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OCTOBER/NOVEMBER 2009

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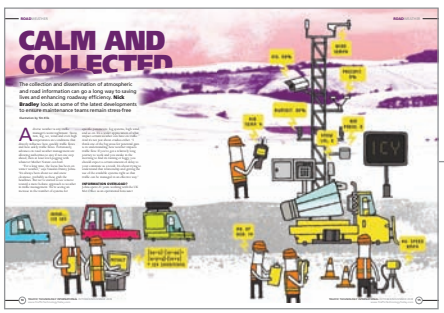
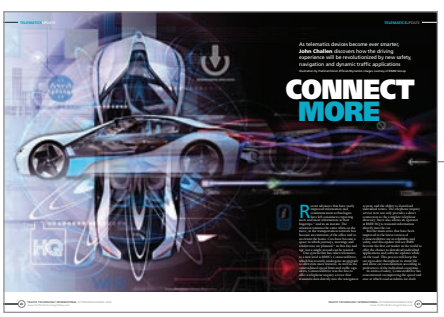
COVER STORY

42 **BIGGER AND BETTER...**
ITS IN AUSTRALIA

The challenges – and those working on the solutions – to managing Australia's enormous and complex transportation network





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Research party

Partners selected to lead active safety program to reduce the number of vehicle and pedestrian accidents

Main: Added pedestrian safety with pedestrian detection and warning
Below: Traffic sign recognition system, as part of the Active Safety Car research project

LEANNE KEEBLE

Wuppertal, Germany Tier 1 automotive supplier Delphi Corporation has been hand-picked to head up the Active Safety Car research project in Germany, it has been announced. In the North Rhine-Westphalia program, an independent jury of experts from industry and academia evaluated 48 project proposals submitted by 138 companies and selected the 14 most innovative proposals for development.

Among the technology specialists alongside Delphi are experts from Wuppertal University, Ceteq, Riedel Communications, Maschinenbau-Kooperation Wuppertal and Wirtschaftsförderung Wuppertal.

The Active Safety Car project is designed to address the EU ruling that mandates a reduction in the number of pedestrian accident victims by next year. As active safety systems continually monitor the traffic environment to identify probable crash events, they use that information to alert drivers to potentially dangerous situations, helping to provide the time needed for action to be taken. They also employ automatic control to avert an imminent crash, or minimize the effects of a crash that is unavoidable.

"Delphi understands how important active safety systems are to the future," said Dr Su Birm Park, Delphi project manager for Advanced

Party pledge

Manchester, UK There will be no UK government funding for new fixed speed cameras if the opposition Conservative party wins the next election. Shadow transport secretary Theresa Villiers said councils would have to raise the money to install them and prove they cut road accidents. Average speed cameras would continue to be used to enforce reduced speed limits during motorway roadworks, although the Conservatives also claimed they "will stop the rollout of average speed cameras on urban roads".

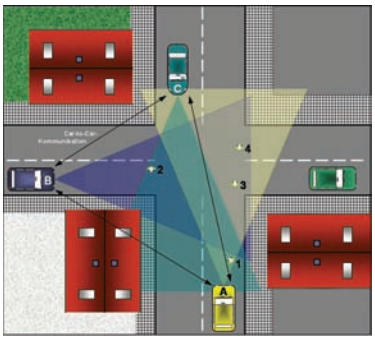
22 …road tunnels in the Paris region will soon boast automatic incident detection (AID) solutions from Traficon. Over the next three years, 1,400 cameras linked to Traficon's AID system will be installed to intensively monitor traffic driving through the Paris Region's tunnels. Strict French regulations demand that tunnel safety is brought to the highest security standards. Every tunnel longer than 300m is required to be equipped with AID to be able to detect all major incidents within seconds, such as stopped vehicles, smoke, congestion, wrong-way drivers, pedestrians and fallen objects.

Green streets

Stockholm, Sweden The results of the latest study on the Stockholm Congestion Charging System show that queuing times on access roads to the city have been reduced in the mornings by 50%. The study of the IBM-created system also shows that overall city traffic is down by 18% and CO_2 emissions in the inner city have been cut by between 14 and 18%. The number of 'green' tax-exempt vehicles has also almost tripled, with the study stating that congestion charging is the most influential factor in the decision to choose a 'green' car.

Engineering Integrated Safety Systems. "Our team's goal is to increase safety for everyone on the road – drivers, passengers, cyclists, and pedestrians – by enabling communication between vehicles." Launched in January 2009, the Active Safety Car project will see an active safety system developed that allows information about potential hazards to be shared and exchanged between vehicles. The team's goal is not only to use radar and vision sensors to recognize obstacles and warn the equipped vehicle's driver, but also to improve the safety of drivers and passengers in other vehicles that could be affected by a recognized danger.

Other project objectives include the development of camera-based pedestrian recognition and high bandwidth car-to-car and car-to-infrastructure communications, establishing a warning suite that alerts drivers of situations that could lead to an accident, and designing an embedded processing technology application. Delphi is currently also defining the requirements for hardware and software, system integration and final testing, and the system is scheduled to be production-ready in about three years.



The above shows how networked sensor data fusion could work in the project

Just around the corner, Delphi's pedestrian detection system with full automatic braking will be on the Volvo S60 to be launched in 2010. At the heart of this system are Delphi's vision and radar sensors. Using data fusion algorithms that combine sensor inputs, it warns drivers of an imminent collision with a pedestrian or vehicle and brakes if the driver is unable to do so.

Clinton's backing for safer roads

New York, USA Former US President Bill Clinton met Make Roads Safe campaign ambassador Michelle Yeoh in New York recently to launch a US$10 million scheme to help the International Road Assessment Programme (iRAP) improve the safety of road infrastructure in developing countries. The 10-year commitment by the FIA Foundation aims to identify road safety improvements that could prevent one million road deaths and serious injuries each year. Funds have been committed to iRAP to provide 'vaccines' for roads – working with developing country partners to assess the safety performance of road networks, making technical recommendations to governments and providing cost/benefit analysis for fixing the road design flaws that contribute to the global road death toll. iRAP's approach is in line with the proposal for a 'Decade of Action for Road Safety', on the agenda at the first global Ministerial Conference on Road Safety in Moscow in November. iRAP would be one key initiative contributing to the Decade of Action by ensuring that key safety measures become an integral part of road infrastructure building.

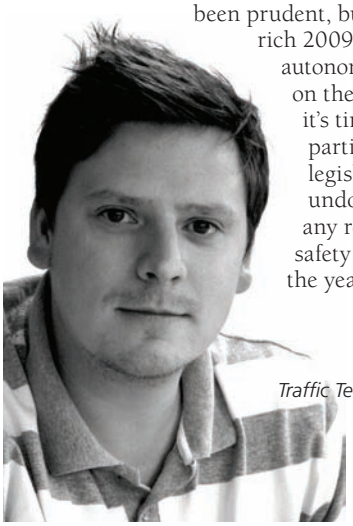
FOREWORD

Over the past six weeks I've been living and breathing vehicle safety. In Rome in early September, I attended the eSafety Challenge at the Vallelunga race circuit, at which pro drivers Timo Glock, Heikki Kovalainen, and Tom Kristensen among others demonstrated the latest ADAS systems, including lane-change assist, blind-spot detection, ACC, and ESC. Such features are readily available in some cars and ESC is now also mandated. Demos aside, a key theme of the event was awareness – or lack of it – of such technologies among the car-buying public, who seem to prefer eardrum-splitting sound systems and leather seats to side-impact airbags and driver assistance. The onus to educate is increasingly being placed on car dealers, yet they rarely promote safety for fear of scuppering a much-needed sale. More on this in the next issue…

The eSafety Challenge gave me the chance to test ESC in a BMW M3 in a controlled environment on a wet skidpan, much to the angst of my co-driver, who became increasingly frustrated at my inability to control the vehicle with the technology switched on or off. I've been driving for 17 years and in that 10-minute period it dawned on me that I don't have the first idea what to do in a crash scenario. And when you consider that young males are the cause of most crashes, some form of mandatory advanced driving course seems sensible.

This subject came up on my recent trip to Germany, where I met Dr Werner Struth, president of Bosch's Chassis Systems Control division, whose youngest son has just been sent on such a course before he can hit the open road. I recounted my experience, proclaiming that I'd be more than happy for my car to take over at any point it felt I wasn't up to the job, leaving me out of the loop entirely if need be. But for that vision to become a reality would necessitate removal of a rather large spanner from the works.

There is much that can be achieved in terms of saving lives and reducing injury that legislation, namely the 1968 Vienna Convention, will not allow. 'Drivers must be in control of their vehicles at all times,' it states. In the late 1960s, this would have been prudent, but in a technology-rich 2009 – and with more autonomous developments on the horizon – maybe it's time to rethink this particular piece of legislation, as it will undoubtedly stifle any real high-end safety innovation in the years to come.



Nick Bradley
Editor
Traffic Technology International

IBEC: A WHOLE NEW WORLD WITHIN ITS

Our relentless and intrepid columnist has signed on the dotted line with IBEC to argue the case for some issues close to his heart. How long before they revoke his membership?

by Al Gullon, Automobiles+Concepts+Environments, Canada

While in Stockholm recently, I was attracted to an all-day seminar called Road Pricing: Beyond the Technology. Regular readers will know that I have some fundamental reservations about governments instituting road charging on roads already paid for by our taxes. They will thus understand that my intention was to bring those reservations to attention – and as forcibly as possible!

But on arriving to register I discovered that IBEC was the International Benefits, Evaluation and Costs (IBEC) Working Group within ITS. Essentially they have some very laudable goals and ambitions. To wit, "IBEC brings together the best knowledge and experience (on evaluation methodology) and is the focal point for discussion and debate of interest to the international ITS evaluation community." They also prepare guidelines for the planning and preparation of evaluation reports, including recommendations that studies be done independent from government with meticulous and comprehensive before-and-after data.

Now, throwing stones from outside an organization only results in retaliation in kind – and they usually have much bigger stones! Accordingly, I have decided to join the gang. Among other subjects, I intend to argue internally and at length for an accounting of those 'priced off' the much-safer motorways onto secondary roads containing a significant proportion of 'vulnerable users' until they start listening… or revoke my membership! Moreover, discovering that IBEC is not only about RUC – but also wants to see truth in the evaluation of all ITS projects – gives me an opportunity to mount my favorite hobby-horse and whip them toward the exclusive use of fatalities per VKmT rather than fatalities per year, which is unscientific and thus unsuitable as a basis for public policy.

I was always intensely involved in the seminar presentations but perhaps as IBEC's newest member rather over-involved during the Q&As. Messrs Soederholm and Evans presented detailed but far from boring evaluations of congestion charging in Stockholm and London respectively. But I was again dismayed to hear that, although significant transfers to public transit and cycling had been measured, a disturbingly large percentage of the reduced traffic volume remained unaccounted for… and thus raised the spectre of an unaccounted economic cost. I anticipate that the first months of my IBEC membership will be interesting indeed! ■

Please email feedback to al@alsaces.ca

• IBEC's Richard Harris tells us that IBEC welcomes members – including Al Gullon – from all around the world who share its objectives for sound evaluation and free dissemination of results on ITS. Al and others are welcome to express their opinions

Animal instincts from new system

Espoo, Finland The VTT Technical Research Centre has developed a VRU (vulnerable road user) system to warn vehicle drivers about the presence of pedestrians, bicycles or even animals in the road. According to VTT, this might be the first roadside sensing system that detects living objects using thermal imaging technology interfaced as part of a cooperative intelligent traffic safety system. The advantage, however, is that a thermal camera is not needed in the vehicle; risky situations are transmitted to each passing vehicle.

The thermal vision system uses image analysis (speed, size, shape, and temperature information) to detect humans and animals. Integrated into a sensor fusion module, this sends data to a local dynamic maps database modeling the driving environment. The system is currently being tested on a motorway in Turin, Italy.

Expanded interest

Scottsdale, Arizona The USA's fourth-largest photo enforcement company, Nestor Traffic Systems, has been acquired by American Traffic Solutions (ATS), so expanding ATS's presence to include Nestor's customers in California, Maryland, Tennessee, Texas, Virginia and Canada. This boosts ATS to nearly 200 communities in 21 US states and two Canadian provinces, with 2,173 cameras under contract, of which 1,492 are already in operation in North America. "ATS anticipates a very smooth transition for current Nestor customers and employees," said James Tuton, president and CEO of ATS. "The communities currently served by Nestor have my pledge that we will work closely with them to ensure a smooth transition while continuing to provide critical life-saving technology."

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- Reliable detection 24 / 7

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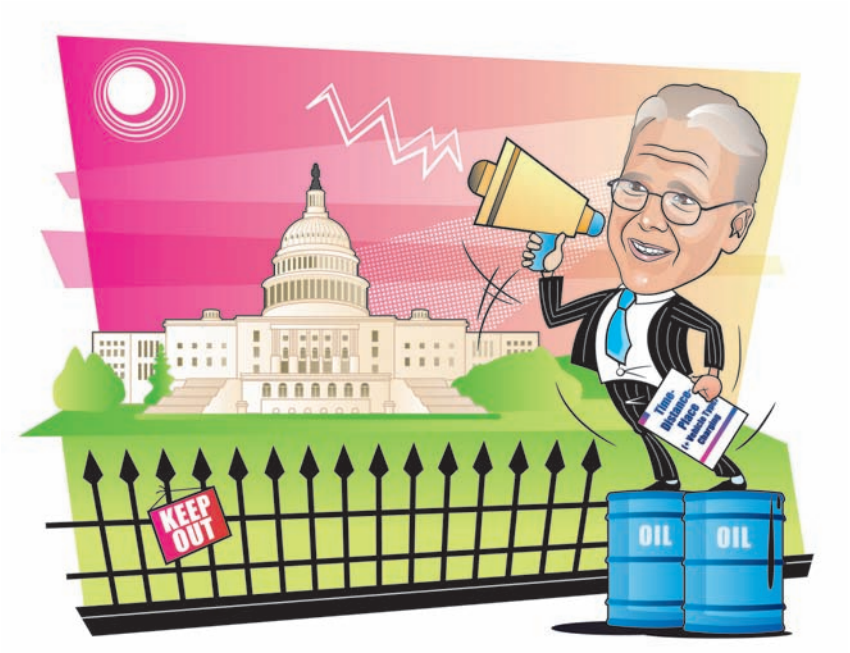


NINE LIVES OF VMT FEES

How to fund the USA's ailing transportation system is an issue that just won't be buried – and our guru on all things road pricing won't let Congress ignore the best way to do it!

by Bern Grush, www.grushhour.com

Recently, a 150-page US study commissioned by AASHTO through the National Cooperative Highway Research Program was released. The NCHRP study – *Implementable Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding* – was conducted by RAND Corporation with the University of Minnesota and answered 'How can the USA deploy VMT fees by 2015?'

Only 20 months prior, the National Surface Transportation Policy and Revenue Study Commission published a two-year, 258-page report that called for a fuel tax increase and indicated that we eventually need to start thinking about VMT charges as a user fee in lieu of fuel taxes. VMT fees were so remote for this Commission that the then Secretary of Transportation and Commission co-chair, Mary E. Peters – who appreciated that they could not be forestalled much longer – wrote a dissenting view with two other of the 12 commissioners that stated that the gas tax was unsustainable and that VMT fees need to be looked at more critically.

In February 2009 – 13 months later – a second US congressional body, the National Surface Transportation Infrastructure Financing Commission, published another two-year, 235-page report. This one was more assertive about the VMT fee idea, essentially agreeing with Peters' earlier dissenting view. In little more than a year, the US thinking went from 'raise the gas tax now and consider VMT charging someday' to 'start thinking about VMT fees in time for 2018, and raise the gas tax as an interim measure'.

The message contained in the NCHRP report from last month was alarming by comparison, stating "Here are nine ways to implement the VMT charge by 2015." By comparison, a fuel tax increase was treated as 'nice to have'.

Buried on page 120 is the clearest evidence of political mischief I have seen regarding fuel taxes and RUC: "If there is a major need for short-term revenue, it is not clear how implementing a poorly thought-out VMT fee is superior to raising the gas tax. There is a lot of room to raise gas tax without affecting behavior… But Congress seems focused on what they can do besides raise the gas tax, such as implement a flat VMT fee based on average mileage."

That statement – which I was greatly relieved to read – should be highlighted in your copy. I hope it gives enough pause to policy-makers to recognize that the single greatest mistake the USA can make now is to kludge its way out of a congested, underfunded, oil-dependent, gas tax-broken, surface transportation mess with a pure VMT charge and assume it can be retrofitted for congestion management later. The USA would be better served by an effective TDP (+ vehicle type) charge scaled to address the funding requirement. ■

Any comments to bgrush@skymetercorp.com

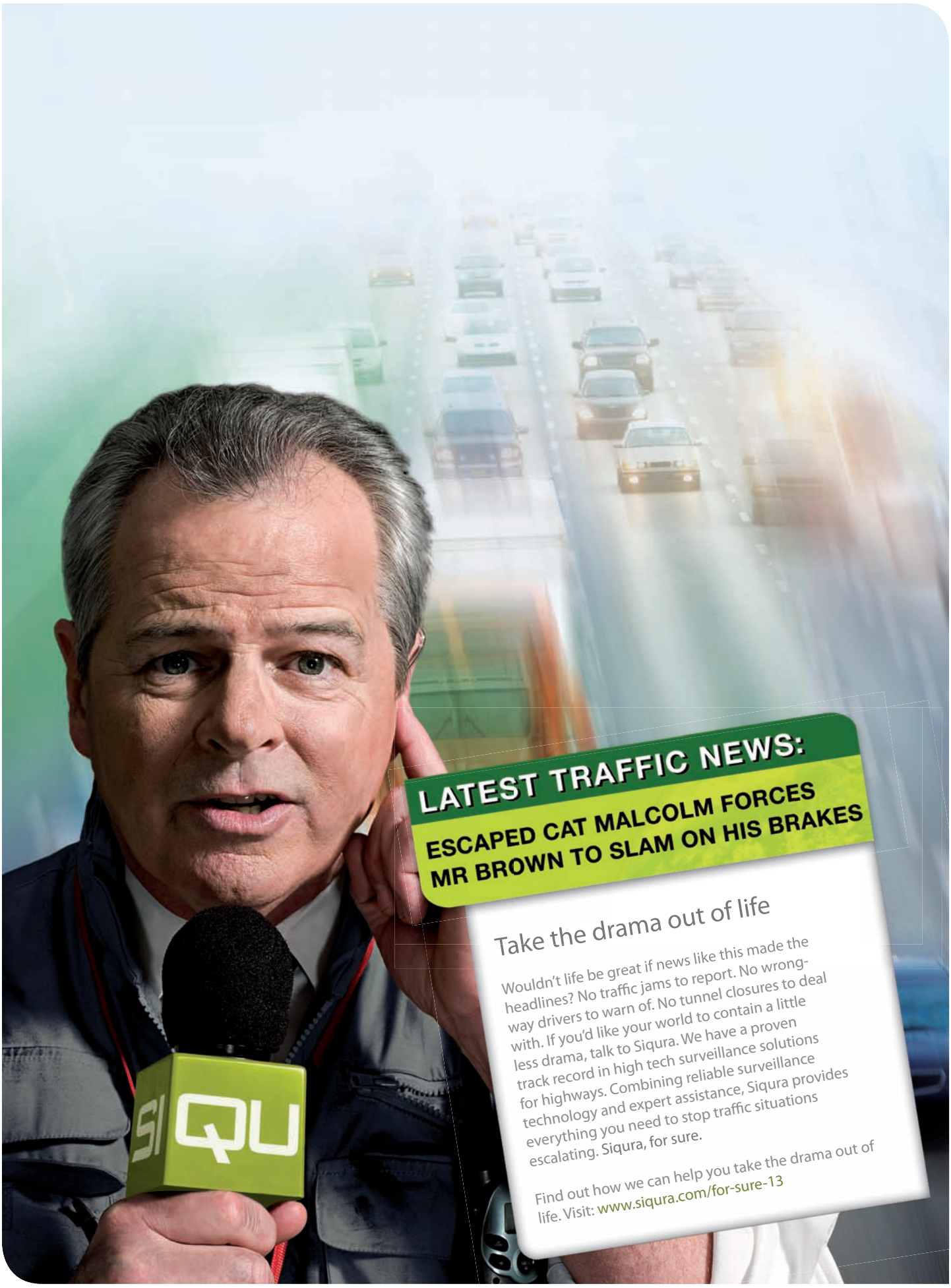
RedFusion system awaiting sign-off

Rockingham, UK At a hands-on demonstration of RedSpeed International's new RedFusion multipoint-to-multipoint average speed enforcement system, the company's new CEO, Robert Ryan, confirmed that the technology has now been recommended for Type Approval by the Home Office. All that awaits now is a signature from Secretary of State for Transport, Lord Adonis. "This should all be completed by November," Ryan said in his presentation. One senior figure from a high-profile Safety Camera Partnership said that the RedFusion system "ticks all of the boxes", so it shouldn't be too long before the system starts appearing out on the road.

African dream

Pretoria, South Africa SANRAL has awarded the contract for the implementation and operations of a multilane free-flow (MLFF) ORT system on its Gauteng Freeway project to the Kapsch-led Electronic Toll Collection joint venture (ETC).

