Emergency Preparedness

- Why LoRa Mesh for Emergency Comms
- Building a Go-Bag Node Kit
- Pre-Deployment Checklist

Why LoRa Mesh for Emergency Comms

Why LoRa Mesh for Emergency Communications

> **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.

Building a Go-Bag Node Kit

Building a Go-Bag Node Kit

A go-bag node kit is a self-contained, portable LoRa mesh capability you can deploy quickly in an emergency without depending on fixed infrastructure. The goal is a kit you can grab and go, with everything needed to establish mesh communications from any location.

> **Mesh is a supplement, not a lifeline.** LoRa mesh is best-effort: messages are not guaranteed to be delivered and there is no reliable end-to-end acknowledgment under load or marginal RF. Do not rely on a go-bag mesh node as your only life-safety communications path - keep a confirmed-receipt backup (voice radio, cell, satellite messenger) and treat mesh as supplemental.

Core Components

Component	Recommended Option	Notes
LoRa Node	Heltec V3 or T-Deck Plus	T-Deck Plus has a built-in keyboard and screen for standalone operation without a phone; Heltec V3 requires companion app on phone
External Antenna	Fiberglass omni, 3 - 5 dBi	Significant range improvement over stock PCB antenna; choose one with SMA connector matching your node. A 3-5 dBi antenna stays within the 6 dBi allowance of FCC Part 15.247, so no conducted-power reduction is required at 1 W.
Power Bank	10,000+ mAh	A 10,000 mAh bank can run a Heltec V3 for a day or more depending on duty cycle and screen use; larger capacity is preferred for extended deployments. Note that some power banks auto-shut-off at the low current a node draws - test yours and use one with a low-power/trickle mode if available.

Component	Recommended Option	Notes
Antenna Jumper / Adapter	Match your node's connector	Identify your node's antenna connector before buying: many boards (including Heltec V3 and T-Deck Plus) already present an SMA jack and need no jumper, while WisBlock and bare LoRa modules use a U.FL/IPEX port and need a U.FL-to-SMA pigtail (15-30 cm) to reach an external SMA antenna.
USB-C Cable (spare)	Short, braided	For charging/data; carry at least one spare

Optional Additions

- **Magnetic antenna mount:** For vehicle deployment - place antenna on roof for dramatic range improvement
- **Waterproof case:** Pelican 1150 or similar; protect electronics in wet conditions
- **Small tripod or mast:** Elevate antenna 2 - 3 meters above ground when vehicle deployment isn't available
- **Solar panel:** 10 - 20W panel + small charge controller for extended field deployment when sun is available. Solar is not guaranteed power - smoke, overcast, snow, and short winter days can zero out a small panel for days, so size the battery for the worst expected no-sun period.
- **Printed QR code:** Link to your local network's channel settings for quick onboarding of others

Kit Preparation

Configure the device before an emergency. A go-bag kit with unconfigured or default-password hardware is useless under stress. Before packing the kit:

1. Flash and configure the node with the correct channel/preset for your local network. This is the step that determines whether the kit works at all: every node you want to talk to must use the *identical* regional preset, frequency, and channel. See the Meshtastic app guide for flashing firmware and selecting the preset and channel, then confirm with a live test (below) before packing.
2. If your node runs room-server / repeater firmware (an advanced feature most personal go-bag users will not use), change its default admin and guest passwords. If you're only using a personal node with the phone app, you can skip this step.
3. Test connectivity with known nodes in your area
4. Label the device with your callsign or contact info
5. Export and store a config backup

Pre-Deployment Checklist

Pre-Deployment Checklist

The single most important rule for emergency mesh communications: **configure and test your equipment before you need it.** A device configured under stress, in the dark, during an emergency will have errors. Do this work now.

Hardware Preparation

- ☐ Flash current firmware from flasher.meshcore.io (MeshCore) or the Meshtastic flasher
- ☐ Set node name to something identifiable (your callsign or neighborhood)
- ☐ Set GPS coordinates (lat/lon)
- ☐ Change all default passwords on room-server firmware before deployment. Some MeshCore room-server/repeater builds ship with well-known defaults (commonly admin: "password", guest: "hello"), but these are firmware-specific — consult your firmware's documentation for its actual default credentials rather than assuming a specific pair. **CHANGE THESE before any deployment:** anyone within RF range who knows the defaults can otherwise take over the node.
- ☐ Apply the correct regional radio preset (a US/Canada preset for most North American MeshCore networks). The preset name and parameters are firmware-version dependent — match the current MeshCore preset for your region and confirm it stays within the legal 902–928 MHz band plan.
- ☐ Attach and secure external antenna
- ☐ Verify the node appears on a network map (map.meshcore.dev or meshmap.net)

Connectivity Testing

- ☐ Confirm channel/preset matches your local network
- ☐ Test two-way communication with at least one other known node
- ☐ Test from multiple locations (indoors, outdoors, vehicle)
- ☐ Confirm room server (if deployed) accepts messages from client nodes
- ☐ Verify MQTT gateway (if present) is publishing to broker

Infrastructure

- ☐ Consider a permanent rooftop or elevated repeater for neighborhood coverage - install before an emergency while conditions are normal
- ☐ Ensure permanent repeaters have reliable power (ideally with UPS or battery backup)
- ☐ Document all node locations, hardware, and configurations in a shared document accessible to your emergency team

Team Preparation

- ☐ Train all team members on the companion app before deployment
- ☐ Establish and communicate channel names and passwords to all participants in advance
- ☐ Assign a "mesh coordinator" role responsible for network status during an event
- ☐ Export config backup and store separately from the device

Realistic Range Expectations

These are best-case, line-of-sight estimates, not guarantees. Handheld and indoor use will be much shorter. Always confirm your real range by testing before you rely on it.

Scenario	Typical Range
Urban direct (street level)	~1 - 3 km typical; up to ~5 km in favorable line-of-sight conditions
Suburban rooftop-to-rooftop	5 - 15 km with clear line of sight / rooftop elevation
Rural / hilltop-to-hilltop	20 - 50+ km (50+ km requires elevated, clear-LOS endpoints with near-ideal Fresnel-zone clearance)
With mesh hops through repeaters	Extends coverage, but each hop adds latency and consumes shared airtime, and Meshtastic caps routing at 7 hops — it is not unlimited.