AUSTRALIA'S INTELLIGENT ACCESS PROGRAM (IAP): ENABLING IMPROVED ROAD SAFETY OUTCOMES

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Abstract

The Intelligent Access Program (IAP) is an Australian Transport Council reform and has been developed at a time when the Australian road network is facing increasing challenges, including safety of the road network. Increases in freight volumes have been higher than truck travel growth rates because of the trend towards larger trucks and higher payloads. Heavier articulated trucks are replacing smaller rigid trucks. Along with freight issues, Australia is facing challenges in road safety through the interaction of people, vehicles and infrastructure.

The IAP provides a nationally agreed platform to support the current and future telematics business needs of governments. This ensures that the public and private benefits of IAP can be realised. The IAP provides a nationally agreed and industry compatible:

- Policy & regulatory framework
- Functional & technical platform
- Operational environment
- Commercial setting

The IAP has been operational for two years and currently has numerous IAP applications in NSW, QLD and VIC. Additional IAP applications are being planned in SA and TAS. The program now has a legacy to provide and build on the learnings from the road safety perspective. Of particular interest are the pre and post qualitative and quantitative observations of behaviour.

The paper presents the IAP as a broad function of applications. It presents specific applications identifying the safety benefits and outcomes.

Keywords

Intelligent Access Program, Telematics, heavy vehicles, ITS, compliance, enforcement, monitoring.

Background

Commercial heavy vehicle telematics have been broadly used in many applications, ranging from providing assistance to drivers to detecting and tracking vehicles and their loads. In Australia, significant investment has been made by the private sector in developing commercial telematics services. Governments have realised the potential of extending commercial telematics services into the regulatory context.

The Intelligent Access Program (IAP) was originally an Austroads initiative (www.austroads.gov.au) which brought the first national regulatory telematics applications in Australia. The IAP enables the provision of accurate compliance monitoring for heavy vehicles. It provides a whole new set of opportunities for both jurisdictions and transport operators to optimise performance of their business in terms of both efficiency and safety, and maximise the performance of the road infrastructure [1].

The IAP feasibility project identified a range of applications to which jurisdictions could apply the IAP and demonstrated the feasibility within business, policy and technical context. It was found that IAP could provide a significant mix of private and public benefits, including commercial advantage to operators, reduced regulatory burden on operators, better road safety, efficiency on road network, reduction in infrastructure wear, and more sustainable environment. A sensitivity analysis of benefits as a function of IAP take-up estimated that the maximum total benefits produced by IAP ranged from $118 to $212 million per annum. A significant part of the total benefits estimated came from the road safety saving which was estimated at $90 to $170 million per annum [1].

Current IAP applications have been primarily focused on increasing productivity and managing infrastructure. However, there are safety benefits associated with these applications, and the IAP can certainly be further extended to provide additional safety solutions as will be discussed in this paper.

IAP Model and Technology

The IAP is administered by Transport Certification Australia Limited (TCA). The IAP provides heavy vehicles with access or improved access to the Australian road network. In return, heavy vehicles enrolled in the IAP are monitored (using GPS technology) for compliance against a set of conditions including spatial, temporal, speed, vehicle type and mass. Importantly, the IAP has been designed to report non-compliant activities only to ensure that only the required information is provided to jurisdictions.

Within the IAP framework, four key players and their roles are defined (Figure 1).

Jurisdictions are the Australian state and territory road or transport authorities. Jurisdictions may establish applications, schemes or permits to improve road access for heavy vehicles and utilise the IAP as a compliance monitoring tool.

A transport operator may enrol in a particular IAP application offered by the jurisdictions. The IAP application typically provides incentives for the transport operators to participate, as the IAP is a voluntary program.

An IAP Service Provider (IAP-SP) is generally a commercial third party telematics company which provides IAP services. An IAP-SP is engaged by the transport operators to monitor their heavy vehicles against a set of Intelligent Access Conditions (IACs). Any non-compliance with the conditions of the IACs will be reported to the jurisdiction in the form of a Non-Compliance Report (NCR).

TCA is funded by the Australian federal, state and territory governments and acts as an independent organisation which provides administration, certification and on-going audit activities across the IAP.

