Case Study

From Reactive to Predictive: AI-Driven Maintenance for a Leading National Rail Operator

Client Overview

The national rail operator faced significant operational hurdles due to reactive locomotive maintenance and aging assets. To improve network reliability and reduce costs, they implemented an AI-powered Predictive Maintenance solution. This platform leverages real-time IoT sensor data to forecast component failures, allowing for proactive servicing and optimized inventory management.

The Challenge?

Network Reliability

Transit failures caused cascading delays across freight and passenger corridors.

Resource Waste

High spare-parts expenditure due to time-based rather than condition-based replacement.

Data Complexity

Difficulty in processing high-frequency telemetry from diverse onboard sensors (GPS, traction, braking).

Solution Delivered

IoT Integration

Real-time streaming of sensor data (vibration, pressure, temperature) via Kafka.

Modern Data Stack

Centralized data processing using Talend and Apache Druid for sub-second query responses.

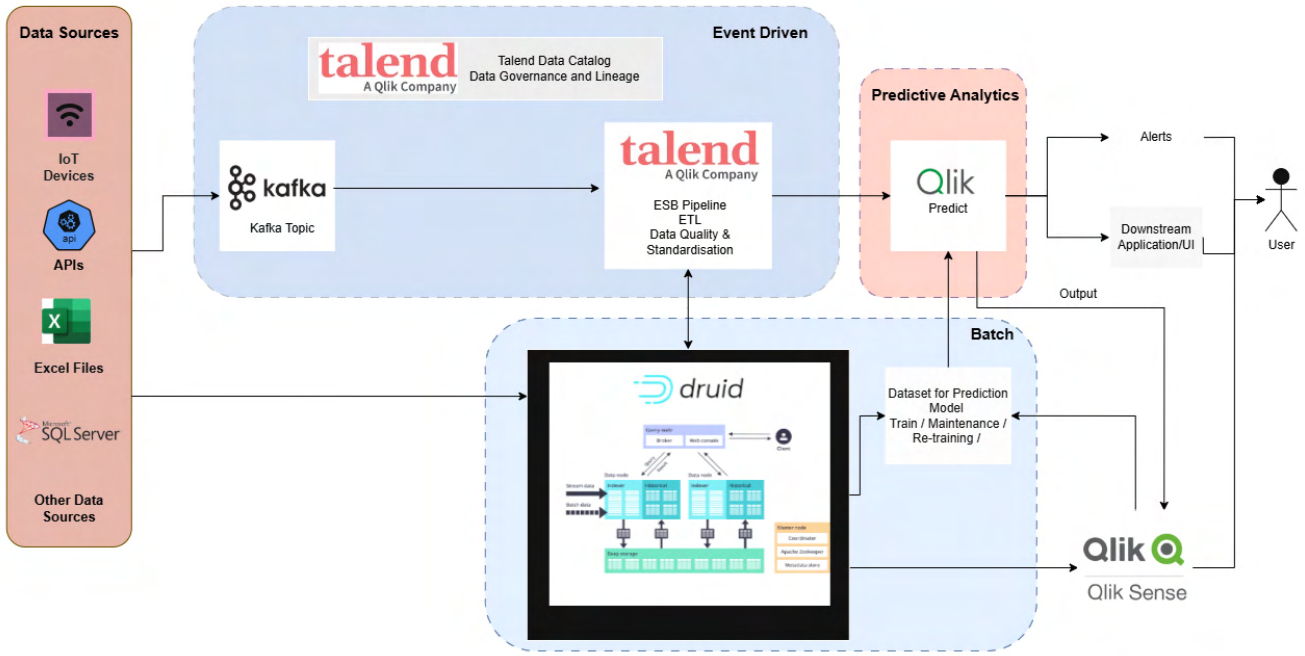
Predictive Modeling

Catboost algorithms to identify "leading indicators" of failure.

Dashboarding

Real-time visibility into fleet health via Qlik Predict, featuring failure probability scores (70–80% accuracy).

The Architecture



The Impact

20–30% Lower Downtime

Significant reduction in mid-route technical failures.

15% Higher Availability

More locomotives available for daily operations.

18% Cost Reduction

Optimized procurement and reduced inventory carrying costs.

Improved Safety

Proactive detection of equipment deterioration before safety limits are reached.

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