INTERNATIONAL DATA SPACES ASSOCIATION

FIWARE
Open APIs for Open Minds

Predictive Fleet Maintenance in Smart Cities

IoT based solution for fleet management problems and the monetization of vehicle data in Smart Cities

Control your fleet

It is critical for many organisations managing a fleet of vehicles to ensure that their vehicles spend more time on the road and less time in the shop. Whether it is a bus, a truck, or another type of transport, productivity can be threatened by a minor malfunction. Unexpected breakdowns can easily turn profit into a loss. Transport efficiency becomes crucial if the companies want to stay competitive and profitable. Efficient fleet management implies trouble-free operation and downtime minimization. Fleet managers need to monitor vehicle health in real-time to keep it up and running. Predictive maintenance aims to identify fleet issues before they occur. Big Data analytics and advanced AI algorithms help to detect part failures via hidden correlations that otherwise would be impossible to find.

The Stratio solution, specialized in AI and Automotive Engineering, can analyze data generated by vehicle sensors. Sensors collect data about the engine, brakes, suspension, tire pressure and other parts. The Stratio platform pulls in this data and detects potential faults which it communicates to the fleet operators, enabling them to optimize the maintenance process. The fleet operator has remote access to the real-time data for any sensor in the vehicle and receives step-by-step support information. Thereby, the operator is able to predict part failures and plan better when to send vehicles to the shop for inspection and maintenance.

Data exchange between vehicle and city

Performance of the Stratio solution is enhanced by the integration of the Smart City data, e. g. air quality data, current and foreseen traffic data, and the weather forecast, which can feed Stratio's algorithms to deliver better results and improve maintenance of vehicles. On the other hand, sensor data, e.g. damping data, speed, captured by the Stratio system can not only be used to improve the maintenance of vehicles but also to inform the city administration about the state of the roads and the average speed of the vehicles in the fleet. A Smart City platform deployed in a given city analyzes this data and updates systems which can take advantage of exploiting data about the state of the roads or vehicle speed. This way, vehicles act as mobile sensors for the city.

In a new data-driven economy, mechanical information absorbed by the solution from the transport is valuable for manufacturers of the vehicles. Information about breakdowns and system errors empowers manufacturers to monitor vehicle performance and enhance their products. This data can be provided by the Smart City Platform to manufacturers of vehicles for a fee. Similarly, other data, e.g. speed of buses in bus lines, can be published in right-time so that third parties can provide new innovative services for citizens. Access Control Policy rules define what information is available to whom, where and when.

An IDS-compliant Architecture implemented using FIWARE turns this into reality: all data exchanges are enabled through IDS Connectors deployed in the Smart City and the Stratio system. Such exchange takes place in a trustworthy manner and data is only accessible when the necessary rights have been acquired.

Challenges

> Breakdowns of the fleet service.
> Vehicle downtime.
> High fleet maintenance costs.
> Measurement of road status.
> Data exchange with third parties.

Collaboration between

> Stratio - Commercial IoT platform for Predictive Maintenance of fleets.
> A fleet of buses in Málaga, a fleet of Waste Management trucks in Porto.
> Smart City platforms in Málaga and Porto.

Solution

> Stratio solution applying IDS-compliant Architecture implemented using FIWARE.

