Real Time System

Recommendations

That the Board:

i. Receive this report.

ii. Note that:

a) BT will continue to improve the current system in conjunction, with the AIFS rollout and report back in June 2014 on results including customer feedback.

b) That BT will continue to research, in conjunction with NZTA and other Australian Transport Agencies, possible alternative solutions that would enable a significant improvement to the customer predictions.

Executive Summary

AT operates the public transport Real Time Passenger Information System (RTPIS) which has not been performing to customer expectations. The original on-board bus equipment was notified as end of life in December 2012 and the contract with the current provider needed to be renewed by October 2013 to enable the system to continue until a replacement was investigated and implemented.

With the introduction of AIFS, a new bus driver console was implemented, this console was required to interface with the RTPIS system on-board the bus. The opportunity was taken to enhance that interface and to replace the additional manual requirement for the bus driver to log onto both systems.

A Tender process was undertaken to seek a replacement system that would meet the functionality and accuracy AT required. This has not resulted in the identification of a suitable replacement.

Improvements have been made on the system as a result of the new equipment.

This paper outlines the situation, the improvements and next steps BT proposes to take to make this or another system meet AT requirements.

Background

The same RTPIS system has been used for approximately 12 years, during which time the vendor has been changed several times. The underlying system has remained the same but has been modified significantly.

During 2012 the system accuracy deteriorated to an extent that there was considerable public discontent, resulting in AT investigating ways to improve the system or alternative solutions.

As planned during 2013 the rail component of the real time system was implemented, following development with KiwiRail of an interface to obtain the real time location of trains. This rail functionality includes the ability for TransDev to manage platform changes at Britomart and Newmarket which previously was done using a whiteboard.

The rail system was tested extensively with onsite performance checks, the outcome being that the system is very accurate and receives no adverse publicity. The rail operator TransDev also considers the system to be accurate and reliable.

The RTPIS system is used to feed schedule and departure wharf information for Ferry to the various wharf display units, it does not predict real time arrivals.

A number of projects were commenced in early 2013 to ensure that AT achieved improvement outcomes without becoming locked into a single vendor (as previously was the case) whilst incorporating the needs of the AIFS project. These improvement projects involved;

a) Componentisation of the system. (moving from a proprietary solution)

b) Replacement of on-board bus equipment

c) Arrival time prediction engine replacement

a) Componentisation

Up until 2012 the system was a complete end to end solution provided by a single vendor (with the exception of the street signs). During 2013 AT broke down the system into discrete components with the help of the vendor. This meant that the bus equipment, signs, and prediction engine can now be sourced separately from multiple suppliers. The benefits of this is that AT can;

- Use any provider for signs
- Use alternative solutions for the on-board bus equipment
- Use an alternative predication engine
- Provide a new interface for the PT Operators

At the same time AT negotiated a new licence arrangement providing for an enterprise licence rather than a per device licence, limiting future cost increases as the system is expanded with additional signs and buses

A new key component of this solution to support componentisation is a Services Bus Gateway built by BT that allows in and outbound messages to be relayed between all the components, processing in excess of 9600 messages per minute for the system.

b) Replacement of on-board bus equipment

In order to meet the obsolescence notice of the on-board bus equipment, and also provide the integration into the AIFS system to overcome some of the identified weaknesses of the current system, BT replaced the on-board equipment at a cost saving of 20%.

Tracking buses is critical to the success of any arrival prediction engine. This impacts on the ‘first stop’ arrival time, which is of importance to operators and AT alike as it is used in performance management as to when services commence at that stop. The result is that bus tracking has improved significantly

c) Replacement of Real Time System or Prediction Engine

In 2009 ARTA went to market for the replacement of the RTPIS, at that time no replacement system was found that could meet the functionality or cost of the current system.

In 2013 the replacement project team worked with NZTA to define the requirements for both Auckland and potentially a system capable of being expanded for other regions.

