

LoRa vs LoRaWAN vs Meshtastic vs MeshCore

One of the most common sources of confusion when starting out is the alphabet soup of acronyms: LoRa, LoRaWAN, Meshtastic, MeshCore. People use them interchangeably, but they are four very different things operating at four different layers. This page explains each one clearly and shows you when each is the right choice.

The One-Line Summary of Each

- **LoRa** - a radio modulation technique (the physics of the signal)
- **LoRaWAN** - a centralized IoT network protocol built on top of LoRa
- **Meshtastic** - an open-source, peer-to-peer mesh protocol built on top of LoRa
- **MeshCore** - another open-source, peer-to-peer mesh protocol built on top of LoRa

LoRa is the foundation. Everything else is a different architecture built on top of that foundation.

Comparison Table

	LoRa	LoRaWAN	Meshtastic	MeshCore
What is it?	Radio modulation (physical layer only)	Network protocol + cloud infrastructure	Open-source mesh firmware + apps	Open-source mesh firmware + apps
Network topology	N/A - just the radio signal	Star-of-stars: end nodes → gateways → cloud server	True peer-to-peer mesh	True peer-to-peer mesh
Requires gateway?	N/A	Yes - a LoRaWAN gateway is mandatory	No	No
Requires internet?	N/A	Yes - gateway must reach a network server	No	No

	LoRa	LoRaWAN	Meshtastic	MeshCore
Who manages it?	Semtech (chip maker)	LoRa Alliance (standards body) + network operators	Open-source community	Open-source community (created by Scott Powell; clients by Liam Cottle)
Primary use case	Any LoRa-based application	IoT sensor reporting (meters, trackers, sensors)	Community mesh, off-grid text + GPS	Community mesh, off-grid text + GPS
Typical data payload	Anything LoRa can carry (up to ~250 bytes)	Small sensor readings (10 - 50 bytes)	Text messages, GPS, telemetry	Text messages, GPS, telemetry
Works off-grid?	N/A	No in practice - requires a gateway plus a network server (almost always internet-hosted)	Yes - fully off-grid	Yes - fully off-grid
Encryption	N/A - you implement it	AES-128 end-to-end (mandated by spec)	AES-256 channel encryption	Elliptic curve, per-message encryption
App ecosystem	None (raw hardware)	Industry dashboards (The Things Network, etc.)	Android, iOS, web client	Android, iOS, web client
Beginner-friendly?	Hardware only - requires firmware development	Moderate - requires gateway setup and TTN account	Yes - free flasher tool, polished apps	Yes - free flasher tool, active community

LoRa: The Physical Foundation

LoRa is implemented inside a Semtech radio chip (such as the SX1276 or SX1262). The chip generates and receives the chirp-spread-spectrum signal. By itself, a LoRa chip does nothing useful - it is like having a blank radio transmitter with no protocol to tell it what to say or how to talk with others. You always need a higher-level protocol on top of it.

LoRaWAN: Built for IoT, Not for People

LoRaWAN was designed to connect large numbers of low-power *sensors* to the internet. The architecture is deliberately star-shaped: sensors (called "end nodes") are not allowed to talk to each other directly. They can only talk upward to a gateway, and the gateway forwards data to a cloud-based "network server." LoRaWAN is excellent for reading water meters, tracking shipping

containers, or monitoring soil moisture across a farm - all cases where data flows in one direction toward a central server.

LoRaWAN is *not* designed for:

- Direct person-to-person messaging
- Off-grid use (without a powered gateway with internet access)
- Community resilience networks (a device loses connectivity when no reachable gateway or the network server is down - the network is only as resilient as its infrastructure)

Meshtastic: Open-Source Mesh for the People

Meshtastic is a free, open-source project that turns cheap LoRa hardware into a fully off-grid text and GPS mesh network. Developed since 2020 and now maintained by a large open-source community, it is the most widely deployed LoRa mesh platform in the world. Key characteristics:

- Nodes communicate directly with each other using a flooding-based mesh routing algorithm called **Managed Flood**.
- Users control the network via polished Android and iOS apps connected to the node over Bluetooth or Wi-Fi.
- There are no gateways required. Any node automatically acts as a relay for other nodes.
- Large community, extensive documentation, active development.
- Best choice if you want to join the largest existing mesh community or buy from the widest hardware selection.

MeshCore: A Newer Alternative with Different Trade-offs

MeshCore is a newer open-source mesh platform with a slightly different design philosophy. Rather than simple message flooding, MeshCore uses a more structured routing approach that can reduce channel congestion on larger, busier networks. Key characteristics:

- Roles are explicit: nodes are configured as *clients*, *repeaters*, or *room servers* (group chat hubs). This clarity reduces unnecessary retransmissions.
- Strong encryption using elliptic-curve cryptography.
- Also has Android, iOS, and web clients.

- Growing community, particularly in areas building more deliberately structured networks.
- Good choice if you want more control over how traffic is routed or if you are building infrastructure (repeaters, room servers) rather than just carrying a node.

Which One Should You Use?

- **You want to buy sensors and report data to the cloud:** Use LoRaWAN with The Things Network.
- **You want to join the biggest community mesh and get started as fast as possible:** Use Meshtastic.
- **You want a more structured network with explicit roles and you do not mind a slightly steeper learning curve:** Use MeshCore.
- **You want to build your own custom firmware from scratch:** Use raw LoRa hardware and write your own protocol on top of it.

For most beginners, Meshtastic is the right first step. MeshCore is an excellent second platform to explore once you have a feel for how mesh networking works in practice. Both are covered in detail throughout this wiki.

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