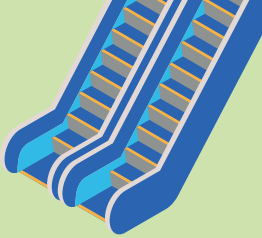
CALCULATING AND SHARING TRAIN OCCUPANCY IN REAL TIME

GOVIA THAMESLINK RAILWAY CASE STUDY

CACI

KNOWING WHICH CARRIAGES ARE FULL IS THE KEY TO REDUCING STATION DWELL TIMES AND IMPROVING THE PASSENGER EXPERIENCE. GOVIA THAMESLINK RAILWAY WORKED WITH CACI AND THE UNIVERSITY OF SOUTHAMPTON, AND USED WORLD-LEADING TECHNOLOGY TO PROVE THE CONCEPT ON THE GATWICK EXPRESS.



SUMMARY

Knowing where there's space on a train – before it arrives in the station – makes a huge difference to passenger experience and operational efficiency alike.

For the passenger, the experience of a crowded carriage is much the same whether the train is completely full, or there are seats elsewhere. And for the rail operator, the chance to direct waiting passengers to the best points on the platform can help to reduce station dwell times, as passengers board and alight more easily.

These were the issues Govia Thameslink Railway (GTR) hoped to address when it won funding from the Rail Safety and Standards Board (RSSB) for a research project into understanding real-time passenger numbers aboard the Gatwick Express. It could then apply this knowledge to deliver reliability across its network – most notably the fast-moving Thameslink service.

But to prove its concept, GTR needed to tackle two key issues in real time: the actual number of passengers, and the real composition of the train.

> We've proved you can know the exact train composition – and how many passengers are aboard – at any given time. That's powerful information to keep our customers informed and happy, and our trains running on time.

Stewart Wells, Customer Information Projects Manager, Govia Thameslink Railway.

THE PROBLEM: FROM FORECASTS AND SCHEDULES TO REAL PASSENGERS AND CARRIAGES

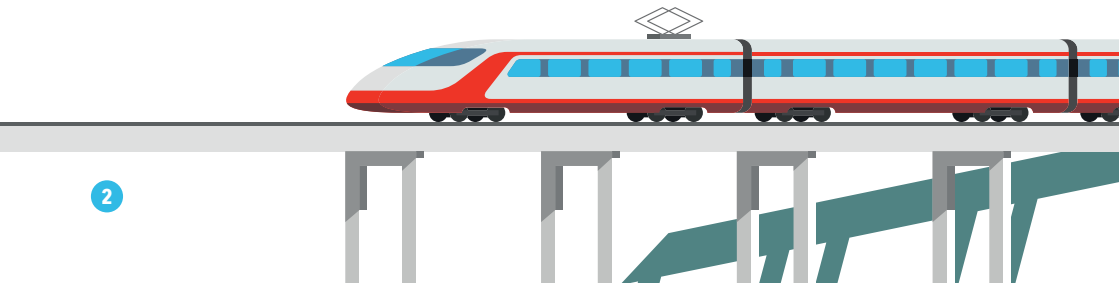
Until 2018, the Gatwick Express ran between London Victoria and Gatwick Airport only – so commuters boarding at Gatwick were virtually guaranteed a seat. Extending the service to Brighton doubled the number of peak-time trains to and from the coast, but also meant passengers at Gatwick could be faced by an already busy train.

GTR realised that improving customer and staff information could improve passengers' chances of finding somewhere to sit – or boarding near a toilet or bicycle space if needed. This would, in turn, reduce the time each train would wait at the station.

A working proof of concept would have wider implications for the network. Ensuring low, predictable dwell times would be key when expanding GTR Thameslink service to 24 trains per hour. Especially in the critical corridor before the new Canal Tunnels, a few seconds' delay on each service would have a mounting knock-on effect.

GTR had historical figures, as well as an events calendar, giving an indication of possible passenger numbers. But turning this into verified, real-time data would require the innovative combination of multiple counting technologies.

Meanwhile, engineers also needed to solve the problem of detecting each train's actual composition and orientation. With 48 possible permutations of its four-carriage train units, maintenance requirements and the realities of running a timely service meant that the actual rolling stock used for each service could be quite different to the day's plan.



THE SOLUTION: 8 DIFFERENT DATA SOURCES, BLENDED BY A UNIQUE ALGORITHM

After a competitive tender process, GTR chose CACI as its technology partner for the pilot. Meanwhile, the University of Southampton would devise an algorithm to review 15 data sources and choose 8 to calibrate and blend to calculate the result.

the model was repopulated with real-time passenger data, blending 8 separate data sources

The resulting system applied a three-stage process to each train. First, the historical data was matched with the scheduled carriage configuration to create an advance forecast for the likely occupancy level, and how this would spread out across the train.

a live, sense-checked picture of the real occupancy of each carriage

Then, this was updated to a more detailed prediction, based upon the train's real composition and any other short-term factors – such as cancellations to other services. The team developed an interface, allowing the system to draw data directly from each carriage's own sensors, detecting which train units were coupled in which order.

