Fauna (Large) Emergency Preparedness – Summary
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Group 31 – CS 440 Fall 2025

Overview

FLEP is a comprehensive web-based system that coordinates large-animal disaster preparedness and evacuation. It targets caregivers (e.g., farmers, ranchers, zookeepers), emergency response agencies, veterinarians, transportation providers, and shelters. The primary objective is to produce actionable, legally compliant evacuation plans that integrate animal rosters, live weather/GIS feeds, transport capacity, and shelter availability – accelerating coordinated responses during wildfires, floods, hurricanes, and other natural disasters. The system emphasizes human-in-the-loop safety: AI/LLM-assisted draft plans are created quickly but require human review, approval gates, and explicit vet sign-offs for high-risk actions.

Scope and Stakeholders

FLEP focuses on planning, coordination, and information management, not physical transportation execution. Key stakeholders include caretakers, emergency managers, transportation providers, shelter staff, state, local, and federal regulators, GIS and weather data providers, and maintenance and support teams. Use cases include animal roster submission, evacuation plan generation, transport assignment, animal tracking, and shelter management, and is designed/intended to operate with partners of different sizes/scale – from small county shelters to large federal agencies.

Core Functionality

The system supports authenticated, role-based access. It also provides the capability to submit and manage animal rosters; attach and read tracking tags; generate drafts with the assistance of an LLM; GIS routing with rapid route recalculation on closures/hazards; transport-to-pickup matching and scheduling; shelter capacity management and arrival manifests; veterinary triage assignment and vet sign-off; multi-channel notifications (push, SMS, and email); offline support for users in areas with low network connectivity; audit logging; and export APIs. Acceptance criteria and test cases are specified in detail to validate functionality, performance, dependability, security, and usability.

Non-functional priorities and constraints

FLEP prescribes strict non-functional requirements: near real-time performance (dashboard and route updates in seconds), high availability (99.5% during declared emergencies), robust fault-tolerance (geographic redundancy, failover RTOs/RPOs), data durability and backups, and strong security and privacy. Safety constraints mandate human approval for large or cross-jurisdictional plans and guardrails against LLM hallucinations. The platform must interoperate with NOAA or NOAA-like weather feeds, GIS providers, drone feeds, and partner systems using standard formats (e.g., GeoJSON, CSV, JSON).

Design and Architecture

The recommended architecture is modular and layered: client (MVC) front-end (available on desktop and mobile), cloud-hosted back-end services (microservices and containers), event-driven orchestration, and a resilient RDBMS built with PostgreSQL, plus object storage for

media and snapshots. Key design patterns include Observer (real-time updates), Strategy (routing strategies), Adapter (external integration, e.g., weather feeds), State (plan lifecycle), and Decorator (logging/analytics). The PlanGenerator wraps LLMs but mandates verification, citation, and confidence scoring before plans become executable. Offline queues (local SQLite/IndexedDB) support intermittent connectivity with reconciliation tooling.

Risks, Open Issues, and Government

There are several open issues, including API availability and licensing, drone feed standardization, cloud vs. on-premises deployment, legal and privacy constraints, and capacity estimates. There are also risks associated with FLEP, such as the potential for data breaches, LLM data drift, partner system overloads, alert fatigue for users, and funding uncertainty. Mitigations include conservative thresholds (e.g., shelter safety caps), human sign-offs, extensive acceptance testing, quarterly drills, penetration testing, and legal/regulatory engagement. Migration is phases (setup and configuration → data migration → operational deployment) with import tools and validation checkpoints.

Operational Readiness, Training, and Costs

FLEP includes extensive usability, training, and documentation requirements – role-based quickstarts, micro-lessons, instructor tools, sandbox/training mode, and certification gating for sensitive actions. Cost estimates and staffing models are provided: development scenarios range from an aggressive ~$300k to a conservative $900k, with additional costs estimated for the first year of operation, as well as suggested funding routes (grants, NGO partnerships, in-kind API licenses).

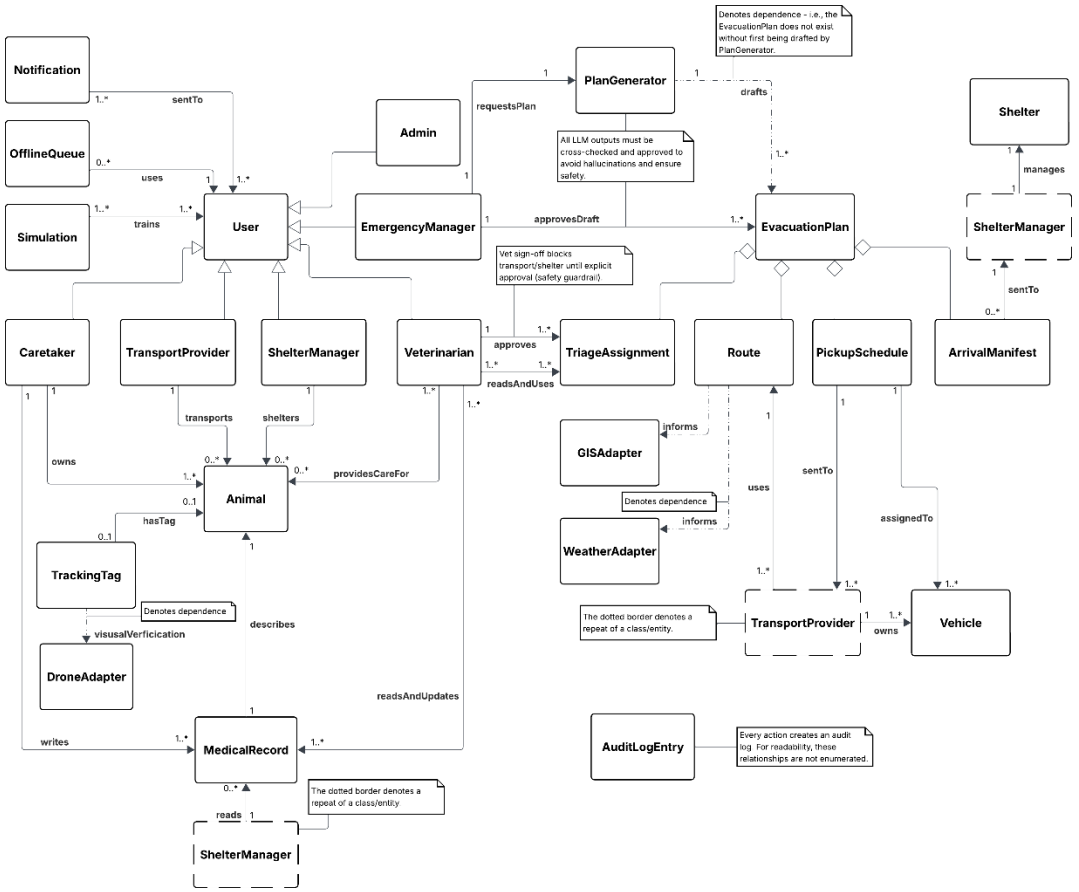

Figure 1: High-Level UML of FLEP