Valued at R1.16 billion (US$156 million), installation will take place over an 18-month period and is scheduled to be completed by April 2011. The new toll system is part of the Gauteng Freeway Improvement Project (GFIP), which involves the current first phase of a 185km upgrade of freeways in Gauteng Province. SANRAL's enhancements will also include 'travel demand management' aspects of the project, which includes the ETC system. The introduction of HOT lanes will reduce the demand on the freeway and improve traffic flow. This MLFF system – which will use DSRC technology – has the benefit of removing the need for physical toll plazas, which requires road users to slow down or stop.



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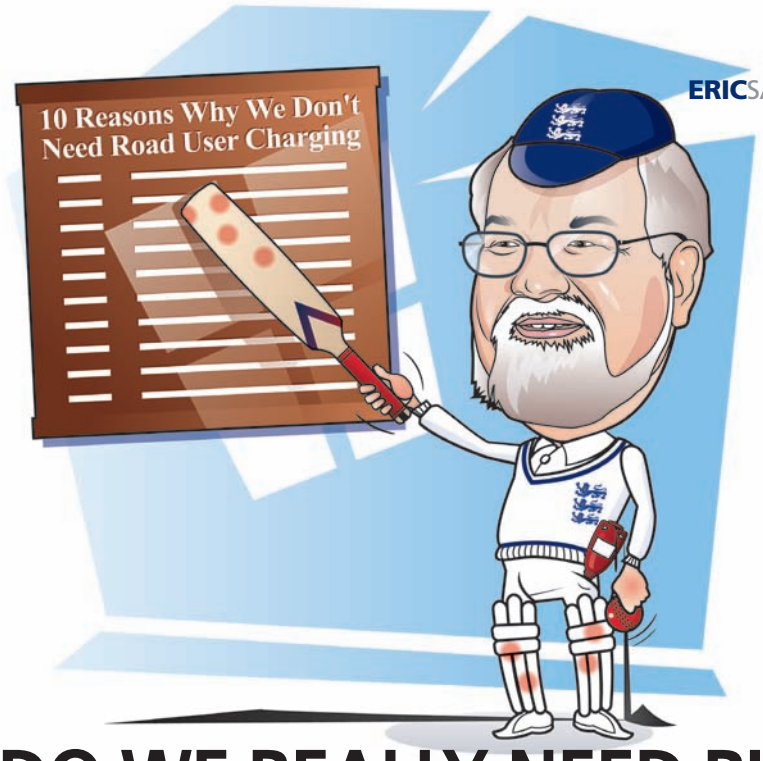
In-car DSRC soon

Tokyo, Japan Toyota has developed an onboard DSRC unit to increase traffic safety by providing drivers with real-time, close-vicinity traffic information, with plans to offer the DSRC unit in Japan on a new vehicle model to be launched soon. The navigation system-linked DSRC unit receives a wide range of traffic information via vehicle-infrastructure communications, broadcast on the 5.8GHz band, and provides it to drivers in visual form as well as voice guidance. It also alerts drvers to obstacles that they cannot see in the road ahead, such as stopped vehicles and stationary traffic, in addition to providing alerts about merging vehicles. The information comes through the use of roadside ITS technologies, which includes Japan's ETC framework.

Dynamic offering for driver monitoring

Guildford, UK MyDrive Driver Analysis – an application enabling the development of unique driving profiles from various characteristics of individual driving style – has been unveiled by Journey Dynamics. The solution provides opportunities for fleet managers, car rental firms, insurance companies, and parents to gauge driver performance. A key feature, however, is that it does not store routes, speeds or the time at which the driver was on a specific road segment, ensuring that privacy is fully protected. It does, though, provide insight into how the vehicle is being driven, which affects driver safety, insurance claims, vehicle maintenance and fuel economy.

"Safety is uppermost in minds when analyzing driving, and our system has been designed to be a vital tool in monitoring safe driving," said John Holland, CEO at Journey Dynamics. "Good driving – by that I mean economical driving – leads to a lower risk of accidents and lower fuel consumption."



ERICSAMPSON

DO WE REALLY NEED RUC?

by Professor Eric Sampson

From downsized vehicles to sat-navs that lead large trucks down small roads, Professor Sampson – tongue firmly in cheek – lists 10 reasons why the UK doesn't need road charging

We don't *really* suffer from congestion. I don't mean by that we enjoy it – it's just not that bad. Sure, the odd road gets a little choked but it's no worse than using the trains in London during rush hour, or queuing at the bar during an Ashes Test match.

What little congestion we have is going to get better because vehicle OEMs are downsizing their new models, so the same number of cars will occupy less road space.

We don't need the potential income from road pricing: fuel taxes and VED raise over £28 billion, of which only £7 billion or so gets allocated to roads so there's plenty of capacity to make life fairer by cutting motorists' payments and increasing charges for health and education.

We also don't need income from road pricing as Gordon Brown keeps telling us he's got the economy sorted out, and as we all know that the government is going to sell off the trunk road network rather than us paying to use roads, we'll all be rolling in it and probably be paid to use them.

There's clear evidence that LAs don't need it as Birmingham, Bristol, Cambridge, Edinburgh and Manchester have all turned it down. These are all university cities with multiparty non-partisan councils so they obviously know what they're talking about.

We don't need it for demand management because as fuel prices go up – which they have done and will continue to do – traffic levels go down.

We don't need it for managing vehicle emissions. All-electric cars are around the corner and hybrid cars are here now and they'll generate their electricity from wind farms, tidal barrages and hydro-electric systems. And anyway, 'global warming' isn't really a serious problem.

We don't need it in order to have a more precise way of targeting tax revenues so that 'the congester pays' or 'the polluter pays'. Fuel Duty and Vehicle Excise Duty are quite good enough for that already.

The technology to do road pricing doesn't really work. It's claimed that France and Italy do it with microwaves in the car but if you've ever been there, you'll know there's no sign of a stove – you pay a machine next to the barrier. And as for the other mad ideas about using TomToms and wireless, we all know that they send big lorries up little roads, and you can count for yourselves how often your car radio has given up when driving past tall buildings.

And we don't want it because it would contravene government equality policies. Everyone says road pricing would be a good thing for people in rural areas but most people live in urban areas or cities so it wouldn't be fair to give the benefit to the countryfolk and not to the city dwellers.

It's obviously a mistake to have it as it is strongly supported by economists and we all know what they do – tell us a hospital is a cost center and a crematorium a profit center. Who needs that sort of advice? ■

Professor Sampson regrets that he is unable to accept correspondence as he has gone to see a mathematician to learn how to count to 10 and will then see his doctor

HOW SMART IS SMART?

As pleased as smart cars make our regular intelligent vehicles expert, there is something about them that makes him kinda sad: a smart car does not make a stupid person a smart driver

by Jim Misener, executive director, California PATH, UC Berkeley

Much of my time is spent thinking about smart cars. I research smart cars. I write about smart cars. Indeed, I love smart cars. I can't wait to get one – although I will have to ask my boss for a significant raise in order to afford one!

I resolutely believe that our collective driving future involves smart cars, first with the plethora of emerging features and functionalities, then later with automated cars. And what of these emerging features? These days you read about them through more venues than just within this column. Given enough money, you may – with enough cash in hand (or credit in name) – purchase a car that has forward collision warning, lane departure warning, parking assist, and stop-and-go adaptive cruise control. These are great, and collectively may represent the future of driving. *Sigh*.

Although roads and traffic dictate different mixes of crash types in various parts of the world, in the USA three major behavior-related crashes deal with speed, seatbelt use, and alcohol consumption. Indeed, each of these is a co-factor in about a third of crash fatalities. *Sigh again*.

Why can't a smart car directly address these? To be truly smart, a car would have speed or throttle control, perhaps with exogenous limits transmitted or linked via map references to posted or designated speeds. To be truly smart, a car would have a seatbelt ignition interlock, such that you wouldn't even be able to drive the car unless each occupant was belted. To be truly smart, a car would have an alcohol detection and similar ignition interlock, such that you wouldn't be able to drive the car should alcohol be detected from the vicinity of the driver's seat. Each of these smart features would address those three major behavioral elements. *Sighs continue*.

Why would these not be available, at least in the USA? Personal freedom? No 'virtual nanny'. Apparently, the road safety culture places predominance on motorists' free reign to drive stupidly than to directly address the three major 'dumb driving' behaviors. Apparently, it's a better idea to address with technology specific crash types (forward and lane departure collisions, etc) caused by stupid behaviors than the behaviors (speeding, not belting, drinking to excess) themselves. *Sighs abound*.

It would therefore be society that transforms the idea of smart cars into what may be not-so-smart cars. This is a shame because to address directly stupid road behaviors may actually require less technological prowess and result in lesser engineering and consumer costs. In the end, we would have truly smart cars, in that unsafe driver behaviors would smartly be addressed. Indeed, it smarts that this may not happen…

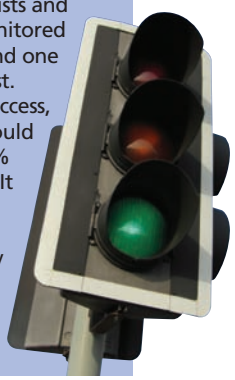
Drive on, drive smart and because technology may not be efficiently marshaled to help you directly, please drive safely. ■

345 …million Australian dollars is the price of the legal battle facing Melbourne's ConnectEast. Leighton Holdings – one of its biggest shareholders – claims the toll road operator misled the construction firm, Leighton subsidiary Thiess John Holland, over inflated traffic forecasts. These underpinned negotiations for a bonus payment upon early completion of the road. An average of 258,000 vehicles were forecasted to use the toll road daily by 2008, although in August just 159,000 a day used the road.

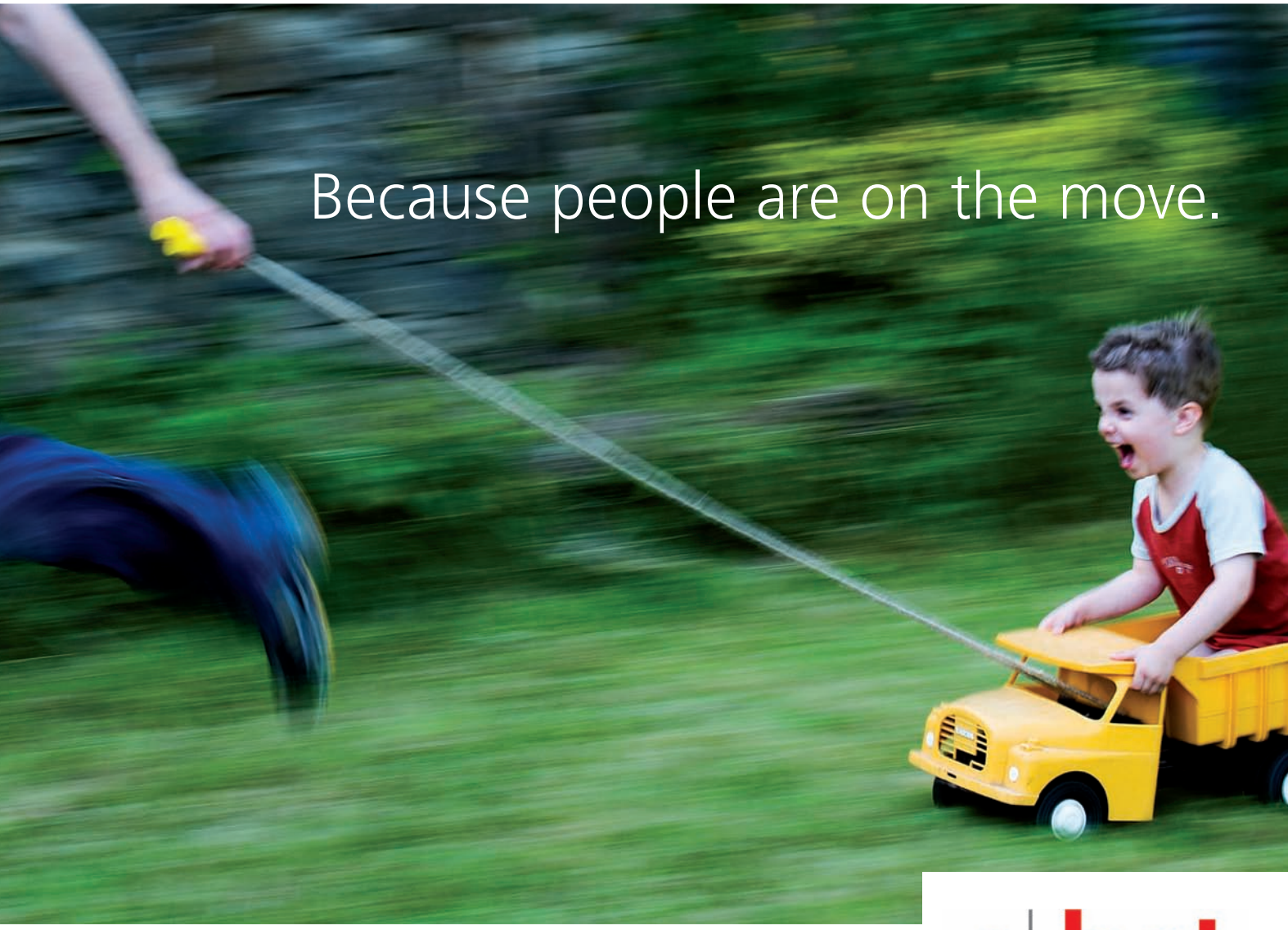
Chaos theory?

London, UK Mayor of London Boris Johnson is behind an effort to switch off traffic signals in the city's center. The experiment is being conducted by Transport for London (TfL) and Westminster City Council, and could see more than 100 signals eventually being removed from the heart of the capital. The experiment will start with a set of traffic signals about 100m from Westminster Abbey. The junction will be monitored over a six-week period with 12 CCTV cameras and eight ALPR cameras. For the first two weeks, the signals will work normally; for the following fortnight, they will be switched off before being put back on for another two weeks. The behavior of motorists and pedestrians will be monitored at both this junction and one about 100m to the west.

If the scheme is a success, Westminster Council could remove as many as 20% of its 400 traffic lights. It is also planning to remove traffic signals completely from a busy junction in Belgravia, near Victoria Station, next year.



Gulf Traffic Dubai, 05-08 December, Stand 4B 30



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CALM AND COLLECTED

The collection and dissemination of atmospheric and road information can go a long way to saving lives and enhancing roadway efficiency. **Nick Bradley** looks at some of the latest developments designed to ensure maintenance teams remain stress-free

Illustration by Tim Ellis

Adverse weather is any traffic manager's worst nightmare. Snow, rain, fog, ice, wind, and even high temperatures are conditions that directly influence how quickly and safely traffic flows. Fortunately, advances in road weather management are enabling authorities to stay if not one step ahead, then at least level-pegging with whatever Mother Nature can hurl.

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And it's not just about crashes either. "I think one of the big areas for potential gain is in understanding how weather affects traffic flow. If you've got a relatively long journey to work and you wake in the morning to find it's raining or foggy, you should expect a certain amount of delay to your commute as a result. It's about trying to understand that relationship and getting the use of the available systems right so that traffic can be managed in an effective way."

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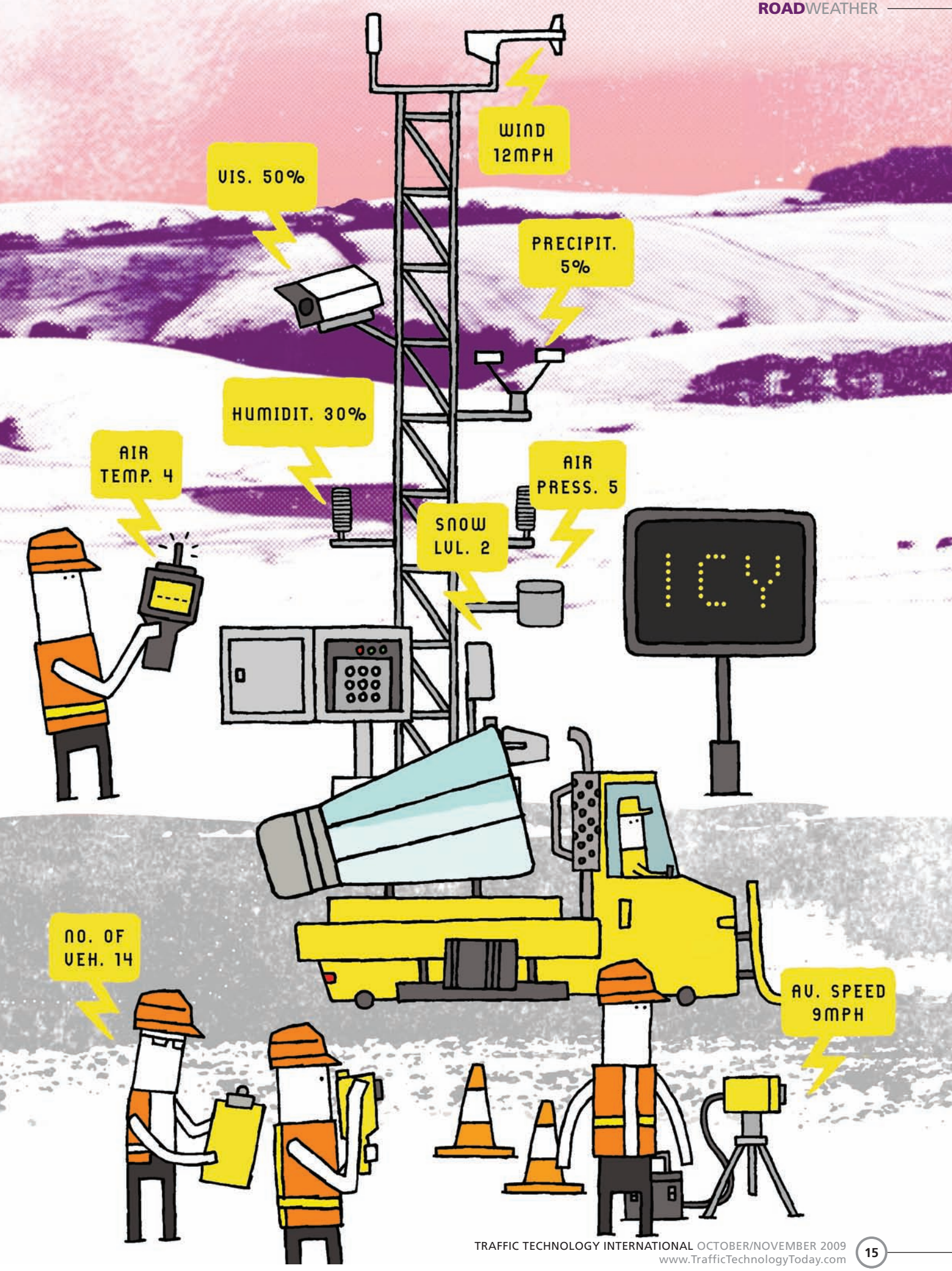
WIND
12MPH
VIS. 50%
PRECIPIT.
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HUMIDIT. 30%
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A lot of Johns' work is currently focused on the way this data is visualized. "Clients require intelligent data that's focused on the way they actually carry out their operations; it's entirely to do with the procedures that they actually follow. It's about streamlining the decision-making process." On decision-making, Vaisala recently obtained the Federal Prototype Maintenance Decision Support System (MDSS) from the USDOT and is expanding its capabilities by adding Road Weather Decision Support Systems (RWDSS) to its portfolio. "The beauty of this is that the practices of the individual operator can be incorporated," Johns says. "It's a decision aid, a real tool for helping to make decisions in the way that you want to make decisions. So if you've got limitations – i.e. the length of time that it takes to get back to the depot on a maintenance run – that needs to be somewhere within the decision support system so that it can understand whether a route is viable or not given the circumstances.

"The MDSS is a federally supported program that most of the US state DOTs have co-funded up to the prototype stage. The idea now is that organizations such as ourselves turn it into a viable commercial solution for the market. It's something that the market has said it really wants, so the customer pull is certainly there for us."

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PASSIVE VERSUS ACTIVE

Sensors are at the heart of every weather data collector, and Saab's Patrik Jonsson has spent the past 13 years looking into the effectiveness of various types – passive and active – from several different vendors. With Saab since 1996, his research has formed the basis of a recent paper, prepared as part of his PhD at Mid Sweden University. "There's a big difference between how a university works and how the industry works," he says. "In the industry, the objectives are obviously more commercial. At universities you have to know a lot of background; what you want to achieve, what you want to gain, etc. So far we have evaluated sensors installed in the road, although in the future I hope also to study the newer remote sensors. That's a very interesting area because everyone wants non-intrusive sensors, but they come with a price tag. Another issue is that you don't have the possibility to get a prognosis of how the road status will change. With embedded active and passive sensors, you can follow the freezing point over time so you can predict when the road will freeze. Some other sensors take more or less a snapshot of the actual condition, so it will tell you that the road is slippery – you might have already crashed by that point!"

