BIGGER AND BETTER...

Congestion is a sizeable problem in Australia that requires an equally significant national response. **Nick Bradley** unearths some of the strategies aimed at bringing relief and safety to the country's burgeoning network

Illustration by Magictorch

Effective transportation is a critical component for any country, but for a country as geographically and demographically unique as Australia, the challenges are extraordinary. With a population that is set to rise significantly – Australia is poised to be the world's fastest-growing industrialized nation over the next 40 years, with a rate of population growth higher than India – more people means more cars, more freight, more emissions, and less infrastructure to play with.

Currently, local roads comprise 85% by length of Australia's entire road network – and 90% of freight is carried on urban roads. You only have to spend a rush-hour in cities such as Sydney and Melbourne to witness the effect of this movement of people and goods. Worse still, it is estimated that by 2020 Australia's total freight task will almost double, with urban passenger trips increasing by about a third and non-urban passenger travel rising by about 70%. Such growth will place much greater demands on local transport infrastructure as well as the safety margins of the country's road system.

It's enough to get a traffic manager down, such is the conundrum facing the country's future. But as the developments in the Australian ITS industry show over the next 16 pages, our friends Down Under are confronting the challenges head-on, with innovative technology, forward thinking, and strong policies, all aimed at making the best out of a difficult situation. Sustainability is a key theme of the schemes being put in place. And, as any Englishman can testify, you just wouldn't bet against Australia pulling it off...

Challenging the 'bigger and better' mantra, ITS Australia's Terry Warin believes that the country's transportation problems can be directly attributed to its sheer size. And it's not helped by the uneven distribution of the 21 million population, as the association's executive director explains in more detail. "As the bulk of the population resides in the cities on the east coast, there are vast distances involved when traveling to Adelaide in the south and Perth in the west. He suggests that these distances are reflected in the transport links of the country, further explaining that a combination of a railway network in need of modernization, as well as people's reluctance to drive through a desert to go cross-country, leave air travel as the only viable transportation option.

As a result, the way forward when it comes to intelligent transportation needs tends to be decided on a state-by-state basis – a situation that Warin is keen to influence as soon as possible: "Looking into transportation in Australia, one thing is apparent – you can't ask who's in charge of transportation, simply because there isn't anyone in charge of transportation! The states all have their own programs." But as he goes on to explain, there is one program that is showing the way toward a nationalized approach, and has helped the roads in the state of Victoria (Australia's smallest but most densely populated mainland state) and beyond run smoother. "One of our committees is the National Electronic Tolling Committee (NETC)," Warin explains, "and it has fostered and achieved total interoperability on all the toll roads in Australia, leaving drivers just having to worry about one e-tag on the windshield."

ON THE ROAD TO DSRC?

Warin says that there is plenty more that is being done to bring Australia up to speed with the rest of the world when it comes to transportation technologies. Having seen the advances that have been made with both 5.8GHz and 5.9GHz DSRC in Europe, the USA, and Japan, ITS Australia is pushing the initiative in an effort to reduce congestion as well as road deaths. "We are supporting the introduction of an ITS spectrum at 5.9GHz to ensure that we are able to make full use of the new global technologies that will be fitted to new vehicles. All states have representatives in the Australian DSRC consortium and the federal government, through AustRoads, has agreed to provide funding for trials."

Warin also believes that DSRC technology will be useful to Australia's railway crossings. "Victoria has the largest

THE UNIQUENESS OF AUSTRALIA IS WHAT ATTRACTS HUNDREDS OF THOUSANDS OF TOURISTS ANNUALLY BUT, SAYS **TERRY WARIN**, IT'S WHAT MAKES MANAGING TRANSPORTATION SUCH A CHALLENGE

Interviewed by John Challen/Photography by Alexis Kembery

> "Looking into transportation in Australia, one thing is apparent – you can't ask who's in charge of transportation, simply because there isn't anyone in charge of transportation!"

number of passive crossings in the country," he says. "This means there are no lights, no barriers – just signs in front of the crossing. The state government has made some changes, but if we could apply some technology to it, through GPS, we would have a better system of communicating warnings." These crossings are an issue in every state, he goes on to say. "A member consortium has put together a concept using a combination of simple technologies to either complement rumble strips that are set into the road network up to 150m either side of passive crossings, or used independently. The concept is based on sensors that are activated by a train when approximately 1km from the crossing." The sensors send signals to devices in a number of ways, including roadside signs that indicate a train is approaching, illuminated studs flush-mounted into the center of the road that flash red as a vehicle gets closer to the crossing, an audible signal sent to a vehicle's radio, which alerts drivers that a train is approaching, and cameras that capture offenders who fail to stop for the warnings. The system will be solar-powered.

