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AllPlantsData Gateway

Technical Report: Generation 2

Collects the data of every AgroTag on the site and sends it to the cloud, by Wi-Fi or the mobile network



1. Overview

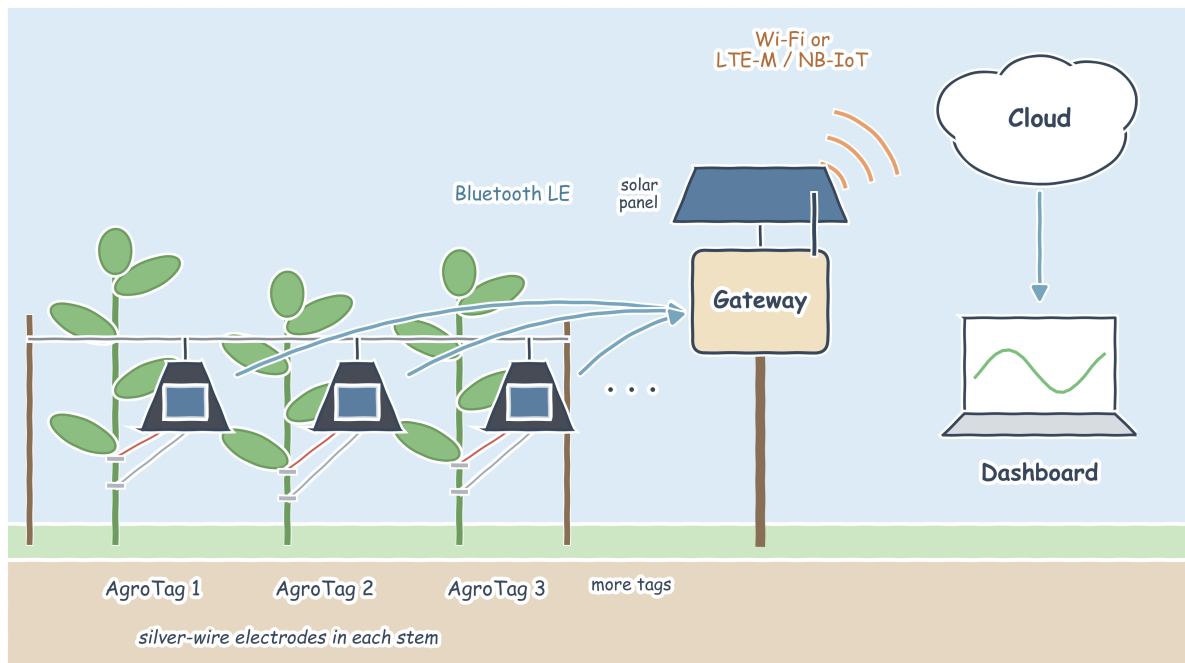


Figure 1. The concept: AgroTags send their readings to one gateway, which passes them to the cloud and the dashboard

The AllPlantsData Gateway is the link between the AgroTags on the plants and the AllPlantsData cloud dashboard. It listens for the radio messages of every tag around it, collects them, and uploads them in batches over Wi-Fi or the mobile network. One gateway normally serves one field, block or greenhouse.

It is built for places without infrastructure. A small solar panel and rechargeable batteries let it run on its own in an open field, and a built-in mobile connection means it needs no Wi-Fi or cabling. Where power and Wi-Fi are available, as in most greenhouses, it can instead run from a standard 5 V USB supply and send its data over the local Wi-Fi.

Main features

- **Tag reception:** Bluetooth Low Energy receiver with a range-extending amplifier, for the AgroTags;
- **Two uplinks:** Wi-Fi and LTE-M / NB-IoT mobile network, with automatic switching between them;
- **Power:** solar panel with two rechargeable batteries, or a 5 V USB supply;
- **No data lost:** readings are stored on the gateway during an outage and sent once the connection returns;
- **Remote management:** settings and firmware updates from the dashboard, with no site visit;
- **Security:** alarms if the lid is opened or the gateway is moved or knocked down.

About this issue. This report describes the second-generation gateway, in service since 2026. The same gateway serves both AllPlantsData and Parkit sensors. Figures are rounded. Where a figure is an estimate rather than a measurement, the text says so.

