Mooving Day Design Report Summary

Group 10: Bruno Correa Marin, Ariel Garcia, Shengteng Wu

Introduction: This phase of the Mooving Day project focused on defining the full system design, including goals, domain understanding, subsystem architecture, object modeling, and supporting considerations such as security, fault tolerance, and hardware/software distribution. The report establishes a foundation for a welfare-focused animal transport application.

1. Design Goals Established

- **Safety**: Ensuring that animals transported under Mooving Day remain within regulated welfare conditions.
- **Accuracy**: Providing reliable, hazard-aware route generation to prevent delays or unsafe travel conditions.
- **Ease of Use**: Designing user interfaces for drivers, managers, and owners that minimize confusion and reduce distraction during transport.

2. Proposed System Design Developed

- **A. Use-Case Dynamic Modeling:** use-case interactions support shipment creation, monitoring, routing, alerting, and review
- **B. Architectural Style:** Two major architectural patterns were selected:
  - **Client–Server**, to support centralized processing and distributed clients.
  - **MVC**, to separate core data models, user interactions, and visualization layers.
  - supports both web and mobile clients effectively.

3. Subsystem Decomposition: Four primary subsystems were defined:

- **Core Transport & Domain Model**: Handles organizations, vehicles, drivers, shipments, and animal groups.
- **Monitoring & Welfare Evaluation**: Handles sensors, environmental data collection, and welfare assessment.
- **Dynamic Routing**: Computes routes, evaluates hazards, and manages weather API integration.
- **Alerts and Logging / Reporting**: Stores alerts, log entries, and transport events for compliance and review.

4. Additional Design Considerations Documented

Offline operation and synchronization for drivers in poor connectivity, scalability for multiple simultaneous shipments, reliability and fault tolerance in safety-critical environments. Security and access control based on user roles, driver usability and reduced distraction, especially during routing changes, data retention and auditing for compliance and investigations.

5. Hardware / Software Mapping Defined

- **On-vehicle hardware**: Sensors and the driver's mobile device running the Mooving Day Driver App
- **External services**: Weather and hazard information providers.
- **Client devices**: Managers and owners use light web/mobile interfaces with no heavy computation.

6. Persistent Data Management Planned

Users, organizations, vehicles, sensors, active and historical shipments, animal welfare rules and species profiles routing and geofencing data, alerts, status history, logs, and compliance records

7. Access Control, Global Control, and Boundary Conditions

- **Access control** was structured around role-based authorization, ensuring each user sees only the information they are entitled to.
- **Global control** described how the system can be used across devices (mobile touch input for drivers, mouse/keyboard for admins).
- **Boundary conditions** address unstable connectivity, ensuring failsafe routing and data synchronization.

8. Application of Design Patterns

- **Adapter Pattern**: For integrating multiple weather or routing APIs under a consistent internal interface.
- **Template Method Pattern**: For standardized welfare evaluation steps across species, with customizable thresholds.

9. Project issues, Cost, Solutions, misc

Mooving Day's project issues center on regulatory uncertainty, technical constraints, and practical deployment challenges. Development will depend on external mapping and weather APIs, which may introduce cost and access limitations. User devices may experience performance strain, and drivers could face distraction or motion sickness during reroutes or alerts. Additional risks include system complexity reducing usability, server overload during high demand. Estimated costs for a full U.S. release are roughly $100,000 with larger teams needed for nationwide deployment. Future improvements such as global access and live health monitoring remain possible enhancements for later phases.

10. Retrospective

We identified strong team communication and weaker time management as key takeaways. That benefitted us and hindered us at the same time

Across this work session, we produced a complete high-level and mid-level design for Mooving Day. This included establishing system goals, identifying domain entities, selecting architectural styles, defining subsystems, preparing persistent storage and deployment plans, integrating design patterns, and documenting the remaining risks and future considerations. The system now has a coherent structure that can be expanded into detailed UML diagrams and implementation plans.