diagnostics & Features	
On-board Sensors	1 × Temperature/Humidity Sensor (based on the SHT40 chip) 1 × GPS (using embedded modem's functionality or a separate module)
Energy Profiling	Accurate Measurement of battery voltage even at charging state Measurement of drawn current at any state (option)

LED Indicators			
Usage	Type	Status	Indication
Charging	RED	ON	Battery is charging
		OFF	Battery charged
		FLASH	Battery not present (USB on)
Modem	RED	OFF	Disabled by micro-controller
		FLASH	Activity (connecting, sending)
Scenario	RGB	BLUE	Sensor measurement
		RED	Connecting to network
		GREEN	Sending Data

Hardware Watchdog (option)	
Operation	Force a power-off/on cycle of the microcontroller after an inactivity period
Control	Software-based timer reset using a GPIO pin (to avoid power cycle, if needed)
Inactivity Period	Pre-programmed (on demand), from 30 seconds to 30 hours

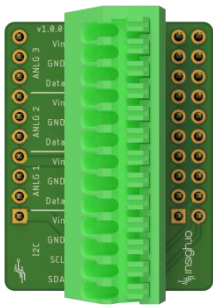
Marking	
CE, FCC, RoHS	Under way

External components required/recommended	
Battery	Cellular IoT: At least 2200 mAh* (recommended: 4000 mAh for deployment)
Solar Panel	6V/1W or 6V/2W

# Sensor Expansion Shields

- Easily expandable IOs
- Swappable (*when not soldered*)
- Rapid testing & built-in software
- Ready for final product
- Power management
- Push-in connectors (no tools required)

## Generic Shield



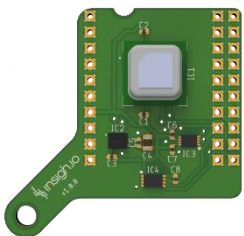
Number of Sensors	4	
Output Voltage	3.3V	
Ports	3 × Analogue 1 × I2C Port	
Example sensors <i>built-in firmware</i>	Analogue	Meter's EC5 (Soil) Pino-Tech's Soil Watch 10 (Soil)
	I2C	SHT20 (Temp/Humidity) BME680 (Environmental)
Example applications	Agriculture, Environmental Monitoring	

## Advanced Industrial Shield



Number of Sensors	5	
Output Voltage	12V	
Ports	2 × SDI12 (RS-485)   2 × 4-20 mA   1 x Digital	
Example sensors <i>built-in firmware</i>		Meter Teros-12 (VWC, EC, Temp) Acclima TDR-315H (VWC, Permittivity, EC, Temp) EnviroPro EP100G Series (Moisture, Temp, Salinity)
	Example applications	Agriculture, Industrial Machines Monitoring

## Air-Quality & Vibrations Monitoring Shield



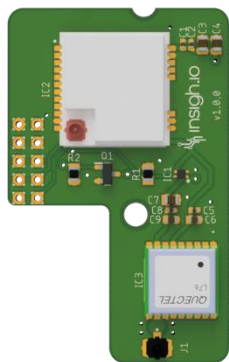
Number of Sensors	3	
Output Voltage	3.3V	
Ports	-	
Example sensors <i>built-in firmware</i>		Sensirion SCD4x (CO <sub>2</sub> , RH/T) ASM330 (3D accelerometer and 3D gyroscope) MLX90397 (Magnetometer)
	Example applications	Indoor Air Quality, Road hazards detection



## Connectivity Expansion Shields

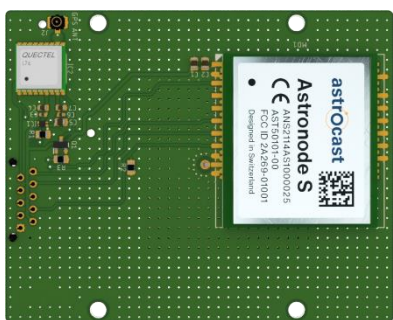
- Special Flexible Connector
- Swappable/removable
- Autonomous GPS
- Ready for final product
- Built-in firmware
- Power Management

### LoRa Shield



Modem	RAK Wireless RAK4270 Module (accessed via UART)
GPS	Quectel's L76L-M33 Module (flashed with I <sup>2</sup> C firmware)
Operating Voltage	3.3V
Dimensions	30.5 x 49 x 16.7 mm
Antenna	External ISM 868-915MHz Antenna Required External Flexible GNSS Antenna (for GPS option)
Firmware Support	Beta version with custom payload formatter available; Final version available in Q2-23
Platform Support	Private Chirpstack Server (available) TheThingsNetwork Support (Q2-23)