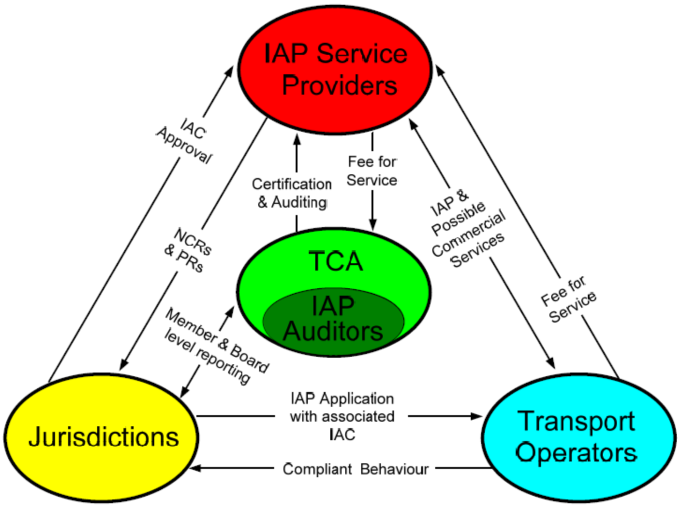

Figure 1: IAP key players

The IAP technology can be broadly described in three components: the in-vehicle-unit (IVU), the IAP-SP System (Back Office), and the jurisdiction system. Figure 2 shows the data flow between these components.

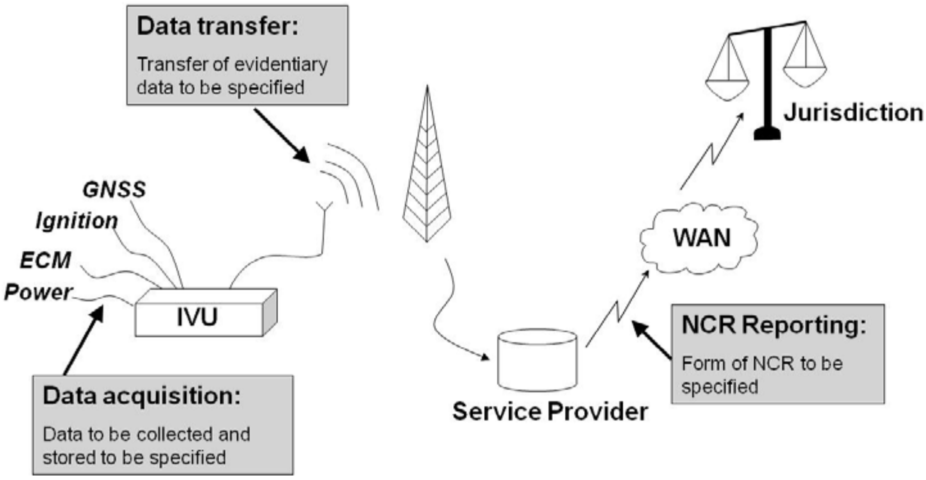

Figure 2: IAP data flow

The IVU is installed in the vehicle. It collects location, time and speed information about the vehicle (using GPS), and transmits the information to the Back Office. The IVU is also capable of receiving data from other sources such as an on-board movement sensor, a mass measurement sensor and driver self declaration and comments.

The Back Office stores the Intelligent Access Map (IAM) as a reference and the Intelligent Access Conditions (IACs) which the jurisdiction requires the vehicle to be monitored against. After receiving data from the IVU, the Back Office assesses the data against the IAM and conditions, and produces Non-compliance Reports (NCRs) which are sent to the associated jurisdiction.

The jurisdiction system is set up to enable secure and automated receipt of NCRs from IAP-SPs.

Safety Development and Outcome

As mentioned previously, the IAP was developed to facilitate safer and more efficient use of the national road network through better and more predictable compliance with road transport law. Previous compliance with road inspectors and police together with other ‘at-roadside’ technologies have now been enhanced with the availability of the IAP. The benefits and confidence of jurisdictions with continuous monitoring for compliance have enabled the flow-on of such benefits to transport operators and industry in terms of increased or improved access.

Under the current IAP applications, the IAP monitors spatial, temporal, speed and self-declared mass compliance. This means that the IAP-SP can determine whether the vehicle has been somewhere other than the permitted route or travelled on the permitted route but at a prohibited time, speed or mass. The exact nature of the access conditions (i.e. the combination of location, time, speed or mass conditions required of the vehicle) are determined by jurisdictions.

Since its introduction, the IAP has been applied to or is in advanced stages of development for a range of safety outcomes. Four such applications are described: speed, high productivity freight vehicles, mobile cranes and railway level crossing safety. A further, fifth, emerging safety application area is where IAP is used in combination with other road safety applications.

