



A High AI-Q[™]
Company



IoT-Driven Worksite Safety and Real-Time Intrusion Detection

Protecting mobile construction zones with a radar-based sensor network and cloud-integrated alerts to eliminate worksite accidents.

Overview

We developed a comprehensive IoT safety ecosystem utilizing radar sensors and AWS-hosted microservices to detect and prevent worksite accidents.

- Achieved zero life or equipment-related incidents and zero worksite stoppages within the first year of implementation.
- Delivered a 12% reduction in insurance costs and a 15% increase in operational efficiency through enhanced safety practices.



Client Profile

This North American leader in building materials employs over 90,000 people across 4,000 worksites in 37 countries. They provide mission-critical construction and paving services to all segments of the global building industry.

Challenges: High-Risk Work Environments

Mobile road construction crews faced constant danger from motorists and heavy machinery due to:

- Lack of continuous, real-time monitoring of personnel and asset locations.
- Delayed or ineffective warnings when vehicles intruded into active mobile work zones.
- Inefficient tracking of equipment trajectory and proximity in high-traffic areas.
- Difficulty managing and upgrading software across a nationwide fleet of safety devices.

QBurst Solution: Radar-Based Cloud Safety Network

We engineered an intelligent safety solution that captures real-time data via a suite of radar sensors and broadcasts instant alerts to employees. The architecture leverages AWS microservices to provide a scalable cloud database, ensuring secure and fast access to safety logs. Using Data Modeling, we remapped existing data to implement a hierarchical access control mechanism tailored to the client's global organizational structure.

Key innovations include:

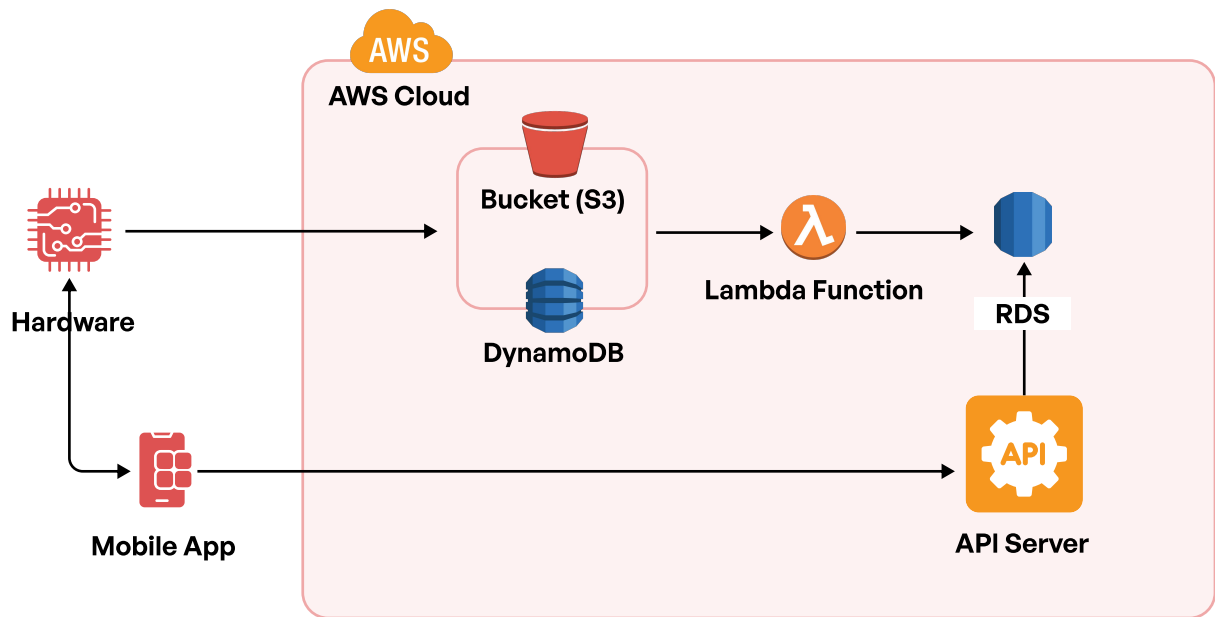
- **Trajectory Tracking:** Real-time monitoring of vehicle speed, proximity, and trajectory to predict potential worksite collisions.
- **Multimodal Alerts:** Integrated geofencing with audio-visual and haptic feedback systems for immediate worker notification.
- **Hybrid Storage:** Critical sensor data is stored locally to prevent loss before being synchronized with AWS S3 and RDS.

Key Features and Technical Highlights

- **BLE Integration:** Seamless communication between iOS/Android base station apps and radar hardware via Bluetooth Low Energy.
- **Serverless Processing:** AWS Lambda-driven execution for scalable, cost-effective data transformation and event handling.
- **Industrial UI/UX:** Mobile interfaces designed with large tappable areas and high-contrast themes for gloved use in varying light conditions.
- **Advanced Analytics:** Integrated Highcharts dashboards for in-depth alert rating, classification, and safety performance reporting.

Implementation Approach

The project followed a strict Test-Driven Development (TDD) approach using NUnit and Mocha/Chai to ensure the smart contracts and APIs were bug-free before deployment. By decoupling the manufacturer and distributor services, the solution remains tech-agnostic, allowing any distributor to join the network regardless of their internal IT stack.



AWS Solution Architecture

Impact

- **Zero Life-Safety Incidents:** Successfully prevented potential accidents relating to personnel or equipment over 12 months.
- **Significant Cost Savings:** Achieved a 12% reduction in insurance premiums and eliminated costs associated with worksite stoppages.
- **Operational Agility:** Realized a 15% boost in efficiency by automating the setup and monitoring of mobile safety zones.
- **Enhanced Compliance:** Provided a permanent, archivable data history in AWS to satisfy long-term safety auditing and reporting requirements.