### Satellite IoT Shield (Astrocast)

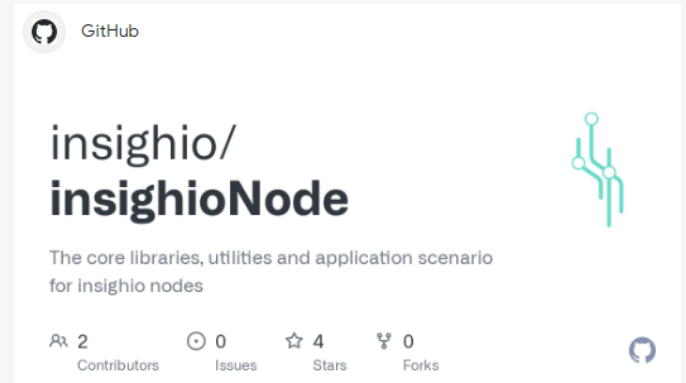


Modem	Astrocast's Astronode S Module (accessed via UART)
GPS	Quectel's L76L-M33 Module (flashed with I <sup>2</sup> C firmware)
Operating Voltage	3.3V
Dimensions	78.31 x 63.15 x 7 mm
Antenna	On-board Astronode Compact ceramic patch antenna Flexible GNSS Antenna (for GPS option)
Firmware Support	Full support through dedicated library
Platform Support	Integration with Astrocast's Platform

## insigh.io IoT device software (firmware)

is an open-source package written entirely in Micropython with a dual-role:

- automate device operation for non-experts.
- accelerate new application development for advanced users.



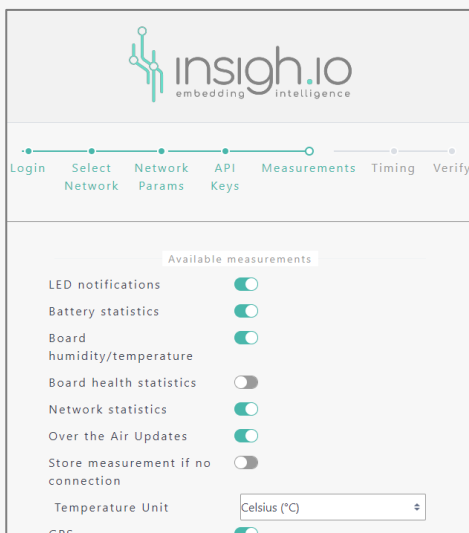
### IoT adopter: A non-expert user

- *Requirement:* A **plug-and-play** consumer-like device
- *Our Solution:* Pre-built software
  - simplifying the device configuration and on-boarding operations
  - based on a mobile friendly web setup environment



### IoT developer: An advanced user

- *Requirement:* An **easy-to-use platform** for building custom applications
- *Our Solution:* Open-source software
  - abstracting all the necessary low-level sensor and connectivity functionalities in a well-defined high-level API
  - empowered by a collection of libraries and sub-modules



## Build-in Web Configurator

insigh.io IoT Node acts as a WiFi hotspot serving a user friendly configuration wizard to setup:

- Network configuration
- insigh.io platform API tokens
- Measurement pack by selecting attached shield
- Device health and statistics
- Execution scenario:
  - Periodic measurement (for battery operation)
  - Batch upload (minimum battery consumption)
  - Always-on connection (for live monitoring)

**insigh.io IoT platform** allows for full administration of your IoT fleet, enhanced data visualization, live reporting, along with instant and flexible data interconnection with external platforms using multi-technology integrations.

### Data visualization

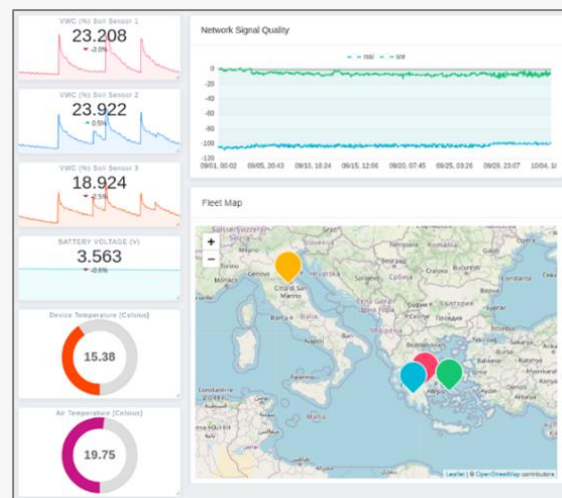
Configurable widgets with access to raw data and meta-data for live views and trend identification

### Administration panels

All tools needed to manage your fleet, from multi-device operations to per-device controls

### Device-level view & control

End device health report, firmware update process monitoring, two-way communication



esp32s3_bg600_generic_03				
ID 34a2a360-506f-4345-9df7-ca5c53e820f5	Key 5261b91d-8c6e-4738-bb77-11221f69752a			
Data Channel e59ebf54-9aa5-4daa-8dd0-31e05d463977	Control Channel f1937d78-6745-4b6b-98c3-62e2201c21ab			
Protocol mqtt	Last Seen 2023-02-14 23:13:06			
Network wifi	Tags			
Serial 7cd1a1e66660	Firmware			
	Free flash 2072704			
	hw version 1.18.17			
	fw commit v2.0.0-49c354			
	hw version v2.0.0-49c354			
OTA package				
Active measurements				
Live View <span style="color: green;">●</span>				
Name	Unit	Value	Time	Raw message
board_hu midty	relative hu midty (% RH)	41.17		No Data

