

Case Study

London Underground "Project Apollo" Data-driven maintenance

Transport for London (TfL) operates two fleets of vehicles: Victoria line 2009 Stock and S Stock, which operate on the Circle, Metropolitan, and Hammersmith and City lines.

The maintenance and reliability of these vehicles is influenced by data received from the on-board TCMS system. Originally, this was processed by the vehicle manufacturer, however, the client wanted to bring this data analysis in house and to interface it to their own predict and prevent, diagnostic platform. This project was called "Apollo" and Infinitive Group staff were a key part of the project team responsible for its rollout.

The project brief was to take the raw data from the vehicle directly in its encoded form and provide an analytical visualisation platform running on software internal to the client. Thus assuring that the client has a much finer control over how the data is presented and utilised to improve the performance of the asset whilst avoiding incurring expense, both now and in the future, to run and change the system.

The Challenge

The raw data obtained directly from the train is in an encoded format, which cannot be easily interpreted or analysed. This required a data decoder to be constructed that could take the raw encoded inputs and produce data in a human-readable format.

To react to the state of the vehicle in a timely manner and rectify faults as fast as possible, a business rules engine was specified to generate

alarms that would be shown to the operational staff working in the control room and/or at the depot. Due to the large amount of complex data being generated by the train, this functionality had to be tightly coupled with the data decoder further complicating the design. A notable objective was to unlock previously inaccessible sensor data to realise benefits not already leveraged before identifying additional and potentially intrusive new sensor installations.

Our Solution

TfL recognised that it needed to modernise train maintenance through data-driven insights, which could be presented to end users.

In response, staff from Infinitive Group were closely integrated into TfL's maintenance modernisation programme to develop bespoke software applications to transform train data into useful analytics.

Delivering a cohesive system, implementing predictive maintenance, and achieving real-time decision making were key requirements.

A data decoder application, written in Java, was created using a combination of "black box" reverse engineering and forward engineering from first principles.

Once the data decoding process had been tested and verified, an alarm logic engine was created from scratch that allowed the client to modify and deploy changes to the alarm system without changing the underlying software.

Visualisations were prepared using the TIBCO Spotfire platform with continuous involvement of the end user to ensure that the final designs met the evolving requirements of the operational staff.

The combined software applications were deployed into TfL's existing enterprise IT estate and integrated into their maintenance and support regimes, making sure that the change deployed was not only significant but sustainable over a long period.

Desirable Business Outcomes

Asset reliability was markedly improved and testing showed an increase of 50% compared to operating without digital asset data. The integrated alarm system enabled predictive maintenance and facilitated real-time decision making.

Project Apollo contributed to over £250m of savings over 5 years helping achieve TfL's business goal of reducing costs and providing better value to the travelling public. The total cost savings from the programme were considerable.

Our client and other operators across the world are keen to see digital transformation revolutionising asset management as soon as possible.