

Camps and Group Activities

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Summer Camp and Youth Group Communications

Summer camps, scouting organizations, and youth outdoor programs have unique communications challenges: large areas, limited infrastructure, young participants who may wander, and adults who need to coordinate across multiple program areas simultaneously.

Mesh is a coordination aid, not a safety system. LoRa mesh delivery is best-effort - messages and position broadcasts are not guaranteed to arrive, and coverage depends on powered relay nodes being in range. In a youth program, every mesh-based safety step below must be paired with a primary method (voice radio, cell/landline, whistle/air horn, physical headcount) and must follow the camp's established emergency protocol. Never let mesh be the sole channel for a child-safety, medical, or severe-weather emergency.

Why Mesh Works Well for Camps

- **No cell service:** Many camps are intentionally located away from cell coverage - that's the point. LoRa mesh works without cell service.
- **Large area coverage:** The number of nodes a camp needs depends heavily on terrain and vegetation. A forested or hilly 500-acre camp can drop LoRa range to a few hundred metres and may need more nodes or repeaters than an open one. Do a site survey rather than assuming a fixed node count.
- **Staff coordination:** Cabin counselors, activity directors, health center staff, and the camp director all need to communicate. Mesh messaging supplements (it does not replace) walkie-talkies, runners, and other established channels.
- **Emergency management:** A lost camper scenario can be coordinated over mesh with position tracking if the search party has mobile nodes - but mesh is a coordination aid only. Lost-camper response must follow the camp's established emergency protocol and not depend solely on mesh delivery, which is best-effort.

Typical Camp Mesh Deployment

Node Location	Type	Purpose
Camp director's office	Base station + store-and-forward server	Central coordination; message history

Node Location	Type	Purpose
Health center/nurse	Fixed node	Medical coordination (supplemental only - see safety note); always-on
Dining hall	Fixed node (roof mounted)	Central repeater; best elevation on most camps
Waterfront/dock	Fixed node + weather station	Safety coordination; wind/weather data
Each cabin cluster	Fixed node	Staff check-in; coverage fill
Hiking/trail staff	Mobile nodes (T-Echo or T-Beam)	Wilderness activity coordination

Note: the health-center node is a convenience for routine coordination only. Medical emergencies must use the camp's primary emergency communications system; mesh is supplementary and best-effort.

Hardware Recommendations for Camp Use

- **Staff mobile nodes:** The LILYGO T-Echo (internal rechargeable ~850 mAh Li-Po, USB-C charged - no removable AAA cells; E-ink display) is a good option for counselors. Charge it overnight via USB; in low-duty use it can last more than a day between charges.
- **Fixed camp nodes:** T-Beam or RAK4631 with PoE power (if Ethernet is available) or small solar panel. Mounted under roof eaves on buildings.
- **Store-and-forward / message-history node:** A RAK4631 or Heltec V3 running Meshtastic in the director's office, powered by reliable AC power with UPS backup. Keep the whole deployment on one ecosystem - Meshtastic and MeshCore are separate, non-interoperable protocols, so a MeshCore Room Server will not communicate with Meshtastic nodes. If you choose MeshCore, run MeshCore on every node instead.

Safety Protocol Integration

Work with camp administration to integrate mesh into safety protocols. In every case below, mesh supplements - it does not replace - the camp's primary emergency communications, and delivery is best-effort:

- **Check-in system:** Activity groups check in via mesh message every 30 minutes during off-site activities, with a voice-radio or phone check-in as the primary method. Define a fallback for missed check-ins: a missing check-in does NOT confirm safety and does NOT by itself confirm an emergency - it may simply be an out-of-range node. Escalate a missed

check-in via radio/phone and a physical check.

- **Lost camper protocol:** All staff nodes receive a broadcast with a last-known-location waypoint; search parties acknowledge via DM. Note that a young camper is almost certainly not carrying a node (so there is no auto-locate), and both the broadcast and the DM acknowledgments are best-effort and can be dropped in a wooded camp - confirm critical acknowledgments verbally. This runs alongside, never instead of, the camp's established lost-camper procedure.
- **Medical emergency:** A dedicated "Medical" channel with health staff and director can help coordinate, but mesh medical messaging supplements, does not replace, the camp's primary emergency communications. Serious incidents must be reported through that primary system.
- **Weather alert:** Waterfront staff broadcasts a severe-weather warning to all nodes to help trigger the activity-shutdown protocol. Because broadcast delivery is not guaranteed, pair the mesh alert with a secondary alerting method (siren/air horn) and confirm receipt where possible.

