



JOINING THE DOTS

Technological aids are closing the communication gaps between operations and engineering departments at bus operators in the UK and Europe, finds Will Dalrymple

For a long time, Nottingham City Transport's engineering director had harboured a vision of making driver defect reports digital. Somewhat bizarrely, that desire was the spur for the operator of 310 buses to invest in a workshop management system, reports chief engineer Liam O'Brien (pictured, above, with technician Christopher Anderson holding device).

He recalls a pivotal conversation. "I said, 'Well, if you want to do that, we

need the back-end done first, so the drivers have a system to feed into.' That's when I started looking at a digital system," O'Brien recalls.

After installation last year during lockdown, Nottingham City Transport now uses Tranzaura for driver defect reports, and Freeway Fleet Systems to manage its two workshops, with a digital bridge between the systems. That provides job-by-job feedback between drivers and technicians, across the organisation.

O'Brien explains how it works: "There is a five-minute import and export clock. When you look at the driver device [in Tranzaura], a defect appears in red. When it has been transferred to Freeway, it turns blue - that means engineering is aware. When the fault has been fixed, Freeway tells Tranzaura again and it goes green, so the driver can see if there are

outstanding or completed defects or if it has been received by engineering."

Although it's helpful for drivers to be kept up-to-date about the status of repairs, the systems' cross-operation communication offers even greater benefits for the workshop. O'Brien continues: "The biggest advantage is in planning night work. Now we are dealing with today's defects. Before, paper defect cards were collected as the buses ran back into the depot so we were not aware of all defects until late in the evening, leaving less time to respond. Also, all our vehicles have radios, so we can talk to the driver that put the defect on. We've never been able to do that before. The driver that reported the fault is often not the same person that brings the bus back in on the evening."

O'Brien says that it chose Freeway because it could be customised to

match its existing processes and to recreate the look of paper forms in a digital format. The difference being that the digital process stores all the inspection and defect data in a single database leaving an auditable trail for every defect on every vehicle. The stored data is also readily available for analysis.

To facilitate this, the operator invested in a bank of 25 Samsung Galaxy mobile phones kitted out with Intelliskin protective cases and a few tablets for technicians' use in carrying out inspections or doing repairs. (Though in fact, when used, the tablets have proven less popular than the phones, which are easier to handle or stow in a pocket when holding a torch and tapping hammer).

Apart from software and hardware, the other major investment was O'Brien's time. He reflects: "I spent a lot of time with the development team and the implementation guy; I am really a super-user on the system, and pass that down to my managers and supervisors and administrators." Set-up began in October-November 2019 and included data import; testing began in early 2020, and the system went live in April. For the first month, it ran side-by-side with a paper system, to help ease the transition.

He concludes: "I am 42 - a bit of a nerd, if I'm honest; I had a Commodore 64 - and I was of the first generation to grow up with computers at school, so I found using the systems fairly straightforward. One of the biggest successes of the project is that it is used every day by staff of all ages and all levels of IT ability to keep our vehicles safe and compliant."

ACROSS THE CHANNEL

Facing similar concerns about internal communication was Nico Schoenecker [pictured, p12], CEO of Autobus Oberbayern, a German bus company, which employs some 800 people to run around 300 buses and coaches around



the Munich area. More than two-thirds of maintenance is carried out in three workshops (one is pictured above) by the company's own staff, with the balance done by OEMs.

One of the operator's biggest technical issues is obtaining up-to-date information about the current status of each bus. Although drivers would naturally be the first to notice a dash light or potential fault, they have little sense of ownership over the bus they are driving, and no way to directly communicate with technicians.

Schoenecker observes: "We have problems getting information from drivers to the technical experts in the workshop, and also a bigger problem getting information back to drivers that the problem is solved, or we couldn't find the problem."

For that reason, he was receptive to a cold call from Awake Mobility, a Munich



neighbour, offering a new approach to bus maintenance. (The tech start-up has recently hired bus industry veteran Steve Appleby, a former First Bus engineering director, to scout for UK market opportunities).

Schoenecker adds that as Autobus Oberbayern was already looking for a way to digitalise communications between workshops and drivers, the predictive maintenance system that Awake Mobility was offering could solve its the operator's problem another way. Instead of relying on drivers to report defects, the buses themselves would inform the technical department.