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Andy Giles is the managing director of MeteoGroup, which supplies winter highways services to over 50% of the UK's market and over 70% in the Netherlands. "This success has been built upon dedicated and highly experienced meteorologists who support our clients 24/7, as well as the accuracy of the forecasts provided," Giles says. The 'traditional' approach to service provision involves MeteoGroup using client outstation data (RWIS installed at strategic locations around the highway networks) to resolve its road forecast model to deliver highly detailed forecasts for specific points on the network, complemented by area-wide information supplied in text format for climatic domains (areas which are meteorologically similar).

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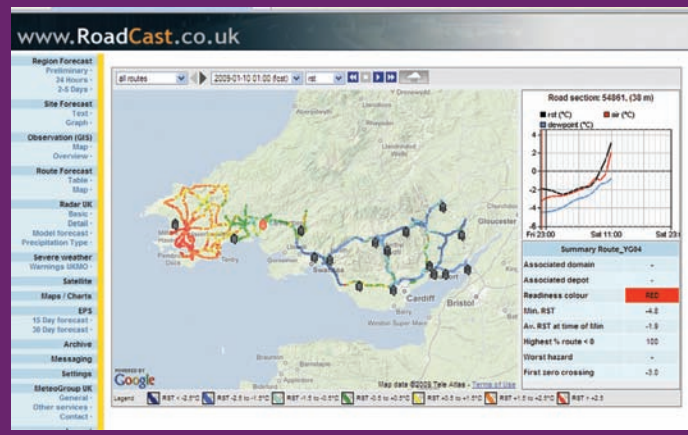
(heating) and night (cooling), along with temperature profile measurements to verify variation within the route-based forecast."

Forecasts generated by MeteoGroup's route-based model are visualized within the same client internet portal, and simple color-coded presentation of the client network on a map interface demonstrate how road surface temperatures and road 'state' will vary over the forthcoming 24 hours. This enables managers to not only target their operations at particular points of the network in timely fashion, but it can provide valuable data that means certain routes may not actually require treatment.

"We are experiencing considerable interest in this new forecast technology, and have recently been awarded a European innovation award for our network forecast technology," Giles enthuses.



Ensuring public safety and minimizing delays requires decisions to be based on the best quality weather forecasts

states. "It's difficult to use infrared systems with those kinds of margins. Sometimes in Sweden, regarding variable speed limits, you're not interested in prognosis, you're more interested in the actual situation. If you detect a slippery surface on the road, you just want to warn the traffic that the road is slippery." But, he adds, if the road is slippery, the road maintenance has failed. "If everything works, that should never happen.

"People often ask me what the best type of sensor is: passive or active? It really depends on what you want to know. Sometimes it's very important to know whether the road is dry or wet because that helps a great deal when conducting winter maintenance. If the road is dry it's no problem, but if it's wet it will become icy. Passive sensors are much better at detecting dry or wet, yet an active sensor will give a much more accurate reading of the freezing point." The best system, therefore, would be one that features both a passive and an active sensor. Indeed, in Jonsson's opinion, the more sensors you have, the better. "It will be a long time before just one sensor gives you all the data you need. The more sensors you have, the better the information and prognosis. My research has helped us to understand that active and passive sensors really complement each other."

In the future, Jonsson predicts that many of the improvements in weather forecasting and road weather management will revolve around advances in the sensors themselves. "We'll have better accuracy, that's for sure," he says. "But I think that maybe the main work will be in better prognosis, more local climate prognosis – trying to predict weather over a stretch of road more accurately." He says that today technology is based more on standard meteorology, but some companies, such as the MeteoGroup (see box, above), are working specifically with road weather, and there remains an important distinction. "They are looking at a whole host of parameters," he says. "For instance, a road stretch where you have bridges will be much colder, or warmer and much faster, than surrounding roads. Areas where you have forest on one side of the road and perhaps an open field on the other side will affect readings as well. I think technologies that can take account of the surroundings with climate mapping and imaging techniques will evolve more in the future."

Photo by Juan Manuel Serrano/AP/Press Association Images

Photo by Haydn West/PA Archive/PA Images

VEHICLE PROBES

The future is something that preoccupies Sheldon Drobot, a scientific program manager for the Weather Systems and Assessment Program (WSAP) within the National Center for Atmospheric Research (NCAR) in Colorado. "What we're doing here at NCAR with our Vehicle Data Translator (VDT) project is really tied in to the whole larger ITS framework that is related to weather, but kind of beyond weather, too," he explains. The basic idea behind the VDT is to combine traditional weather measurements from atmospheric sensors – such as roadside sensors and weather stations at airports, weather model data, radar, and satellites – with a new way of collecting data from mobile platforms. This work is supported by the Research and Innovative Technology Administration's (RITA) IntelliDrive initiative, and overseen by RITA's Ben McKeever and Paul Pisano at the FHWA Road Weather Management Program.

"In the USA, there's some 250 million vehicles out on the road, which represents a much bigger network than the more traditional forms of weather collection can

provide," Drobot says. Of course, at the moment, those vehicles are not providing data from functions such as ABS, windshield wipers, etc, but in the near future Drobot insists they could. Ultimately, the aim is to combine those mobile observations with the traditional sensing capabilities and develop road and atmospheric hazard products, with the goal of saving lives and increasing mobility. "Studies over the past decade show that every year we are losing about 7,400 lives in crashes during hazardous conditions, such as rain, snow, and ice. It's a huge problem that hadn't really received a whole lot of attention. Not only that, other studies show that we were easily losing a couple of billion dollars in economic terms as a result of mobility issues, such as trucks getting stuck in bad weather."

In Drobot's vision, vehicles will essentially become mobile weather probes, collecting, disseminating, and transmitting information about road and atmospheric conditions in real-time to other vehicles and agencies. If ABS or traction control systems are activated, it could be that a patch of ice is posing a hazard. If headlamps are activated, maybe visibility has reduced due to fog. Likewise, if windshield wipers are activated, is it raining? If so, how hard? "For the average driver, it will provide situational awareness," Drobot adds. "Your car will feature a navigation unit that will have built-in weather information based on the research we're currently conducting. Five miles ahead, cars could be reporting icy roads, or there could be a thunderstorm 10 miles down the road. Imagine you want to drive from Denver to Colorado Springs and you have a route that you would normally take, but via the display your system is telling you that a rainstorm is moving in that could delay your journey, so an alternative route might be a faster and safer option.

"At a state transportation level, they'll see these cars reporting different conditions and if they're charged with de-icing – and they see this stretch of road where cars are activating ABS or stability control – they could send out a truck and conduct some spot de-icing. Not only does that improve safety, it will save a ton of materials because they don't have to blast the whole road."

Going mobile is likely to be a big part of road weather management in the years to come. Having developed a remote sensing capability known as spectroscopy, Vaisala's Danny Johns says that the next step is to mount it onto vehicles. "What the sensor does is actually calibrate to the extent that it can show what the friction change is – or is likely to be – given the fact that there is now something on the road surface." It's not an absolute measure of friction, but an index that is described as 'grip' that shows how slippery the road has become due to weather conditions. "It does that by looking at the different combinations of water and ice crystals on the road surface. That is particularly groundbreaking."

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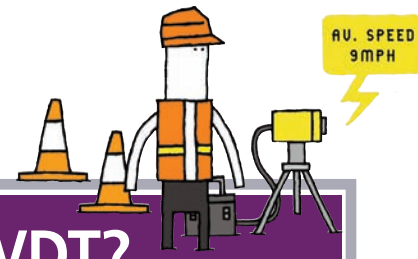
Photo by Owen Humphreys, PA Images

THE FORECAST

Johns and many others in the weather sector believe technologies such as NCAR's VDT will have their day. "One thing I would be wary about, though, is the quality of the data," he says. "We spend a great deal of time and effort making sure factors such as the natural car temperature doesn't conflict with road temperature readings. I think you'll find that a lot of the existing sensors on a car give a good indication of what's happening in the air, but when you start looking at road surface temperature you're going to get bounceback from other cars, heat from tailpipes, etc – so it's something to consider in the early days. I'm not saying it's not going to happen, just that a lot of thought needs to be given before we go down that route."

"It's definitely a really exciting time," Drobot concludes. "There's so much going on that it seems that every year there's some new kind of development or innovation that will have a big impact. By the time that those people born today will get around to driving a vehicle, it's going to look remarkably different to how it looks today – and I think that's pretty cool." ■

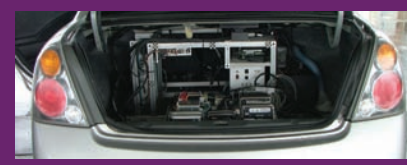


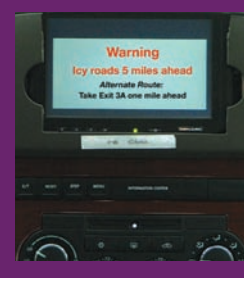
What next for the VDT?

NCAR's VDT is presently just a prototype, with tests in Detroit (where RITA has a testbed for the IntelliDrive program) hoping to compare the collected data with that from traditional weather systems. "We did a 25-car test in the fall of 2008, and then we got funding to run a separate experiment this past April with another 10 vehicles," says Sheldon Drobot. "We can see how the VDT data compares to what we're seeing from the traditional instruments, in terms of things like vehicle temperature and vehicle pressure. We can also compare in terms of accuracy and bias to the more traditional sensing that we would get from meteorological instruments."

Drobot reveals that he has been pretty impressed so far with what he's been seeing. "We've been comparing the vehicle data with traditional observations at Detroit International Airport. That's about 50km from the actual testbed, so there's a bit of ambiguity in the sense that on certain days that we were testing, there were some subtle differences in what was going on at the airport and at the testbed." By and large, Drobot reports, the majority of vehicle-based temperatures were within about ±1-1.5°C of those recorded at the airport. "It gives us a lot of confidence that the temperatures that we're getting from the vehicles are consistent with what we get from traditional observations, so that bodes very well for going forward.

"We want to refine the algorithms and get them to be a little bit more accurate," he adds. "And we're basically planning that in the early part of next year we'll have the next version of the VDT software ready to go. That probably won't be something that will be ready for wide distribution, but it will be an improvement nonetheless."



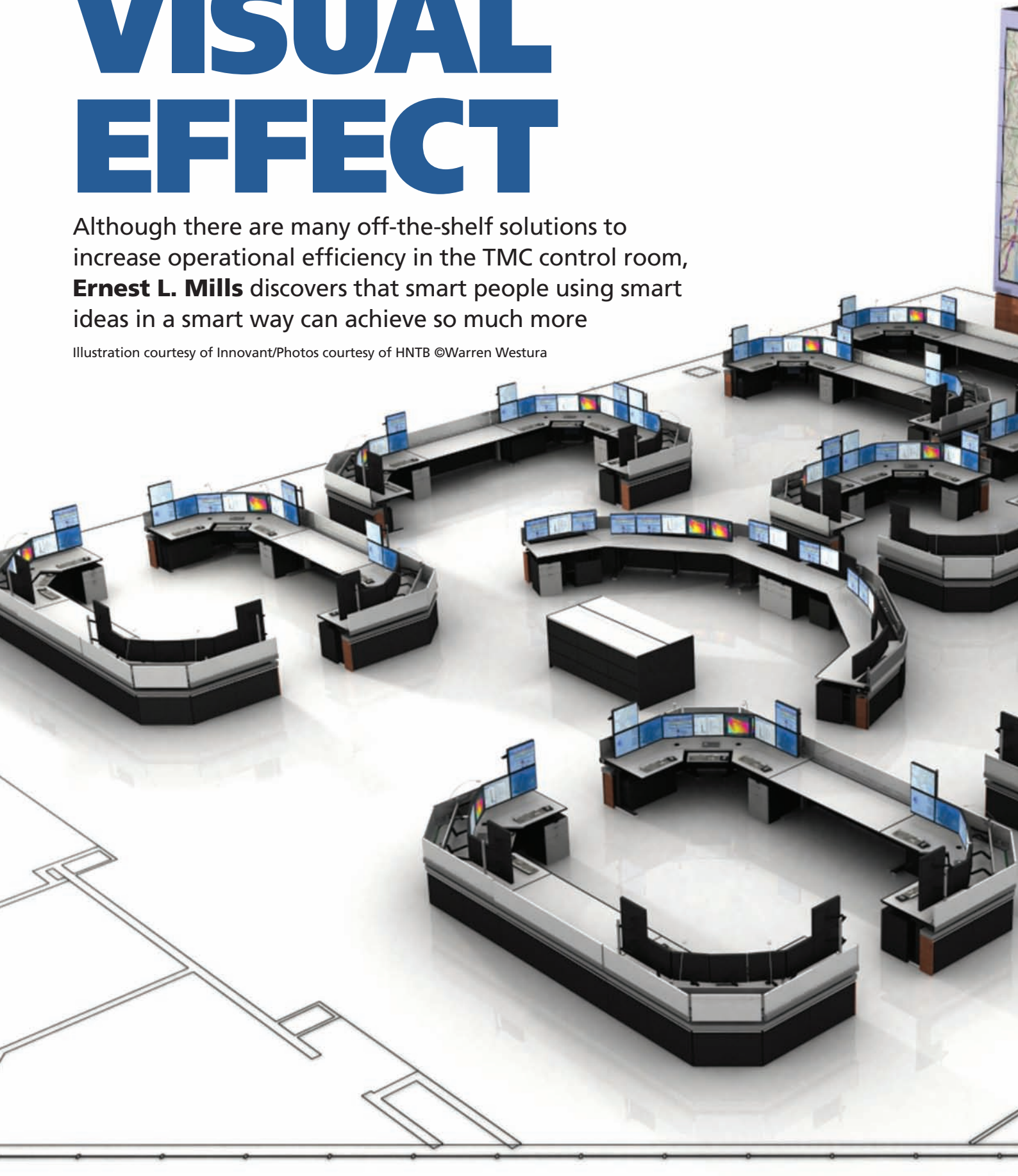


The sheer amount of data potentially flowing through a vehicle-based data network could be immense

VISUAL EFFECT

Although there are many off-the-shelf solutions to increase operational efficiency in the TMC control room, **Ernest L. Mills** discovers that smart people using smart ideas in a smart way can achieve so much more

Illustration courtesy of Innovant/Photos courtesy of HNTB ©Warren Westura



Imagine it's rush-hour and you're driving up a highway ramp in New Jersey when your tire blows, forcing your vehicle into a guardrail. As other road users whizz past your disabled vehicle, you ponder your limited options. Yet, within moments, a police cruiser pulls up, then a tow truck. Before you've fully grasped the situation, you and your car have been delivered from danger.

Such a scenario of response may be idealized, but it represents a daily situation in New Jersey, which in recent years has invested in the technology, facilities and operational culture to revolutionize the efficiency and safety of the state's roadways. The most visible sign of this investment is the state's US$29 million 28,000ft^2 New Jersey Traffic Management Center (TMC), located in the town of Woodbridge. Opened in 2008, the Center brought together for the first time professionals from the New Jersey Turnpike Authority, Department of Transportation and State Police. Then it armed them with some of the most advanced traffic management technology available. The results have been transformational. "We've significantly reduced the mean time for removing incidents from the road," enthuses Brian Gorman, director of IT and administration for the Center. "The obvious impact is that the sooner you respond to incidents, the lower the chance for secondary incidents.

"But a major, less easily discerned benefit is in the preemption or reduction of traffic build-up," he continues. The standard metric for peak traffic in the region is that for every minute it takes to clear a traffic-stopping event, the build-up of idling vehicles will stretch one mile. Furthermore, it takes as long as 15 minutes for that single mile of back-up to clear. So, seconds really matter and tight coordination among units – police, fire, towing, maintenance – is critical.

POWER OF PROXIMITY

According to Gorman, the impetus for the creation of a unified TMC came from the merger of the state's Turnpike and Garden State Parkway authorities in 2003. As opportunities for consolidating operations of these two groups were investigated, it became clear that there was an opportunity to do more than save money.

For decades the Turnpike, Parkway and DOT – which covers all other state roads – operated as insulated, vertical operations. They communicated but not in ways realized in a unified environment. They shared information via phone, email or even fax, and at times notices would be issued only after the heart of a crisis had already passed. If a motorist caught in a major back-up was to call one of the authorities to complain, the response may have been 'Sorry, that isn't my road'. People

If a state is to improve congestion, highways must be operated more efficiently – which starts off in the control room

The new Woodbridge TMC brings separate agencies together for the good of the community

"We organized workstations into pods, and arrayed them around a slightly elevated staging so supervisors are within earshot of all groups"

don't want to hear that – they demand the accountability and coordination afforded by a fusion center approach.

Woodbridge resolves this issue by putting key traffic management professionals, as well as state police dispatchers, in one facility – and in one cavernous room. To create the TMC, New Jersey worked with general architecture and engineering firm, Kansas City-based HNTB. According to HNTB's Anthony Bartello, who led the firm's involvement, the aim from the start was to create a facility that would transform the way traffic was managed in the state. "Working with Brian Gorman and his team, we designed this facility from the user outward," Bartello details. "The entire focus was to create a working environment that would bring about better communication and better decisions." For example, the team's best-practices research uncovered the fact that NASA-style floor layouts in control rooms (i.e. series of long rows all facing forward) can actually create artificial boundaries between groups – people from the front row never actually interact with the people in the third row. "To create greater synergy among our teams, we organized workstations into pods, and arrayed them around a slightly elevated staging so supervisors are within earshot of all the groups. The turnpike and DOT traffic supervisors are literally shoulder-to-shoulder in this design," Bartello says.

Due to the workplace design, there is a continuous flow of critical information as people take a few steps to confer with other teams, or in an emergency call out to alert a team to a problem. Each of the 42 workstations has a computer, four flat-screen monitors and access to an array of traffic-related data and visual information. Supplementing these are phone and radio communications, which connect staff to one another and to a range of emergency resources, police and maintenance crews – even motorists, who will call to report accidents or inquire about back-ups.

An agency employee works on programming the communications system in the state-of-the-art Data Center below the operations floor of the facility

According to Bartello, the Center in Woodbridge has an additional hidden benefit – it is extraordinarily 'green', constructed with 25% recycled metal panels and with a control system that intelligently manages lighting, heating and air-conditioning, and even window blinds to minimize energy use while maximizing the comfort of the traffic teams.

THE WALL

As with many control centers, the most instantly impressive element in the New Jersey Center is the operations room with its massive array of video screens. The state's videowall is 18ft tall by 55ft wide, comprised of 48 integrated DLP video screens. These act as one large computer screen with images extending across individual screen boundaries. The turnpike and DOT have more than 450 traffic video cameras across the state, connected by 440 miles of fiber-optic cable that form a massive figure of eight across New Jersey. Supervisors who control the wall can display video from any of these cameras, as well as being able to control the camera movements. They can bring up a map of the state as a whole, featuring color-coded alerts, or introduce such information as television newscasts of breaking news or weather reports.

The technology behind this swift synthesis of visual information was developed by Activu Corporation, a New Jersey-based software and services firm that focuses on enhanced visualization, information sharing and collaboration for control room environments. Activu is an open, scalable network-based solution that runs on commercial, off-the-shelf hardware. This makes it well suited for the complex systems challenges faced by New Jersey traffic operations, which has accumulated a broad range of highly specialized programs over the decades. Each of these valuable programs does a specific task well. For instance, a program might translate and

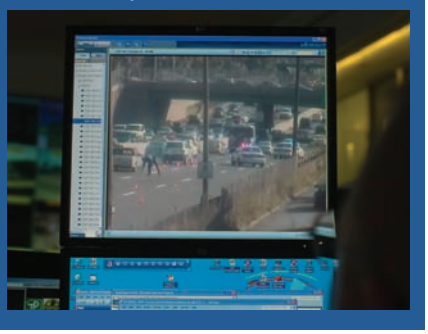
send data from a traffic volume sensor or a certain type of video camera. The problem is that, until recently, it had been nearly impossible to harness all of these diverse data streams into one, meaningful whole. "Right from the start, Brian [Gorman] made it clear that he wanted to evolve our software in certain ways to meet their needs," explains Paul Noble, Activu's CEO. "We were very open to that idea because, as a company, we believe that technology should be client-driven, not feature-driven. We knew they would take our technology and run with it in a new direction."

When minutes are miles…

Triage is the word Brian Gorman uses to describe what traffic supervisors do in the moments following a roadway accident or other incident. Gorman, the director of IT and administration for the New Jersey Traffic Management Center in Woodbridge, says that supervisors must process information, direct others to act, listen to feedback, respond to change – and communicate with other parties to ensure they can react appropriately. The time it took to perform these tasks – and the implications of a timely response – changed dramatically after the Center brought Turnpike, Parkway and DOT staff together with state-of-the-art technology tools.

Imagine that an incident occurs during peak travel times. If it takes a minute to begin to mitigate the incident, about a mile of back-up will occur. That mile of back-up can take 15 minutes to clear. Extrapolate that to four minutes and motorists are facing an hour of delay. If more minutes pass, a back-up involving hundred of cars now perhaps involves thousands, with idling cars generating many tons of CO_2 emissions – and fuming motorists as well.

In the traffic management arena, minutes really are miles…



INTEGRATION

In essence, Activu acts as a unifying software layer that gets the best from the myriad of other programs used by New Jersey traffic units without requiring that they be upgraded or modified. As a result, Activu allows users to access data without regard to its source – the hardware and software simply put the information in front of you without the need to intellectualize it. In this kind of technology ecosystem, all systems continue to contribute value, whether they are rusty old analog cameras, new IP cameras, news TV, or any variety of sensors or other data sources.