An RFI was completed and subsequently a RFP was released. Eight responses were received to the RFP, not all the RFI respondee companies participated and of note two of the preferred RFI vendors did not bid in the later RFP process.

The RFP Process has determined that none of the respondents can provide the functionality required for Auckland. This is due to the way Auckland operates services, i.e. link services that are completely circular in nature, and routes which have loops in them as buses cross back across their path and some of the driver required information provision.

Predication Analysis

Work was undertaken to improve the accuracy of the current system, in parallel with the procurement of the new system, in order to see if the current predication engine could work better for Bus given the positive results of Rail. The introduction of the Thales Bus Driver Console could improve the data exchange with the bus component of the RTPIS. Two elements have been considered relevant here:

1) Overseas agencies (New York) have removed the minute timing for bus arrivals and show either one or two stops away instead. The rationale for this is that the last two stops are the most unpredictable, given if a bus may get either a red or green light at any intersection just prior to the stop resulting in the predication being plus or minus minutes. Most people at a bus stop would be able to see a bus one stop away in the traffic. This option is available with the incumbent supplier and is currently being implemented on a trial basis.
2) The prediction engines generally use historical data to help determine the time between points, however these times vary according to several known factors i.e. weather and holiday traffic. Work can be done to take account of those factors in either the current or a new system.

Prediction Improvement Initial Findings

The system performance with the new on-board bus equipment linked to the AIFS equipment has resulted in the following results