1. Speed

The ability to monitor speed was one of the original capabilities of the IAP when it was introduced. In IAP, a configurable speed threshold for the vehicle is pre-set by a jurisdiction. If this threshold is exceeded, a speed NCR (an exception report) is generated and sent to the jurisdiction. Speed compliance can be monitored to ensure vehicles operate at speeds appropriate for the environment and conditions in which they travel.

One jurisdiction has used speed compliance monitoring to notify transport operators of possible malfunctions in their speed limiter. The speed compliance application has provided visibility about the behaviour of heavy vehicles and potentially led to a considerable impact on this jurisdiction's consideration of future speed compliance policies. Another way of describing this is to say that the current compliance and enforcement policies were formulated based on information gained with roadside technology and human observations.

An example of some of the behaviours found is depicted in Figure 3 which shows the speeding behaviour of a heavy vehicle during a 12 hour shift from 8am to 8pm. The figure shows rest breaks as well as numerous occasions when the speed threshold of 105 km/h is exceeded, in some cases for brief periods and in other cases, for durations in excess of 5 minutes.

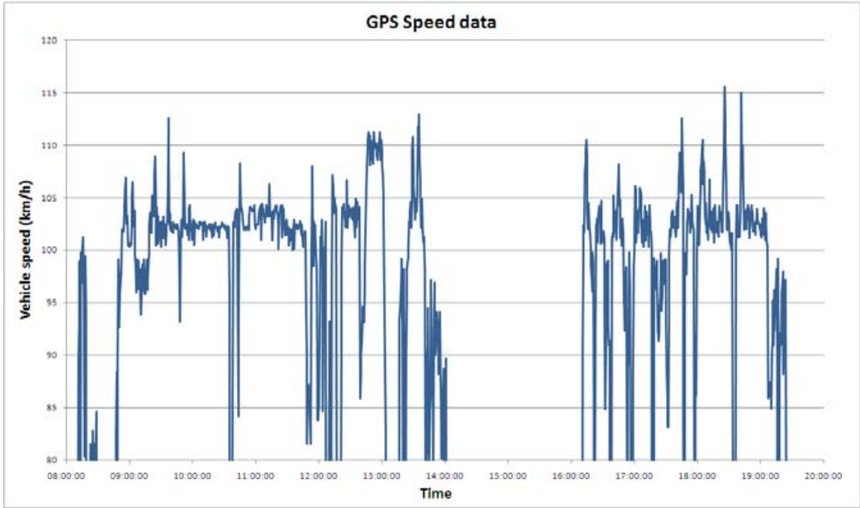

Figure 3: Example of GPS speed data (illustrative)

This information will lead to more informed decision making and strategies in relation to road safety outcomes supported by complementary compliance and enforcement policies.

2. High productivity freight vehicles

The introduction of the IAP, whilst aimed at providing improved access for heavy vehicles to the national road network has also resulted in improved safety for all road users. This is especially the case in striking a balance between permitting larger vehicles to safely use the road network while addressing community concerns about 'monster trucks' in their neighbourhoods.

A case in point is the rapidly increasing container freight movements around many Australian ports which are located within close proximity of major Australian cities. A doubling in freight will see a doubling in heavy vehicles. Various pilots and trials are investigating the deployment of 'higher productivity' freight vehicles, essentially a prime mover with two trailers to move containers from the port areas to yards and distribution centres further inland. In September 2009, Victoria announced a trial of next generation High Productivity Freight Vehicles (HPFVs). The use of these vehicles has the potential to reduce the number of heavy vehicles on dedicated routes by almost a third, and reduce emissions and cost of travel by up to 22 percent. The trial is an important step in the implementation of a Performance-Based Standards approach to heavy vehicle regulation in Victoria and the broader introduction of new, safe and efficient freight vehicles [2]. The IAP plays a critical role which provides a safety benefit for communities impacted by decisions to provide such access to longer and bigger vehicles.

3. Heavy mobile cranes

Heavy mobile cranes are one of the vehicle types which pose the most serious impact on infrastructure. Such vehicles also pose a high safety risk for other road users and pedestrians as they journey from their depots to locations in metropolitan and rural areas to conduct their activities. In Victoria, heavy mobile cranes were required to enrol in the IAP from early 2009.

Generally, heavy mobile cranes operate under special permits which grant access to the sites where they are required via defined routes in order to prevent damage to vulnerable assets and alleviate the safety risk to local residents. However, a common misunderstanding by crane drivers is that "access is given to the site". As a result, the most convenient route is sometimes taken by a driver, and issues are raised as some cranes go over different local roads as a result of the main access road to the site being temporarily impeded due to other deliveries and construction activities. Such activities have been brought to light with the use of IAP resulting in increased road safety benefits to the community.