Beyond delivering this functionality, Activu integrated its solution with Verint IP cameras already deployed across New Jersey, which allowed users to pan, tilt or zoom key cameras to get better views of highways – all without leaving the Activu environment. Another client-driven innovation involved the creation of a 'preview' mode, in which users can view their content on local displays without affecting the larger videowall. Activu also customized the solution to allow for 'touring' – a process by which users can view all of their cameras in regular rotation.

VIRTUALIZATION

Perhaps the most unusual aspect of the New Jersey Center is that – although it is a remarkable facility – it also is smart enough to make itself non-essential in an emergency. This 'virtualization' capability, also driven by Activu's software, begins with a fully redundant system on a second set of servers, so that in the event of a disaster, the traffic control team can switch seamlessly to the back-up system. In addition, punctuating the 440 miles of fiber-optic cable that loops through the state are 120 points of connection, ranging from service plazas to EZ-Pass computer nodes. At any of these locations, a team can set up an emergency control room using laptops. What's more, as the system stores user preferences, when this team connects they will instantly see their information in their preferred views. They can manipulate the cameras, crop and send screens to colleagues – much as if they were back at their workstations in Woodbridge. According to Gorman, this gives the traffic team the ability to respond to extraordinary events, regardless of the time of day, or even where the skilled staff members happen to be in the state.

> "We believe that technology should be client-driven, not feature-driven. We knew they would take our technology and run with it in a new direction"

The Activu solution has removed many of the obstacles that previously hindered efficient real-time response

LOOKING AHEAD

Gorman reveals that the Center is now investigating two new technologies that may further compress response time and improve public safety. The first is the use of automated response mechanisms that offer staff a set of likely 'actions' based on a traffic scenario. For example, if a truck were to overturn, the computer might suggest that fire, police and cleanup crews be dispatched and that certain key roadway signs above and below the accident point be illuminated to detour motorists. Such automation could help get the message out faster.

Beyond such enhancements, Gorman envisions ultimately moving to predictive traffic tools. By running traffic data through sophisticated algorithms, these tools would tell traffic managers in advance where back-ups are likely to occur, allowing for proactive efforts to mitigate the problems with using the usual array of tools.

Gorman also envisions a future when there is seamless, regional coordination of traffic flow. In essence, by sharing tools and data, traffic managers will be able to help drivers traverse long corridors with minimal disruption. In the northeast, conversations about such regional cooperation are just beginning to overcome many decades of institutional animosities. But Gorman is hopeful, concluding "Good ideas survive." ■

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As telematics devices become ever smarter, **John Challen** discovers how the driving experience will be revolutionized by new safety, navigation and dynamic traffic applications

Illustration by Flatliner/Vision EfficientDynamics images courtesy of BMW Group

CONNECT MORE

Recent advances that have vastly improved information and communication technologies have left consumers expecting more and more information at their fingertips – and in an instant. The situation remains the same when on the move, as the transportation network has become an extension of the office and to an extent the home. Cars have become a space in which journeys, meetings and rendezvous are planned – in this day and age, not a single second can be wasted.

One system that has taken telematics to a new level is BMW's ConnectedDrive, which has recently undergone an upgrade to offer even more features. As well as the camera-based speed limit and traffic sign alerts, ConnectedDrive was the first to offer a telephone inquiry service that transmits data directly into the navigation system, and the ability to download individual routes. The telephone inquiry service now not only provides a direct connection to the complete telephone directory, but it also allows an operator at BMW HQ to transmit information directly into the car.

But the main areas that have been improved in the latest version of ConnectedDrive are in reliability and safety, and this update will see BMW become the first car maker in the world to offer the chance to download individual applications and software updates while on the road. This process will keep the car up-to-date throughout its entire life and allow car customization according to preferences of the individual occupants.

In terms of safety, ConnectedDrive has concentrated on improving the speed and ease at which road accidents are dealt

with, and in doing so minimizing disruption to the road network. BMW's enhanced Emergency Call function, for instance, ensures that rescue services are not only given detailed information about the collision before arrival, but also have an idea of the risk of injury affecting the occupants. Using this information, rescue teams can prepare appropriate medical treatment of the victims in good time. The system can also decipher which safety restraint systems triggered, as well as the belt status in the front seats to figure out what type of accident (head-on, rear-end, side-on and multiple collision) has occurred, and thus make the necessary distinctions.

SERVICE-RICH FEATURES

BMW probably doesn't want to hear that Mercedes-Benz models will soon boast a telematics system that its makers claim goes above and beyond what the Munich motor manufacturer has to offer. But that is exactly what is happening with Hughes Telematics' Cocero system. "Cocero is similar to BMW's ConnectedDrive but has much more contemporary technology and more services," suggests Kevin Link, vice president, Marketing, Hughes Telematics.

Similar to ConnectedDrive, Cocero will help keep traffic hold-ups to a minimum when an accident occurs through the transmission of information from the vehicle. Furthermore, Link believes that depending on privacy laws, more might be possible: "There is ever more rich data coming out of the vehicle all of the time. That data will be used by responders as well as the dispatcher. Maybe some day the system will be married to your medical records, so that the response unit knows what to expect when they get onto the scene."

There are also many security benefits to Cocero, one currently being the ability to lock the navigation system in a stolen vehicle to prevent it heading toward 'home'. "In the future, there will be a lot more integration within the vehicle with those systems," Link predicts. "Theoretically, it will be possible to shut down the car. OnStar is working on slowing the vehicle down when in pursuit, and we are working with a couple of further options. One idea involves triggering a loud noise within the vehicle that is so intrusive, the driver would have no option but to come to a stop. And once the vehicle is stationary, it is immobilized." Link says that there will be a lot more vehicle-disabling techniques in next generations, highlighting the ability to remotely slow down stolen vehicles and even shut them down completely.

This new BMW ConnectedDrive technology will ensure the vehicle comes safely to a halt and that assistance is quickly on hand

BMW researchers have converted a 3 Series into a prototype for a sat-nav system that, even when the driver has not entered a destination, predicts where he'll be heading and route selected

Beyond in-car solutions, Link explains that Hughes Telematics' dedication to smoother-running highways goes much further, too: "We'll soon be launching a website related to eco-telematics that will help go beyond the navigation being overlayed with current congestion patterns." As well as the website, Hughes Telematics is revisiting a solution to congestion that has in the past faced much resistance – car-pooling. "In a recent survey, only half of those people questioned said that they had tried it – and just 20 to 25% of those had actually stuck with it! The main issue is that people are not aware of others in their neighborhood going to the same office. Our car-pooling program registers commuting patterns and builds up a profile based on 10 to 12 days of driving. This profile can be matched with similar people with similar profiles."

"Maybe some day the system will be married to your medical records, so that the response unit knows what to expect when they get to the scene"

Kevin Link, *vice president, Marketing, Hughes Telematics, USA*

THE FINAL INCH

Ford's SYNC system platform – developed in conjunction with Microsoft – takes a low-cost approach, using the driver's own

The car driver's experience is being redefined by Ford's SYNC, with navigation and safety benefits being delivered

cell phone or Bluetooth-friendly device to transmit information. The technology will launch in Europe within the MY2010 Ford Focus after being equipped in over one million Blue Oval products in the USA. "We try to think about the final inch when it comes to technology," explains Venkatesh Prasad, group leader of Infotronics Research and Advanced Engineering, Ford. "There are clever technologies around in terms of using the consumer's phone – and relaying the data across it – and that is where I think we will be heading.

"SYNC was really the first example of a technology that did something useful with voice recognition, and did it in a manner that was truly affordable," Prasad continues. "BMW, Lexus and Acura products have a fraction of the vocabulary that SYNC has, while our product is expandable. Today, we are looking at services that are found in phones and bringing them into the vehicle. We started the process with our Traffic, Directions and Information feature," he adds. This uses voice-recognition software, GPS and Bluetooth to deliver customer-specific traffic reports and turn-by-turn directions. "If you continue along the path where consumers want more and more information – and everyone is making the same right turn and heading down the same back road to avoid jams – you need to think two steps ahead," Prasad says. "We are looking at clever ways of using your time, and other options of the routes people are taking." Indeed, Prasad and his team are "in the early stages of planning" individual filtering options depending on the final destination of the vehicle, thereby indirectly managing SYNC-equipped Ford traffic.

Fully aware of SYNC's limitations and maturity, Prasad nevertheless believes it is integral to a more dynamic transportation network. "It is easy to see that the smartest element in the vehicle is the bit that is bought in," he says. "What SYNC doesn't have is a way of being able to be aware that it is in the car. We are receptive to having information beamed in spontaneously and realize that is the future – and SYNC is likely to be the conductor of the symphony."

Mileage accumulation

Mapfre is just one of the many insurance companies that has made use of the information available to it through telematics systems. Following a pay as you drive (PAYD) project called Generation Y, run by the insurer and involving 10,000 cars, a similar product (YCAR) has now been introduced. The main motivation? To reward those who drive safely. "In Spain, we are very concerned about road casualties," explains Luis Peña, head of research and analysis in the strategic planning and innovation area of Mapfre. "We have analyzed telematics service providers worldwide, such as Canada, Germany, UK, and Italy. The main thing we asked them for was a low telematics fee. Our average premium is Euro 600, so we can't pay for a terminal that is more than 20% of that," he says.

Peña goes on to explain that there is resistance from telematics providers to PAYD policies: "Many of them do not want to enter into PAYD insurance because their business model doesn't fit this strict situation. But we don't want to make profit out of telematics, because our benefits come from our services, and having more ratings factors that let us offer better premiums to safer drivers."

Peña – who has an MBA in PAYD telematics – says Mapfre is learning all the time, and wouldn't say no to any data that helped build the perfect policy. "In truth, it is too early to tell which parameters are best to work with," he concludes. "What we are doing at the moment is looking to see if higher claim frequency is related to higher mileage, speeding, and predominantly driving at night. Other insurance companies are investigating highest acceleration and braking, so at this stage all the information provided is useful."

"We are receptive to having information beamed in spontaneously and realize that is the future – and SYNC is likely to be the conductor of the symphony"

Venkatesh Prasad, *group leader, Infotronics and Advanced Engineering, Ford, USA*

The VW Research Group is using Wireless Wolfsburg to test new vehicle information applications, including weather and traffic conditions

TALK AMONG YOURSELVES

Cell phones or smartphones are also essential to a communications collaboration between Volkswagen and the city that it calls home, Wolfsburg. For the Wireless Wolfsburg project, the car is an integral but not the main part of a plan to connect a whole city. "Wolfsburg AG (a public-private partnership between Volkswagen and the city) has built up a complete Wi-Fi network in Wolfsburg in conjunction with Tropos Networks," explains Klaus Schaaf, the project leader. "Although Tropos was selected as a hardware supplier, it could have been Motorola or others as well. The system allows inhabitants, visitors and car passengers access to the internet via a broadband connection while driving. We are building up a city information system that could eventually also go onto navigation systems. It's a new way to bring information to the navigation, instead of a DVD. We can add extra local information direct from the city. The current concept in Wolfsburg has 66 access points within the inner city (each costing around Euro 2,000), but the long-term plan will require 400 points – each one spaced about 200m apart – to service the 120,000-strong population of the city."

Expansion plans for Wolfsburg will move at a steady pace as Schaaf and his team look for other opportunities: "We are currently building up a start-up company under the roof of Wolfsburg AG that will bring wireless networks to other cities," the German details further. "We would like at least five more cities signed up by summer next year." Schaaf adds that drivers will get more information about traffic standstills, which is useful both as a passenger and a driver: "We are also providing a system for the local bus company. So, as a customer, you can see on your smartphone where the bus is and if it is going to be late. This scenario is relying on actual data rather than the bus timetable. It eliminates the need to wait at the bus stop – saving time and making travel more efficient." In fact, Schaaf actually believes that this could be a more mobile solution than some current in-car systems.

Only time will tell which way forward is right, or indeed the most popular, but it is fair to say that as telematics advances, the world gets closer by the second. ■

PERFECT PACKAGE

Tremendous opportunities exist for wireless communications solutions in ITS. When integrated into a transportation system's infrastructure, **Jim Gunn** writes, such technologies can help to relieve congestion, improve safety, increase mobility, as well as enhance productivity

Illustration by Giovanni Meroni

Broadband has for a number of years been touted as the hot future commercial telecommunication prospect. Indeed, we have provided background in several previous *Traffic Technology International* articles on these emerging broadband services and technologies, as well as their potential synergies with ITS initiatives. In 2009, the international commercial cellular industry has been very active in finalizing standards and plans for its Long Term Evolution (LTE) broadband wireless technologies. As 2010 is the targeted timeframe for initial deployments – and LTE appears poised to become the centerpiece of commercial broadband wireless – an overview of LTE technologies and standards would seem timely. Of course, there are many potential synergies for LTE and ITS initiatives.

The graph in Figure 1 presents the number of international subscriptions and penetration (subscriptions/population) for cellular, telephone lines, and broadband. The figure also presents the number and penetration of international automobiles on the road. Since 2000, international cellular subscriptions have surpassed international telephone line subscriptions. Cellular penetration has advanced from 15.7% in 2000 to 59.3% at year-end 2008. In comparison, the number of broadband subscribers is in the infancy of significant growth, with 480 million international subscriptions at year-end 2008, with penetration at around 6.0% and a 26.7% year-over-year growth from 2007 to 2008.

Broadband services that provide instant access to necessary information are rapidly becoming essential to both consumer and corporate users to increase their productivity and enhance their lifestyles and activities. Although cellular and telephone line voice subscriptions are still the killer applications, broadband data and video are increasingly becoming essential features that users are willing to purchase – provided they are available at reasonable monthly rates. Operators therefore covet broadband services for their revenue growth potential, although voice services will undoubtedly continue to be the revenue cashcows for some years to come. As we have previously discussed, operators around the world are targeting quadruple play services, which include cellular (wireless), voice, internet, and video services.

Multiplay services also have many advantages for operators. There are, for instance, potentially up to three or four times the revenue opportunities from triple-play or quadruple-play service offerings,

although this is somewhat offset by a more competitive environment and lower cost structure requirements. Potential competitors include cellular, fixed, and cable (TV) operators, as well as content providers such as Google. Additionally, with common network deployment for all services, there are substantial Operational Expense (OPEX) and Capital Expense (CAPEX) savings opportunities. There are also many common marketing and customer service functions with significant cost-saving opportunities, not to mention benefits associated with common billing and collections from subscribers. It is also important to note that multiplay is a business model that offers attractive revenue growth opportunities compared to the declining opportunities in more narrowly focused legacy-saturated telephone and cellular operations.

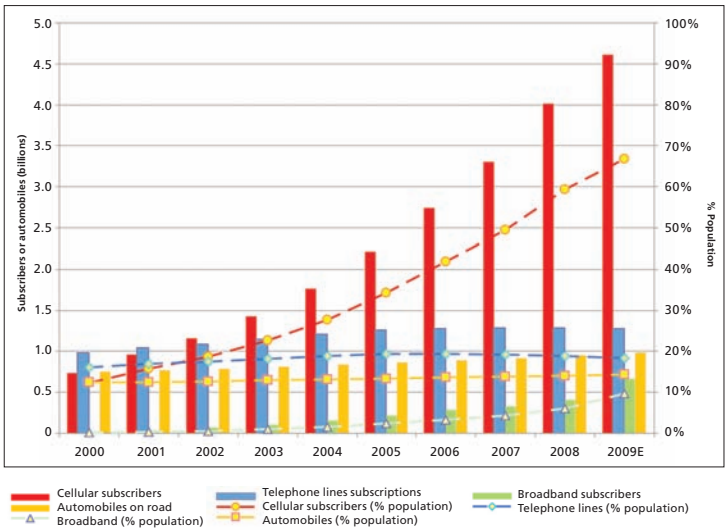

Figure 1: International telecommunications subscriptions and automobiles on the road

Table 1: Download rates of the broadband standards in EGPP evolution

Standard	3G/WCDMA	HSPA	HSPA+	LTE	LTE Evolution
Bit rate	384Kbps	14.4Mbps	21/28/42/84Mbps	> +150Mbps	1Gbps 3 target

LTE OVERVIEW

LTE is a product of work within the 3rd Generation Product Partnership[1] that was created in December 1998 to produce technical specifications and reports for the emerging third-generation cellular standards. 3GPP was created as an international organization to address 3G with an international perspective compared to traditional standard organizations that were historically regional organizations – for instance, ETSI, CTIA, etc. Today, 3GPP has responsibility for GSM, WCDMA/HSPA, TD-SCDMA, and related standards. According to the Global Mobile Suppliers Association[2] the GSM and WCDMA/HSPA cellular deployments have just under four billion international subscribers based on early September 2009 data.

The goal of LTE is to enable higher bit rates for mobile broadband subscribers. For comparison purposes, a typical digitized voicecall requires a bit rate in the range of 5Kbps to 15Kbps (kilobits per seconds, or 1,000 bits per second). In the emerging broadband internet era, subscribers desire bit rates of 1Mbps (megabits per second, or one million bits per second) – or even higher. If mobile broadband is to compete with fixed broadband services, then mobile bit rates of several Mbps per subscriber will undoubtedly be desired. Of course, mobile broadband has the advantage of mobility, which is a significant differentiator to many subscribers. However, for mass-market penetration, comparable bit rates to fixed services will probably be an enabling competitive feature.

The minimum bit rate to be considered broadband has been increasing over time and now appears to be 785Kbps, and this will certainly continue to increase in the future. Subscribers also demand reasonable rates, which substantially enhance subscriber uptake. Mobile operators must therefore notably reduce the cost per Mbps of delivered service to compete with fixed operators in the quadruple-play broadband era. LTE is the technology of the cellular community for these emerging opportunities – and WiMAX is a competing technology that we will cover in future issues.

Table 1 above presents the planned peak download bit rates of the broadband standards in 3GPP evolution plans. It should be noted that these rates are the technologies' maximum deliverable bit rates by an RF carrier in a sector of a base station, and the shared bit rates experienced by individual subscribers are less. Many issues must be addressed by operators to competitively deliver increasing bit rate services to the mass market, of which adequate spectrum is one, as mobile broadband will require more spectrum, which may require regulatory changes and undoubtedly greater cost. Another issue is more cell sites to provide greater capacity. A third issue would be a new LTE technology with learning experiences and enhancements in evolution to large-scale, mass-market operations. Finally, it is also recognized that mobile broadband networks cannot scale costs with higher bit rates and must substantially reduce the cost (per Mbps) of

"Using Bluetooth for communication with their cell phones, drivers can use this driver-friendly HMI to access ITS, as well as non-travel services in their vehicles"

High-speed comms technologies are key to many of the world's most successful ITS systems and help to relieve congestion on the road

delivering wireless broadband services compared to previous technologies.

The technology details of LTE are covered in many texts, papers, and articles. In short, though, its most salient feature is the use of Orthogonal Frequency Division Multiple Access (OFDMA) modulation as opposed to the Code Division Multiple Access (CDMA) of current 3G technologies. LTE will also employ advanced antenna technologies – Multiple Input Multiple Output (MIMO) and Smart Antennae – to enhance wireless coverage and capacity. It will evolve the network to a flat structure to substantially reduce latency, and it will utilize an all-internet protocol (IP) packet network as opposed to the legacy circuit-switched networks of previous wireless standards. The net effect of the LTE technology features will be an RF network with greatly enhanced bit rate, coverage, and capacity capabilities to address the demands of mobile broadband services. And, of course, an 'all-IP' focus for popular and efficient internet access and integration.

SYNERGIES OF LTE AND ITS

LTE appears on track to become the most pervasive international cellular technology. It will be the first cellular standard to achieve consensus acceptance as a single standard in all regions of the world. In the USA, the two largest cellular operators, AT&T wireless and Verizon Wireless, have both selected LTE as their 4G technology. Historically, current international cellular deployments have included selection of different standards in various regions of the world. The successes of the 3GPP standards now providing cellular service to close to four billion subscribers and over 80% of the total world cellular subscriptions have created economies of scale, interoperability, lower cost structures, and many other benefits and advantages.

As Figure 1 shows, the international number of automobiles on the road is 950 million vehicles at year-end 2008 and appears on track to achieve one billion vehicles by approximately year-end 2010. Internationally, there are approximately 150 vehicles per 1,000 people in the population. And because vehicles are shared, the user space is much larger. Drivers – who are also usually telecommunication users – spend many hours in their vehicles per day and are increasingly demanding better in-vehicle communication services tailored to their driving needs and abilities. Smartphones are becoming more affordable and have feature sets that can be programmed to support ITS services and driver services. GPS can be cost-effectively integrated into smartphones and can support location-based services (LBS). Car makers are providing an enhanced HMI in vehicles, tailored for safe and efficient use. Using Bluetooth for communication with their cell phones, drivers can use this driver-friendly HMI to access ITS, as well as non-travel services in their vehicles. Overall, ITS appears to represent a 'win-win' proposition for additional cellular services and a substantial market opportunity.

