Why LoRa Mesh for Emergency Comms

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> **Mesh is a supplement, not a lifeline.** LoRa mesh (Meshtastic and MeshCore) is best-effort: messages may not get through, the shared half-duplex channel can saturate under load, and coverage depends on powered relay nodes being in range. It is NOT a replacement for 911, NWS alerts, or licensed amateur/voice nets. For any life-threatening emergency, use 911/voice first; use mesh as a fallback when those are unavailable.

LoRa mesh networks provide a low-power, infrastructure-light, best-effort (no guaranteed delivery) text and data communications platform that complements — never replaces — existing emergency communications systems.

Key Advantages in Emergencies

- **No external infrastructure required at the radio layer:** Nodes talk directly without cell towers, internet, or grid power — though useful neighborhood coverage normally relies on pre-placed elevated repeaters, and each node still needs its own power.
- **No amateur license required:** 915 MHz ISM band operation is legal for anyone in the US using FCC-certified Part 15 equipment, subject to the 1 W (30 dBm) conducted power limit and the EIRP cap — no amateur radio license needed. This enables rapid community-wide deployment.
- **Long range:** LoRa achieves multi-kilometer range at low power — far beyond Bluetooth or Wi-Fi — though range depends heavily on line of sight and antenna height (a transmitting node is typically powered by an 18650 or LiPo cell, not a coin cell).
- **Text and data:** Provides messaging when voice radio is saturated, inaudible, or unavailable

- **Mesh redundancy:** Messages can route around failed nodes when an alternate path exists (subject to the hop limit — default 3, max 7 on Meshtastic — and node density). This is self-healing, not guaranteed multipath.
- **Low cost:** Nodes are $20 - $60 each, enabling community-wide deployment at minimal cost

Use Cases

- **Neighborhood coordination** during extended power outages
- **Family/group location tracking** over long distances without cell service
- **Relay messaging** across disaster zones where infrastructure is down, where surviving relay nodes or pre-placed repeaters bridge the gap (without surviving relays in range, the mesh does not span the zone)
- **Sensor monitoring** - water levels, temperature, structural sensors with LoRa mesh backhaul

What LoRa Mesh Is Not

LoRa mesh is a complement to, not a replacement for, traditional emergency communications:

- **Not guaranteed delivery:** Mesh is best-effort. Messages can be delayed or lost with no acknowledgment in basic operation; never rely on it for life-safety traffic that must be confirmed received.
- **No voice:** Text/data only - voice communications still require traditional radio
- **Limited bandwidth:** Not suitable for transferring large files or images in real time
- **Range limits:** Urban environments with buildings and terrain obstacles reduce range substantially vs. hilltop-to-hilltop links

Integration with ARES/RACES

Amateur Radio Emergency Service (ARES) and Radio Amateur Civil Emergency Service (RACES) are established frameworks for emergency communications. LoRa mesh can operate alongside these systems - handling neighborhood-level text coordination while licensed amateur radio handles regional and state-level coordination. See *Mesh and Amateur Radio (ARES/RACES)* for integration guidance.

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