SPECULATE TO NAVIGATE

Traffic messaging is also growing in popularity with more accessibility planned for drivers. "ITS Australia chairs a consortium that has been given a federal group government grant to do the location tables for Australia, so that we can introduce a TMC (traffic message channel) onto portable navigation devices," Warin explains, adding that the east coast has already been covered. "There is one provider in the country, but it is taking live traffic feeds for the various road authorities in the capital cities of all Australian states." This measure alone has gone a long way in reducing congestion, although more is needed.

Warin is hoping for inspiration from the upcoming Australian Intelligent Transport Systems Summit, which takes place from November 18-20 in Melbourne. "From this one event, we have to come up with the backbone of a strategic plan for Australia. One of the objectives is to come up with an implementation plan of ITS technology deployments for the next three to five years, and to also look to the next 10 to 15 years.

"It's been five years since ITS Australia produced the *E-Transport* document, which was a national plan for the integration and deployment of various ITS technologies throughout Australia," Warin recalls. "This document now needs updating and should form the basis of a new national plan. Given the fact that the states often have their own programs, what we are trying to do is to have a common agreement as to technologies and standards required to take Australia well into the 21st century." He says the group will be working on areas including license plate and railway signal commonization, cashless public transport, and infrastructure requirements to meet the demands of the new technologies. "As a result of the size of the country – and because the middle of the country is uninhabited – anything to do with transportation is difficult, but we want to try. We would like to see a national approach to transportation. We need to think like a country, not individual states."

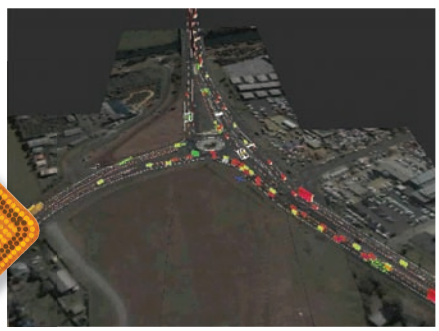
Overall, though, Warin remains positive for the future, and hopes to welcome the ITS community back to Australia at some point... "We would love to host the World Congress on ITS again, but I doubt that we will see one here before 2017, which is a shame because we have a lot to offer. I know that with our members and our very active board, we can add a lot of value to the bigger ITS picture in Australia and we can play our part in the global ITS community."

On a more personal note, Warin also has his own goal: "I'd like to be remembered as the guy who asked the right questions and got people thinking about change, because change is certainly something that is needed." ■

A better understanding of traffic flow

New technology being trialed on the streets of Sydney could have a big impact on incident response and traffic build-up

On a signalized intersection to the south of Sydney, NICTA – Australia's Information and Communications Technology Research Centre of Excellence – has started the first pilot of its kind in the country by installing new and advanced technology to help improve traffic flow at intersections. "NICTA is developing new technologies for detecting, monitoring and controlling traffic," reveals the project manager of NICTA's Smart Transport and Roads Project, Geoff Goeldner. "This is our initial on-road implementation of those technologies."



Computer modeling was used to see how to improve traffic flow at Albion Park Rail

Vehicles traveling northbound on the Princes Highway, exiting the Illawarra Highway or turning right onto the Illawarra Highway at Albion Park Rail have experienced extensive delays during peak times in the past. Traffic lights were recently installed at the roundabout that switch on when lengthy queues form in order to help ease traffic flow problems. "Our researchers have developed technologies that take this one step further," Goeldner continues. "The control systems give a more precise understanding of what is happening on approaches to the intersection."

The technology being trialed applies real-time computer modeling to identify the onset of queuing, and initiates the switching of the traffic lights to improve traffic flows at the roundabout during peak periods. "It will respond to the first sign of congestion, even before the queues reach the detectors."

NICTA is making a large investment in ITS and looking at innovative traffic control communications, traffic sensing, modeling, and control room user interfaces. "We are readying the traffic control systems to be able to utilize increasingly rich sources of traffic data, environmental data and even economic data that are becoming available as vehicles become 'smarter' and begin to communicate with one another, the roadside infrastructure, and the traffic systems themselves."

Better control of traffic lights is key to cutting congestion

With enhanced information and modeling capabilities, control systems will be better able to predict and respond to traffic build-ups and more rapidly detect and respond to problems such as bottlenecks, accidents, and vehicle breakdowns. All of this serves to improve the efficiency of roads and extend the life of the large capital investment in those roads.

NICTA researchers are also making an impact at the human level through what Goeldner describes as some groundbreaking research in measurement and management of cognitive load on operators in TMCs.

TMC operators have to cope with high volumes of complex information, often under pressure, which can place a heavy mental demand on them and lead to errors, omissions or less than optimal management of incidents.