### Rule-based triggers

User defined rules on incoming messages trigger retransmission to 3<sup>rd</sup> party systems or calls on external REST APIs

### Data Plugin support

Configurable incoming data sources in the form of user defined plugins to accept measurements from external systems

### Open APIs

Multi-protocol APIs allowing smooth integration with 3<sup>rd</sup>-party applications (REST, MQTT, WebSockets and more)



### Inherent security features

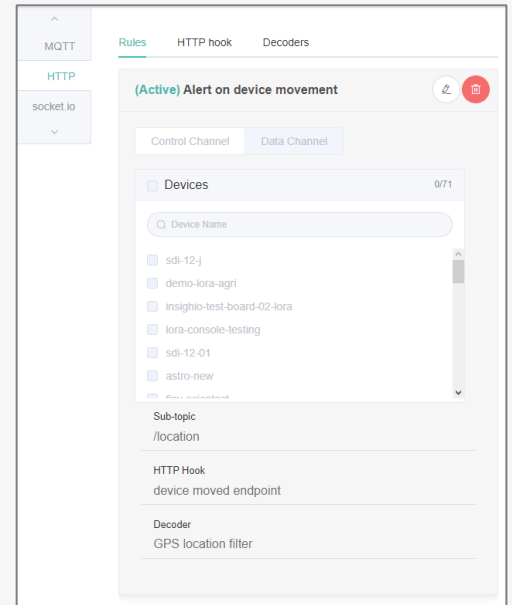
End-to-end data encryption through TLS with reverse proxies for access control and per-device authorization through unique API keys

### Predictive maintenance

Device behavior pattern extraction to identify operation deviations calling for maintenance

### Flexible deployment

Our managed cloud deployment is the quickest way to get started, while on-premises deployment is always an option for special needs



Dashboard / Devices / Overview

Battery statistics 30d 7d 1d

Name	Oldest	Newest	Diff	Now	Estimation	OTA Status
elgo_05	4.06 (83.33%)	4.05 (82.50%)	-0.83%	4.05 (82.50%)	91d	-
prima_mc_40	4.078 (84.83%)	4.076 (84.67%)	-0.16%	4.076 (84.67%)	88d	✓
prima_mc_13	4.118 (91.00%)	4.11 (90.00%)	-1.00%	4.11 (90.00%)	79d	✓
prima_mc_106	4.028 (80.67%)	4.026 (80.50%)	-0.17%	4.026 (80.50%)	79d	✓
prima_mc_105	4.028 (80.67%)	4.026 (80.50%)	-0.17%	4.026 (80.50%)	59d	✓
prima_mc_18	3.742 (23.00%)	3.74 (22.50%)	-0.50%	3.74 (22.50%)	4d	✓
prima_mc_10	4 (77.50%)	3.998 (77.25%)	-0.25%	3.998 (77.25%)	296d	✓
elgo_30	4.034 (81.17%)	4.03 (80.83%)	-0.34%	4.03 (80.83%)	200d	-
prima_mc_107	3.868 (59.50%)	3.86 (57.50%)	-2.00%	3.86 (57.50%)	19d	✓
prima_mc_14	4.148 (94.75%)	4.144 (94.25%)	-0.50%	4.144 (94.25%)	165d	✓

### Connecting Remote Beehives

Periodic monitoring of beehive production & environment

- Weight
- Temperature
- Location
- Daily reporting

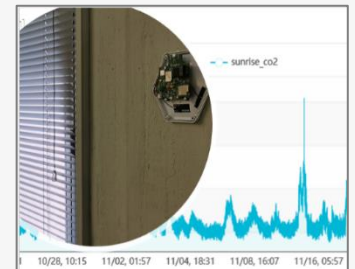


*\* in cooperation with  
TERRA-SPATIUM*

### Ensuring Good Workspace Quality

24/7 indoor air quality monitoring & occupancy prediction

- CO<sub>2</sub>
- Temperature
- Humidity
- 1 minute reporting



*\* in cooperation with  
COSMOTE R&D*

### Optimizing Agricultural Production and Processes

Regular soil status & weather monitoring

- Water Content
- Temperature
- Humidity
- Daily reporting



*\* in cooperation with DATAVERSE*

### Enabling Incentivized Recycling

Disposable plastic litter weighing as it is thrown

- New item identification
- Weight Measurement
- User association
- Instant reporting



*\* in cooperation with  
CYCLEFI & RECYTRUST*