

Integration with Official Systems

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Working with ARES, CERT, and Emergency Management

The most effective community mesh deployments are integrated with existing emergency communication structures - Amateur Radio Emergency Service (ARES), Community Emergency Response Teams (CERT), and local emergency management agencies. This page covers how to make those integrations work.

Understanding the existing structure

ARES (Amateur Radio Emergency Service)

ARES is the ARRL's organized volunteer program connecting licensed amateur radio operators with emergency communication needs. ARES groups typically operate at the county or served-agency level. Key contacts: ARRL Section Manager, Emergency Coordinator (EC), and Net Manager.

Mesh relationship: Many ARES operators are interested in LoRa mesh as a complementary technology. It fills gaps that VHF/UHF radio cannot (group text, GPS tracking, message logging). One foundational distinction to keep clear with partners: the LoRa mesh layer here operates on the 915 MHz ISM band under FCC Part 15 (no license required), while ARES/RACES voice operates under Part 97 (amateur license required). Keep encrypted mesh traffic off amateur frequencies - 47 CFR §97.113(a)(4) prohibits messages encoded to obscure their meaning on amateur bands. A strong relationship with local ARES puts your mesh infrastructure in front of the people who already train for emergency communication.

CERT (Community Emergency Response Team)

CERT programs train community members in basic disaster response skills (first aid, light search and rescue, fire safety) and organize them as neighborhood response assets. CERT teams operate at the neighborhood or block level - exactly the scale where mesh radio is most useful.

Mesh relationship: A mesh network that equips each CERT team leader gives them a supplemental text and position capability, including during the early phase of disaster response before professional responders arrive. Be clear about what it is: mesh is unlicensed and best-effort, it is not guaranteed to deliver, and it must not be the sole means of summoning help. CERT teams should retain whatever primary communications (cell, FRS/GMRS, runner, amateur radio) their authority having jurisdiction (AHJ) specifies. Within those limits, CERT and mesh are a natural operational fit.

Local Emergency Management (OEM/LEPC)

Local emergency management agencies coordinate preparedness and response at the city and county level. They maintain Emergency Operations Centers (EOCs) that become the coordination hub during disasters.

Mesh relationship: EOC integration is a longer-term goal. Most EOCs start by observing mesh capabilities in exercises before formally adopting the technology. A well-demonstrated mesh network with clear procedures becomes a credible EOC resource.

First steps for integration

1. **Contact your local ARES Emergency Coordinator.** Introduce the mesh network, demonstrate its capabilities, and offer to participate in ARES-sponsored exercises with mesh alongside traditional radio.
2. **Attend CERT training.** CERT graduation puts you in direct contact with team leaders and the sponsoring fire department or emergency management agency. Offer to demo mesh at the graduation exercise.
3. **Contact local emergency management.** Most counties have a website listing the Emergency Manager or OEM director. A brief email introducing your mesh community and offering to participate in preparedness planning events opens the door.

Formalize with an agreement. Before deploying nodes into official operations or onto agency property, execute a written MOU that addresses limitation of liability, insurance/indemnification, equipment ownership, and non-reliance - including an explicit statement that mesh is supplemental and non-guaranteed. As a 501(c)(3), documenting these

Exercise integration

The most effective way to demonstrate mesh value is through exercises where it can be directly compared with existing methods. Propose a tabletop or functional exercise where:

- Mesh nodes are distributed among CERT teams
- Teams use mesh for status reporting during a simulated disaster scenario
- Net control demonstrates the GPS position board (where is every team right now?)
- Compare time-to-update for mesh vs. voice radio vs. runner

Emergency managers respond to demonstrated capability, not technical descriptions. One well-run exercise does more than months of email correspondence.

ICS compatibility

Emergency response in the US uses the Incident Command System (ICS). Mesh deployments serving ICS operations should align with ICS terminology and procedures:

- **Net Control maps to the Communications Unit Leader (COML) role within the Logistics Section (Service Branch)** per FEMA NIMS 509; the Communications Unit sits under Logistics, not Planning.
- **Channel naming:** Use ICS-aligned channel naming if possible (e.g., "IC-TAC1", "LOGISTICS-1") rather than geographic names
- **Message format:** ICS 213 General Message Form format for formal communications (from, to, message, date/time, signature)
- **Check-in/check-out:** Track mesh node operators on an ICS 214 Activity Log

What not to do

- Don't present mesh as a replacement for ham radio, CERT radios, or existing systems. It's a complement, not a replacement.
- Don't overstate capabilities. Know the coverage gaps in your mesh and be honest about them with partners.
- Don't deploy in a real emergency before deploying in exercises. The first time field operators use any communication system should not be during an actual emergency.
- Don't let the technology drive the relationship. Build the relationship with emergency management first; the technology adoption follows from trust.

Go-Bag and Field Kit Setup

A mesh communications go-bag is a pre-configured kit that can be grabbed and deployed within minutes. For emergency communicators, this preparation is as important as the hardware itself.

