Local Bus Priority, Centrally

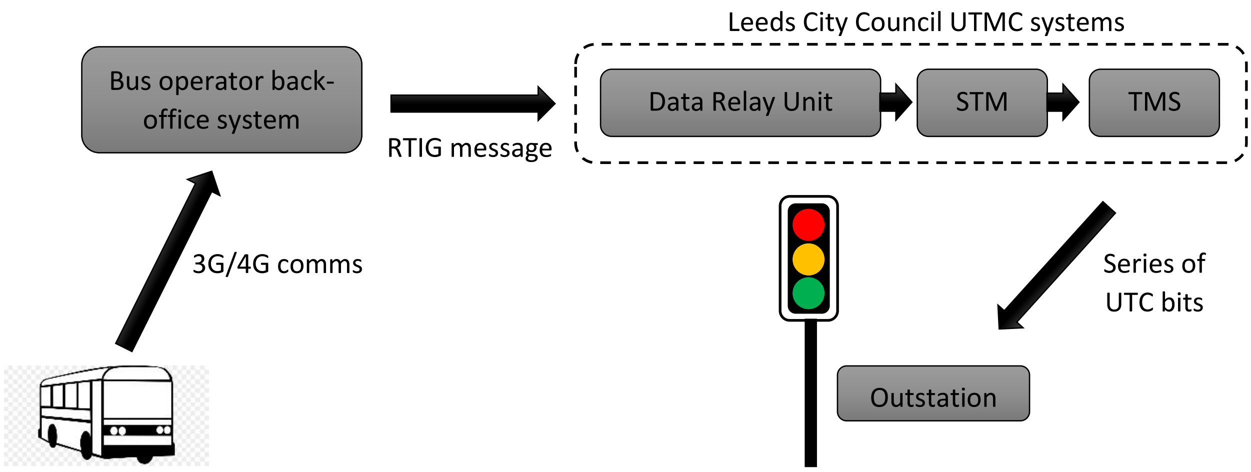
Pep Corso: giuseppe.corso@leeds.gov.uk, **Dan Morris:** daniel.morris@motustraffic.com, **Ben Hallworth:** ben@brhallworth.co.uk, **Tony Smith:** tony@underdogsoftware.co.uk, **Joel Dodsworth:** joel.dodsworth@leeds.gov.uk

Background

Leeds City Council (LCC) is currently delivering a major public transport investment programme of approximately £174 million. In Leeds this means investment is focused primarily on bus priority. The schemes within the programme include the introduction of a significant length of physical bus lanes along with other measures to improve access to the bus network such as upgrading walking and cycling infrastructure. However, it has also been recognised that technology has the potential to add significant value to the investment in physical infrastructure.

Traffic Light Priority (TLP) has already been in use in Leeds for a number of years but the Leeds Public Transport Investment Programme (LPTIP) has provided an opportunity to review the system operation and identify opportunities for improvement. One area that has been identified is the communication between the back-office systems located in the centralised server room and the outstation units on street.

In the past, a beacon system was used to transmit bus priority requests from buses to either central or local systems (via different methods) that interfaced with the signal control strategy to provide bus priority. However, this required additional equipment on buses that became unviable to maintain. Current TLP systems use the bus ticket machines to provide priority 'triggers' when the bus drives through a geo-fenced detection zone. The triggers are transmitted through the onboard 3G/4G communications, through the back-office system of the bus operator and then onto the UTC back-office systems, shown below.

