



ChainLynx Bikepacking App – Location Services

Pre-Release Technical Documentation — November 2025

1. Overview

The location subsystem powers the ChainLynx Bikepacking App's core features: real-time tracking, meetup visibility, and trail context awareness. It supports both GPS-based device tracking and optional satellite-based integrations for remote regions.

2. Concept and Objectives

Concept: Location data connects riders and informs route context within the app. It enables users to share their position, discover nearby riders, and receive safety updates — all within a privacy-first framework.

Objectives:

- Provide accurate, real-time positioning for users and meetups.
- Ensure offline tracking continuity in areas without connectivity.
- Offer optional live sharing through GPS or satellite integrations.
- Maintain complete user control over visibility and session data.

3. Location Architecture

Implementation: The system operates across three layers:

1. **Device Layer:** Accesses GPS data directly from the user's phone or connected device.
2. **Backend Layer:** Temporarily stores shared coordinates for meetup and route-based visibility.
3. **Ephemeral Layer:** Automatically deletes temporary data once the session ends, ensuring no long-term tracking history.

Offline Design: The app continuously logs location points locally using low-frequency updates to conserve power. When connectivity returns, location data synchronizes with the backend to update meetups and trail statistics.

4. GPS and Device Integration

The app uses native device APIs for location services:

- Android — FusedLocationProvider (Google Play Services).
- iOS — CoreLocation framework.

Data collection frequency adapts dynamically based on user movement speed, mode (tracking, navigation, or rest), and battery level.

Accuracy Modes:

- High Accuracy — Uses GPS, Wi-Fi, and cell towers.
- Balanced — Prioritizes GPS but reduces update frequency.
- Battery Saver — Logs position intermittently for multi-day trips.

5. Garmin inReach and MapShare Integration

Integration with Garmin inReach devices via MapShare is planned for future development. This will allow riders to connect their satellite devices to ChainLynx, enabling automatic

position updates from remote regions without cell coverage.

Planned Features:

- Secure OAuth-based linking of Garmin accounts.
- Automated import of MapShare position updates into ChainLynx routes.
- Background synchronization when the user reconnects to the internet.
- Optional visibility to route members or specific meetups only.

Status: Integration is currently under design review. The goal is to launch it as part of a future update once Garmin API partnership approval is secured.

6. Location Sharing Logic

Workflow:

1. User opts into location sharing for a specific route or meetup.
2. App begins transmitting coordinates (hashed and anonymized) to the backend.
3. Other riders on the same route can view active participants on the map.
4. Sharing automatically deactivates when the user ends the session or goes offline for a set duration.

Privacy Model: Location data is always ephemeral — it exists only for the duration of active sharing. No long-term history is retained, and all updates are encrypted during transmission.

7. Privacy and Security

Encryption: All location transmissions use TLS 1.3. On-device logs are encrypted with AES-256 until synchronization. Data retention on the backend is temporary and purged every 24 hours.

User Control:

- Users decide when to share their location.
- Sharing is opt-in and session-bound.
- No background tracking occurs outside active use.
- The user can delete all cached location logs at any time.

8. Offline Functionality

The location system continues functioning in complete offline mode by storing points locally and syncing them when connectivity resumes. Map matching and POI proximity checks are handled through pre-downloaded vector tiles and local spatial queries.

9. Recommendation

The location system is a cornerstone of the ChainLynx platform. By combining GPS accuracy, privacy-first design, and planned satellite integration, it ensures reliable navigation and safe social connectivity — even in the world's most remote regions.