Behavioral adaptation and in-vehicle ITS

Dr Christina Rudin-Brown from MUARC asks if humans could become too reliant – or take more risks – in an ADAS future

The introduction of ITS within vehicles to assist with driving is generally seen as a positive step toward reducing crash risk and improving road safety. But what if these systems were to have unexpected effects on driver behavior that offset – or even negated – any benefits? What if drivers learned to rely on lane departure warnings to keep them in their lane, and ended up driving more often while fatigued or distracted? What if having ESC gave drivers the confidence to drive more often in snowy or icy conditions? What if drivers using adaptive cruise control (ACC) were to use any freed-up mental effort to read or write text messages?

The ability to adapt to novel situations in ways that provide benefit to the individual and/or group is an intrinsic characteristic of being human. In terms of driver psychology, the expression 'behavioral adaptation' refers to the collection of unintended behavior(s) that arises following a change to the road traffic system. Although their effect on road safety can be positive, negative, or neutral, it is the negative consequences of behavioral adaptation that are of primary concern to road safety professionals.

Experimental studies using driving simulators or test tracks have found evidence of behavioral adaptation to various in-vehicle ITS, including LDW systems, ESC, ACC, and collision warning systems. Early theories put forth to better understand behavioral adaptation tended to focus on the concept of risk compensation, and how drivers control or maintain a given level of risk by changing their behavior in response to changes in the environment. Recent models have considered the impact of driver characteristics to the development of behavioral adaptation. Certain personality traits have been found to influence whether a driver will be likely to develop behavioral adaptation, by affecting the amount of trust they have in a device.

For example, locus of control is a personality trait that relates to an individual's assumptions regarding responsibility for positive and negative events. Those who believe they are able to act so as to maximize the possibility of positive outcomes while minimizing the negative are described as having an 'internal locus of control', while those who believe they are helpless and at the mercy of external forces, luck, or fate have an 'external locus of control'. Drivers who score high on a scale that measures 'externality' are more likely to trust in-vehicle ITS to function

If drivers become too dependent on in-vehicle ITS, they risk becoming distracted from the road

Through non-invasive techniques for monitoring such loads, researchers are able to highlight system-induced and incident-induced load for real-time or offline intervention. "With approximately 30% of road congestion arising from traffic incidents, it is extremely important that road authorities make the most of the human problem-solving capabilities for effective incident management and ensuring that those critical human assets are not overloaded," Goeldner concludes.

Advanced modeling aids NICTA's research

Certain characteristics can affect how drivers use and respond to collision-mitigation systems

reliably. They are also more likely to show behavioral adaptation. In a test track study of drivers' use of ACC, 'externals' intervened more slowly than 'internals' and continued to perform an in-vehicle secondary task when the ACC system failed. Similarly, when exposed to either reliable or unreliable LDW systems, drivers classified as 'externals' were more likely than 'internals' to report an increase in trust in both systems, and to depart the lane when the system failed to provide a warning.

Luckily, the benefits of in-vehicle ITS usually outweigh these risks. However, it is important for system designers and legislators to consider behavioral adaptation when making predictions regarding a device's overall benefits on safety.

Jim Morris, managing director, Traffic Tech

Q&A

What's the latest news from Traffic Tech?
We recently launched our new Pedestrian Switch Pad (PSP) – a pedestrian and bicycle detection pad, which has a tactile surface, is simply glued to a pedestrian ramp and is able to detect the presence and direction of a pedestrian or bicycle that passes over it. The PSP has had great acceptance from customers in the USA and Europe.

What trends are you noticing in your particular sector?
State and federal government road authorities are looking for better and more reliable, vehicle, bicycle and pedestrian detection methods, to help improve accuracy of information-gathering, providing them the necessary information needed to forecast infrastructure spending into the future.

What are your plans for 2010?
We will be showing the Switch Pads, EzyLoops and iStud systems at Intertraffic Amsterdam in March 2010 (Stand 11.112). We will also be looking to expand our marketshare in Australia with the introduction of new, locally made and imported products, such as the iStud range of vehicle detectors.

Tell us a recent success story…
Our Subsurface EzyLoops system has been specified for loop-based classification systems installed into the Gateway Bridge duplication in Brisbane. We will be installing over 100 of the preformed, sub-surface loops into the road, before the final asphalt wearing cause is laid.

Where do you see your company in five years' time?
We have a growing product range and expanding international markets and would expect export sales into the USA and Europe to exceed AU$5 million by 2015. We market to prospective customers though participation in international exhibitions, such as Intertraffic. Next year we'll be promoting our range of EzyLoops, iStuds and PSPs.

