

Remote Asset Tracking

Use Case Overview

LoRa mesh networking provides a low-cost option for tracking assets in areas with no cellular coverage: vehicles, heavy equipment, livestock, shipping containers, or packages moving through rural or remote areas. Unlike cellular asset trackers that require a SIM and data plan for every asset, LoRa-based trackers report over your own mesh, avoiding per-asset SIM costs. Note that this does not eliminate recurring cost entirely: to deliver positions off the local mesh to a server you still need at least one gateway with internet backhaul, which may itself be a cellular/fixed connection with its own monthly cost. The savings come from not needing a SIM per tracked asset, not from eliminating connectivity costs altogether.

How It Works

1. The asset carries a LoRa node configured to broadcast GPS position packets at regular intervals
2. Any mesh node or gateway within range receives the position packet and propagates it through the mesh via multi-hop routing
3. A gateway node with internet access (WiFi or cellular backhaul) forwards the position via MQTT to a server
4. The server stores the position in a database and displays it on a web map or dashboard

Meshtastic MQTT + Cloud Visualization

Position packets forwarded via Meshtastic's MQTT gateway can be ingested by a variety of tools:

- **Grafana map panel:** InfluxDB stores the time-series position data; Grafana's Geomap panel displays asset trails and current positions
- **Custom Leaflet application:** a lightweight web app using the Leaflet.js mapping library can display live asset positions from a database backend

- **Home Assistant:** device tracker entities can be updated from MQTT position packets, integrating asset positions into your existing HA setup

MeshCore Asset Tracking

MeshCore advertisement packets can **optionally** include the sending node's GPS position - this is not unconditional. The advert location mode controls it: **share** broadcasts the live GPS location, **prefs** advertises a location stored in preferences, and **none** (the default) includes no position in adverts. So position is only present in adverts when the node is configured to share it. Where positions are being advertised, a repeater that hears an advert and logs the contact (node ID and time) can make it possible to reconstruct asset movement through a coverage area by analyzing which repeaters logged contact with a given node ID and when. This is useful for:

- Understanding which parts of a property or trail system an asset has visited
- Detecting when an asset enters or leaves a coverage zone
- Post-event reconstruction of movement without requiring a centralized database during the event

Update Interval Trade-off

Position update frequency involves a trade-off between tracking resolution, battery life, and mesh traffic:

- **Every 1 minute:** good resolution for fast-moving vehicles, but significantly higher battery drain and substantial added mesh traffic. On a shared LoRa channel, 1-minute position broadcasts are aggressive - they can quickly eat into practical airtime/duty-cycle budgets on a busy mesh and crowd out other nodes. Meshtastic deliberately defaults position/telemetry to much longer intervals (30 minutes). Reserve sub-minute or 1-minute rates for a very small number of nodes or short tests, not a fleet.
- **Every 10 - 30 minutes:** appropriate for most slow-moving assets (livestock, equipment); much better battery life, and roughly in line with Meshtastic's 30-minute default
- **Motion-triggered:** the most power-efficient approach - configure the node to transmit on movement detected via accelerometer, and go silent when the asset is stationary. Ideal for parked equipment or containers that move infrequently.

Hardware Options

- **RAK4631 + RAK1910 GPS module:** excellent for asset tracking - the RAK4631's nRF52840 has very low sleep current, and the modular WisBlock system allows GPS to be

powered down when not sampling. Best-in-class for long-term battery-powered deployments.

- **T-Echo:** integrated GPS and ePaper screen for field checking the last known position; good for assets that someone will physically inspect periodically (e.g., a piece of equipment on a large property)
- **T-Beam:** has built-in GPS and is popular for vehicle tracking; higher power consumption than the RAK solution but easier to integrate with vehicle 12V power

Coverage Considerations

Asset tracking over LoRa mesh requires mesh coverage in the asset's operating area. Without a mesh node or gateway within range, the asset simply does not report until it re-enters coverage:

- For wide-area tracking across a large property, plan repeater placement to improve coverage of the operating area
- A gateway with cellular backhaul at the edge of coverage can ensure position data reaches a server even if the local mesh is isolated
- Assets that travel outside the mesh coverage area will have gaps in their track. The mesh does **not** fill these gaps: positions a node broadcasts while it is out of range are lost entirely - there is no retroactive delivery once it returns. The server can only ever display the last position that was received while the asset was in range, so store the last known position and timestamp to show "last seen at X location at Y time."

Regulatory and Privacy Considerations

Transmitting GPS coordinates of people or assets has legal and ethical implications. The points below are general guidance, not legal advice - consult local law for your situation:

- **Consent:** ensure anyone being tracked (employees, family members) is aware of and consents to the tracking. Covert GPS tracking of people may be illegal depending on your jurisdiction - laws vary widely by state and country, so consult local law and obtain consent before tracking any individual.
- **Employees:** employer tracking of company vehicles during work hours is generally permissible in the US but varies by jurisdiction; consult applicable state employment law (this is general guidance, not legal advice)
- **Livestock and equipment:** tracking your own property is generally straightforward; tracking assets on shared or public land may have additional considerations
- **Channel access:** as with all mesh data, position packets are visible to anyone with access to the same channel. Use a private channel with a unique PSK for asset tracking deployments to prevent third parties from observing your assets' movements.

Revision #3

Created 2026-05-03 04:10:49 UTC by Mesh America Admin

Updated 2026-06-10 03:14:44 UTC by Mesh America Admin