Introduction to LoRa Mesh for IoT

LoRa mesh networks provide a compelling platform for IoT sensor deployments, especially where WiFi doesn't reach, cellular is too expensive, and wired connections are impractical.

When LoRa mesh is the right choice for IoT

Scenario	LoRa mesh advantage
Remote sensors (field, barn, remote cabin)	No cellular or WiFi needed; solar-powered nodes transmit data back to base
Large properties (farms, ranches, campuses)	Single gateway + relay nodes covers miles; WiFi would require many access points
Emergency/event temporary deployment	No infrastructure setup; nodes self-organize; deploy in minutes
Low-bandwidth telemetry (weather, soil, water)	LoRa's low data rate matches sensor data volumes perfectly
Deep sleep battery operation	Sensors sleep between readings; nRF52 nodes draw only microamps in deep sleep, so the radio's duty cycle dominates run time

LoRa mesh vs. standalone LoRaWAN for IoT

LoRaWAN (The Things Network, Helium) requires fixed gateways with internet uplinks. LoRa mesh (MeshCore, Meshtastic) self-organizes and works in areas with no internet or gateway infrastructure. Tradeoffs:

	LoRaWAN	LoRa Mesh (MeshCore)
Infrastructure required	Yes - gateway needed	No - self-organizing
Range extension	Gateway-only (no repeating)	Multi-hop relay through mesh
Data rate	Higher (ADR)	Lower (fixed preset)
Cloud integration	Built-in (TTN, Helium)	Manual (MQTT bridge)
Best for	Fixed sensor fields near gateways	Remote, no-infrastructure, or mobile IoT

Typical IoT payload sizes

LoRa mesh is suitable for low-bandwidth sensor data. Typical packet sizes:

- Temperature + humidity: ~10 - 20 bytes
- GPS position: ~20 - 30 bytes
- Multi-sensor (temp + humidity + pressure + battery): ~40 bytes
- Short text alert: ~50 - 100 bytes

Long Fast is the faster of the common presets (higher data rate, shorter airtime); Medium Slow and Long Slow are progressively slower (lower data rate, longer airtime) in exchange for more range and sensitivity. A 40-byte sensor reading transmits in a fraction of a second on Long Fast and takes longer on the slower, longer-range presets. Either way, IoT use cases are generally not limited by data rate.

Battery life for IoT sensor nodes

With the Heltec T096 (nRF52840, ~13 µA deep sleep on the bare board, around $30 as of 2026-06-08) and a 1000 mAh LiFePO4 cell:

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Bare-board deep-sleep current: ~13 µA
Wake + measure + transmit: ~25 mA for ~0.5 seconds every 15 minutes

Average current ≈ 13 µA + (25,000 µA × 0.5s / 900s) ≈ 27 µA average

Battery life (radio/MCU only) ≈ 1000 mAh / 0.027 mA ≈ ~37,000 hours ≈ ~4 years (theoretical)
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This is a best-case theoretical figure for the bare board: a real enclosed node adds sensor and quiescent draws, and LiFePO4 calendar aging plus self-discharge mean the cell will not actually deliver four full years of capacity. A small solar cell can keep the battery topped up across most of the year, but size for your worst-month sun and expect seasonal limits - "maintenance-free for 5+

years in any climate" is an over-promise. Never charge LiFePO4 below 0 °C (32 °F); use a charger/controller that blocks charging below freezing.

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