Transport for London, UK

Integrated operations control system for more than 9000 vehicles

Industry

Bus

Challenge

Provide bus operators with effective service control tools

Solution

AVLC Operations control system (ITS technology)

Overview

- 9,200 buses
- 700 routes
- 89 control centres
- 250 service controllers
- 40 control centres

Snapshot

- ✓ Performance measurement for fair service billing
- ✓ Real-time information for London's bus passengers
- ✓ Connected to the emergency control room

Background

London has more than 9000 buses operating on around 700 routes, taking more than six million passengers to their destinations everyday. Bus services are run by private operators with up to 250 service controllers managing the routes in 40 control centres. In 2005, London Buses and Trapeze embarked on a major programme to enhance the bus fleet management capabilities across London: the iBus project.

Objective

London Buses wanted to provide the bus operators with effective service control tools. All buses should be equipped with new technical systems. This needed a completely new solution, which was provided on the basis of Trapeze's AVLC operations control system. At this point in time, Trapeze's LIO system was already an established vehicle management solution that had proved its worth throughout Europe and was operating in many German cities. London Buses and the engineers were given a local demonstration of the system. The technical specifications for London were then produced. The solution includes dead reckoning in combination with map matching – an innovative approach to navigation that produces location data, even without satellite navigation signals. In the course of the project, iBus proved very convincing with comprehensive, reliable data provision so London Buses also decided to integrate an automated mechanism for monitoring and measuring the performance of the bus operator companies.

Solution

One central challenge of the iBus project was that the system should be able to respond flexibly to the constant growth of London with a corresponding need to expand the bus service to up to 10,000 buses. iBus meets this challenge with the possibility of a seamless extension of both buses and routes at any time. Absolutely reliable navigation for the vehicles was another equally important criterion for London Buses. Furthermore, crucial significance was given to the stability and availability of the new solution.

With the functional demonstration testing concept, London Buses and Trapeze were able to introduce the bus operators to the individual components and system functionalities with corresponding demonstrations as soon as these had completed the development phase. This gradual approach greatly enhanced the willingness of the service controllers to accept the new system. Moreover, the actual official acceptance of iBus was preceded by an introductory phase with verification tests, where London Buses was involved in every step of the proceedings. The final official tests were then no more than a formality.

Following a successful eight-week pilot on route 149, the 18 month roll-out of the iBus system to all vehicles commenced in 2007. During roll-out, the system was installed on 28 buses a day at two

installation sites in London, with the addition of a roving team installing buses on-site at garages. By 2009, all 8200 buses in London were fully equipped with the iBus system.

iBus is also now the data collection and calculation engine behind the payments to bus operators. In the past, London Buses used manual random sampling methods to evaluate the performance of individual bus operators. To automate this process, an additional system was developed to cover all trips and incidents. Processing of the local garage records permitted fair performance assessment of the operators. Incidents causing delays or breakdowns beyond the operator's control are entered at a user interface in order to calculate the performance that would have been achieved without these special circumstances.

Headways with appropriate waiting times have to be observed on the bus routes. If service is jeopardised by an accumulation of trips, then service controllers can intervene accordingly. Total performance measurability thus also helps to make the bus service more reliable.

All buses have been equipped with a precise tracking system, digital stop DPI signs and audio announcements. A prediction system uses the tracking information to compute the arrival times at every stop and permits dynamic, real-time, constantly up-to-date passenger information via countdown signs at over 2600 bus stops, digital signs at bus stations as well as through the internet and text messaging.

iBus is connected with CentreComm, London Buses' control centre for emergencies and escalation. The exact location of every bus can be displayed on monitors in the control room, thus shortening the response time in emergencies. Immediate intervention is also possible, even if a driver cannot set up a voice call.

The real-time information integrated in the AVLC system permits efficient dispatch of all vehicles together with dynamic timetable adjustment in any situation. The position of the buses is known at all times, thanks to a combination of GPS, dead reckoning, map technology and logical location. The current general overview also ensures that the right decisions can be taken swiftly at critical moments and in unscheduled operating conditions.

User-friendly Mobile Data Terminals (MDT) give the drivers all the relevant information about the schedule/headway situation at the touch of a button, as well as displaying messages issued by service controllers and enabling contact with the garage and CentreComm. Important tasks such as traffic light control or announcements at bus stops are triggered automatically by an on-board computer.

iBus currently handles communication between the buses and the garage/CentreComm with an analogue voice radio system that can also be used for GSM. When a priority call comes in, the analogue system automatically sends the GPS coordinates to the emergency control room. From mid-2018, a roll-out programme will commence which will see the analogue radio upgraded to a new digital radio system. This will provide sufficient scalable capacity and coverage to cover voice and data capability for buses over the next ten years.

Results

Punctual completion of the system roll-out was assisted by a solution strategy for problem buses. A contingent of additional buses was available besides the planned vehicles. If an operator was not able to make a certain bus available, the equipment was installed on a "replacement bus" instead. In addition, weekly schedules were drawn up at regular meetings to stipulate the sequence of bus garages and corresponding iBus installation. Effective solution methods were defined for current problems.

"The major iBus project by LBSL entails data and voice connections for the world's largest AVLC solution. Implementation of the project would not have been possible without the know-how,support and commitment of our main partner Trapeze"

Paul Fitzpatrick, Technical Services Group,
Transport for London