Cycling, Gravel, and Ultra-Endurance Events

Long-distance cycling events - gran fondos, gravel races, bikepacking routes, and ultra-endurance events - span dozens to hundreds of miles, making traditional radio-based support communications challenging. LoRa mesh can supplement support communications for both safety monitoring and participant experience.

“ **Mesh is a coordination tool, not a rescue system.** It is best-effort - messages may not get through, and positions can be stale or missing. It is NOT a substitute for a cellular call, licensed event radio, a PLB/satellite messenger, or 911. Search and rescue does NOT monitor Meshtastic. On a long course a downed rider can easily be out of range of any node. Carry dedicated safety gear and run a primary comms plan; use mesh only as a supplement.

Use Cases in Cycling Events

- **SAG wagon coordination:** Support vehicles tracking rider positions and routing efficiently to riders in need
- **Medical team dispatch:** Crash or medical event location sharing to nearest first aid support. *Mesh medical alerting depends on having a deployed, staffed relay network covering the whole course; it is best-effort and unmonitored, so it must be backed by a primary comms plan (cellular, licensed event radio, or formal dispatch) and never relied on alone. A downed rider may be out of range of every node.*
- **Course condition updates:** Road hazards, weather changes, re-routes broadcast to all participants
- **Family tracking:** Participants' families can monitor position via community mesh map (if riders carry nodes)
- **Time station check-ins:** Automated check-in when rider passes a time station node

Participant Node Options

For riders, the node needs to be light, compact, and battery-efficient:

- **LILYGO T-Echo (~120-130 g cased):** Clips to a jersey pocket or handlebar bag. Has an internal ~850 mAh Li-ion cell charged over USB-C (no AAA cells - the battery is built in and not user-removable). Expect roughly a day of active-GPS runtime - more at low duty, much less in cold. The e-ink display shows basic status without backlight power drain.
- **RAK4631 in minimalist case:** ~20g if stripped of display. Mount to handlebar stem with Gorilla tape or 3D-printed bracket.
- **Phone-paired node:** Node in saddlebag, phone on handlebar for map viewing. Useful if participants want messaging capability.

Cold-weather charging: Never charge a lithium cell (the T-Echo's internal Li-ion or any LiPo/LiFePO4 pack) below 0 °C (32 °F) - cold charging causes lithium plating, permanent damage, and a latent short/fire risk. Discharging in the cold is fine. Keep any battery you intend to recharge warm (near body temperature), and bring a cold device into a warm layer before plugging it in.

Event Infrastructure Layout

For a 100-mile gravel event:

- **Start/finish area:** Room server + base station (permanent GPS-located on map)
- **Aid stations (every 20-30 miles):** Fixed node at each station; powered by generator or car battery. Serves as relay and check-in point.
- **Roving support vehicles (3-5):** Mobile nodes in SAG vehicles. Track positions relative to riders on course.
- **Course marshals at critical junctions:** Mobile nodes; can relay course condition reports.

This layout helps, but do not treat node spacing as a coverage guarantee. Single-hop, ground-to-ground LoRa range is typically only a few kilometres - far less than the 20-30 mile aid-station spacing - so a rider at ground level will frequently be out of range of any fixed node between stations. In open line-of-sight terrain the spacing plus SAG vehicles may keep most participants within a few hops; in forested, rolling, or hilly terrain, coverage gaps are likely and additional relays are needed. Do not rely on this layout for safety-critical coverage.

Privacy and Opt-In Considerations

Not all participants want to be tracked. Best practices:

- Clearly disclose tracking capability in pre-event registration materials
- Offer opt-out: participants can turn off position broadcasting while keeping messaging
- Limit position data retention: purge from map and database after event ends
- Position data for safety use only: don't share with sponsors or use for marketing