Benefits

> Enhanced predictive analytics for management of fleets enabled by access to the Smart City data.
> Advanced AI techniques for predictions.
> Secure exchange of data between fleet and city.
> Availability of information for manufacturers of buses and trucks.
> Data monetization benefiting city administration.
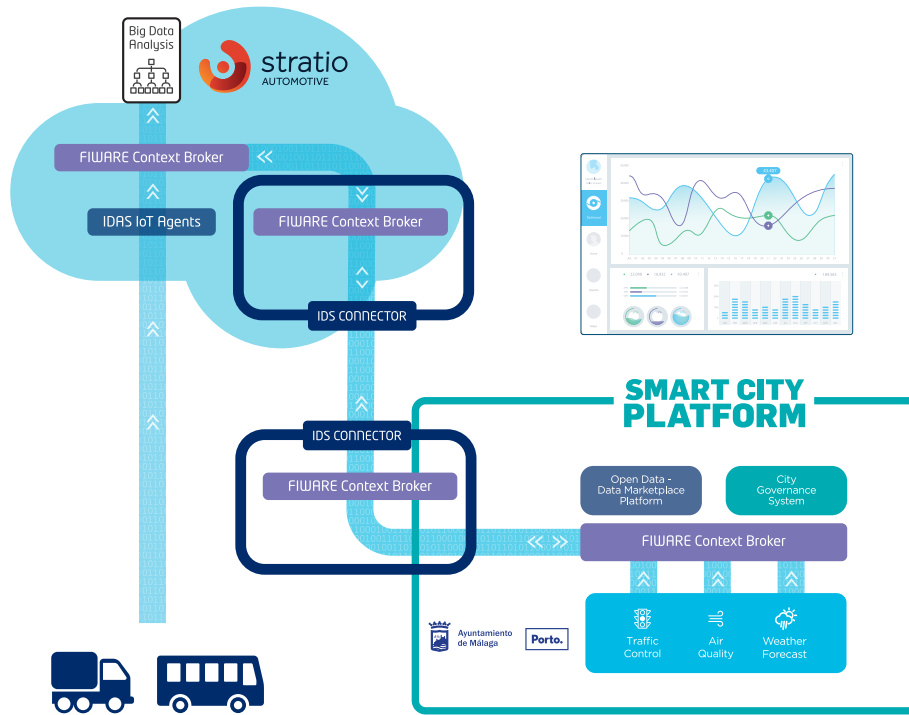
Stratio IoT device tracks the location and transfers this data along with the technical information about the vehicle to the IDS compliant infrastructure implemented in FIWARE.

FIWARE Orion Context Broker is a part of the Stratio software architecture, managing the data captured by the Stratio plug. Part of this data is published through the FIWARE Context Broker component that is the core part of the external IDS Connector deployed on the Stratio Cloud system.
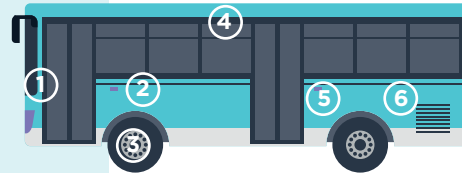
Smart City systems check the traffic status and monitor the weather and air quality. The Smart City platform exports this data using **FIWARE NGSI compatible JSON format** and publishes it through the FIWARE Context Broker. This component is the core part of the external IDS Connector deployed in the Smart City.

Publication and monetization of data resources rely on the **FIWARE Biz Framework** and **CKAN extensions** which were developed relying on **TM Forum Open APIs.** The extended CKAN platform, bringing capabilities for monetization of data resources and management of access rights, works as an implementation of the IDS Broker element in the IDS Architecture.

Fleet data is visualised on **the maps** and available to the fleet manager. Vehicles which do not show any problem are displayed on a map in green. A fleet manager sees yellow or red icons in the dashboard that signify potential problems during the shift or already existing malfunctions.

Data that was sent from the vehicle sensors to the Smart City system is published on **the data marketplace** supported by the city. It is monetized through the charges for the usage by third parties, e.g. vehicle manufacturers.

1. Engine
2. Brakes
3. Gearbox
4. Steering system
5. Air quality conditions

The Stratio Plug performs a continuous mechanical analysis and monitors the vehicle for possible malfunctions in real time.

About IDSA

The International Data Spaces (IDS) approach addresses a key topic in the evolution of Industrie 4.0: how companies and institutions can build a space where data is shared in a decentralised manner so that each organization can use available data to improve their processes as well as govern and monetize data exported to third parties.

For this, the International Data Spaces Association (IDSA) is creating a reference architecture to implement secure and trustworthy data exchanges where data providers keep control over the use of their data ("data sovereignty"). It also addresses interoperability with many different data types used in global supply chains

About FIWARE

FIWARE is an Open Source initiative whose mission is to build an open sustainable ecosystem around public, royalty-free and implementation-driven software platform standards for the development of Smart Applications in multiple sectors. The FIWARE platform provides a rather simple yet powerful set of Application Programming Interfaces (APIs) and also combines components enabling the connection to the Internet of Things with Context Information Management and Big Data services on the Cloud.

The FIWARE Foundation is the legal independent body providing shared resources to help to achieve the FIWARE mission. The FIWARE Foundation is open: anybody can join contributing to a transparent governance of FIWARE activities and rising through the ranks, based on merit.