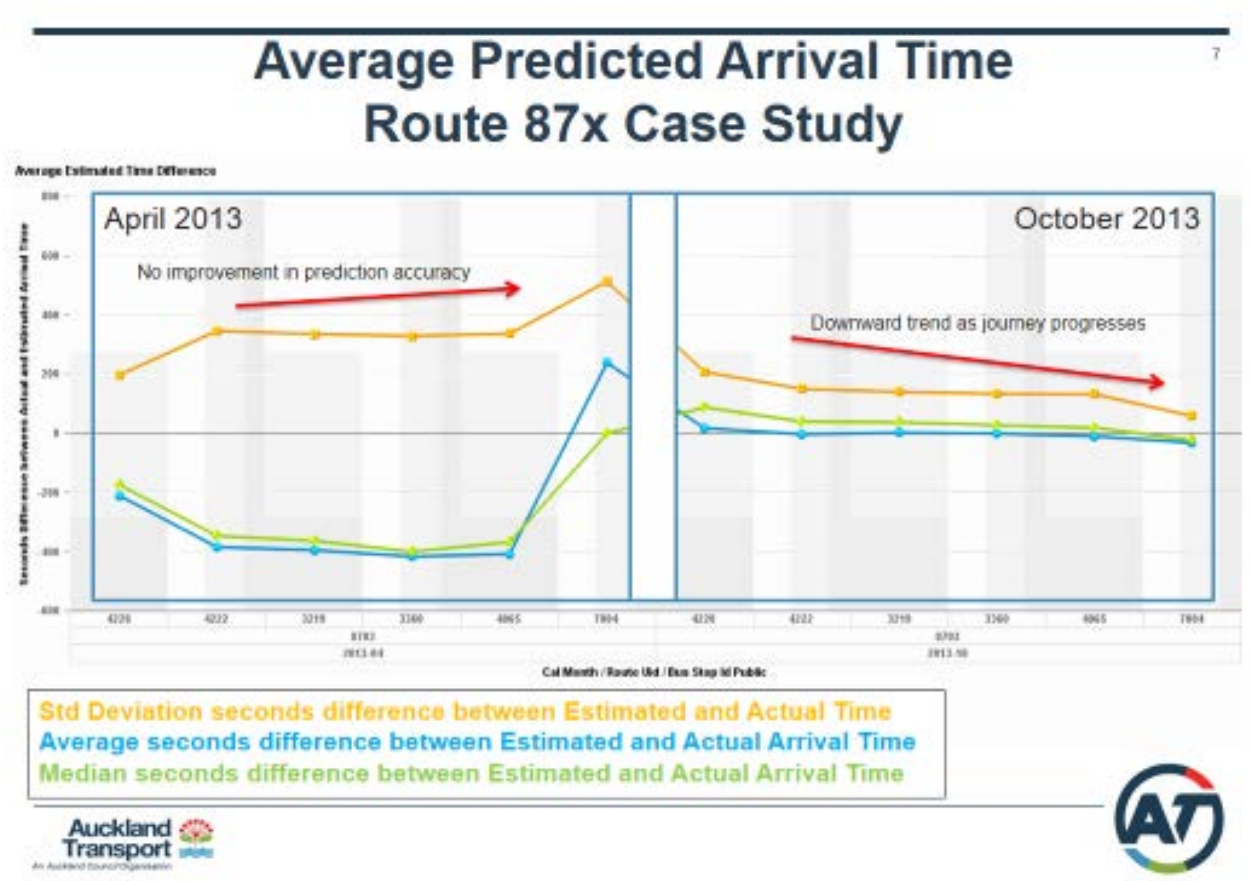
First Stop Sightings

Operator	% Sighting at First Stop - January 2013	% Sighting at First Stop - October 2013
Birkenhead	38%	87%
NZ Bus	75%	88%

Overall Bus Sightings

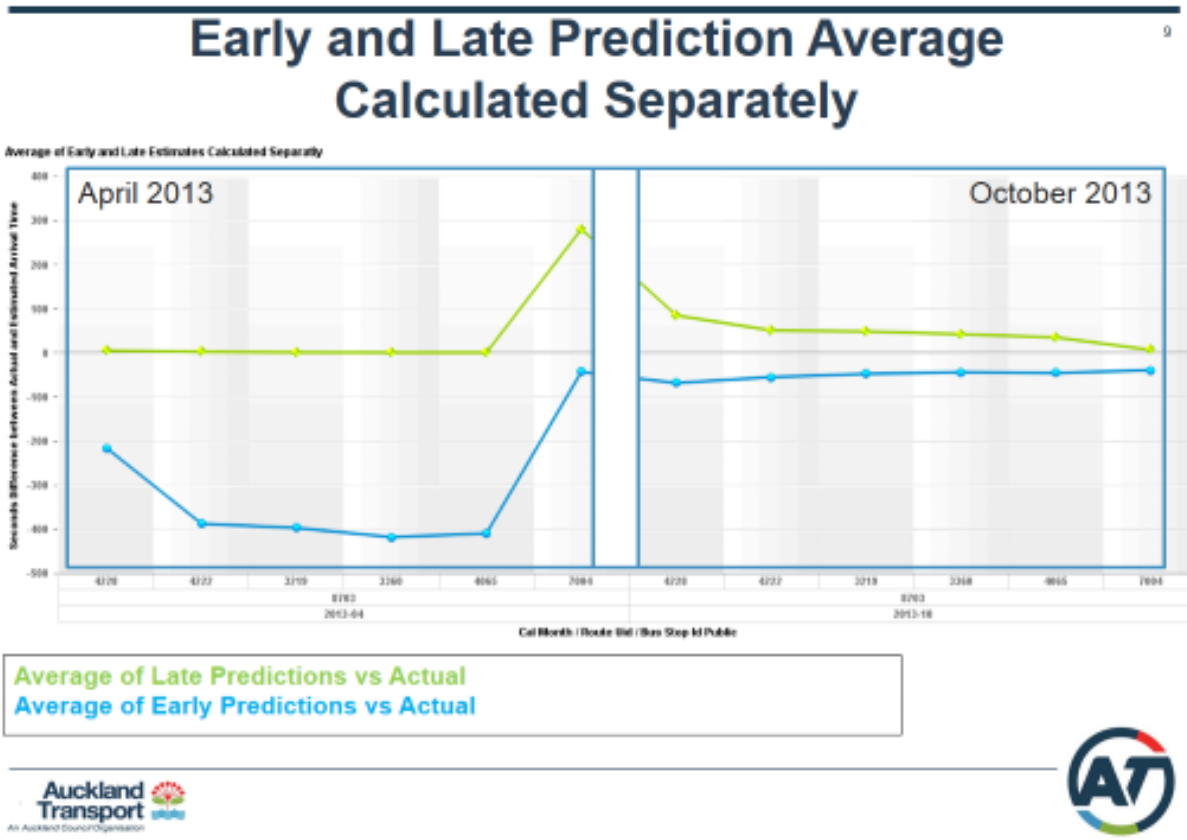
Operator	% Sightings at January 2013	% Sightings at October 2013
Birkenhead	43%	96%
NZ Bus	97%	97%

