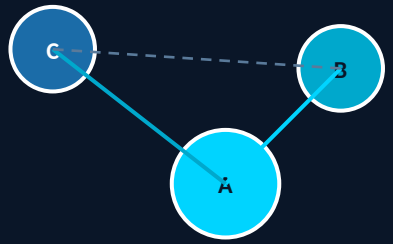
MESHTASTIC & MESHCORE

Off-Grid • Encrypted • Decentralized Communication



~10 Minute Overview

THE PROBLEM

Remote Adventure

Backcountry hiking, mountain climbing, no cell service

Disaster Response

Power outages, cell towers down, emergency comms needed

Off-Grid Community

Festivals, events, farms, remote worksites

LORA: THE FOUNDATION

Long Range
5 to 15+ miles line-of-sight

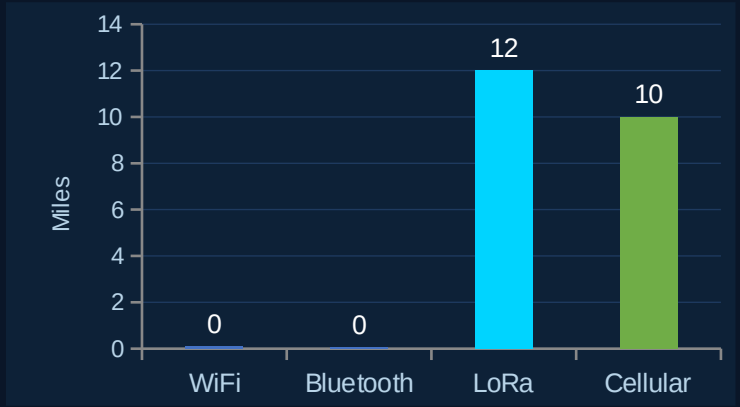
Low Power
Days/weeks on a battery

No License
915 MHz (US) · 868 MHz (EU) · 433 MHz (Asia)

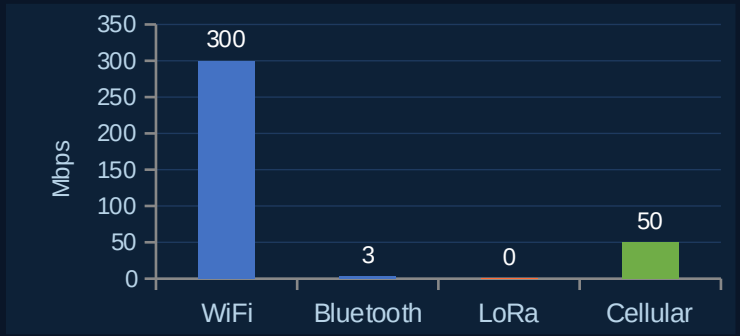
Slow Data
~1 to 5 kbps, text & telemetry only

Not LoRaWAN
Meshtastic/MeshCore use raw LoRa (decentralized)

Max Range (miles, line-of-sight)



Data Rate (Mbps, higher is faster)



LoRa trades speed for range & low power, perfect for text messaging

WHAT IS MESHTASTIC?

Open-source firmware (est. 2020) providing encrypted, off-grid text messaging and GPS sharing over LoRa mesh networks.

- AES-256 encrypted channels
- GPS position sharing & mapping
- Multiple named channels (public + private)
- Telemetry: battery, environment sensors
- Python API and MQTT gateway support
- Controlled via Bluetooth (iOS/Android app)
- Huge community, very beginner friendly

5 to 15+
miles range

AES-256
encryption

$25 to $60
per node

100%
open source

App: meshtastic.org
flasher.meshtastic.org to flash firmware

Protocol: Flooding Mesh (every node rebroadcasts)

WHAT IS MESHCORE?

A newer, alternative LoRa mesh firmware focused on scalability and intelligent routing, the power-user alternative to Meshtastic.