In the early deployment of this IAP application, some cranes have been found to have travelled within prohibited residential areas. While safety concerns were raised from local communities, education has since been carried out by the jurisdiction to assist drivers and operators to better comply with the permit condition, and hence achieve safer operations.

The Minister for Roads and Ports in Victoria has praised the IAP for delivering benefits for transport operators. He stated that by keeping heavy mobile cranes on approved routes, "*IAP will deliver better efficiency and productivity for the road transport industry alongside improved road safety and access for all road users*" [3].

4. Railway level crossing

Safety at railway level crossings has long been a serious concern for governments, especially in regional and rural areas where at many crossings, no warnings of approaching trains are provided to drivers and pedestrians. In Victoria, from January to June 2007 there were 11 crashes between a train and a vehicle or pedestrian at level crossings, resulting in a total of 13 fatalities [4]. In addition, near-misses by a train or vehicles or pedestrians were reported on a more frequent basis. V/Line Passenger reported an average of about one near-miss each week on their country lines [5]. Crashes which involve vehicles, particularly heavy vehicles, have created the most devastating impacts to the community.

While some may argue that ideally, all crossings should be spatially separated from roads with a bridge or underpass, or equipped with boom gates which deploy to prevent vehicles and pedestrians going through the level crossing when trains are approaching. However, the high costs of building and maintaining infrastructure and warning systems make this ideal situation not feasible for every level crossing in regional and rural areas. Therefore, in-vehicle telematics has been considered as an alternative to improve safety at railway crossings.

In July 2007, the Road Safety Committee was issued with a reference by the Legislative Council to inquire into and report on existing, new and developing technologies for implementation to improve safety at level crossings [4]. Subsequently the Committee received submissions from both private and public sectors. In December 2008, the Committee reported and published a number of recommendations as potential improvements to safety at level crossings. Recommendation 43 suggests:

"*That the Department of Transport investigates: The feasibility of incorporating the monitoring, and later the enforcement of, driver behaviour at level crossings into the Intelligent Access Program; ……*" [4].

Indeed, the IAP is not only able to provide a technical solution, more importantly, it encourages drivers to change their behaviour in terms of complying with speed limits at railway level crossings.

On 14 April 2008, the IAP solution was presented by TCA to the Victorian Road Safety Committee. The solution proposes the monitoring of heavy vehicles around the designated railway crossing. Under the IAP, an IVU collects Position Records of a vehicle in 30 second intervals. Position Records found around the designated railway crossing will be reported to the jurisdiction in the form of a Spatial NCR. The jurisdiction will then assess whether the driver has complied with the speed limit around the railway crossing by calculating the distances between any two consecutive Position Records.

Figure 4 demonstrates the concept of this solution. It can be seen that the Position Records around the railway crossing are closer to each other than those that are further away. This implies that the vehicle slowed down when approaching the railway crossing.