2. How the system fits together

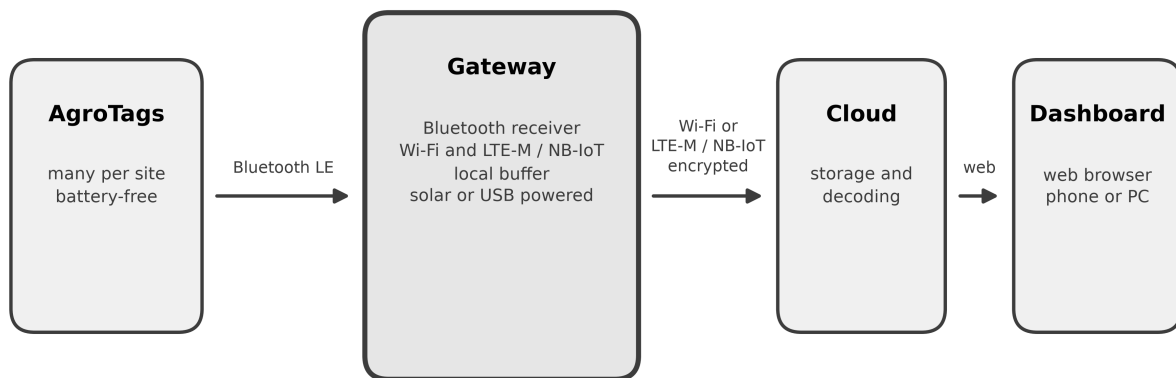


Figure 2. The gateway between the tags and the cloud

The AgroTags broadcast short messages several times a minute. The gateway receives them, keeps them in batches, and sends each batch to the cloud over an encrypted connection. A batch is sent as soon as it is full or after a short time limit, so readings normally appear on the dashboard within about 15 seconds. The gateway also sends its own health report: battery, solar input, signal strength and temperature.

3. The gateway



Gateway unit with its antenna



With the solar panel

Figure 3. The gateway and its solar panel



Panel mounted on the gateway



On a vineyard post, September 2026

Figure 4. Mounting

4. Communications

Link	Details
From the tags	Bluetooth Low Energy 5 receiver. A low-noise amplifier on the receiver extends the range. Any number of tags within range.
Wi-Fi	2.4 GHz, 802.11 b/g/n. Used first when a known network is available.
Mobile network	LTE-M and NB-IoT, the low-power cellular networks for IoT. Built-in eSIM plus a micro-SIM slot. Used when there is no Wi-Fi or when Wi-Fi drops.
Switching	Automatic: Wi-Fi has priority; the mobile network takes over within about 30 seconds if Wi-Fi is lost, and hands back when Wi-Fi returns.
Connection modes	Wi-Fi and mobile (default); Wi-Fi only, for example in a greenhouse, with no SIM or data plan needed; mobile only, for open fields.
Tags per gateway	Designed for up to about 100 tags per gateway (calculated from its upload and radio capacity; tested so far with up to 5 tags).
To the cloud	Encrypted connection (TLS) with a unique certificate in each gateway.
Upload	In batches: when a set number of readings is collected (10 to 30) or after a set time (10 to 60 seconds), whichever comes first. Both are set from the dashboard.

The range from the tags to the gateway depends on the site: line of sight, the height of the gateway and the density of the foliage. The gateway is best mounted above the canopy, for example on a trellis post or a wall.

5. Power

The gateway can be powered in two ways, chosen with a switch inside the case.