MESHTASTIC

- Flooding protocol, every node rebroadcasts
- Simple, proven, widely adopted
- Consumer friendly mobile app
- Great for small to medium networks
- Massive community & hardware support
- Established since 2020

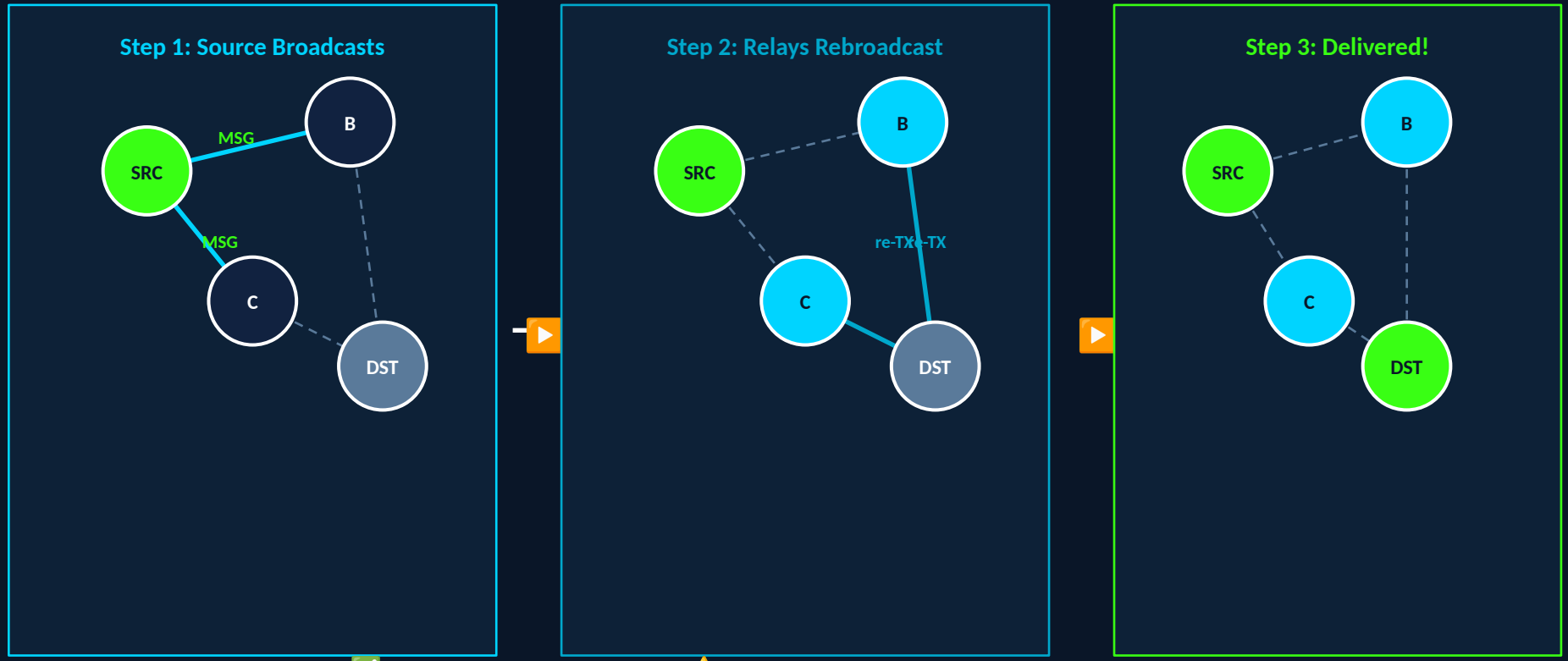
MESHCORE

- Routing protocol, intelligent path selection
- More efficient at scale, less congestion
- BBS-style boards, private messaging
- Better performance on large networks
- Power user oriented CLI + app
- Newer, smaller but growing community

⚠️ **Both use the same hardware, but protocols are NOT cross-compatible**

HOW IT WORKS, FLOODING MESH (MESHTASTIC)

Every node that receives a message rebroadcasts it until it reaches the destination (or hits the hop limit)



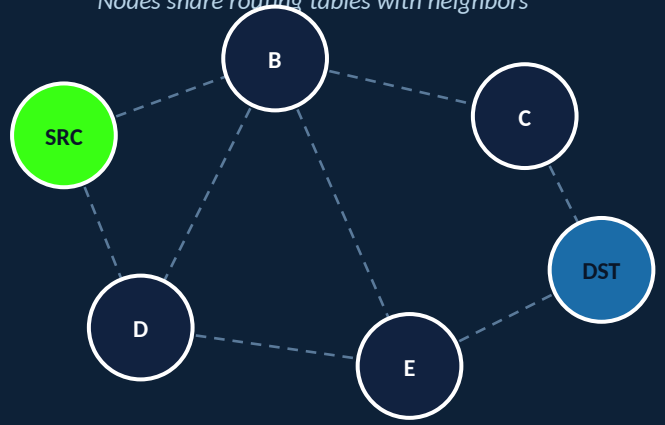
✅ Simple, robust, self-healing ⚠️ More radio traffic, less efficient on large networks

