CONGESTION

Auckland International Airport has taken to the streets to boost the city-to-gate experience for its passengers

Managing traffic at airports — connecting the data

By Richard Young

The extended solution provides a seamless picture of traffic flow information between the airport and Auckland CBD

CONGESTION IS the scourge of city life, but nowhere does it have quite such significant effects as when it occurs around international airports. When passengers and crew miss their flights, the knock-on effect can create air travel pandemonium that stretches out to other cities and countries.

For Auckland International Airport, this is exactly what played out in December 2016. An undetected early-afternoon incident triggered a succession of events that by 5pm turned a routine 20-minute journey into a 90-minute crawl. The resulting public, media and political outcry hardened the resolve of the airport, Auckland Transport and the New Zealand Transport Agency (NZTA) to do all they could to prevent a reoccurrence.

At that time there were multiple monitoring systems in place, including loop detectors and CCTV cameras with reasonable, if not comprehensive, coverage (operated by different organisations); several in-road count sites; and real-time data on passenger movements inside the terminals from an existing remote digital recognition (RDR) solution – BlipTrack – from Blip Systems. What was missing was an end-to-end view of the road system outside the airport.

Creating a solution – quickly

Beca was commissioned to deliver an immediate 'quick fix' intelligent transport system (ITS) solution in the short period ahead of the busy Christmas break. Given the two-week time period available, we recommended expanding the existing Beca-designed RDR traffic monitoring system that was in use on the motorway immediately outside the airport.

A robust and effective ITS system could be built quickly by adding 15 more RDR sensors and augmenting those with four, advanced multi-lane Doppler tracking radar systems to count and classify every vehicle approaching and leaving the airport threshold and terminal areas.

RDR is an advanced radio-based system that anonymously tracks a vehicle or mobile phone by collecting that device's unique digital ID and then matching it as it passes through a network. By partnering with Blip Systems of Denmark, a world leader in RDR technology, Beca has been instrumental in delivering this powerful technology to highways, airports and major spectator events throughout New Zealand.

Our thinking was, wherever possible, threefold:

Accelerate implementation time

The sensors we chose could be deployed rapidly, at less than 30 minutes per sensor. They also had rechargeable batteries and we located them on streetlights, where they could harvest power, and equipped them with 3G modems. That meant no extra cabling or fibre connections, which would require additional time and money, and we could place the RDR sensors on any available streetlight and not be tied to sub-optimal ITS cabin locations. Plus, we were able to work on configuration 24/7 by sharing shifts with our technology partner in Denmark.

Piggyback on existing resources

The solution used the well-proven BlipTrack RDR system. The Doppler tracking radar solution could be retrofitted onto existing RDR sensors, so no new power or communications needed to be deployed.

Use non-invasive implementation techniques

As well as helping to avoid causing traffic delays, this also avoided any need to work in the road which was an important 'safety in design' feature of the system. All configurations were undertaken remotely from site, making the process more efficient and safer.

As a result, deployment was achieved in two days, with commissioning running in parallel. The rest of the time was taken up refining point-to-point travel-time algorithms so the analytics software could learn to accurately identify useful trends in a complex travel environment, and calibrating the advanced radars to count traffic over six lanes and two directions simultaneously.

How to avoid gridlock

In a busy, confined road system, gridlock occurs when the inflow exceeds outflow and all the available on-road capacity is used. The analogy is that of a doorman letting too many people into a busy bar, resulting in no one being able to move or leave. To prevent gridlock, controllers (human or machine) need to know where to intervene to control inflow, pinpoint the moment that intervention is necessary, and measure the effectiveness of that intervention.

1. Identify critical intervention points

In the roads around the airport, we identified two key signalised roundabouts that offered the potential to intervene and reduce the inflow. These were the control points.

2. Measure the indicators that are most crucial to the customer

Whilst traditional highway engineers focus on level of service, occupancy, free flow and speed, none of these resonated with the airport's operations team. To them, and their customers, the only metric that was important was overall travel time – 'will I catch my plane?' As the Beca-provided RDR system provides live accurate and live travel times – updated every two minutes – this proved to be the key method of assessing performance and managing traffic flows.

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3. Pool area-wide data to track inflow/outflow and journey times

To monitor for signs of any impending gridlock, the solution pools the RDR and radar data from both the airport and NZTA equipment and feeds it into an Active Balancing™ (AB) module developed by Blip Systems and Beca specifically for the project. The beauty of the AB module is that it tracks the inflow and outflow in real time and presents the results graphically to the traffic controller. When inflow approaches or exceeds outflow, the display turns red, alerting the controller of the need for an intervention – in this case, to extend the inbound red signal time.

4. Make numbers-driven decisions and be bold

Unlike relying on CCTV screens, the traffic operations teams are using hard numbers to assess when to intervene, how much to intervene and then to measure how effective that intervention has been. The airport team set an overall maximum target journey time from joining the back of an airport-bound queue to arriving at the terminal of 30 minutes.

When travel times around the terminals grow too long, the most important action is to allow traffic to leave the airport. The most effective intervention is to use the approach motorway as a short-term store by holding traffic on a red at the signalised airport entry roundabout. This managed delay of up to eight minutes is advised to drivers through a mobile VMS (variable message sign) showing live travel times. Once released from the queue, the overall inbound journey to the terminal is still faster than allowing the motorway traffic to freely enter the airport and add to the congestion.

Since the Beca-designed and delivered AB solution was implemented, peak delays have been limited to the targeted 30 minutes.

What can other clients learn from Auckland Airport?

The critical ITS success factors at Auckland International Airport were a combination of:

- Public and private willingness to collaborate and share data across a neutral traffic analysis platform
- Customer-focused outcomes with emphasis on the metrics that matter to customers and clients
- Pooled city-wide data from multiple sources to provide live actionable decision-making insights

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- Critical data visualised simply in real time so controllers can respond appropriately
- A modular, non-invasive solution for fast, no-disruption deployment
- Managing by numbers through the use of hard numbers to make decisions and measure the effect of an intervention the same way.

But, perhaps the biggest take-out is that this solution to actively manage traffic can readily be adapted to other locations. While it will not solve every local congestion issue, it may provide a cost-effective and flexible method to alleviate congestion.

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