Individual go-bag (personal responder)

Minimum kit for a personal mesh communicator:

Item	Purpose	Notes
T-Echo or T1000-E	Personal mesh node	Pre-configured with correct channel & preset; fully charged
USB charging cable (device-specific)	Field recharge	Tape/label with device name; easy to grab wrong cable
10,000 mAh power bank	Extended operation without grid	Can provide several additional days to over a week of T-Echo runtime depending on usage and power settings (GPS, TX rate, and screen use draw significantly more). This is an estimate, not a bench-tested figure.
Printed config card	Quick reference	Channel name, PSK, preset, net control contact
Spare SMA antenna	Backup if stock antenna damaged	915 MHz, 2 - 3 dBi, same connector type as device. Verify SMA vs RP-SMA polarity (commonly mismatched) and check u.FL on some boards; see the Meshtastic antenna docs (meshtastic.org/docs/hardware/antennas/).

Net control go-bag

Expanded kit for net control operators or team leaders:

Item	Purpose
T-Deck Plus (running MeshOS)	Primary net control station; standalone, no phone needed; QWERTY keyboard; map view. Note: MeshOS is MeshCore firmware (not Meshtastic), so this station serves a MeshCore network.
OR: Raspberry Pi Zero 2W + RAK4631 USB	Room server + radio gateway; provides message persistence and network visibility
5W foldable solar panel + MPPT charge controller	Recharge power bank and devices from any outdoor location
~240 Wh lithium-ion portable power station (e.g., Jackery Explorer 240), or a separate LiFePO4 bank/station	Powers Pi room server for several hours; recharges via solar. Note: the Jackery Explorer 240 is a ~240 Wh lithium-ion (NMC) power station - not a 12,000 mAh LiFePO4 power bank; do not conflate chemistries, and use watt-hours (Wh) for power stations.
Laptop (optional)	Python API access, MQTT monitoring, additional visibility
Printed participant roster	All mesh participants, device names, and contact info
Printed frequency/channel card	Config for all channels in use; can hand to new arrivals

Portable repeater kit

A portable repeater that can be deployed at any elevated location within 30 minutes:

Item	Notes
RAK4631 WisBlock (configured as repeater) in IP65 case	Pre-flashed with repeater firmware; USA/Canada preset; flood advertisements
5 - 10W foldable solar panel with cigarette lighter connector	Mount using clamps or hook-and-loop straps
LiFePO4 18650 cells (4x, in battery holder)	~3 day autonomy at 6 mA; LiFePO4 chosen for temperature range. Specify whether the 4 cells are wired in series (~12.8 V nominal) or parallel (~3.2 V) and confirm the resulting pack voltage matches the target node's input voltage range. Never charge any lithium cell, including LiFePO4, below 0 °C (32 °F) - discharge is fine to roughly -20 °C, but charging below freezing damages the cells (a BMS blocks cold charging, it does not enable it).
5 dBi fiberglass antenna with 30cm LMR-200 pigtail	Generally better range than a stock rubber-duck (gain and LMR-200 loss vary; check the antenna datasheet). Note: under FCC Part 15 (47 CFR §15.247(b)(4)), antenna gain above 6 dBi requires a dB-for-dB reduction in conducted power; this 5 dBi antenna is under that threshold, but do not swap in a higher-gain antenna without reducing conducted power.

Item	Notes
Pole mount clamp (adjustable)	Mounts to chain-link fence, sign post, vehicle roof rack, or trekking pole
All contained in a clear 12" × 8" zip-lock bag	Waterproof; visible inventory check without opening

A note on runtime figures: Device endurance numbers across the emergency-communications pages are estimates that depend heavily on whether the device is idle vs. active, screen on/off, GPS on/off, and TX rate. Treat any runtime figure not bench-tested as an estimate to verify with your own hardware and settings; compute conservatively from average current draw and pack watt-hours rather than relying on a single optimistic number.

Battery storage between deployments

For longevity, store lithium nodes and power banks at roughly 40-60% state of charge rather than full - sitting at 100% accelerates calendar aging of the cells. Note that a LiFePO4 pack at 12.8 V is at roughly mid-charge; a full 4S LiFePO4 pack rests at about 13.4-13.6 V, so "100% = 12.8 V" is incorrect. Top everything up to full only when you arm the kit before a forecast event or activation (see the pre-event checklist below).

Pre-event deployment checklist

Run this checklist before any exercise or real deployment. (For long-term storage, keep batteries at ~40-60% - see the battery storage note above - and top up to full only at this pre-deployment step, not continuously.)

- ☐ Top up all devices to full before deployment
- ☐ Top up power banks to full before deployment
- ☐ Solar panel functional (brief outdoor test)
- ☐ All devices verified on correct channel and preset
- ☐ Device names are current (verify in app)
- ☐ Printed config cards included and current
- ☐ Contact list current (who has which device)
- ☐ Portable repeater tested (connect, verify advertisement)
- ☐ Go-bag weight and bulk acceptable for intended deployment