HOW IT WORKS, ROUTING MESH (MESHCORE)

Nodes exchange topology info and route packets along an optimized path, fewer transmissions, better scalability

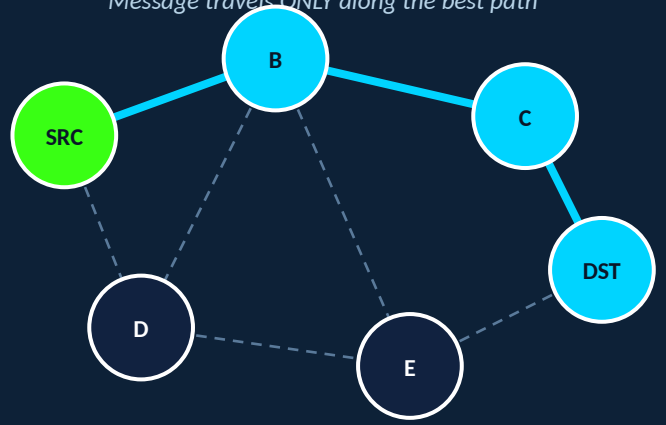
Phase 1: Topology Discovery

Nodes share routing tables with neighbors



Phase 2: Optimized Routing

Message travels ONLY along the best path



Route: SRC → B → C → DST

✅ Fewer transmissions = Less congestion ✅ Scales to larger networks ⚠️ More setup complexity

HARDWARE OPTIONS

Heltec LoRa32

$25 to $35

Built-in OLED display. Great for beginners. Compact.

Meshtastic ✓ MeshCore ✓

LilyGo T-Beam

$35 to $45

GPS onboard. Screen optional. Great for tracking.

Meshtastic ✓ MeshCore ✓

RAK WisBlock

$30 to $50

Modular system. Ultra low power. Best for solar nodes.

Meshtastic ✓ MeshCore ✓

SenseCAP T1000

$50 to $65

Credit-card sized. Rugged & weatherproof. Great portable.

Meshtastic ✓

All run on ESP32 or nRF52 microcontrollers • Flash firmware via USB or web browser at flasher.meshtastic.org

DEPLOYMENT OPTIONS

Personal / Hiking

Phone + 1 handheld node
One-person off-grid comms
Bluetooth to phone

Group / Team

Each person carries a node
Mesh grows with the group
No infrastructure needed

Community Network

Solar repeaters on rooftops
Highpoint nodes extend range
Covers county-sized area

MQTT Bridge

WiFi-connected node
Bridges mesh to internet
Hybrid online/offline coverage

Emergency Comms

Pre-cached node deployments
Rapid activation after disaster
No infrastructure dependency

Solar + battery = fully autonomous nodes for months • With a few hilltop repeaters, cover an entire county

LIMITATIONS & CONSIDERATIONS

Low Bandwidth

Text and telemetry only, no voice, no images, no file transfer. Think SMS, not email.

Latency

Messages can take seconds to tens of seconds depending on number of hops.

Line-of-Sight Dependent

Terrain, buildings, and trees significantly reduce range. Hilltop placement is key.

Regulatory Limits

Stay within legal transmit power limits for your region. Check local ISM band rules.

MeshCore Maturity

Newer firmware with smaller community and hardware support matrix than Meshtastic.

Battery Trade-offs

With GPS and screen enabled, battery life is hours, not days. Tune your config.

These are manageable trade-offs for the use cases these tools are designed for

WHY IT MATTERS

Resilient, decentralized communication, free forever

Disaster Resilient

Wildfires, hurricanes, grid failures, these networks work when everything else fails

Decentralized

No company can shut it down, no service provider can charge you, it's owned by its users

Open & Hackable

Active open-source communities, easy to get started, great entry to RF and embedded systems

📚 Resources

meshtastic.org • **meshcore.net / GitHub** • **r/meshtastic** • YouTube: Andreas Spiess (LoRa deep dives)