

# Telemetry & Monitoring

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# Environmental Sensors & Telemetry

MeshCore nodes can be equipped with environmental sensors to report weather data, air quality, and precise positioning across the mesh. This turns repeater nodes into distributed sensor stations.

## Supported sensor types

Sensor	Measurements	Interface	Cost	Notes
<b>BME280</b>	Temperature, humidity, barometric pressure	I <sup>2</sup> C or SPI	\$3 - 8	Most common; accurate; fast response
<b>BME680</b>	Temperature, humidity, pressure, VOC/air quality index	I <sup>2</sup> C or SPI	\$8 - 15	Adds air quality score; best for environmental monitoring
<b>SHT31</b>	Temperature, humidity	I <sup>2</sup> C	\$5 - 10	Higher accuracy than BME280 for humidity; no pressure
<b>GPS modules</b>	Latitude, longitude, altitude, speed, heading	UART	\$5 - 25	See GPS module comparison below
<b>INA219 / INA260</b>	Voltage, current, power draw	I <sup>2</sup> C	\$2 - 5	Battery and solar monitoring; useful for remote health checks

## GPS module comparison

Module	Constellations	Current draw	Cold fix time	Notes
<b>u-blox M8N</b>	GPS, GLONASS, BeiDou	~25 mA	~30 s	Common in T-Echo, T-Beam; good urban performance
<b>u-blox M10</b>	GPS, GLONASS, BeiDou, Galileo	~15 mA	~25 s	Newer generation; lower power, better accuracy

Module	Constellations	Current draw	Cold fix time	Notes
<b>u-blox MAX-M10S</b>	GPS, GLONASS, BeiDou, Galileo	~5 mA	~25 s	Ultra-low power; T-Deck Plus; best for battery nodes
<b>Quectel L76K</b>	GPS, GLONASS, BeiDou	~20 mA	~35 s	Budget option; lower sensitivity than u-blox
<b>UC6580</b>	GPS, GLONASS, BeiDou, Galileo, QZSS, NavIC (L1+L5)	~30 mA	~20 s	Heltec T096; dual-band L1+L5; highest precision available

**Note:** GPS draws significant power (~15 - 30 mA active). For repeater deployments where position is static, configure the node to fix position at startup and then disable GPS polling to save power.

## Connecting a BME280 to common boards

Most MeshCore-compatible boards expose I<sup>2</sup>C headers. Standard connection:

BME280 pin	RAK4631 / WisBlock	Heltec V4 / V3	T-Echo
VCC	3.3V	3.3V (pin 13)	3.3V
GND	GND	GND (pin 14)	GND
SDA	IO1 (SDA)	GPIO 41	SDA (P0.26)
SCL	IO2 (SCL)	GPIO 42	SCL (P0.27)
SDO	GND (I <sup>2</sup> C addr 0x76)	GND	GND
CSB	3.3V (I <sup>2</sup> C mode)	3.3V	3.3V

## Enabling telemetry in MeshCore firmware

Sensor support is compiled into the firmware for supported boards. For custom sensor connections:

```
# In platformio.ini build flags, add sensor definition:
build_flags =
  -DHAS_BME280=1
  -DBME280_I2C_ADDR=0x76
```

```
# Then rebuild and flash
pio run -e your_target --target upload
```

Pre-built firmware with BME280 support is available for RAK4631 WisBlock (which has a dedicated sensor slot) and select Heltec builds. Check the MeshCore firmware releases page for available variants.

## Telemetry data in the mesh

Sensor data is included in periodic telemetry packets broadcast by the node. Other nodes and apps that receive these packets display:

- Temperature and humidity at the repeater's physical location
- Barometric pressure trend (useful for weather monitoring)
- Air quality index (BME680 only)
- Battery voltage and solar input (if INA219 connected)

The [RegionMesh](#) community operates several telemetry-equipped repeaters on hilltops and tower sites, providing real-time weather data for the surrounding area via the mesh network.

## Network monitoring with MQTT

For operators managing multiple nodes, MeshCore can be bridged to MQTT for centralized monitoring:

- Run a MeshCore Room Server (running on dedicated nRF52840 or ESP32 hardware)
- All mesh traffic (messages, telemetry, node advertisements) is forwarded to MQTT topics
- Visualize with Grafana + InfluxDB for historical trending
- Alert on node disappearance (node stops advertising = possible power failure)

See the *Room Servers & Gateways* section for MQTT bridge setup details.