Outdoor Use Case Guides

Detailed guides for mesh networking in specific outdoor activities and sports.

- Hiking and Backpacking with Mesh
- Skiing, Mountain Biking, and Motorsports

Hiking and Backpacking with Mesh

Why Mesh for Hiking?

Wilderness hiking and backpacking take groups far beyond reliable cellular coverage. Mesh networking with LoRa-based devices solves this by providing two-way text communications and position tracking without satellite subscription fees. Key benefits include:

- Two-way text messaging across the group with no ongoing subscription cost
- Automatic position sharing so all members can see each other on a map
- Works entirely offline - no cell towers, no internet required
- Multi-hop routing means one device out of direct range can still reach the group via intermediate nodes

Recommended Hardware

For multi-day trips, prioritize small form factor and long battery life. Avoid power-hungry ESP32-based boards.

- **Heltec T114** (nRF52840, 28 dBm output) - compact, runs weeks on a small battery, one of the best options for extended trips
- **RAK4631** - nRF52840-based, low power consumption, excellent for custom enclosures
- **T-Echo** - nRF52840 with built-in ePaper screen and GPS; excellent battery life, reads last position even when phone is stowed
- **Avoid T-Beam (ESP32)** for multi-day trips - the ESP32 draws significantly more power; same 1000 mAh battery lasts 1 - 2 days vs. 3 - 7 days on nRF52840 devices

Battery Life Expectations

Battery runtime depends heavily on message frequency and modem preset:

- **RAK4631 / T-Echo on a 1000 mAh LiPo:** approximately 3 - 7 days depending on message frequency and modem preset
- **T-Beam (ESP32) on a 1000 mAh LiPo:** approximately 1 - 2 days under similar conditions

- Disabling Bluetooth when not actively using the companion app can extend runtime further on all platforms

Modem Preset Considerations

Wilderness use is generally low-traffic, so slower presets that trade throughput for range are appropriate:

- **Long Fast** or **Medium Slow** - good all-around choice for most hiking scenarios
- **Long Slow** - maximum range, ideal for above-treeline ridgeline hops; be aware that slow presets increase airtime per message, which matters if the group is chatty
- Verify all devices in the group are on the same modem preset before departure - mismatched presets mean devices cannot decode each other's packets

Practical Range

Real-world range varies enormously with terrain:

- **Ridgelines and open terrain:** 10 - 30+ km node-to-node is achievable with good antenna orientation and line-of-sight
- **Dense forest or deep valleys:** 1 - 5 km is typical; vegetation and terrain absorb and diffract the signal significantly
- Multi-hop routing extends effective group coverage - a node at a summit can relay messages between parties on opposite sides of a ridge

Group Use Tips

- Set a shared channel name and PSK before departure so all devices communicate on the same private channel
- Designate one person's phone as the "base" with full power settings; others can operate as client-only devices to save battery
- Set position update interval to 30 minutes to conserve battery - continuous GPS polling is one of the largest power draws
- Set a descriptive long name on each device (e.g., "Alice-RED" or "Trail Lead") so messages are identifiable without needing to look up node IDs

Pre-Trip Checklist

- All devices fully charged

- Shared channel name and PSK configured on every node
- Modem preset verified identical on all devices
- Each device has a recognizable long name with contact info
- Position update interval set appropriately (30 min recommended)
- Offline maps cached in the companion app on each phone
- Quick test message exchange confirmed before hitting the trailhead

Emergency Position Sharing

Meshtastic position packets are available to any app with channel access, making your location visible to all group members without any action on your part. MeshCore also transmits position in advertisement packets received by any node in range.

Important: Mesh networking is a group coordination tool, not a rescue beacon. It is *not* a replacement for a Personal Locator Beacon (PLB) or satellite communicator (e.g., Garmin inReach, SPOT) for true emergencies. Mesh devices require another mesh node within range to relay a message - in a genuine emergency in remote terrain, that may not exist. Carry a PLB or satellite communicator on any serious backcountry trip.

Skiing, Mountain Biking, and Motorsports

Fast-Moving Group Coordination

Mesh networking excels for groups spread across dynamic environments - ski resorts, trail systems, and off-road courses - where cellular coverage is patchy and voice radio is impractical. Text-based mesh communication provides:

- Asynchronous messaging that doesn't require everyone to be listening simultaneously
- Position tracking on a shared map so support vehicles or guides know where riders are
- No ongoing subscription costs compared to satellite communicators

Ski Resort Scenario

A typical ski resort deployment looks like:

- **Base node** at the lodge or parking area - plugged into power, acts as a gateway if internet access is available
- **Summit repeater** - many resorts already have communication infrastructure at the top; a solar-powered or battery-backed repeater here provides coverage across the mountain
- **Personal nodes** on each skier - small device in a jacket pocket or pack

Coverage inside chairlift cabins and trees can be spotty - expect short message delays rather than instant delivery. The mesh will retry and deliver when a node comes back into range.

Mountain Biking Trail Networks

Trail systems can be extended with simple infrastructure nodes:

- Small solar-powered repeater in a weatherproof enclosure mounted at trail junction kiosks or on trees at high points
- Battery-powered repeater in a waterproof box works well for seasonal deployment - install at the start of the season, recover at the end
- Even one well-placed repeater at a summit or ridge can dramatically extend coverage across an entire trail system

Motorsports: Off-Road Racing and Overlanding

Mesh networking is increasingly popular in off-road motorsports for convoy coordination and driver-navigator communication:

- **Convoy position tracking:** each vehicle's position appears on the map view, letting support vehicles follow the convoy's progress without voice radio check-ins
- **Driver-to-navigator text:** eliminates voice radio clutter; the navigator can send turn notes as text while the driver focuses on the road
- **Support vehicle coordination:** sweep vehicles can see the full convoy spread and know where stragglers are without repeated radio calls

Vehicle Mounting for Better Range

Handheld devices inside a vehicle cab perform poorly - the metal body acts as a Faraday cage. For serious use:

- **Magnetic-base NMO antenna mount** on the roof, connected via SMA adapter to the mesh device inside - this dramatically improves range vs. a device sitting on the dashboard
- Route the coax through a window gap or door seal to keep the device accessible inside the cab
- A roof-mounted antenna provides near-omnidirectional coverage with no body blockage

Device Recommendations for Action Sports

Smaller and lighter is better for action sports use:

- **RAK T-Echo** - fits in a jersey pocket or chest pack, built-in GPS, ePaper screen readable in sunlight
- **T-Beam** - bulkier and heavier; better for vehicle mounting than body-worn use
- Use a silicone protective case or a small dry bag for rain and mud protection
- Secure the device so it won't shift or be damaged in a crash - a chest pocket or internal pack pocket is better than an external clip in rough conditions

Power in Vehicles

For continuous in-vehicle operation, power the mesh device from the vehicle's electrical system:

- 12V accessory socket to 5V USB adapter for any USB-C or Micro-USB device
- For permanent installations, tap a switched 12V circuit (ignition-controlled) so the device powers off with the vehicle
- A continuously powered gateway node with internet access enables real-time MQTT position forwarding to a server during an event