A problem that cellular operators face in their evolution to wireless broadband services is identifying and achieving profitable business models. Historically, operators have enjoyed very profitable, largely standalone business models of connecting subscribers to other subscribers and businesses where they owned the customer and his revenues. The emerging internet and TV services will change this model. Operators have for many years stated that they do not want to become bit pipes and simply connect users with other users. In essence, they have envisioned supplying additional services that multiplay TV, internet, voice, and wireless offer – and, of course, achieve the additional potential revenues that these services offer. The operator community seems to be evolving to the recognition that the number and complexities of these many potential additional services cannot be effectively addressed with their historical walled-garden approaches and that opening their networks to third-party services with win-win business models is essential to their potential future broadband successes.

ITS services should be one of the most attractive potential services. Potential ITS services include LBS services, traffic reports, route guidance, emergency services, plus many more. And of course, the services can be provided on cell phones (e.g. smartphones) that subscribers purchase for many attractive services, including ITS.

Emerging wireless broadband services and LTE offer many additional synergies with intelligent transportation systems, some of which are detailed further in the sidebar above. Ultimately, the cellular industry appears on track to deploy LTE beginning in 2010, and the opportunities for synergies for ITS and LTE appear immense. ■

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The driving force of ITS?

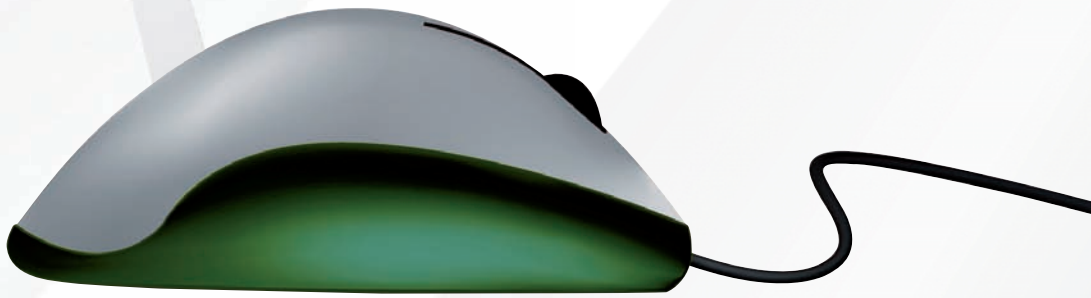
Wireless broadband networks will require more base stations to achieve capacity and coverage goals, so the roads and highways of the world will be key targeted coverage areas, which could offer new public-private partnerships that have historically proved elusive.

As we have pointed out in previous articles on the subject, cellular phone sales provide the largest single consumer electronic market in terms of units, with over a billion cell phones sold annually. The semiconductor industry therefore focuses on supplying chips for this market, so consequently the high volume and lowest-cost chips are available for this market segment. Although cell phones often do not have the functionality or appropriate environmental specifications (e.g. temperature range), the chips can often be used in tailored cost-effective products for ITS and other public safety applications.

In addition, wireless networks are designed for peak-load capacities during high-usage time of the day. During off-peak time periods, unused capacity might be available at lower bulk rates for ITS applications.

Meanwhile, backhaul communication (i.e. cell sites to core network) capacity requirements for broadband will substantially increase. Traditional circuit-switched technologies and services will also not be adequate or cost effective. Operators are evolving to Carrier Ethernet technologies and services, which involves deployment of new fiber and equipment in many metro, suburban, and rural areas, including along roads and highways.

"Broadband services that provide instant access to information are essential to both consumer and corporate users to increase their productivity and enhance their lifestyles and activities"



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CRIME WAVE

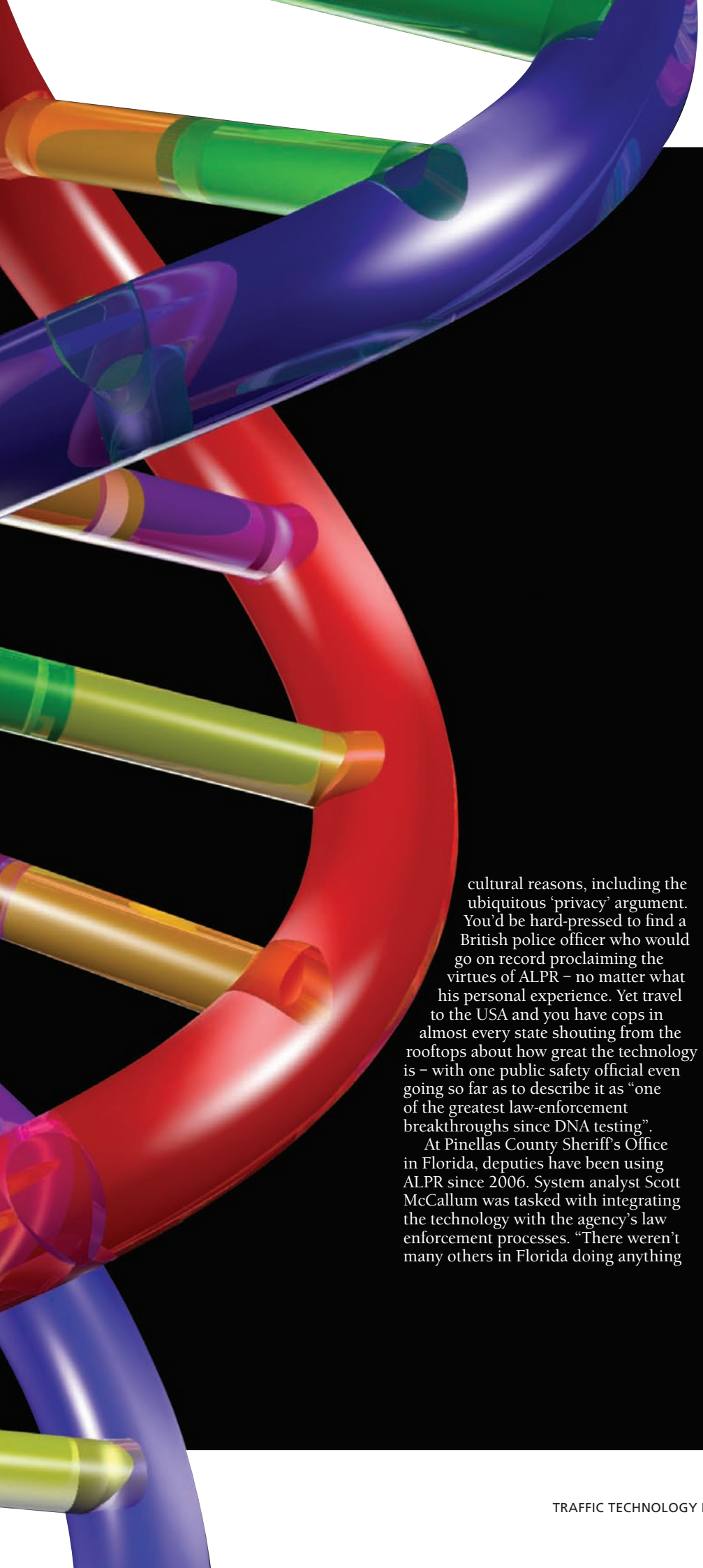
One of the must-have technologies of the ITS sector is also having a huge impact in fighting crime. **Louise Smyth** asks some of the law enforcement personnel deploying ALPR why they think it's the DNA profiling of this generation

Illustration by Andrew Johnson

Civil law enforcement and traffic management are two sectors that are increasingly overlapping. Whether we're talking about removing drunk drivers and dangerously illegal vehicles from our roads, or preventing the abuse of HOV lanes, we can't have truly intelligent transportation networks without the support and acquiescence of police agencies. Likewise, those agencies are discovering more often that tools from the traffic management field can assist them with enforcement... and not only for enforcing traffic laws.

Used in a variety of applications from parking management to average speed schemes, ALPR is deployed by the traffic community across the globe. It has not, however, seen such a high level of take-up with police agencies. Reasons for this are relatively straightforward – one being the technology itself. It's taken a long time for ALPR systems and their components (notably the cameras and OCR processes) to reach a high enough standard to convince law enforcement agencies to invest. If you are managing a parking lot, less than perfect data may be acceptable. If you need to apprehend a wanted criminal, though, it's a different story. Other factors include cost and logistics: law enforcement agencies are working within budgets that are precarious at the best of times. It has taken time for ALPR systems to come down in price and to be produced in dimensions (namely small, mobile units) that make them an attractive option.

But there are moves toward a more widespread use of the technology. Many police departments are using ALPR extensively – they just might not want you to know about it. In the UK, efforts are downplayed for various political and



cultural reasons, including the ubiquitous 'privacy' argument. You'd be hard-pressed to find a British police officer who would go on record proclaiming the virtues of ALPR – no matter what his personal experience. Yet travel to the USA and you have cops in almost every state shouting from the rooftops about how great the technology is – with one public safety official even going so far as to describe it as "one of the greatest law-enforcement breakthroughs since DNA testing".

At Pinellas County Sheriff's Office in Florida, deputies have been using ALPR since 2006. System analyst Scott McCallum was tasked with integrating the technology with the agency's law enforcement processes. "There weren't many others in Florida doing anything with the technology at that point in time," he says. So McCallum conducted his own research into how ALPR could help and what to look for in a vendor. His bottom line was that the technology had to be user-friendly: "When it comes to law enforcement, if it's not easy to use and intuitive, then it won't get used – it'll be stashed in the trunk of the car."

He purchased four dual-camera systems from Elsag North America and within a few months another two. All six systems are vehicle-mounted and can easily be switched between vehicles (for instance from a marked to an unmarked car). Infrared cameras capture plates and the images are entered into a system that compares them with data from both local and national sources. If a match occurs – e.g. a plate corresponds to a vehicle listed as stolen – the deputy is alerted.

Since the six systems have been in operation, they have been used to assist in a number of criminal investigations, including some unusual cases. "Two counties to our south there was a man who was wanted by the FBI for a US$38 million Ponzi scheme," McCallum says, outlining one recent success story. "And we had a hit on this guy. There was no warrant on the license plate, but there was a warrant on the person, which we identified. We were able to bring him to justice pretty quickly."

More usual ALPR usage is in the area of stolen plates and vehicles. Cracking down on auto theft is a useful way for police to improve crime-rate statistics, and mobile ALPR units allow them to do this in a far more efficient manner than in the past. There is also a recognized link between illegal vehicles and other illegal activities, as McCallum observes. "Stolen vehicles are used in a number of different crimes, so taking vehicles like that off the street is a big deal," he says.

Mark Windover, Elsag North America's CEO, is enthusiastic about his company's efforts in the crime-fighting sphere. "We are proud to work with police agencies and we strive to offer them the best technology possible. We provide an advanced ALPR system that reads day and night, in all weather conditions. We can read reflective, non-reflective, embossed and flat plates, and the readers are complemented by a powerful back-office operations center for data analysis."

"There was no warrant on the license plate, but there was a warrant on the person, which we identified. We were able to bring him to justice pretty quickly"

Scott McCallum, *system analyst, Pinellas County Sheriff's Office, USA*

CINCINNATI BID

In Cincinnati, Ohio, Heather Whitton – a computer programmer analyst with the Cincinnati Police Department – has also spent the past few years immersed in the crime-fighting benefits of ALPR. Her story is similar to Scott McCallum's in that her department had not used ALPR before and she was tasked with bringing it into use. "In September 2007, I got put on a pilot project for LPR," she explains. "It was a successful pilot and we decided to initially purchase seven PIPS Technology units from Federal Signal in April 2008."

Mobile plate-reading units from Elsag North America assist the deputies out on the roads

Whitton can easily recount several instances where ALPR made a significant impact on criminal investigations. "There was a spate of aggravated robberies at convenience stores," she details. "At the last one there was a witness who made a note of the plate and a description of the vehicle. Although the witness didn't get the plate

totally right, we were able to wildcard search to what we thought they might have seen and came back with an image of the vehicle that matched the description. Every time the license plate readers see a plate, it's put into the database that investigators can search. Our vehicles 'GPS tag' every time they take an image, so not only could we see that vehicle driving in the general area on the morning of the robbery, we were also able to see that plate was registered to a false address, and by tapping into the database we could see that the vehicle was parked on a particular street almost daily. Our investigators staked out the location, witnessed a guy walking to the vehicle, brought him in for questioning and he confessed to being the getaway driver. He subsequently gave us information that led us to the actual robbery suspect."

Whitton goes on to detail another, more gruesome instance where ALPR played a big role. After committing a double homicide, this suspect set the apartment on fire to cover his tracks and stole one of the victim's vehicles. "It wasn't until the fire was put out that officers realized it was a homicide scene – several hours had passed before they knew what was going on and realized a victim's car was missing," Whitton says. "They put out a BOLO (Be On the Look-Out) and one of the officers in a plate reader car said to himself 'I remember seeing a car like that' and scrolled through the plates and images he had seen that day and found the car."

The database was used to map the area where the car had been spotted and it was found within five hours of the bodies being discovered. "That was a big break for us because there were two individuals in that vehicle without records or prints," Whitton adds. "The suspect traded the car for drugs to get rid of it, so not only could we tie those two individuals' prints to the vehicle and eliminate them as homicide suspects, they actually had information that ultimately led to the arrest of the actual murder suspect."

FINANCIAL INCENTIVE

As much as cases like the above demonstrate the importance of ALPR, police agencies continually have to justify investment in such technology. "The way I explain it is that ALPR provides value in two ways. In terms of street value, it helps officers be more efficient; it's a force multiplier. The other element is the investigative side; the LPR cars are out scanning plates and taking images that can be used at a later date to help with investigations. We also do things like parking sweeps to capture vehicles with many outstanding fines, so there's a quantitative value that I can put behind their

The unusual world of ALPR…

As well as crime-fighting and traffic management applications, ALPR is also being deployed for a number of other tasks. CitySync is one vendor that has noticed a growing number of alternative applications during its 10 years in the industry. "We have been involved with a number of somewhat unusual projects where ALPR has been put to work," explains CTO Lawson Noble. "These range from a system for access control at a cheese factory in Italy to a system at a shopping mall where we identify vehicles of known shoplifters as they enter the parking lot and alert security in real-time to prevent theft. We also work on non-road vehicle projects: for instance, in the USA, we are using our PlateFinder VMD for detecting planes taking off and landing (for a new legal requirement)."

Less unusual work involves systems to help drivers find their cars in huge car parks. "In the tallest building in the world (the Burj Dubai), you can easily lose your car. We put a system in to help you find it," Noble says. CitySync installed a similar system at Terminal 5 at Heathrow airport. Also at Heathrow, CitySync was tasked with using ALPR on a queue-busting scheme. "This is a mini JTMS project to monitor queue times for vehicles going airside at Heathrow. CitySync ALPR provides accurate real-time information allowing fast and effective queue management 24/7, ensuring service-level agreements are met and saving the airport operator from incurring fines that could run into hundreds of thousands per month."

On a similar note, another scheme involves policing a car park that offers free parking for 10 minutes to prevent drivers from repeatedly driving out and straight back again.

More innocuous applications include using the technology simply for monitoring purposes, such as at road tunnels – counting vehicles going in and then coming out.

ALPR is also deployed in some unusual locations, as Noble reveals: "At a US airbase in Germany, the Americans were being overcharged for being in a secure zone for too long. Our ALPR solution has led to a greater accuracy in charging and has dramatically reduced billings."

"There's a quantitative value that I can put behind ALPR. In 2008, we recovered around US$270,000, which paid for the systems themselves more than twice over"

Heather Whitton, *computer programmer analyst, Cincinnati Police Department, USA*

PIPS Technology ALPR systems from Federal Signal are used to assist crime-fighting and law enforcement efforts in Cincinnati

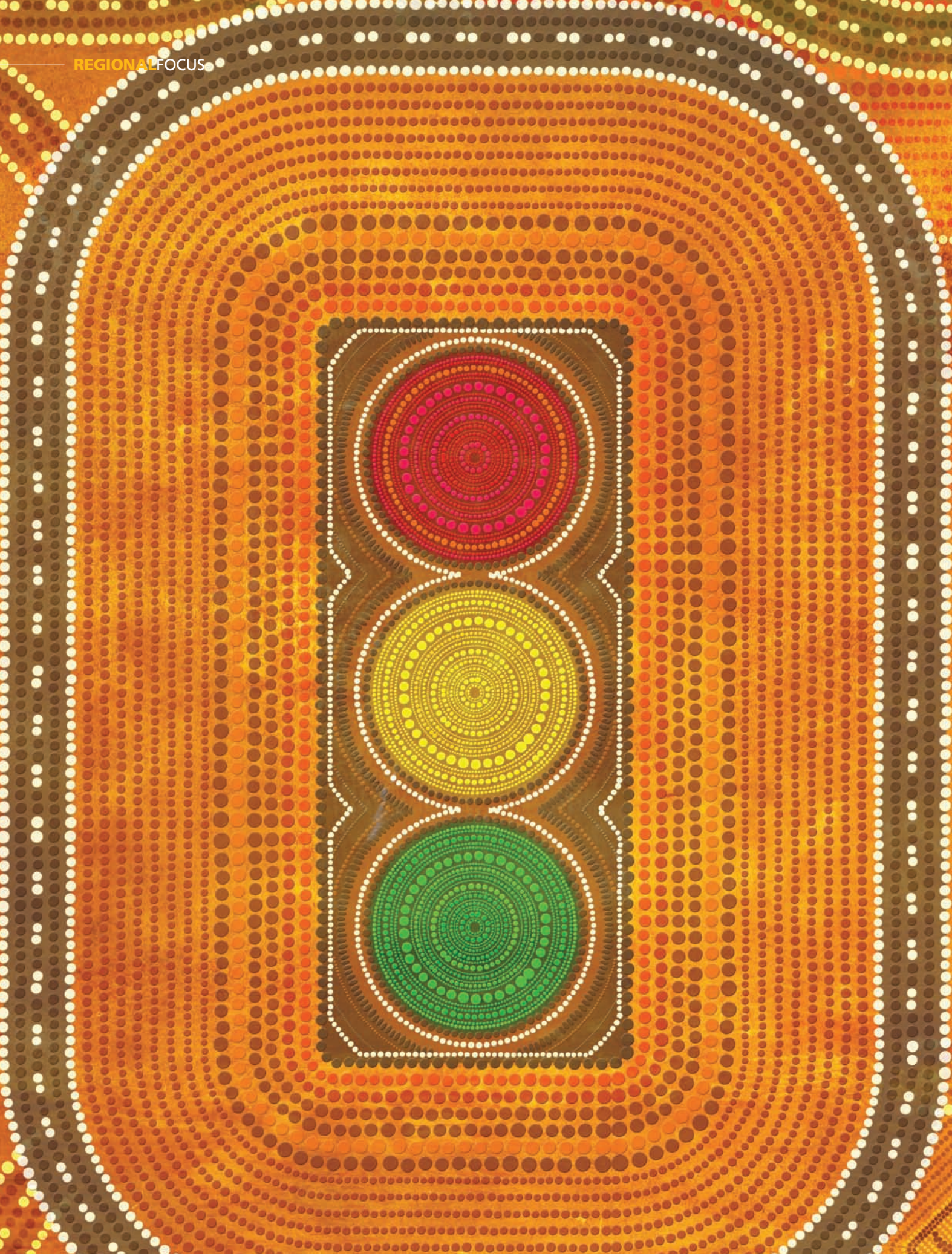
ALPR is just as valuable for police officers as it is for traffic managers

deployment. In 2008, we recovered around US$270,000, which paid for the systems themselves more than twice over."

The next step in Whitton's strategy is to get the go-ahead to invest in some fixed systems to encircle the region and ensure a more controlled stop on any suspicious vehicles, and she plans to head straight to Federal Signal: "Their customer service is top-notch. Before we even purchased the first systems, we were able to receive a demo system. I had dozens of questions and was on the phone to them every day. We ran into a standardization issue but they re-engineered their software so that it would work with our systems – their receptiveness to change and be flexible was huge."

As well as service, Whitton also cites camera size (Federal Signal's products offered the smallest profile) and the powerful back-end system as reasons why the vendor was selected. The company's Brian Shockley was unsurprisingly delighted with this feedback and echoes the importance of the Back Office System Software (BOSS) for crime-fighting: "Harnessing the investigative potential of license plate data is key to realizing the full potential of ALPR, as it's no longer just about finding stolen vehicles. Our ALPR system coupled with the investigative power of our BOSS solution has been a vital tool in solving robberies, homicides, gang violence, and many other crimes around the world."

Shockley is also keen to point out how his organization responds to customer feedback through continual product development: "Recognizing the importance of not hindering the functionality of the lightbar, PIPS introduced the lowest-profile ALPR camera on the market, Slate, earlier this year. It fits entirely underneath the profile of the police car lightbar. Although there are obvious performance advantages to a lightbar-mounted system, we are also introducing a portable solution of our already proven Slate camera and SupeRex processor to allow for movement from car to car, and for rapid deployment on unmarked vehicles." ■



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."