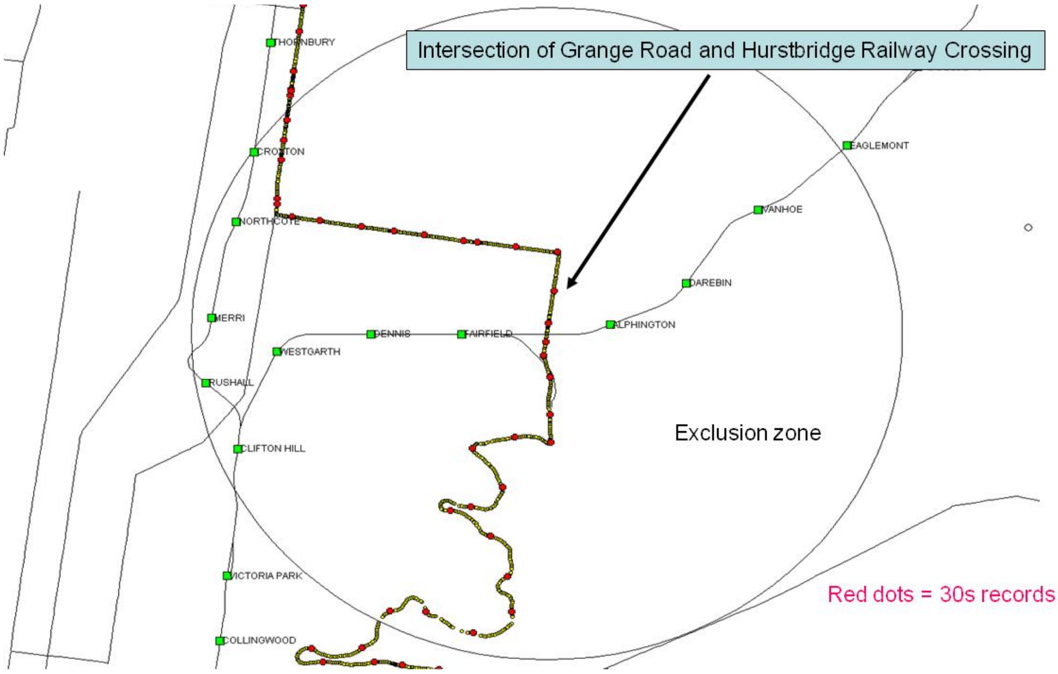

Figure 4: Exclusion zone around railway crossing

The IAP solution could also be extended to provide real time information or automatic intervention to the drivers, if further technologies such as in vehicle displays, speed limiters and haptic feedback are utilised. Nevertheless, at its most basic, the current IAP will play a part in influencing driver behaviour to comply with speed limits around railway crossings, because they are "being watched" when approaching these areas. Over time, the IAP provides an additional tool for road safety practitioners to change drivers' behaviour for better safety performance.

5. Integration with other safety systems

One of the core design principles behind the IAP is that it is a platform that supports the operation of other regulatory applications while allowing commercial applications to co-exist on the IVU. As such other safety applications can operate, utilising the same GPS data (for location, speed and time) and augmenting such data with data from other sensors, be it fatigue measurements or other engine or brake parameters. One such application where the IAP supports and complements another road safety application is with the OPTALERT™ technology.

Since its establishment in 1998, Sutherland Transport in Cootamundra, NSW, has been a responsible transport operator in south-west New South Wales with a strong commitment to safe and efficient deliveries.

In late 2009, Sutherland Transport signed a five year agreement with Visy Pulp & Paper to supply three specialised B-doubles to transport woodchips from Bathurst to Tumut. These vehicles are fitted with a number of leading edge technologies, including IAP, to assist compliance with road and OH&S laws.

The IAP Service Provider worked closely with Sutherland to integrate the IAP with "OPTALERT™" technology. The integration has been considered as a step forward into direct tracking of driver fatigue levels. Operational staff at Sutherland is now able to constantly monitor truck and driver activities, and receive immediate system alerts whenever a non-conformance is detected. Therefore, warnings and alerts can also be provided to drivers for safer operations. Speed limiters are also installed on the vehicles to restrict maximum vehicle speed to 95 km/h.

Figure 5: Sutherland Transport vehicle fitted with compliance and safety technologies

Further investigations of the use of IAP in road safety continues with the use of IAP devices in a recent Australian Research Council grant for the assessment of Safety Management Systems in heavy vehicles. This project is being led by the Injury Risk Management Research Centre of the University of New South Wales as chief investigator with the Roads & Traffic Authority of NSW, the Motor Accidents Authority, TCA and Zurich Insurance collaborating as principal investigators.

In this project, the IAP is used to collect data for before and after assessments of transport companies who operate safety management systems. The IAP will operate as the core platform to which other sensors (images, fatigues, engine condition monitoring, brake systems, etc) will be interfaced, to provide researchers with the information that will result in improving safety management systems for heavy vehicles.

Conclusion

The IAP is intended for the monitoring of compliance to various access conditions laid down by jurisdictions, and the subsequent road safety benefits are obvious and gradually making an impact in addition to the initial benefits of access. The visibility of the data has achieved road safety outcomes at all levels in the transport and logistics chain of responsibility, from drivers, transport operators, freight owners, insurers and into local communities where these vehicles operate.

At the same time, the increased level of understanding of the behaviour of such vehicles is also causing jurisdictions to evaluate their own policies and strategies as a result of better understanding of behaviours. A number of emerging applications are under investigation and the potential of the current IAP data in combination with data from other sensors to achieve road safety outcomes are being developed.

Local councils are now realising that they can allow heavy vehicles to access certain previously restricted routes when the IAP is utilised to monitor for compliance as it provides the safety assurances that the general public demands.

This paper is one of the first papers presented on the benefits of IAP in the road safety field and as yet, the understanding of IAP is believed to be developing among road safety practitioners. Much of the current evidence is anecdotal and there are considerable opportunities for further assessments and studies to more clearly define the data, findings and implications for road safety.

Acknowledgements

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