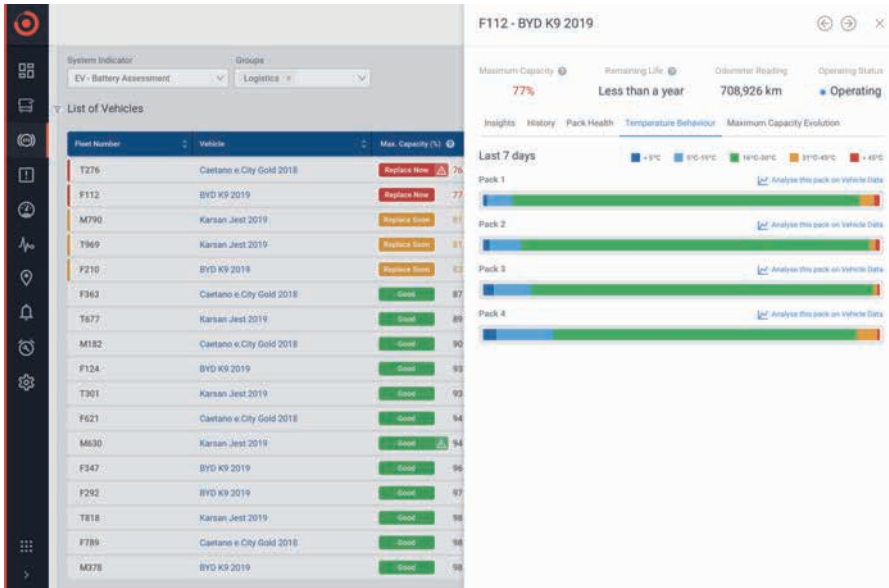
THE TRIAL BEGINS

In May, the company fitted some 20 buses with devices that read vehicle signals off the CAN-Bus and send them to Awake Mobility. The detectors transfer some 80-100Gb of data per bus, per month, to the company's databases, where a proprietary algorithm (software) will look for patterns. Over time, the algorithm will learn to distinguish between normal operations and anomalies. Based on this experience, the system will start to make predictions about what is likely to happen in the future. Given enough data and enough time, the system should be able to predict breakdowns before they occur, the company claims. It has promised



“We have problems getting information from drivers to the technical experts in the workshop, and back again”

Nico Schoenecker



Autobus Oberbayern a 50% reduction in unplanned breakdowns by the end of the trial in 12 months, says Schoenecker.

The operator is just one of a number of 12-month trials currently under way, and involving a total of 80 buses, explains Awake co-founder Daniel Tyoschitz. That relatively long trial period was chosen for a few reasons, he says. First, buses experience different problems in different seasons, so it will take a year for the system to experience everything. Second, he says that it takes time to convince sceptics. “Our approach is to on-board mechanics, and co-create a solution.”

The third reason is to allow enough time to pass for everything to go wrong. Explains Tyoschitz: “The more failures we see, the more data collected, the better the system’s suggestions and recommendations for maintenance.”

The final step is to validate the algorithm; to tie anomalous signals back to a failure code on the vehicle. It also collects manual maintenance data from its SAP system for analysis.

He continues: “We are crazy data guys; we are turning the industry upside down.” He describes the traditional way an operator approaches maintenance

cost-savings, by typing past failures and their costs into a computer spreadsheet programme, and calculating an average. Then they can compare the average cost of wear parts and the distances travelled to calculate a cost/km in part value. Concludes Tyoschitz: “But that’s not accurate. We come with a new approach that most people don’t really grasp, because AI is new, complex and ever-evolving, always improving. But we believe it will be the future, not only for buses, but also for other sectors.”

A RIVAL

The approach is very similar to Portuguese rival Stratio, which began as a research project and transferred to a commercial footing in 2017. Since then, it has expanded into markets such as Spain (Tussam), France (Keolis, RATP), Czech Republic (Arriva), Singapore (SBS Transport, corporate cousins of Metroline), Mexico and the UK.

Like Awake, its on-vehicle detectors pass on every bit of data they can. Explains head of research Rune Prytz: “There is too much data for even semi-manual processing; it needs to be automatic.” He adds that its research team, which is responsible for the AI

model, is multidisciplinary, and includes automotive experts.

That diversity is to try to connect the digital signals and what’s actually happening on the vehicle (its dashboard is pictured at left). One technique in particular that Stratio’s system uses is to go back in time before a breakdown occurred, he explains. “We can find something that has happened in the past [a fault], and look at how the data looked beforehand. Then we gain knowledge and build backward.”

Prytz contends that the principal value of predictive maintenance for bus fleets is to minimising maintenance, to make the best use of relatively few workshops. He adds: “The garage needs to know beforehand what they need to do. If they don’t know, they will have to spend the time figuring out and then they won’t have the spare parts ready.”

Although the company declined to share the system’s precision – the accuracy of its forecasts – for commercial reasons, Prytz did say that it is monitored daily. “We need to know when things are going wrong, to see if we need to revise the model.” And he also adds that the company is very careful about false positives – when the system predicts a problem that never materialises. “We basically don’t have any. We would rather miss a repair than have a false positive, because of the risk of losing trust.” (For more information about its analytical approach, see the white paper available via www.is.gd/pusuna.)

Stratio has set its sights wider than just buses and just maintenance; it has also expanded into long-haul transport, and is looking to move into fleet management more broadly. Marketing manager Mário Cruz says: “We are a data-driven company, and not all transport management companies are. We are able to feed a fleet management system with maintenance information from a totally different set of technologies.” **TE**