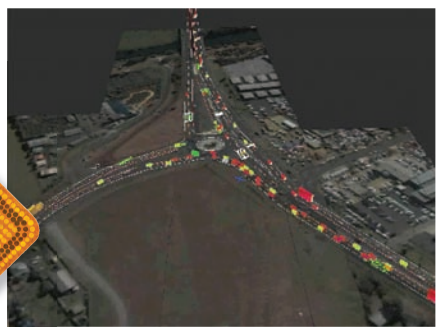
Overall, though, Warin remains positive for the future, and hopes to welcome the ITS community back to Australia at some point... "We would love to host the World Congress on ITS again, but I doubt that we will see one here before 2017, which is a shame because we have a lot to offer. I know that with 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.

Today, ESC is available in vehicles of all sizes, makes and prices either at no extra cost or as an optional extra. Yet its uptake in Australia is only 45%.

RACV commissioned market research to better understand what factors were of greatest importance to Victorians when purchasing a new vehicle and to gauge their level of understanding of in-car safety technologies. Although safety was considered to be of prime importance, the majority of drivers surveyed based their final purchase decision on criteria such as looks or price of a car, rather than examining its safety features. Many people said they didn't actually ask the dealer about the vehicle's safety features – they just assumed that if the car was new, the necessary features would be included. Others assumed in-car safety features were only available in luxury vehicles, or that they would cost more than they were willing to spend.

Perceptions of safety were not primarily linked to specific in-car safety technologies. A safe car was, rather, judged by a number of factors, such as the size of the vehicle, performance, and handling/good brakes, and features designed for 'personal' safety.

Essentially, the research showed a poor level of understanding on what in-car safety technologies are available, how they work, and their safety benefits.

RACV developed the Between Friends campaign in order to encourage more people to learn about in-car safety, to share this information with their friends, and to ensure that these technologies are at the top of their shopping list.

Car buyers rely on the advice of family and friends. The Between Friends campaign provides information on safety devices and encourages people to talk to friends and family about how in-car safety technologies can keep them safe.

The Between Friends campaign includes a range of easy-to-understand fact sheets and checklists. It also includes an animated clip featuring RACV's newest ambassadors to the campaign – 'the Shelldons' – whose in-car safety adventures help explain how some of the most common features work.

Many drivers are not even aware of the safety features available across the market today

RACV is aiming to spread the safety message to all Victorian drivers

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Is DSRC the route to a crash-free future?

Professor Alex Grant from the University of South Australia's Institute for Telecommunications Research focuses on the state's new DSRC trials that will enable cars to talk to each other

In Australia in 2008, 1,463 people were killed in road crashes and over 22,000 were seriously injured. This is consistent with the worldwide ratio of deaths to serious injuries, and minor injuries of 1:15:70.1 Road accidents are the 15th most common cause of death in Australia and are the leading cause of work-related deaths, injuries, and absence from work. According to a report from South Australia's Department of Infrastructure, Transport, Regional Development and Local Government, *Road deaths Australia: 2007 Statistical Summary*, the number of road deaths in Australia "...has not changed markedly since 2003". In Australia, the total economic cost of road crashes exceeds AUS$15 billion a year, which is about 2% of GDP. Worldwide, it exceeds US$145 billion.

There are many approaches that can be brought to bear on this problem: technology, education, improved roads, lower speed limits, legislation, and policing. Current vehicle safety technologies are reaching a limit of efficacy as a result of focusing on risk reduction (ABS, ESC, etc) and crash mitigation (such as seatbelts, crumple zones, airbags) for individual vehicles. To make further major improvements, cooperative safety systems are required. Low-latency, high-reliability wireless communications together with accurate positioning systems provide a platform for accident prevention.

Cooperative ITS based on allocated radio spectrum at 5.9GHz are in the final stages of international standardization. These systems will rely on a variation of IEEE 802.11 (Wi-Fi) wireless communications known as DSRC. Allowing vehicles to communicate with each other and the broader environment provides the ability to avert hazardous situations such as potential intersection crashes, rear-end collisions, dangerous overtaking, lane drift, or imminent road departure. DSRC-equipped vehicles broadcast basic safety messages 10 times a second. These contain detailed dynamic information, including latitude, longitude (obtained via GPS and vehicle dead-reckoning), speed, heading, four-way acceleration, brake status, steering wheel angle, throttle position, and vehicle size. DSRC provides a very robust, low-latency radio connection – even in safety-critical, non-line-of-sight conditions (in contrast to other technologies, such as GSM). This gives cars the ability to 'see around corners' and to 'see through other vehicles'. Similarly, it enables infrastructure to know about the traffic movements and to communicate with vehicles. Onboard units alert drivers to hazardous situations, or can take automatic intervention via interface to the vehicle Controller Area Network – e.g. to automatically increase brake pressure, arm airbags, and pre-tension seatbelts in the case of an unavoidable crash.

The safety benefits of DSRC can be estimated from crash statistics, knowing the kind of crashes that DSRC will help avoid. Statistics for New South Wales show that 61% of crashes involve collision of two moving vehicles. Furthermore, 46% of all crashes occur at some kind of intersection (cross, T-junction, Y-junction, or roundabout). Prevention of even half of these crashes would be significant.

The Australian Communications and Media Authority placed the required 5.850-5.925 band under embargo in April 2008, and is currently contemplating allocation and licensing arrangements for DSRC. The Australian Dedicated Short Range Communications Cluster (www.AusDSRC.com.au) is actively promoting this allocation.

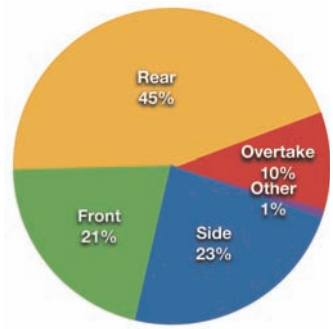
Adelaide-based company Cohda Wireless – a spin-out from the University of South Australia – has developed a DSRC product that has been internationally accepted as providing unique performance. Existing commercial Wi-Fi devices are designed for indoor, non-mobile use, and perform poorly in the highly mobile outdoor conditions required for vehicle-to-vehicle road safety applications. This is a challenging problem that arises due to time-varying radio 'echoes', interference, and Doppler effects.

Cohda Wireless has developed standards-compliant signal processing technology that solves this problem. It provides a very robust, low-latency radio connection, even in safety-critical, non-line-of-sight conditions. This translates directly into increased warning and stopping time for the driver, which is a key competitive advantage – saving more lives more of the time. It also provides increased receiver sensitivity, transmission range, and data speed. These are compelling advantages for traffic management.

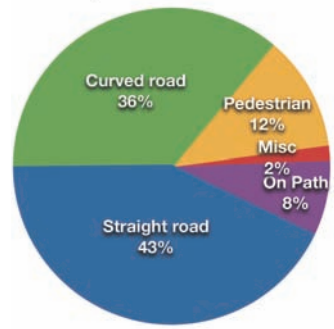
The safety benefits of this technology have been demonstrated in over 10,000km of on-road trials in five countries, conducted by Cohda in partnership with vehicle OEMs, Tier 1 suppliers, and automotive silicon vendors.

Internationally, large-scale field trials are commencing this year in Europe (EuroFOT and simTD, for example) and the USA (including IntelliDrive and SafeTrip-21). Australia is currently contemplating large-scale field trials of its own for several sites around Australia. Large-scale trials are required to evaluate system performance in Australian conditions, quantify safety and environmental benefits, inform Australian Design Rules and standards, inform regulatory and legislative aspects, and build stakeholder readiness.

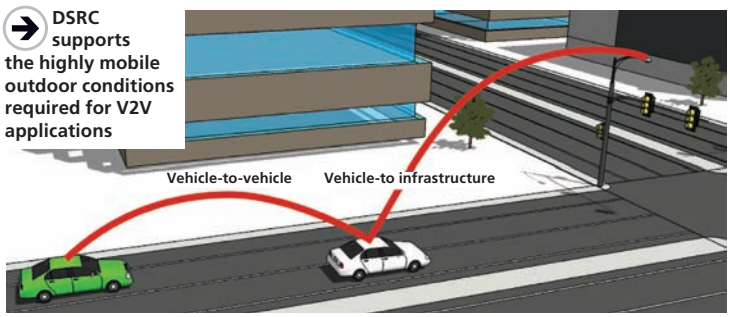
Vehicle-to-vehicle crashes (61%)



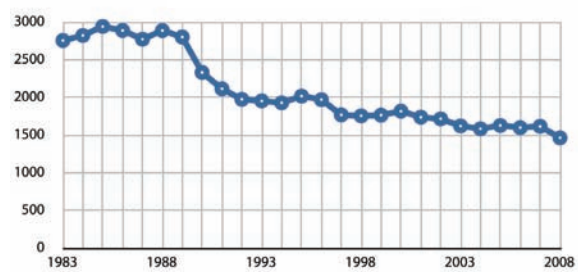
Single-vehicle crashes (39%)



DSRC supports the highly mobile outdoor conditions required for V2V applications



Road deaths, Australia (1983-2008)



Public transport and freight efficiency key to strategy

Heavy investment into ITS now is set to pay mobility dividends in the future, as South Australia's population is set for a boom

Although one of the smaller Australian states in terms of population, South Australia covers a vast area of the central and southern part of the continent. The state capital, Adelaide, is the dominant population center, with a metropolitan area that extends over 80km along the coast, but is constrained by the escarpment of the Mount Lofty Ranges. In the 30-year Plan for Greater Adelaide released as a draft by the state government recently, populations are expected to grow by 560,000 from the 1.1 million of today, and 70% of this growth is expected within the existing developed area.

Allied to this plan is a massive investment in transport with a focus on public transport and freight efficiency. ITS is envisaged to play key roles in both areas.

The ITS will build upon that already operating in South Australia. This includes the TMC that was established in 1997. Over time its role has grown with additional ITS implementations. For instance, arterial road traffic signals in the entire metropolitan area are operated with SCATS, using the adaptive capabilities of the software, with periodic reviews of settings for changing traffic patterns. The TMC also intervenes during incidents or events. The Southern Expressway, meanwhile, is an ITS-enabled one-way, fully reversible facility that opened in 1997 and was extended in 2001. Using boom gate and signal control, VMS/CMS and extensive CCTV, the TMC remotely changes the direction of flow to match peak demand twice a day.

Additionally, traversing the Mount Lofty escarpment with a long 6.5% grade, the safety of the Adelaide-Crafers Highway was enhanced with CCTV and variable speed limits in 2005. Vehicle detection is now being installed and the VSLs are being extended.

Regulation of heavy vehicle driver fatigue is enhanced with the establishment of the Safety-Cam system with IR cameras on gantries on strategic freight routes.

Across remote parts of the state, outback roads are being equipped with CMS to advise drivers whether these unsealed roads are open, suitable only for four-wheel drive vehicles, or closed due to weather damage.

Road and rail bridges across the Port River were completed in 2008, and ITS is employed to enable the bridges to be remotely controlled from the TMC using CCTV and VMS/CMS to monitor traffic and advise drivers. Warning and barrier boom gates close off the road bridge before it is raised for marine vessels to pass.

ITS backbone is being installed on all big road projects, notably the 23km Northern Expressway, while CCTV, vehicle detection, VMS and CMS are being included. The government has also announced the intention to make the route between the Port River Expressway and the Southern Expressway a non-stop facility. Together with proposed links to the Northern Expressway, this major new corridor will require ITS for fully managed operations.

Take-up of ITS is growing rapidly throughout South Australia

Deliver the right data at the right time

In New South Wales, accurate key information is now accessible in a smart format that enables better management of the data

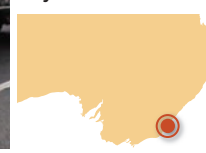
The basis of any useful traffic management data collection system is an arrangement that integrates detector performance, communication performance, and effective centralized data management. Since 2007, Excel Technology Group (ETG) has sourced vehicle classification technology and actively participated in the development of the Road & Traffic Authority (NSW) Traffic Facilities group's road user data retrieval management system.

The RTA's Traffic Facilities group developed an in-house real-time data retrieval and management system utilizing Google Earth map referencing and locational visual screen presentations as a backdrop for displaying and processing site-based real-time data. Sites may be selected through Google Earth map referencing with a mouse click. Once selected, the physical attributes of the site may be viewed in 'Street View' and actual site data is displayed simultaneously on the Google screen. Sites are connected to the central platform through a Next G Virtual Private Network solution that provides high-speed reliable data transfer. Sites using the ETG vehicle classifiers facilitate remote real-time viewing, maintenance access, and automated compressed data retrieval. The remote access software was developed collaboratively with the RTA using a generic function-based DLL device emulation program provided by ETG, which was integrated into the RTA's system control program. Utilizing the 'Free to Use' ETG communication program saved several hundred hours in software development.

ETG XL500 vehicle classifiers power supply flexibility options facilitated either 240VAC or 12VDC battery power source through plug-in interchangeable modules. This allowed the RTA to establish a diverse site base using whatever power source was available, from street light circuits to solar sites. Earlier sites incorporating an RS232 interface into a GSM phone network have been migrated to an Ethernet TCP/IP interface NEXT G VPN platform over the past eight months.

A typical site has two loops and one TYPE II Piezo per lane. To date, the project has used the basic vehicle classification card, which is configured with eight loop+4 Piezo inputs per card. Each chassis has provision for four of these cards – a typical chassis can therefore accommodate sites with two to 16 lanes. The chassis may be easily upgraded in the future to the high-performance eight loop +8 Piezo card, which provides additional binary weight and full WIM functions. The binary weight function utilizes the existing in-pavement sensors and adds a 'load state' to the existing vehicle classification record. Heavy vehicle classes produce a load-state parameter accuracy of typically 98% for loaded or unloaded vehicles. However, in some lighter transport vehicle classes with only two axles, this performance may decrease to 92%.

Google Earth is used in the data retrieval and management system



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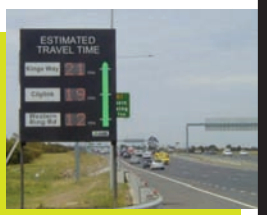

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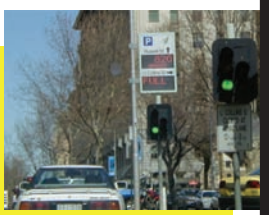
- Train / Bus
- Time / Temp
- Airports
- Marine

Information

- Car Park Guidance
- Control
- Call Centre Information
- Industrial Displays



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WA's ITS infrastructure being improved from the ground up

Managed freeways to star in Western Australia's traffic-busting schemes

Main Roads Western Australia covers a large road network spread over 2.5 million square kilometers and is currently responsible for 18,000km of road network, carrying around 60% of the road traffic. The road assets are valued at more than US$36 billion, representing 30% of the state's assets. However, the relatively low population of 2.2 million people spread over a vast area presents a great challenge for Main Roads.

The bulk of the road authority's recent ITS activities have been within the Capital City of Perth. The city is mostly low density with a spread over 140km north-south and 40km east-west. Due to the long and narrow layout, the main congestion problems are on the north-south freeway system. The freeway extends some 105km after a recently opened 32km extension and is complemented by a high standard control of access highway extension that adds another 38km to the southern end.

To assist in managing the network, an ITS rollout commenced about 10 years ago, with a stepping-up of investment in the past three years. The main activities to date have been foundation-level ITS on the freeway, which includes the installation of optical fiber, CCTV, VMS, and vehicle-detection systems.

The state's integrated transport approach includes an electrified rail system within the center of a significant proportion of the freeway. To maximize the use of state resources, an innovative agreement was established with the Public Transport Authority to mutually share CCTV images along the freeway system. CCTV cameras at the rail stations are used to maximize coverage when managing incidents that may not be fully visible with the Main Roads cameras. This reduces capital and recurrent costs by removing the need to duplicate facilities. In the future, this approach may be expanded to share redundancy in the separate fiber-optic systems.

Outside of the freeway system, a number of projects have recently been activated. The existing communications system to the 850 traffic signal sites is currently being changed over to an IP-based system. A safe systems upgrade to traffic signals on high-volume roads has also seen installation of uninterruptable power supply back-up to 86 sites over the past three years.

ITS solutions are also assisting in providing solutions to reduce road trauma. In August 2009, the state's first variable speed signs were installed in a busy shopping strip on Fitzgerald Street, which is a main arterial feed into the Perth CBD. Solar-powered LED variable speed signs over an 800m length display 40km/h with white text for the speed and a flashing red annulus. The 40km/h limit is displayed during the day and into the main trading period at night, when pedestrian activity and the risk of injury is high. At lower-risk times, a 60km/h limit is displayed.

Investigation into future installation of a managed freeway system has also begun.

UPS are being installed in Perth

Evolving tools to aid appropriate decision-making

The ARRB Group has developed a suite of decision-support systems to assist in the delivery of a safe road system

XLIMITS is the Australian Road Research Board's (ARRB) family of decision-support programs developed to assist road authorities in coming to appropriate speed-zoning decisions. Programs have been developed for each of the Australian states, for the USA and for New Zealand. The programs (VLIMITS for Victoria, WALIMITS for Western Australia, USLIMITS for the USA, and so on) reflect jurisdictional speed-zoning policy and practice. Recent versions of the software embody Safe System principles.

Australia was an early adopter of the road safety audit process, and ARRB developed the Road Safety Audit Toolkit to assist with audits at all stages of a project, from project feasibility to the audit of existing roads. Experience with road safety audits indicated that audits identified more deficiencies than could be addressed, and the need for a means of prioritizing remedial action became apparent. This resulted in the Road Safety Risk Manager (RSRM) – a tool that enables practitioners to assess the relative risk associated with road safety hazards, and the risk reduction that would be expected from different safety treatments in various situations.

The Austroads Road Safety Engineering Toolkit

Screenshot taken from the RSRM program

The Austroads Road Safety Engineering Toolkit is a free online tool that provides information on low-cost road safety engineering measures. Users can search for solutions based on specific crash types (head-on crashes, for instance) or road deficiencies (such as inadequate pedestrian facilities). It includes information on the expected casualty reduction from various treatments. An international version has recently been developed in association with iRAP and gTKP, which is aimed at users in low-and middle-income countries.

NetRisk is a network assessment process that can be applied across any road environment. It was developed in a joint effort between ARRB and the Queensland Roads Alliance. Stage 1 involves a network-level assessment on the basis of factors such as alignment, cross-section, and traffic flow to allow the identification of sites where risk exceeds the criterion level. Stage 2 involves a detailed investigation of the high-risk sites during which specific hazards are identified and assessed, and the treatment options are compared to identify the preferred option.

Technology at the hub of road safety

As advances take place and research becomes available, the Australian Road Assessment Programme will continue to evolve

With five people killed in road crashes on Australian roads every day and a further 70 admitted to hospital with serious injuries, there is no doubt that safer roads are needed. The Australian Road Assessment Programme (AusRAP) highlights sections of road where improvements could be made to reduce the likelihood of crashes – and to make those that do happen survivable.

As most crashes are caused by human error, road safety initiatives have traditionally focused on fixing the driver. Approaches typically involve education, testing, and enforcement. However, psychology tells us that people will always make mistakes.

More recently, engineers have focused on mediating the outcome of a crash by designing safe vehicles and safe roads. It is possible to protect the road user in the event of a crash by designing vehicles and roads to work together to ensure crash energies do not overwhelm vehicle occupants and road users. For vulnerable road users, the road design must work even harder to ensure they are not exposed to high-speed traffic.

AusRAP Star Ratings are based on a detailed visual inspection of a road's design elements. AusRAP uses an innovative approach to undertake these inspections by obtaining state and territory road authorities' video data of road networks, which is usually collected for asset management purposes.

The data is collected using specially equipped vehicles which record digital photographs of a road (generally at 5-10m intervals) using an array of cameras aligned to pick up various views of the road (forward, rear, side-left, and side-right). The vehicles are able to drive along the road at near normal speed while collecting this data.

The digital images are streamed together to form a 'video' of the network. Analysts then undertake desktop inspections by taking a virtual drive through the network, at highway speed or on a frame-by-frame basis, depending on the complexity of the road. The software they use enables measurements to be made of elements such as lane and shoulder widths, and distance between the road edge and fixed hazards, such as trees.

Using these inspections, a Road Protection Score (RPS) is calculated for each section of road. These scores – which build on work undertaken by the European Road Assessment Program (EuroRAP) and draw extensively on the research by Austroads and ARRB Group in the development of the Road Safety Risk Manager – then underpin the Star Ratings.

To date, more than 30,000km of national and state highways have been assessed by AusRAP. For instance, in Queensland the Royal Automobile Club of Queensland (RACQ) has published Star Ratings for more than 8,000km of highways. Of the 2,700km of state-controlled highways assessed, 17% rated two stars, 82% rated three stars and just 0.4% rated four stars. There were no one-star (highest risk) or five-star (lowest risk) roads. This compares with 1% two stars, 59% three stars and 40% four stars for the 5,200km of Queensland's national road network.

By combining the Star Rating results with historic crash data available in the state government's online database, RACQ was able to identify nine key sections of road where there is both a demonstrated history of road trauma, and where the infrastructure-

Australia's intelligent way forward

Smarter thinking and greater collaboration is proving key to enhancing efficiency and productivity in the transport industry

The Intelligent Access Program (IAP) is a new approach to addressing a number of fundamental challenges facing Australia's road freight industry, and uses what is claimed as 'world first' innovation to improve productivity and commercial viability.