Option	Details	Typical use
Solar	Solar panel of about 3 W (about 14 × 16 cm) on an adjustable bracket, charging two standard rechargeable 18650 lithium-ion cells inside the gateway	Open fields, vineyards, orchards
USB, 5 V	Any standard 5 V USB-C supply, such as a mains adapter. The batteries, if fitted, keep the gateway running through a power cut	Greenhouses, farm buildings, sites with mains power

Power	Value	Basis
Batteries	Two 18650 lithium-ion cells, user-replaceable	—
Solar panel	About 3 W, about 14 × 16 cm	—
USB input	5 V, USB-C	—
Operation without any sun or USB power	About 1 week on Wi-Fi, about 2 weeks on the mobile network	Calculated estimate, not yet measured
Battery charging	Automatic, from the panel or from USB	—

Without any sun or USB power, two fully charged cells (3500 mAh each) are estimated to keep the gateway running for about one week when it uses Wi-Fi and about two weeks when it uses only the mobile network,

which needs less power than Wi-Fi. These figures are calculated from the typical consumption of the gateway's parts and have not yet been measured; a run-down test is planned and its result will replace them in the next issue. In normal use the solar panel recharges the batteries every day, and even a cloudy day adds charge.

The mobile modem uses the network's power-saving modes and sleeps between uploads. The status lights can be switched off from the dashboard where blinking is not wanted, which also saves a little energy.

6. Reliability: no data lost in an outage

If both Wi-Fi and the mobile network are unavailable, the gateway keeps receiving tag readings and stores them. Several hundred readings are held in memory, and with a microSD card fitted the store covers many hours. When the connection returns, the stored readings are sent first-in, first-out alongside the live data. Readings older than a set age (8, 12 or 24 hours, set from the dashboard) are discarded so that the store never fills with stale data.

A watchdog restarts the gateway automatically if its software ever stops responding.

7. Remote management

Function	Details
Health report	Battery level, solar input, signal strength, internal temperature and connection state, at an interval set from the dashboard (from 15 seconds to 6 hours)
Settings	Upload rules, report interval, alarms, status lights and offline storage, all changed from the dashboard without a site visit
Firmware updates	Over the air, for every processor in the gateway. Each update is digitally signed, and the gateway refuses an update that is not
Installation	The gateway is registered on the dashboard. Its position comes from the installer's phone; a coarse position from the mobile network is also available
Wi-Fi set-up	Network details are entered through the dashboard with the gateway connected by USB
Service console	A technician console over USB; information that identifies the site is locked behind a PIN

8. Security and alarms

Alarm	Meaning
Lid opened	The enclosure was opened; repeated while it stays open
Moved	The gateway was moved away from its installed position
Knocked down	The gateway fell or was hit
Storage card removed	The microSD card was taken out
Mains power lost	The USB supply was disconnected (USB-powered gateways)
Stopped reporting	The dashboard emails the owner when a gateway or tag stops reporting

Each alarm can be switched on or off from the dashboard. The connection to the cloud is encrypted and each gateway has its own certificate, so one gateway cannot pose as another.

9. Mechanical



The 3 W solar panel



Gateway and panel

Figure 5. Solar panel

Item	Details
Enclosure	About 13 × 9 × 5 cm (about 19 cm long with the mounting tabs)
Mounting	Screw tabs for mounting on a wall or a post; the solar panel fits on the gateway on an adjustable bracket
Antenna	External antenna
Connections	USB-C for power and service; solar panel lead
Outdoor use	Designed for outdoor use; formal ingress (IP) rating not yet tested

10. Specification summary

	AllPlantsData Gateway, Generation 2
Receives	AgroTag Bluetooth LE messages, with a range-extending amplifier
Uplink	Wi-Fi 2.4 GHz 802.11 b/g/n, and LTE-M / NB-IoT with eSIM and micro-SIM; automatic switching
Tags per gateway	Up to about 100 (calculated; tested so far with up to 5)
Connection modes	Wi-Fi and mobile, Wi-Fi only (no SIM needed) or mobile only
Cloud link	Encrypted (TLS), unique certificate per gateway, batched upload
Offline storage	Several hundred readings in memory, many hours with a microSD card
Power	Solar panel (about 3 W) with two 18650 lithium-ion cells, or 5 V USB-C
Operation without power	About 1 week on Wi-Fi, about 2 weeks on the mobile network (calculated estimate)
Management	Remote settings, health reports and signed over-the-air updates from the dashboard
Alarms	Lid opened, moved, knocked down, storage card removed, mains lost
Enclosure	About 13 × 9 × 5 cm, wall or post mount, external antenna

Figures are typical and rounded. Specifications may change without notice.

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