

# Eastlink, Melbourne, Australia

## Image Processing System

Eastlink is a 39 km toll road operated by ConnectEast, that runs through the eastern and south-eastern suburbs of Melbourne, Australia.

It was constructed in 2008 and observes more of a million vehicle passages per day, making it one of the busiest tollway operations in the country. The original tolling system at the time relied on a high on board units, also known as tags, to be operational to determine the identity of the vehicle for charging purposes, as well as an Optical Character Reading (OCR) engine that would determine the license plate number (LPN) for those transactions corresponding to vehicles without a tag. This resulted in a large number of images that needed to be manually reviewed and validated by operators.

### Shifting from a heavily manual to automatic image processing.

In the year 2010, ConnectEast identified the need to reduce the operational costs associated to the manual review process done by their business, and awarded to Kapsch the contract for the External Exception Passage Consolidation System (EEPCS), a system that allowed ConnectEast to facilitate the automatic identification of the licence plate numbers (LPNs) of those vehicles using the road.

Kapsch delivered the system and became operational later in that year. Since then, a series of further enhancements have been implemented as the product evolved, which has boosted the automatic number plate recognition (ANPR) performance over the last decade to reach unprecedented high levels achieved in the whole world.

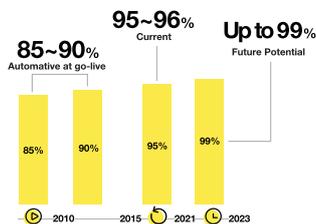


Figure 1 – ANPR performance



## Project Scope:

- Image Processing System adaptations, deployment, testing, training and go live just under a year.
- At the end of phase 1 (Go live) the system reached 85% of automation rate, with 0.1% false positive rate.
- At the end of phase 2 (+6 months after go live) the system reached 90%, with 0.1% false positive rate.
- Maintenance of the system since then until today, with several continuous improvements delivered over time.

## The Challenges:

- A large quantity of toll transactions required to be manually identified on a daily basis to properly charge the vehicle driving through, resulting in high costs associated to such activities.
- The error rate associated to the manual determination of the LPN was also relatively high. Human error rate averages between 2 and 4 out of a 1,000 transactions. This created an impact on the business reputation and resulted in the additional overheads to reverse a wrong charge.
- Delays between the time the vehicle drove through the road and when the charge is applied to the account owner usually resulted in delayed billing. An image going through a manual review process can take several hours to reach the front of the queue, and when we are talking about thousands of transactions we can figure out the importance of streamlining this process.

## The Solution:

Kapsch IPS has addressed these challenges in a compelling way. On one hand, it reduced the total number of manual validation required on a daily basis, from approximately 30% to 40% of the image based passages before its implementation down to just 3% to 4% as of today.

The way we provide a solution to these common challenges is by combining the use of several smart image processing algorithms with innovative and statistically derived logics, such as:

- Passage based automation: the system uses multiple OCR engines and ANPR algorithms in combination with data available from the roadside sensors and systems.
- Comparison with a reference: the system incorporates a fingerprint engine, which creates a unique identifier of the image containing the license plate (fingerprint). This results in an extremely low number of false positive results, which cannot be achieved with pure OCR engine base methodologies.
- Trip and time recognition: the system learns how and when a vehicle uses the road, and that knowledge is used to make automation decisions.

## The Added Value

- Reduction of the manual validation required (up to 10 times)
- Reduction the total number of errors (up to 2 or 3 times)  
Reduction of the total time required to charge vehicles for the use of the road
- Enabled a user friendly experience for the manual review of those images that can't be automatically validated