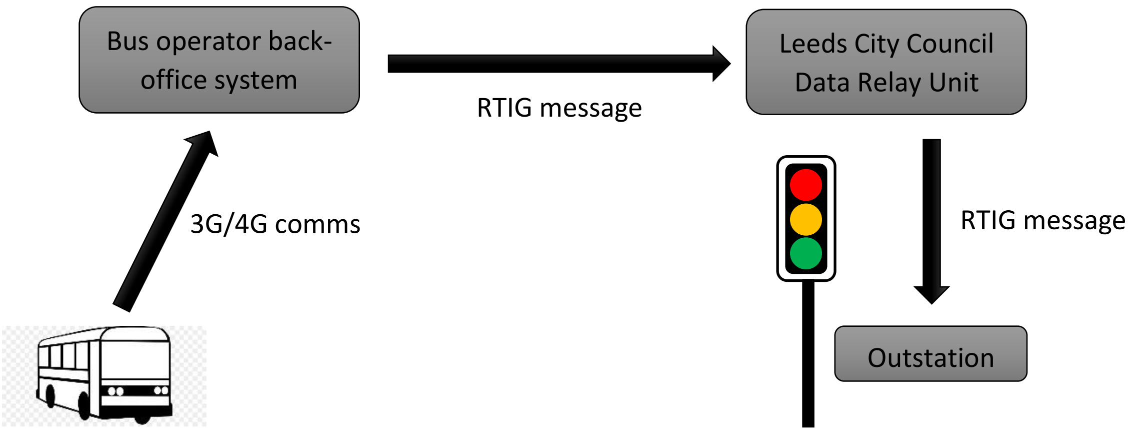


Pep Corso: giuseppe.corso@leeds.gov.uk, **Dan Morris:** daniel.morris@motustraffic.com, **Ben Hallworth:** ben@brhallworth.co.uk, **Tony Smith:** tony@underdogsoftware.co.uk, **Joel Dodsworth:** joel.dodsworth@leeds.gov.uk

Changing to this method of TLP has removed the previous possibility of providing local priority via direct communication (i.e. for use in MOVA) and thus has required sites to be connected to a UTC system to enable bus priority. Furthermore, the bus trigger message (using the RTIG protocol) has to be converted in the central UTC system into a bit that can be transmitted through the UTC system to an outstation. This process was estimated to add 2-3 seconds latency to 'local' bus priority compared to the previous direct method using radio transmitters, given the second-by-second nature of the UTC system.

The magnitude of latency reduces the effectiveness and efficiency of the bus priority action at a junction. In some cases the latency can be accounted for by simply placing triggers further upstream but this supposes consistent latency. However, where bus stops are located on an approach, it is desirable to trigger a bus priority action as soon as a bus leaves the stop. Furthermore, to maximise efficiency at a junction, it is preferable for 'cancel' triggers to operate with as little latency as possible to prevent green extensions continuing after a bus has crossed the stop line.

To overcome the issues described, it was proposed that the UTC systems could be removed from the process of communicating the bus priority request to outstations. To do this would require that the outstations could directly handle the RTIG bus priority message sent from the LCC Data Relay Unit and convert it into an output to be used locally (see below). Leeds City Council challenged our outstation suppliers to develop that functionality into their existing outstations and our partners to develop the back-office systems to support it.

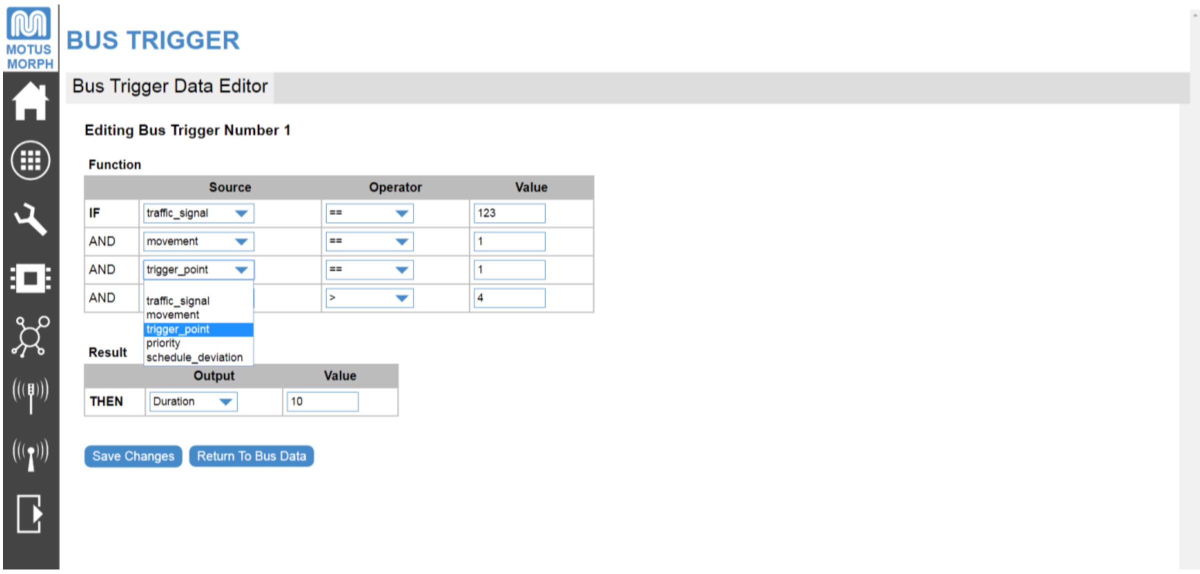


Local Bus Priority, Centrally

Pep Corso: giuseppe.corso@leeds.gov.uk, **Dan Morris:** daniel.morris@motustraffic.com, **Ben Hallworth:** ben@brhallworth.co.uk, **Tony Smith:** tony@underdogsoftware.co.uk, **Joel Dodsworth:** joel.dodsworth@leeds.gov.uk

