Innominds
Engineering Intelligence. Responsibly

Case Study

IIoT Structural Monitoring Real-Time Integrity Insights via Cloud-Enabled Edge Intelligence

- Secure, scalable cloud for continuous IIoT streaming
- Automated AWS data ingestion, storage, analytics
- Efficient EDGE processing of high-frequency sensor data

Client

A leading provider of large-scale asset monitoring with patented structural health monitoring technologies. Their systems use multimodal non-destructive testing to deliver advanced infrastructure diagnostics across tunnels, ports, and other critical assets.

Business Need / Challenges

The client relied heavily on manual inspection processes that were slow, resource-intensive, and unable to provide continuous insights into structural health. This created several challenges:

- No real-time visibility into asset integrity
- Limited ability to detect issues early due to periodic inspections
- Difficulty integrating data across multiple sensors and edge devices
- Slow assessment times caused by manual or offline analysis
- Lack of scalable infrastructure for handling continuous sensor data

To enable proactive maintenance and reduce infrastructure risks, the client needed an IIoT-driven solution capable of continuous monitoring, real-time alerts, and cloud-based analytics.

Solution Delivered by Innominds

Innominds delivered an end-to-end IIoT structural health monitoring solution that combined intelligent edge processing, secure cloud infrastructure, and real-time analytics for continuous asset integrity insights.

Key Solution Components

Edge Data Processing – ESP32 devices running FreeRTOS for continuous data capture and local preprocessing.

AWS IoT Cloud Integration – Secure, scalable data ingestion and processing pipelines for real-time monitoring.

Cloud-Native Storage & Insights – DynamoDB for high-speed querying, enabling actionable insights and anomaly detection.

Intuitive Visualization Dashboard – Angular web application providing real-time structural health metrics and alerts.

Remote Device Management – BLE-based Wi-Fi provisioning, over-the-air updates, and predictive maintenance analytics.

Business Outcomes

Reduced Operational Downtime by 40% Predictive maintenance prevents failures before they escalate.

Scalable Monitoring Across Distributed Assets – Reliable data collection across remote tunnels, ports, and infrastructure sites.

Real-Time Structural Integrity Insights Faster anomaly detection and risk mitigation.

Field-Ready Deployment – Architecture built for rugged, real-world infrastructure environments.

Tools & Technologies Used

ESP32 FireBeetle | FreeRTOS | Arduino IDE | Angular | Python | AWS IoT Core | DynamoDB | Edge Intelligence

Transform Infrastructure Monitoring with IIoT - monitor smarter, analyse faster, and maintain better.

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