Jim Giffin, marketing manager, Aldridge Traffic Controllers (ATC)

Q&A

What's the latest from ATC?
We have developed a railway level crossing advanced warning sign (AWSC4) to provide motorists approaching a level crossing with advanced warning of an approaching train. They are typically installed in remote, rural roads with high approach speeds, and consist of static warning signs enhanced with flashing yellow lights located up to 200m from the crossing. These are deployed especially where visibility on approach is limited due to geographical or weather conditions. We have also developed a range of traffic signal controllers that are integrated with uninterruptible power supply (UPS) units that provide operational continuity in the event of loss of mains AC power. We have also designed two types of Traffic Signal Controller with UPS products to cater from the smallest to the largest application with 24 Signal Group Outputs. With the first product, our engineers created a single cabinet solution for small to medium intersections that can cater for up to eight signal groups with a maximum load of 450VA.

Tell us about a project that highlights ATC's expertise?
There has been an increase in the number of accidents involving trains and motor vehicles at railway level crossings. In conjunction with VicTrack and VicRoads, we recently installed Advanced Warning Signs for railway level crossings at locations in Victoria. This experience and R&D work has led to the development of a sophisticated traffic management device that delivers flashing warning lights to approaching motorists, and also includes a reporting system that verifies the operation of the device and includes safety systems to ensure the equipment is functionally tested on a regular basis.

What are your plans to develop your international presence?
We are expanding around the world with controller sales linked to the recent awarding of a SCATS distribution licence. The ATSC4 controller is SCATS-compatible and with many cities looking for more than a traffic controller's scenario, the SCATS option being supplied by ATC gives impetus to additional controller sales. Geographically the targets for us will center on China, South East Asia and the Middle East – we expect these areas to emerge from the downturn earlier than other regions, giving potential for additional markets to be opened up.

Rod R. Riquelme, project manager, Compusign Pty Ltd

Q&A

What's the latest from Compusign?
This year we have developed and supplied two new products. The first of these is the the Advance Lane Use Sign (ALUS) – a variable speed limit and lane-use sign hybrid composed of a 32x32 centralized white pixel matrix surrounded by a red LED annulus. There is a red LED cross that extends from the center into the annulus. This is capable of displaying speed limits from 10-110km/h, as well as a whole range of graphical lane-control symbols, such as merge arrows and red lane-closed symbol. The device comes fitted with amber conspicuity devices at each corner. It's available in our Arterial Road VMS and is being installed in the Citylink section of the Monash Freeway upgrade. Our Arterial Road VMS, meanwhile, developed for VicRoads, has a screen resolution of 103 pixels wide by 27 pixels high, and utilizes Avagos extra-high-brightness AlInGaP amber LEDs. It's due for installation this month (October) as part of Melbourne's 'Keep Melbourne Moving' initiative.

What are the trends in your sector?
There's a greater requirement for hybrid devices that combine two or more functions into one display. Examples of this would be the Lane Use/Variable Speed control sign and Ramp Metering/VMS Signs that advise motorists of ramp status and freeway travel times. We are also seeing an expansion of the RTA's protocol for roadside devices into traditional SCATS devices, such as ramp control signs.

Tell us about a recent success story that highlights your ITS expertise…
Our products are being used in most of Australia's largest ITS projects. For instance, our range of LED display systems are used on the M7 motorway, the Liverpool/Parramatta Busway, and Lane Cove Tunnel in New South Wales. They're also on the Brisbane Busway in Queensland, and in Victoria there's the Eastlink Motorway and Citylink. Products used include VMS, passenger information displays, VSL displays, travel-time sign, ramp metering sign, freeway condition sign, and tunnel message signs.

Where do you see your segment of the market in five years' time?
Display technology is changing at a very fast pace and we are seeing a great range of new display components that are applicable to ITS display products. But there has always been a reluctance to use these components as there is a proven lifetime on existing devices. I believe we will begin to see a move away from the old leaded LED components to surface-mount devices. There are many benefits in using SMD LEDs, particularly in production and display alignment. With increasing need in power efficiency and a smaller carbon footprint, we are already seeing the demise of the old fluorescent tubes as these are replaced by more efficient LED backlights. Display devices will need to be more efficient in terms of the display and drive technology they use, as well as in relation to thermal management.

Sharing in-vehicle safety knowledge with your friends

RACV's Thunuja Gunatillake on a new campaign to raise awareness of ADAS

In-car technology advances at such a pace that many of us struggle to keep up. But recent research from the Royal Automobile Club of Victoria (RACV) shows that most consumers figure that if the technology is worth having, it will be included in their new car purchase. Unfortunately, this is not the case.

The uptake of in-car safety technologies in Australia lags behind many other countries. The life-saving potential of this technology is not being realized because it is not adequately understood by government, by stakeholders, and by the end consumers.

The Australian government recently announced that ESC will become mandatory in new car models from November 2011, and in existing models from 2013. Yet ESC first made its appearance on the market in 1995. Thousands of lives have been lost on Victoria's roads alone since then.