Outcomes

Motus was the first supplier to take on the challenge of developing the RTIG interface into its Morph unit. A user interface has been developed (see below) that enables users to build up logic using schedule deviation and other parameters to drive outputs that can be directed to MOVA.

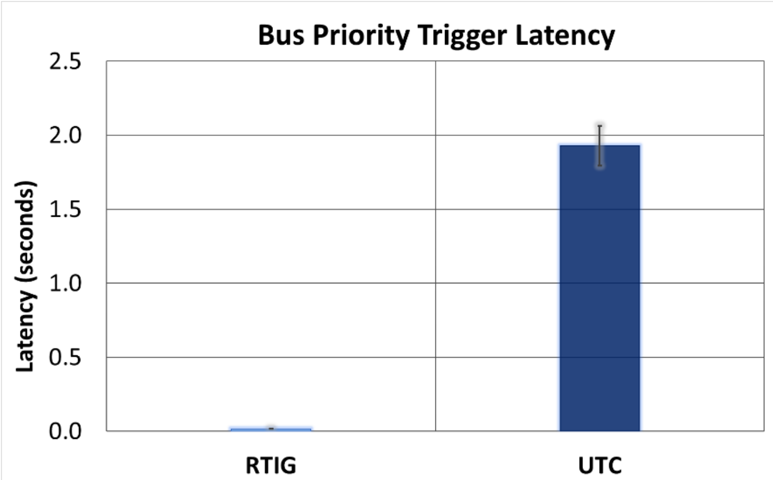


The test site was chosen due to it being an existing MOVA 8 junction operated using a Morph unit. The site is located to the north of Leeds on the intersection between the A660 and Farrar Lane. A regular bus service travels through the junction along the A660 and so bus priority trigger zones were configured on the north and south approaches to the junction. The back-office system was updated to send the RTIG messages directly to the Morph unit and, for comparison, the UTC system (via the existing STM software and TMS) was also configured to output a bit to the Morph. The time stamps for each method were recorded to compare latency.

Initial testing has proven that this method consistently and significantly reduces latency, by approximately 2 seconds, compared with the previous method (chart below displays this with 95% confidence intervals). This validates the initial estimation of the potential benefit of the software development. The user interface also enables bus priority rules to be easily constructed and provides flexibility for engineers compared to dealing with multiple back-office systems.

Local Bus Priority, Centrally

Pep Corso: giuseppe.corso@leeds.gov.uk, **Dan Morris:** daniel.morris@motustraffic.com, **Ben Hallworth:** ben@brhallworth.co.uk, **Tony Smith:** tony@underdogsoftware.co.uk, **Joel Dodsworth:** joel.dodsworth@leeds.gov.uk



Providing bus priority locally still requires a method of communicating with the Data Relay Unit that handles the RTIG feed from the bus operators but the reduction in latency reinstates the local priority level of service that was previously lost.

Next Steps

Other suppliers are now developing their own interface to provide similar functionality and this will be rolled out over the next few months along the A65 corridor which is being upgraded to MOVA 8 as part of an NPIF funded scheme. The upgrade of junctions as part of LPTIP will begin to follow shortly afterwards which will enable the system to be deployed across a large number of sites in Leeds.

The way that bus priority is deployed is also being tested to take advantage of the new features of MOVA 8. The effectiveness of providing additional weighting to buses (at different levels depending on whether they are late) is being observed and compared to providing absolute priority. This will become increasingly important at sites with multiple, competing, bus services.

Acknowledgements

Many thanks go to Dan Morris at Motus for being the first to develop this innovation and to Tony Smith and Ben Hallworth for their support in developing the specifications and modifying the Data Relay Unit to provide the necessary communication with the outstation. Thanks is also due to Telent for developing an interface that is due to be tested very shortly.