With a higher accuracy on the signs there is a direct impact on the customer. As an example the results from route 87X are outlined below:



Comparison of the Average Predicted Arrival time for April 2013 vs. October 2013

- An overall improvement in the Average prediction time is visible
- The Median prediction time is significantly closer to the actual time
- The Standard Deviation in October indicates that the overall predictions for this route are still on average 100 to 200 seconds later than the actual arrival time however, this is a major improvement on the April figures (between 400 and 500 seconds). In addition, the October figures show an improvement in the Average prediction time as the journey progresses. This indicates the predictions are self-correcting. This does not occur in the April figures.



Early predictions and Late Predictions analysed separately

Early and late predictions were analysed separately. This is to avoid Early and Late predictions being combined in the average calculations, and providing an incorrect picture of the overall average. For example, if two predictions were analysed one being -10 minutes early and the other +10 minutes late. The resultant average would be 0 minutes, and would indicate that on average the predictions were On-Time. This would be incorrect.

- The results indicate that on average there is a narrower variation in the predictions in the October figures, and both averages trend towards Zero. In the April figures a wide variation is evident in the averages (between +10 seconds and -400 seconds) whereas in the October figures the variation is far narrower (between +30 and -100 and reducing to +3 and -50). This narrowing of the variation, and move towards zero, indicates that the late predictions are less late, the early predictions are less early, and overall the predictions are a better indication of the actual timings.
- The overall improvement of the predictions across the journey is also evident in these averages.

Prediction result summary to date

The data from this case study indicates that a person at a bus stop is now likely to see an increased number of small changes in the prediction times. These will vary, both earlier and later than the actual time, but are not likely vary more than + or – 100 seconds either way from the actual arrival time. In the past a person was more likely to see a larger number of very inaccurate predictions and a small number of very accurate predictions. Further improvement on this will be made.

In addition, bus stops further along a journey are now more likely to have more accurate predictions, where in the past the opposite may have occurred.

Implications on the Capex and Opex Work Programme

RTPIS funding for this year included $4.1 million from the AT budget. Approximately $465,000 has been spent on RTPIS improvements this year.

Indications are that any new arrival time prediction engine will cost approximately $2 million.

AT will use some of the RTPIS replacement budget to fund delivery of the improvements identified in this paper. Deferred spending this financial year of $2.6 Million has been identified, and is included in the Second Reforecast of Operating and Capital Spend Board Paper. This will be finalised when the 'next steps' are completed and a decision is made on whether to replace the system.

Next steps

Based on the improvements achieved this year and the results of the tender process, BT will progress the following:

- Continue with present system and enhance it further
- Conduct research on existing systems to define why our business requirements cannot be met, then redefine the requirements further and go to market again potentially selecting a partner that would develop their system to meet the AT requirements;
- Continue to research the market by:
  - Exploring systems offered by the two preferred RFI vendors that did not respond to the FRP to determine if their systems could meet AT requirements
  - Monitor procurements that are currently underway in several Australian states for real time systems and their results
- System accuracy testing will then be required across the system to determine the exact results
- Develop mobile application to show Bus location on routes

Document Ownership

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Glossary

Acronym	Description	Business Unit
AT	Auckland Transport	
BT	Business Technology	BT
NZTA	New Zealand Transport Agency	
RTPIS	Real Time Passenger Information System	