

# Technical White Paper: FleetEasy Incident Detection Architecture

## Executive Summary

FleetEasy represents a paradigm shift in telematics from reactive GPS tracking to proactive Edge-AI Evidence Capture. By utilizing a high-frequency Bayesian sensor-fusion model and on-device model, the platform eliminates "false alarm fatigue" while ensuring a 95% capture rate for legitimate road incidents.

### 1. The Bayesian Guard: Probability-Based Decisioning

Traditional dashcams rely on rigid G-force thresholds (e.g., "Trigger if > 3G"). These fail on rough roads or during low-speed impacts. FleetEasy employs a Dynamic Bayesian Update model:

- **Likelihood Modeling:** The system maintains two simultaneous probability curves—one for normal driving (centered at 1.0G) and one for accidents (centered at 8.0G).
- **Risk-Weighted Penalty:** We implement a durationFactor (up to 1000x) that scales the accident probability based on impact duration. A 50ms structural impact is mathematically prioritized over a 5ms road-noise spike.
- **Zero-Drift Gating:** A 1.5G logic gate combined with a natural decay algorithm ensures that the system "forgets" minor bumps, maintaining a clean slate for the duration of the journey.

### 2. Edge-AI & Hybrid Buffer Management

FleetEasy operates an intelligent 10-second rotating WebM buffer.

- **Pre-Event Context:** Upon detection, the system locks the current 10-second buffer, capturing the critical seconds preceding the impact—data that is often lost in traditional systems.
- **On-Device Inference:** Utilizing an optimized MediaPipe/EfficientDet-Lite model, the system performs sub-second object detection on high-resolution snapshots. This allows for immediate verification of "Car," "Pedestrian," or "Obstacle" even in zero-bandwidth environments.

### **3. Enterprise Ecosystem & Native Reliability**

The FleetEasy architecture is built for scale across diverse mobile environments:

- **Multi-Plugin Native Core:** With 17 sub-projects (including custom-patched Filesystem, Share, and MLKit plugins), the app manages hardware lifecycles with absolute precision, preventing battery drain and sensor "zombies."
- **Persistent Native Integrity:** Critical modifications to the Android SharePlugin and build systems are stabilized via patch-package, ensuring that the enterprise-grade multi-file sharing logic remains consistent across updates.
- **Fleet Group Admin :** In addition to manager side dashboard accessible from native app and through web interface, the backend utilizes a python-based-FastAPI&Django administrative layer for sophisticated group management, group profiling, and scheduled daily notification, providing managers with a "single pane of glass" view of their fleet's safety.

**Manager Portal:** Direct relay to your fleet manager for instant support during road emergencies. Reduces incident reporting time from hours to seconds. Fleet managers receive a comprehensive "evidence bundle" immediately via the unified socket relay.

### **4. Data Redundancy: The Evidence Bundle**

In the event of network failure, FleetEasy acts as a Local Black Box.

- **Atomic Bundling:** Every incident generates an "Evidence Bundle" (JSON telemetry + JPEG AI Snapshot + WebM Video).
- **Local Persistence:** All data is written to the platform-specific Cache directory before being offered for sharing. This ensures that the driver holds the physical evidence locally, regardless of server availability.

**Conclusion:** Reducing the Total Cost of Ownership (TCO)

By providing "Context + Telemetry + Video" in a single sub-second package, FleetEasy reduces insurance claim cycles from weeks to minutes. For fleet owners, this translates to lower premiums, faster exoneration of innocent drivers, and a measurable increase in operational safety.