Finally, the model was repopulated with real-time passenger data, blending 8 of the 15 separate data sources, including:

- Ticket gate feed data – validated with the world's first use of shoe-counting camera technology in a railway setting
- Wi-Fi and Bluetooth data, using mobile device MAC addresses to track passengers' progress from the London underground to the platform, and on to the train
- Load weighing data from each carriage – calibrated at 6km/h using the changing weight of an average passenger relative to the time of day

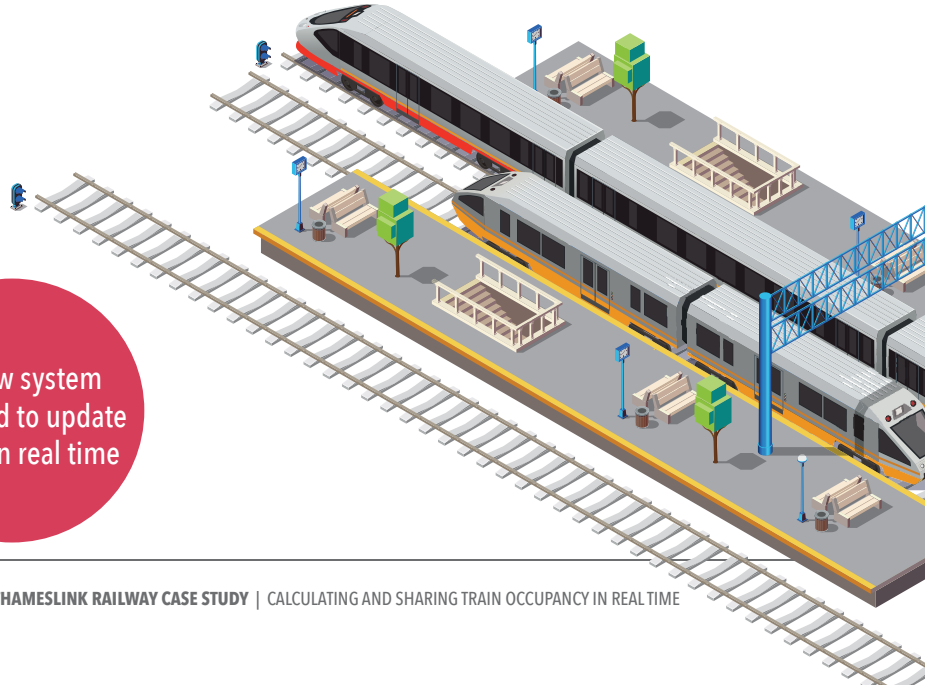
The data was collected in a back-end system developed by CACI, processed by the University of Southampton's algorithm, and fed back into the system – to give a live, sense-checked picture of the real occupancy of each carriage.

THE OUTCOME: EASY, WIDESPREAD ACCESS TO TRAIN CONSIST AND LOADING DATA

Creating an accurate, live picture of each train's consist and loading was only the first part of the picture. The team also worked with the developers of Darwin, the GB rail industry's official train running information engine, to create new fields for the data.

The new system interfaced to update Darwin in real time – first with its load and carriage composition forecast, then with live information as the real train consist and loading were confirmed.

This, in turn, populated downstream systems – including the Gatwick Express app powered by Darwin, and on-platform signage. CACI also developed a separate application for GTR staff, enabling them to direct passengers to the best possible point for a prompt, trouble-free departure.



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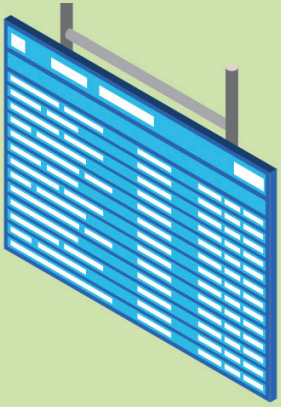

A SUCCESSFUL PROJECT – AND A PROVEN CONCEPT

GTR's project showed it's possible to automate live, accurate train and load information for passengers and operators by combining multiple data feeds. The RSSB declared the initiative a success.

> This project shows how the smart use of data can make a real difference for passengers and operators, too. We learned so much – which of the data sources are most valuable, and how they work together – and there's potential for further value in improving accessibility and tracking the real mileage of rolling stock. It's an important step forward.

Jason Durk , CACI Head of Rail Development

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