The IAP became operational this year at a time when the Australian road system faces influences that are increasingly in conflict. These include a growing population, transport and freight task, constrained road budgets, pressure from the transport industry for operation of larger and heavier vehicles, and community expectations on road safety.

The IAP is primarily a voluntary program that provides participating freight operators with enhanced access to the road network in return for compliance with agreed access conditions. A fundamental and unique element is the evidentiary nature of its data collection, which allows road authorities to optimize road freight policy, the use of Chain of Responsibility Legislation, and on-road enforcement activities, resulting in reduced compliance costs through more efficient administration procedures.

Transport Certification Australia (TCA) is the organization tasked with administering the IAP. "In giving Australia's road authorities a method to better manage and provide for the growing transport task, the IAP increases road transport industry efficiency and productivity," explains Chris Koniditsiotis, TCA's CEO.

"This provides for more efficient and compliant heavy vehicle operations that promote sustainable road infrastructure, improve road safety and reduce environmental effects," he adds.

The IAP business model provides an Australian Transport Council (transport ministers) nationally agreed sustainable telematics platform, which allows regulatory and commercial applications to operate through multiple IAP Service Providers.

In September 2009, the IAP business model, 'Framework for collaborative ITS applications for heavy vehicles', was approved as a new work item by the ISO TC204 in Barcelona, demonstrating the international significance and uniqueness of the model. TCA's general manager of development, Dr Charles Karl, will chair the working group, as this sustainable platform takes its next steps toward international recognition.

The IAP is administered by Transport Certification Australia Limited (TCA), an

To collect data for determining AusRAP Star Ratings, vehicles record photos of roads that form a 'video' of the network that can be streamed for analysis

based Star Ratings were poor. According to the RACQ, "these sections of road are compelling candidates in need of urgent repairs and improvements."

AusRAP Star Ratings were integral to a recent independent review of more than 4,500km of South Australia's strategic highway network. The RAA's South Australia report, *Towards 2020*, details improvements required to achieve a higher standard of safety and efficiency on the state's regional and urban road network. The RAA makes a case for investing early, claiming "The fact is that the longer investment is delayed, the more expensive it will be to deliver."

Towards 2020 specifies a number of safety enhancements for the network, including removing power poles from urban roadsides, increasing shoulder widths, installing safety barriers, and building overtaking lanes. Drawing on the AusRAP results, RAA points out that locations previously identified for their poor safety have benefited from targeted investment. On the Sturt Highway, for example, where lane and shoulder widths were increased, the number of deaths dropped from 31 in 2000-04 to 14 in 2003-07.

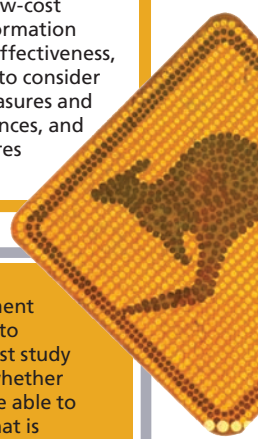
The RACV has used AusRAP Star Ratings to demonstrate the life-saving impact that road upgrades can have. By producing Star Ratings for the Calder Highway before and after its upgrade, RACV showed that its road safety star rating improved from just two stars to four stars. The upgrades involved duplication of the existing single-carriageway road, which has the effect of dramatically reducing the risk of head-on crashes, and substantial improvement of roadsides, which influence the risk of injury in a run-off-road crash.

AusRAP research has shown that this type of improvement can have a dramatic effect on crash costs. By correlating actual crash data with Star Ratings, it found that, on average, improving a road's Star Rating from two to three stars halves crash costs. Similarly, improving from three stars to four stars halves the crash costs again.

Through its affiliation with the International Road Assessment Program (iRAP), AusRAP also supports the promotion of safer roads in developing countries, where nine out 10 of the world's 1.3 million roads deaths occur each year.

In partnership with the Global Transport Knowledge Partnership (gTKP), iRAP developed the Road Safety Toolkit to deliver comprehensive road safety information to help practitioners from around the world find the best and most affordable road safety countermeasures to reduce casualties.

Guidance provided by the Toolkit is particularly relevant to low- and middle-income countries, focusing on low-cost countermeasures. As well as information about cost, treatment life, and effectiveness, the Toolkit also canvasses issues to consider when implementing countermeasures and provides links to technical references, and non-engineering countermeasures that may be effective.



organization established by its members – the road authorities of Australia's state, territory, and commonwealth governments. TCA manages the certification and auditing of IAP Service Providers and oversees the implementation of the IAP, and is increasingly being tasked by government to investigate other regulatory applications.

Under the IAP, participating heavy vehicles are monitored using telematics services with an in-vehicle unit (IVU). The IVU is supplied and operated by an IAP Service Provider – a company that may already provide telematics services to transport operators. The IAP is currently capable of monitoring three parameters – route, time, and speed. This means that the IAP Service Provider is capable of determining whether the vehicle has been somewhere other than the permitted route, traveled on a permitted route but at a prohibited time, or even exceeded the speed condition stipulated by the road authority.

A more collaborative approach to heavy vehicles will increase Australia's road transport efficiency

Although a vehicle operating in the IAP is monitored continually, road authorities are only interested in the data that demonstrates the vehicle's non-compliance with its conditions of access.

To date a number of states have implemented IAP-supported applications, which are serviced by four IAP Service Providers – Transtech Driven Partnership, Minorplanet Pty Ltd, OmniSTAR Pty Ltd, and Transport Compliance Service Pty Ltd.

A number of applications went live on July 1, 2009, with approximately 1,800 vehicles initially participating in the program. Companies taking up the IAP represent a broad cross-section of the industry, from smaller operators to some of the country's largest freight operators.

In May 2009, TCA released outcomes of a feasibility report into onboard mass monitoring for heavy vehicles. Funded by the Commonwealth government, the initiative was designed to assess whether onboard vehicle-weighing systems could be engaged to support the government road-reform process, in addition to private sector uses. This world-first study was commissioned to ascertain whether current onboard mass systems are able to produce evidentiary-level data that is accurate, robust, and tamper-evident. TCA engaged all eight Australian vendors/agents and tested 12 systems as part of the study.

Feasibility study findings established that it was possible to achieve onboard mass measurement within 2% accuracy. In addition, the systems demonstrated a robustness and usability that could cater to different Australian needs and physical environments.

"The findings from the study have been very encouraging," suggests TCA's general manager of development, Dr Charles Karl. "Ultimately, the feasibility study highlights that it is possible to write evidentiary-level standards and produce tamper-evident hardware." In response to the outcome, the Australian government has requested that TCA develop specifications, with full specifications anticipated in early 2010.

"This has been an impressively successful assessment because it has demonstrated that the demands of both government and private sectors can be achieved with what is available in today's marketplace," concludes Koniditsiotis. "This has proved to be a great achievement in terms of collaborating and consulting with industry to find a solution that benefits all sectors."

Coordinated ramp metering on the Monash Freeway

The daily appearance and continuous increase in traffic on Melbourne's roads has called for some smart traffic management

Ramp metering, the most direct and efficient way to control freeway networks, aims to improve the traffic conditions by appropriately regulating the inflow from the on-ramps to the freeway mainstream. Traffic-responsive ramp metering strategies – as opposed to fixed-time strategies – are based on real-time measurements from sensors installed in the freeway network and can be classified as local or coordinated. Local ramp metering strategies make use of measurements from the vicinity of a single ramp to control each on-ramp independently of all other metered ramps in the network. Coordinated ramp metering strategies use measurements from a freeway network to control all metered ramps included therein.

Since 2000, Melbourne's freeways have become heavily congested with extended periods of flow breakdown. The Monash Freeway is a six-lane dual carriageway carrying in excess of 160,000 vehicles per day, with up to 20% commercial vehicles and experiences long periods of congestion between three to eight hours a day.

Melbourne has seen positive results after rolling out ramp metering

Tackling congestion requires innovation

Ramp metering is a key strategy to help improve traffic flows

To address this congestion problem, VicRoads identified a number of needs, including a system-wide approach to ramp metering that would provide the ability to coordinate on-ramps to balance flows and ramp queues across the network. Similarly, a system-wide approach to resolving freeway bottlenecks by maximizing the available capacity of the freeway under all traffic loading and environmental conditions was identified. Finally, there was the need for a control logic that supports the above goals.

Under this perspective, VicRoads decided to implement the HERO (HEuristic Ramp metering coOrdination) suite of algorithms, which aligns with its freeway management objectives. HERO is a new traffic-responsive feedback control strategy that coordinates local ramp metering actions for freeway networks. It was developed by Professor Markos Papageorgiou and Dr Ioannis Papamichail at the Dynamic Systems and Simulation Laboratory of the Technical University of Crete, Greece, and was extensively tested via simulation before being deployed in field implementations. HERO is simple and utterly reactive – i.e. based on readily available real-time measurements, without the need for real-time model calculations or external disturbance prediction. HERO has a modular structure and includes many interacting and cooperating feedback control loops (e.g. mainstream occupancy control, ramp queue-length control, waiting time control) and two Kalman Filters for the estimation of the ramp queue length and the mainstream critical occupancy. Generic software has been developed that implements the HERO coordination scheme for any freeway network via suitable input configuration.

In early 2008, HERO was operational at six consecutive inbound on-ramps of the Monash Freeway extending from Jacksons Road to Warrigal Road. These six inbound on-ramps were previously operating under a fixed time ramp metering system. This AUS$1 million pilot project is part of the Monash-CityLink-West Gate (MCW) upgrade.

An evaluation of HERO's field performance was undertaken by VicRoads. HERO sensibly reduced the space-time extent of freeway traffic flow breakdown and provided significant improvements in throughput and travel speed. The control logic has proven to be robust and transparent to traffic engineers, while transition to HERO has been seamless to motorists and provides significant flexibility and capability to operate the freeway close to optimal conditions.

It is observed that there are very significant improvements in productivity, mean speed deviation from the posted speed, and reliability achieved through HERO when compared with the previous fixed-time systems.

This pilot project has won two 2009 Victorian Engineering Excellence Awards – one for Technology and one for Innovation. According to VicRoads, the implemented technology is saving drivers on Melbourne's Monash Freeway more than AUS$94,000 per day in vehicle operating costs and reducing inbound peak hour travel times by up to five minutes. The economic payback period of this investment was just 11 days. The successful implementation and evaluation of HERO has led to its rollout during 2009/10 at 63 sites across the entire 75km route of the MCW upgrade.

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IN AN ISSUE THAT FEATURES A WEALTH OF AUSTRALIAN TALENT AND EXPERTISE, THE TIME SEEMED RIGHT TO SPEAK WITH MUARC'S **ROD MCCLURE**

Interviewed by Louise Smyth/Photography by MUARC

Writing for a publication dedicated to road traffic technology, it is all-too easy to become engrossed with specialized technical areas and to lose sight of the bigger picture. It is somewhat refreshing, then, to speak with someone who is not promoting the latest ITS product or service; someone who has made it a priority in life to bring road safety out of its somewhat niche sector and place it firmly in the wider societal context. Professor Rod McClure is not a traffic engineer nor an ITS expert. He comes from a medical background and has worked for several respected organizations in his home country, Australia, with numerous career highlights – including establishing the Queensland Trauma Registry. Since July 2007, however, McClure has been the director of the Monash University Accident Research Centre (MUARC) in Melbourne, Victoria.

APPLYING SCIENCE TO SAFETY

"The ultimate aim at MUARC," he explains, "is to produce the science that allows us to work with government and industry to reduce the harm that comes from all causes of injury deaths." Coming from a health background has been beneficial in this respect: "I understand primary prevention in terms of the public health approach, which you can see across a whole range of disease conditions – of which injury is just one. Although I came from the health model, I found I was doing pretty much the same work as someone from the engineering model – in road safety, for instance. The terminology may be slightly different but the principles that both groups bring to bear on the issue of road safety are almost the same."

Indeed it was partly McClure's background that prompted his desire to work on injury prevention. During his time as a medical practitioner (including six months in Edinburgh, Scotland, in the days when doctors were the onsite resuscitators at road accidents), he witnessed some horrific sights: "I was the on-scene practitioner after a major bus crash in New South Wales where 39 lives were lost," he recalls. "The accumulation of situations where you couldn't do very much about treating the problem – in some cases because the patient had already died by the time you got there – naturally made me think of prevention as the most sensible solution."

MUARC is now 22 years old, and has long been known for its road safety research efforts – a fact that McClure attributes in part to one of its early directors being a road safety practitioner: "A lot of the translational research that we did in those days was for transport agencies – the police, departments of roads, and insurers such as the Transport Accident Commission."

It's not hard to see why this is such a pressing area of research: "The distribution of injuries in Australia – and it's similar in many high-income countries – is that road deaths are about a third of the total injury deaths," he says. "Suicide (intentional injury) is about a third, and the other third is from the home and leisure sector." It is logical, then, that road safety is the most obvious target for preventative efforts. "Road accidents involve high kinetic injury and hence there's a high fatality consequence. Sporting injuries, on the other hand, are very numerous but less severe – they're not traveling at 100km/h."

So what are the areas of ongoing road traffic research at MUARC? "We've got several teams that cover the main areas of the Safe Systems Approach. One team is involved with human factors – looking at the road user, their characteristics and the interface between the road user, the vehicle and the infrastructure." MUARC also has a simulator and instrumented vehicles that allow researchers to test individuals in experimental circumstances: to challenge them with issues such as different interior layouts of the car, or different interior distracters. The team also assesses the impact of individual characteristics – older or younger drivers, and impairment – whether they are fatigued, intoxicated, etc. "Our vehicles have five cameras and most parts of the control panels are instrumented so that we can record aspects such as braking times and steering alterations, and map that back onto the vision from the cameras, then analyze them to explore the characteristics of driver performance."

Another group works on in-depth crash investigations, looking at occupant protection and characteristics of vehicles that make them safer. Research is also conducted on active safety and between-vehicle communications. "They look at various warning systems that can be built into cars and triggered by algorithms identified by our human factors team," he adds.

"Our other two major transport safety teams are the ones that are looking at the road infrastructure and analyzing data to identify the characteristics of most of our major road trauma, investigating to what extent you can actually change the infrastructure to make it safer in a crash. An example of their work is mapping the run-off-road deaths in Australia. With large amounts of rural travel and many trees on the roadside, 40% of our deaths result from cars leaving the road and hitting roadside obstacles." In this respect, MUARC has been instrumental in the increase of wire-rope fencing along the roadside in Victoria, to minimize the severity of collisions.

MUARC's final group works on looking at the data: "We've got a good data system in Australia from a number of sources related to roads: the main roads themselves, but also police reports and data from the Transport Accident Commission. We link that through to health data and other economic sources and look at the number of crashes in certain conditions, the injuries that occur to the

"It is inexcusable that something that is achievable – that will lead to such great results – could be hampered by human nature and government silos"

occupant depending on the nature of the vehicle, and the nature of the crash. We can then develop crashworthiness scales of vehicles, crash-risk analysis for roads, and monitoring programs so that when transport and police agencies put in a program to try and reduce crashes, we have a background database that will quantify the impact of it.

"That really summarizes MUARC's biggest contribution over recent years. As we've got a Safe Systems Approach and expertise from several areas underpinned by a sophisticated database – which has been ongoing for 12 years – changes in road fatalities and serious injuries in Victoria can be plotted for the benefit of those who can make a difference. We have incredible government interest in improving road safety."

This joined-up way of thinking appears from the outside to be such a straightforward way to make a difference that it is strange to think that it is not happening in every country worldwide. McClure, however, is a realist as well as a researcher: "Yes, this approach sounds so beautifully simple and I think if it can be achieved elsewhere, then it's got huge potential. It is inexcusable that something that is achievable – that will lead to such great results – could be hampered by human nature and government silos."

DIVIDED RULES

"Political and cultural differences between countries affect the uptake of road safety measures. We in Australia seem to be happy enough to accept some interventions – such as seatbelts – earlier than other regions. On the other hand, some countries have a much lower speed limit than we do and we won't get (at the moment) a political discussion about lowering that limit."

Peering beyond Australia's boundaries, MUARC wants to improve road safety elsewhere, too. As well as Monash campuses in South Africa and Kuala Lumpur, MUARC Europe in Prato, Italy, opened in 2008: "Our role in Prato is really to network between centers and create an information hub. We basically want to end up with a sort of global economy of knowledge on road safety."

As technological and engineering solutions have accelerated over the years, McClure observes one factor that remains a challenge – driver behavior. "In Australia, the rapid drop in major injuries has now plateaued out a little. Where deaths are still occurring, in many cases driver error can be attributed as the cause, yet they've occurred in locations where the system hasn't been forgiving enough. Engineering solutions can be used to encourage improvements and more interaction between all parts of the Safe System. So we encourage people to drive safely because they've got an intelligent system that gives them the right feedback, or doesn't allow them to do something wrong – the use of alcolocks, for instance. We'd like a situation where we have an unwritten contract with the driver that if they stay within the road rules – they don't drive fatigued or drunk or over the speed limit – then we could create a system forgiving enough that if they made a mistake, they won't end up as just another KSI statistic. And yes, I think we can get to that stage." ■

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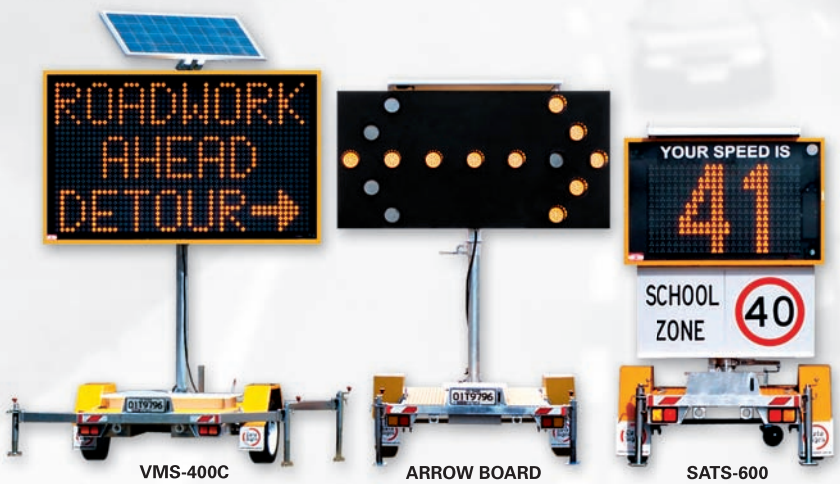

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CHARGED WITH TAKING OPTELECOM-NKF TO ITS NEXT STAGE OF GROWTH, DAVE PATTERSON IS LOOKING AT CONTINUED INVESTMENT IN R&D TO PAY BIG DIVIDENDS

Interviewed by Nick Bradley/Photography by Optelecom-NKF

Great strides are being made in many areas of the ITS sector, but few people would argue against surveillance technology being one of the frontrunners in the intelligence race. From the emergence of internet protocol or IP-based systems to developments in sensory analytics, video surveillance is now more proactive and innovative than ever before. This means that those in the control room can focus more effort on ensuring that the traffic out on the roads flows smoothly and safely. Furthermore, the pace of this development shows no sign of abating, as Optelecom-NKF's recently installed president, Dave Patterson, reveals in an interview from Germantown, Maryland.

Patterson joined Optelecom-NKF in March of this year, having previously been president and CEO at Siemens Government Services (SGS), which provides systems integration and IT services to the US government's defense and civilian agencies, much of which was security-related. Prior to SGS, though, the Tennessee-born Patterson held a senior position at Fluor, among others, so his combined expertise in advanced visioneering and transportation made him a natural choice to take over the reins from Edmund Ludwig, Optelecom-NKF's present chairman and CEO, who will retire at the end of this year.

GROWING THE BUSINESS

"My major task has been to shape a strategy for growth," reveals the 50-year-old Patterson. "We are a publicly owned company listed on NASDAQ, so our shareholders and customers benefit as we grow stronger." But Optelecom-NKF's new top man (who is presently adding an MBA to his resume) insists the only way to achieve this aim is through continued investment in R&D. He describes Optelecom-NKF as a "technology" company, and is proud of the fact that 20% of total personnel are involved in R&D. "As we have moved beyond video-over-fiber to video-over-IP networks, a big focus of our attention is now on software," he says. "Part of our strategy going forward will be to concentrate on certain strategic markets, of which traffic is our biggest. If we can take the company to the next level of growth, it will allow us to invest even more into R&D, enabling us to create further products and solutions required by the market."

Evidence of this organic approach can be seen in the company's TrafficServer solution – a joint development with Belgium's Traficon. Combining incident detection, event data collection, and intelligent camera monitoring in an all-in-one, off-the-shelf product, TrafficServer was officially unveiled at the 16th World Congress on ITS, although news of the collaboration first leaked at last year's event in New York. "What we've done is amalgamate Traficon's established and proved incident detection algorithms into our own Siqura encoder," Patterson explains. "This has two major benefits: you increase the quality and effectiveness of the AID solution and at the same time reduce the amount of resources required."

The second point is especially important when DOTs and agencies are struggling to make their budgets stretch further. "We are not finding that projects are being cancelled," Patterson says of the current climate in the USA, "but they are being deferred as customers have to deal

with their own constraints. But this is where products such as TrafficServer can really assist DOTs.

