Optibus

Enabling smarter public transport systems through real-time analytics of in-motion big data

Overview

The need
Optibus wanted to re-invent the way public transportation services are delivered. How could it give bus companies intelligent tools and solutions for real-time operational planning and optimization?

The solution
Optibus built an intelligent, algorithm-based, scheduling optimization platform using IBM® InfoSphere® BigInsights™ and IBM InfoSphere Streams software running on a SoftLayer® cloud platform.

The benefit
Saves seven to ten percent in operational costs. Tracks fleet status in real time, and enables intelligent response to changing conditions. Optimizes resource utilization and cuts CO_2 emissions.

Founded in 2011 and headquartered in Netanya, Israel, Optibus Ltd. specializes in intelligent optimization solutions for public transportation companies. Using unique, algorithm-based technology, the company helps bus companies in Israel and beyond to optimize operational scheduling in real time.

Real-time flexibility
For bus companies, a key challenge is optimizing the utilization of staff and vehicles to maximize customer satisfaction, while minimizing operational costs and carbon emissions.

Events such as vehicle breakdowns and accidents, adverse weather, driver or passenger illness, construction delays, traffic congestion – or even unexpectedly clear roads – can play havoc with carefully planned schedules.

Traditionally, operational planning for vehicles and crews is an offline process involving significant manual effort – and it does not adapt quickly or easily to changing real-world conditions. As a result, bus companies tend to maintain costly reserve vehicles and crews to fill gaps in the schedule.

Powerful IBM big data solutions helped Optibus to create a fast-growing new business, as Amos Haggiag, Co-Founder and CTO, explains: "We saw a clear opportunity to use IBM big data to build data-driven solutions for public transportation companies, enabling them to harness vast amounts of data and use our algorithms to predict the best schedules as conditions change."

Solution components

Software
- IBM® InfoSphere® BigInsights™
- IBM InfoSphere Streams

Services
- IBM Bluemix™ platform
- SoftLayer®

Amos Haggiag, Co-Founder and CTO at Optibus, comments: "We recognized that bus companies waste millions of dollars annually through inefficient scheduling, oversized fleets, and delays in responding to unexpected events. We wanted to help these companies make more intelligent planning decisions, giving them a data-driven capability to adapt their operational plans in real time as conditions change.

"To do this, we needed to combine our advanced algorithms with technology capable of rapidly ingesting and analyzing huge volumes of highly diverse data."

A smooth journey

"We selected IBM InfoSphere Streams to collect and analyze data in real time and InfoSphere BigInsights to perform advanced statistical and predictive analysis" says Haggiag. "Running our unique scheduling algorithms on these IBM technologies enables our clients to test multiple rescheduling strategies and find the one that makes the most sense both economically and in terms of customer service levels."

Optibus built its solution on the IBM Bluemix™ platform, which enabled rapid deployment of computing resources on the SoftLayer cloud, as well as providing application program interfaces that enable clients to plug the Optibus intelligent scheduling solution directly into their own planning tools if they prefer.

"With SoftLayer, we can specify the resources we need, including GPUs [graphic processing units] for intensive parallel computing," says Haggiag. "InfoSphere Streams ensures extremely low latency, so our clients can perform real-time analysis and optimization."

The Optibus solution pulls in bus data in real time – including GPS [global positioning system] position, speed, acceleration, and even the number of passengers, calculated from onboard video cameras – and combines it with traffic and weather data to give bus operators a 360-degree view of key factors affecting services. InfoSphere Streams powers the optimization engine, which uses advanced algorithms to compute optional rescheduling decisions. Human operators can adjust the model and receive a new rescheduling plan in real time.

> *"InfoSphere Streams ensures extremely low latency, so our clients can perform real-time analysis and optimization."*

— Amos Haggiag, Co-Founder and Chief Technical Officer, Optibus

Optibus uses InfoSphere BigInsights, IBM's Apache™ Hadoop® distribution, to continuously optimize the model used in InfoSphere Streams, analyzing historical data to set benchmarks for each bus route. For example, the system might determine that it is normal for a bus to be 50 percent through a particular route by distance, yet based on journey time, the bus may be 70 percent of the way through, if most of the scheduled stops are in the first half of the journey.

Keeping clients in the know

Backed by IBM InfoSphere Streams and InfoSphere BigInsights, Optibus provides fully optimized planning in seconds for large bus fleets, calculating the best use of vehicles and drivers based on constantly changing conditions. When a bus is stuck in traffic or when a sudden rainstorm affects average speed, the real-time decision engine instantly determines the optimal response. In doing so, it takes in a huge number of factors based on both current and historical data.

For example, if the solution sees that a particular intercity bus is running late, but is also nearly full, it can decide – based on historical data – that the bus will make fewer stops in the latter stages of its journey (as existing passengers will remain on board until the final destination) and will be able to make up the lost time. In this scenario, no scheduling changes would be required.

"Our solution can take into account a huge number of different constraints on service levels, and intelligently determine the likely outcomes from a given set of real-time and past conditions," explains Haggiag. "It then determines the best response based on parameters set by each client – and can flexibly adapt to emerging requirements. In addition to reducing operating costs, it provides unprecedented visibility of KPIs around costs and resource utilization."

In a pilot exercise for Egged, a major Israeli transportation company that is now deploying the full solution, Optibus used its technology to show how the company could shut one of its two parking depots without any impact on schedules – potentially generating enormous annual cost savings.

"Another client, Kavim, has seen a seven to ten percent reduction in operating costs," says Haggiag. "We forecast similar savings for Egged, which will translate into larger revenue savings based on the size of the company. And in other areas, we have shown clients how to improve quality of service without raising costs."

By helping bus companies run the right number of buses to cope with changing patterns of demand, the Optibus solution helps to cut emissions, supporting international efforts to reduce air pollution and greenhouse gases. Kavim reports eliminating approximately 0.5 tons of CO_2 per bus each year – representing a significant saving in fuel costs, as well as a boost for the company's green credentials.
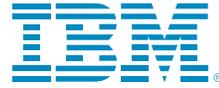
SoftLayer provides a highly scalable platform for the Optibus solution, making it easy for the company to expand its SaaS offering into new markets. "We aim to change the way public transport is organized, promoting greater responsiveness and efficiency," says Haggiag. "IBM Big Data & Analytics solutions on SoftLayer are helping us solve big data challenges for transportation companies worldwide."

For more information

To learn more about how IBM data management solutions can help to meet today's big data and analytics challenges, please contact your IBM representative or IBM Business Partner, or visit the following website: **ibm.com**/software/data

To learn more about IBM BlueMix, visit **ibm.com**/software/bluemix

To learn more about Optibus, visit www.optibus.co