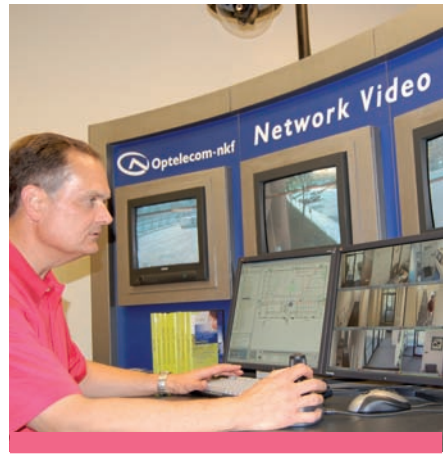
"TrafficServer supports each of the four phases of what I refer to as the 'security lifecycle' – prevention, detection, response, and investigation. By sharing infrastructure – cameras, communications, etc – you can save money. Less infrastructure means reduced power consumption, it means less maintenance, and it means lower cost of ownership. Our TrafficServer product, for instance, features an integrated dedicated digital signal processor (DSP) that can handle all analytics at the edge, so subsequently you don't require as much processing power and network load. This is a massive benefit when you consider factors such as bandwidth." The TrafficServer also allows the transfer of H.264, MPEG-2, MPEG-4 and MJPEG at the same time, which is also beneficial. "We have a great deal of expertise in compression technologies, crossed with various types of compression algorithms, and we build that knowledge into our hardware and TrafficServer is the ideal proof of this," Patterson says. "Each stream is optimized for a specific purpose: high-quality MPEG-2 and MPEG-4 to support the installed base; H.264 for low-bandwidth, high-quality storage and viewing; and MJPEG for streaming web applications (low resolution), and remote devices. In addition, being able to select compressions means the system is more compatible with other existing video management systems, as well as being future-proof.

"Combining safety and economics into one system is key: safety from the point of those four phases I've already mentioned, and economics in terms of being able to maintain more efficient and smooth traffic flow. What we've developed in TrafficServer brings together the strengths of two companies that have decades of experience in supporting the traffic industry, and combining many of the various sensory inputs into one system results in a lower cost of ownership for customers."

SAFE AND SECURE

Some authorities have already been granted a sneak preview of the TrafficServer system and unsurprisingly, given the range of benefits, the reaction has been positive. One of the primary applications will be in controlled environments, such as tunnels. "Certainly, the European Commission's 2004/54/EC Directive – which demands improved safety in tunnels over 500m long – will mean it spurs a lot of interest among tunnel operators," Patterson says. However, he is keen to highlight that the same technology can be applied just as effectively to bridges and elevated expressways.

On the subject of critical infrastructure, a 2003 report released by the FHWA, *Recommendations for Bridge and Tunnel Security*, identified that in order to truly improve homeland security, enhancements to critical bridges and tunnels had to be addressed. Among the 600,000 bridges in the USA, there were approximately 1,000 where "substantial casualties, economic disruption, and other societal ramifications" would result from isolated attacks, not to mention the 337 highway tunnels and 211 transit tunnels on the network. The report concluded that cost-effective security measures be implemented to reduce the "vulnerability of such infrastructure to terrorist attack". TrafficServer, with its ability to detect pedestrians as well as vehicles, could be a prime weapon in this battle.



"TrafficServer supports each of the four phases of what I refer to as the 'security lifecycle' – prevention, detection, response, and investigation"

Regarding potential deployments of TrafficServer on the horizon, Patterson does reveal a few details about a project in Paris. "In France, every tunnel longer than 200m must be equipped with AID in order to detect within seconds incidents such as slow-moving or stopped vehicles, smoke, wrong-way drivers, fallen objects, etc." Directed and financed by the French Ministry of Equipment, the installation involves 22 tunnels around the capital, and for Patterson this is an exciting prospect. "It's the largest traffic-monitoring project of its type ever implemented in Europe and the first to fully utilize AID," he reveals. "Our Siqura product will play a key role, along with several other industry players, to deliver a future-proof installation."

TRANSITIONING FROM ANALOG

There are definitely high hopes for TrafficServer in Optelecom-NKF corridors, although the company still has plenty of other solutions in its surveillance locker, many of which have been designed specifically to assist agencies in the transition from legacy analog systems to digital. "In the USA, there's still a lot of fiber in place, so there is a great deal of potential for our existing technologies in the future. There are also networks with fiber transmission and IP cameras," Patterson adds, "and that kind of hybrid is something we excel in."

Optelecom was established in 1972 with a primary focus on fiber-based transmission of video, while NKF started in the 1980s and specialized in IP-based video transmission. The two companies joined forces by merging in 2005, and much of the organization's success in recent years can be attributed to the rise of video over IP in a variety of surveillance sectors.

In developing all of its IP components from scratch, Optelecom-NKF's team of engineers has built up a substantial portfolio of knowledge and practical experience, which Patterson suggests helps the company ensure a seamless integration from one system to the other. "Every customer has specific challenges based on current infrastructure, growth rate forecasts, and needs to be able to keep pace with changes in terms of population and traffic patterns. Part of what we are able to do with our fiber-based product portfolio is help them develop a roadmap that takes account of their current state of technology and their own growth strategy, as well as how they want to approach the changing needs they have in their region. As an example, we have fiber technologies that enable customers to maximize the use of their fiber infrastructure as they migrate over to IP-based systems."

As well as the continued migration over to IP, in the future Patterson foresees authorities demanding more intelligent analytics capabilities. "Improved situational awareness will be a big thing for traffic," he confirms. "If we consider a traffic system as a constantly changing environment, it's very complex in terms of all of the moving parts at any given time. Being able to oversee all of that – to sort out what is normal from abnormal – is paramount. Having actual road surfaces and tunnels, etc – that's just a part of it. But the actual movement of vehicles on top of this infrastructure is an entirely different matter: the ability to quickly ascertain the severity of an incident, to bring the right resources to bear quickly, and to prevent additional problems occurring as a consequence, whether congestion or other incidents. It's a continuing challenge, because the world population is growing; there are more drivers, and the infrastructure as we all know has quite frankly not been designed to cope with such numbers. This is why technology is ever more important; it helps you deal with the imbalance that has been created. Of course, there are no magic bullets, but companies such as ours have to supply the tools that support traffic managers and engineers in maintaining and developing greater intelligence with the living system out there." ■

See the difference

Exciting developments in visual and audio technologies are creating great opportunities for managing congestion, allowing everyone from small municipalities to large state agencies to harness the power of information for true intelligent traffic management

by Brady O. Bruce, Jupiter Systems, USA

Across the USA and worldwide, municipalities are turning to ITS to manage traffic, respond to emergencies and coordinate among local agencies during an accident, disaster or unforeseen event. However, the growth in the number and complexity of data streams (camera feeds, fixed and mobile road sensors, GPS) has in turn driven the need to control huge and complex amounts of information. System managers must thus be able to scale operations in both scope and speed in order to respond to rapidly evolving situations.

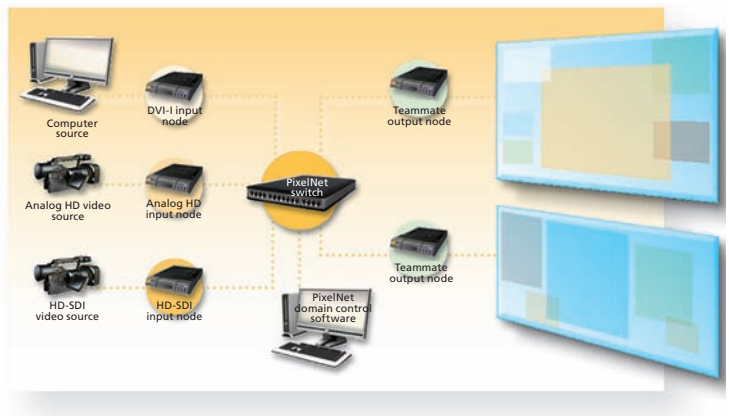
Much of the information is best represented visually, so system managers must develop a common operating picture in order to create appropriate responses. Real-time video streams, periodic still images, maps, and metrics from traffic and environmental sensors yield the situational awareness required.

Improvements in video technology combined with lower prices for large, high-definition flat-panel displays put videowalls within the budgetary reach of almost any municipality. For the first time, smaller municipalities can afford a state-of-the-art ITS that will help them achieve dramatic improvements in traffic control, emergency responsiveness, and security. Larger cities will benefit, too, as they are now able to increase the scope of operations at a lower cost.

THE NERVE CENTER OF ITS

At the heart of these new ITS systems is the display wall processor – the nerve center of intelligent command and control. These sophisticated systems pull in data from a broad range of information sources and project it onto a large display wall (or individual operators' desktops) where it can be viewed, manipulated, and shared. Such controllers provide a shared, high-resolution environment that displays events unfolding out in the field, offering the capability of zooming in on a specific traffic intersection or trouble spot.

Jupiter Systems' Fusion 980 display wall processor



PixelNet networks automatically self-organize, and PixelNet nodes exchange visual data in a common digital format

Jupiter Systems' 470 DVI serial digital video input node for PixelNet

There are primarily two types of these processors, both of which have been pioneered at Jupiter Systems. The first – the so-called monolithic processor – consists of a single centralized unit in which information from a broad range of sources can be captured, analyzed and shared. These centralized controllers, such as the company's Fusion series of display wall processors, provide an intuitive graphical overview and comprehensive software that seamlessly provides complete control of a display wall and all of its connected visual sources.

Having supplied display wall processors to nearly 10,000 command and control systems and traffic management centers from Sweden and China to the USA and beyond, Jupiter Systems designs its own software and hardware as an integrated whole in order to ensure a tightly woven architecture that provides the best functionality and the highest performance.

The second type of display wall processor is a distributed system that pulls in and sends out information over a network, much like a computer network. This distributed system, called PixelNet, offers an advanced new way to capture, distribute, control and display digital and analog video sources for audiovisual applications.

This new distributed system is all about scalability. The same component parts can scale from a single input distributed to a single output to literally hundreds of inputs and outputs, making it a perfect choice for growing municipalities and state governments. Outputs can be defined as a single display or can be logically grouped together to create one or more display walls. If an agency needs to add another input, or to expand the existing display wall, they can simply add another PixelNet node.

PixelNet makes the process of creating complex topologies of inputs, outputs and switches simple, cost-effective and future-proof. The system's PixelNet Domain Control software, meanwhile, provides an intuitive, drag-and-drop interface that makes it easy to control and manage multiple inputs, outputs and display walls. ■

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Moving to wireless

Low risk with high return on investment is surely the Holy Grail for the cash-strapped traffic industry? Yet the latest advancements in wireless solutions could offer this (and more) in a pain-free transition – with the right guidance, of course

by Rami Avidan, Wyless, UK

The transition to wireless technology has been one of the big trends within the transport sector in recent years. As more people discover the wide-ranging benefits of going wireless, their expectations and goals also rise. As companies specializing in such solutions have been assisting customers and partners to meet these goals, they themselves have enjoyed a consequent period of rapid growth.

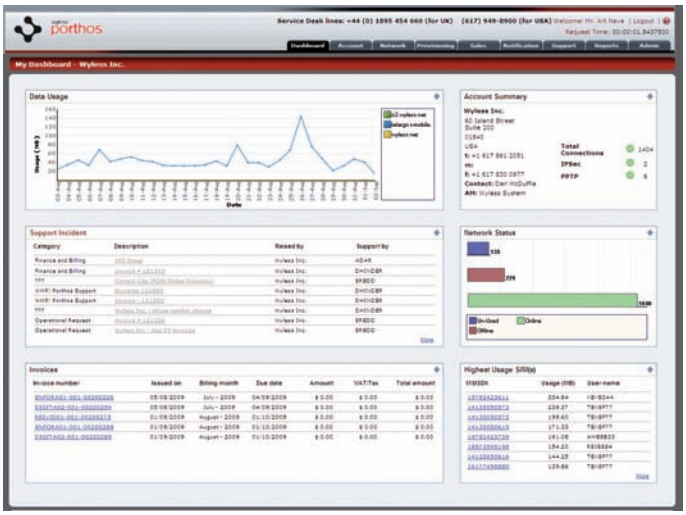
A scenario frequently encountered by the UK-headquartered company Wyless is companies looking to expand their business geographically with the least possible pain. Such organizations want to increase their revenue by gaining customers outside of their home country, yet the challenge they face is the complexity of multiple operators, SIMs, tariffs and invoices with no visibility or control over their connections. Wyless offers lower total cost of ownership as customers do not need to build their own network infrastructure or support team. Data security is provided via fixed IP connectivity, while users have visibility and control of the data from their vehicles and just one supplier for global connectivity.

WIRELESS IN PRACTICE

A recent Wyless success story from the traffic sector involved a company that wanted to launch a new real-time vehicle-monitoring project, with the aim of improving business modeling and forecasting. Requiring better control over wireless connectivity for mobile devices worldwide, Wyless provided a cost-effective, robust global network – coupled with Porthos, its management platform – to lower administration time and enhance connectivity management capabilities.

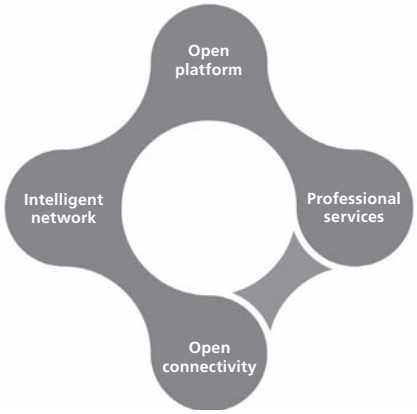
Companies involved in improving driving style for insurance purposes, CO_2 emissions, and safety are also reaping the benefits. Key requirements from these customers include continual wireless connectivity, a management platform that enables data from vehicles to be updated to the existing IT and ERP systems through an Application Programming Interface (API), as well as visibility and control of their vehicles.

Improved time to market is also a big motivator when choosing to go wireless.



Screenshot of the Porthos management system from Wyless

Companies hoping to make advances on this front are looking for partners that can 'pre-enable' their solution – in essence, provide 'plug-and play' to allow them to bring their products to market quicker. For such companies, Wyless offers its Managed Service, a simple and quick provisioning process. Porthos gives the company control over its network as well as information audits and monitoring of individual vehicle assets and overall fleet management statistics. The result is a preconfigured and network-enabled product that works over a secure, managed global network, supported by sophisticated management tools.



Four key elements are required to implement a truly global Managed Services strategy – open connectivity, intelligent network, open platform, and professional services. Wyless open connectivity allows any device in any country on any platform to be connected to the intelligent network. There is no need to deal with multiple operators or for customers to develop, manage and support their own wireless infrastructure. Putting this into perspective, Wyless currently has a contract for a wireless data network spanning more than 120 countries, using more than 200 GPRS and more than 400 GSM networks. The intelligent network has been designed to focus on wireless data communication and to manage the global network and technically integrate with multiple network providers. The internet-based Porthos management platform provides visibility and control of wireless and wired connections across the network. It can be 'white-labeled', allowing Wyless's customers to provide their own billing to their customers. And with regard to professional services, the company prides itself on providing experienced consultants and support from development through to deployment. ■

For further information, please contact Wyless by calling +44 1895 454 699, emailing sales@wyless.com, or visit www.wyless.com

Data on the move

As highlighted by the advances in RWIS, weather information is a much sought-after component of ATMS. In the future, however, vehicles may be able to collect real-time details on environmental conditions, ensuring efficiency and safety for all

by Sheldon Drobot, National Center for Atmospheric Research (NCAR), USA

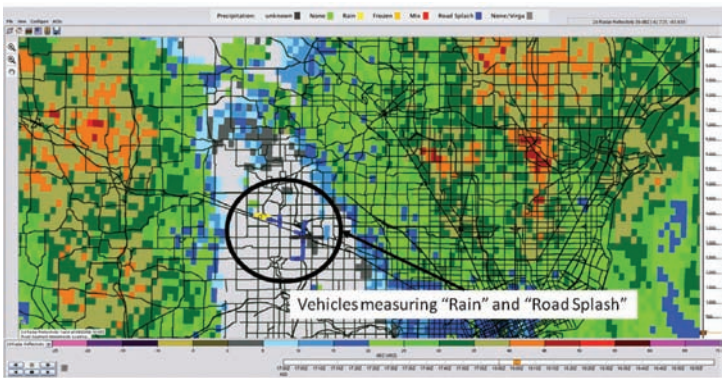
During a typical year, there are 1.5 million weather-related vehicle crashes in the USA, leading to 673,000 injuries and nearly 7,400 fatalities. Adverse weather and the associated poor roadway conditions are also responsible for 554 million vehicle-hours of delay each year, with the associated economic costs reaching to billions of dollars.

One possible solution for mitigating the adverse impacts of weather on the transportation system is to provide improved road and atmospheric hazard products to road maintenance operators and the traveling public. With funding and support from the USDOT's Research and Innovative Technology Administration (RITA) IntelliDrive initiative, and direction from the FHWA's Road Weather Management Program, the National Center for Atmospheric Research (NCAR) is conducting research to develop a Vehicle Data Translator (VDT) that incorporates vehicle-based measurements of the road and surrounding atmosphere with other, more traditional weather data sources, and creates road and atmospheric hazard products for a variety of users.

The initial VDT prototype was developed and tested using data from 11 specially equipped cars driven within the IntelliDrive testbed near Detroit, Michigan. These cars sensed and recorded more than 500,000 temperature and pressure observations and several million other vehicle data elements – with an emphasis on collecting data during rain and snow – over 11 days in April 2009.

A critical component of the VDT is rigorous data filtering and quality-checking (QCh) routines, because bad data can be worse than no data. Some of the QCh routines are similar to those used at traditional, fixed weather-sensing stations, but vehicle data also poses additional QCh challenges. For example, outside air temperature measurements from vehicles may not be representative of the true ambient conditions if the vehicle speed is less than approximately 25mph, so this data can be filtered out. After these procedures are complete, the VDT statistically generates road and atmospheric variables, as well as hazard condition products, for user-specified road segments. As a default, it calculates information on one-mile road segments, with a five-minute update cycle.

Adverse weather is responsible for 554 million vehicle-hours of delay per year



Example of a Vehicle Data Translator display, with the vehicles measuring rain and road splash

WHATEVER THE WEATHER

Keeping in mind the need to serve a variety of users, the VDT also generates a wide range of information and products, roughly grouped into three categories. First, the system outputs and displays information about 'derived observations' on the road segments, computing the mean and standard deviation for ambient air temperature and the number of times a vehicle's ABS system was engaged. Second, it combines individual vehicle data observations and ancillary data via statistical processing to generate road and atmospheric hazard products for defined road segments. For example, a major hazard for the surface transportation industry is precipitation (both liquid and frozen), which lowers friction between the tires and the roadway and increases the probability of accidents. The VDT has a 'road precipitation' fuzzy logic algorithm that blends vehicle data elements (such as wiper status distribution, or air temperature) with radar data, nearby weather station data, and weather model and satellite data. The end result is an indication of whether a motorist might encounter various precipitation-related conditions, such as rain, frozen precipitation, mix, road splash, none/virga, or uncertain. Road splash occurs when precipitation is no longer falling, but vehicles are still reporting significant wiper activity. Although there is a tendency to think that the impact of precipitation on the roadway is confined to when it is falling, the period immediately after – when roads are wet, snowy, or slushy – can be equally (if not more) dangerous as friction and visibility are reduced. On the other hand, the VDT can classify a none/virga condition even in the presence of radar returns if the precipitation is evaporating before it hits the ground, as information is known about wiper usage. In this case, the precipitation would not be significantly influencing the motoring public as it is not reaching the ground. Finally, the VDT collects and displays ancillary data, such as radar and satellite data, and observations from nearby fixed RWIS.

Now that the prototype has been successfully tested, NCAR and USDOT are moving toward increasing its capabilities. ■

For more information, please contact Sheldon Drobot at NCAR by calling +1 303 497 2705, emailing drobot@ucar.edu, or alternatively visit the website at www.rap.ucar.edu/projects/intellidrive/

Play by the rules

An integrated Electronic Detection System (EDS) is proving to be a nightmare for lawless drivers on the roads of Istanbul. However, those who don't break the law are enjoying smoother and safer journeys, whatever their mode of transport

by Muhammed Alyuruk, Ersoy Pehlivan & Selami Yazici, Isbak, Turkey

Visitors to Istanbul are likely to remember not only the beauty of the Bosporus, but also the agility of the local drivers. These drivers are also famous for their tendency to break the traffic rules. However, with the determination of Mayor Topbas, the situation in the city center has changed greatly since 2007.

While implementing various road safety projects, the Traffic Directorate first decided to create a precaution package related to the many red light violations. The decision to invest in enforcement technology was made because the number of vehicles is continuously increasing and human-based inspection just cannot keep up.

With several solutions in the ITS field within this scope – and also operating Istanbul Traffic Control Centre – Isbak was chosen to install an enforcement system with various configurations at seven important locations in the city. The company has developed a prototype, which is known as the Electronic Detection System (EDS). This work has been supported by Tubitak, the country's leading research institution in the traffic safety field. The institution has provided a resource of approximately Euro 200,000 to the pilot project.

Positive reactions have been received from the public during the first implementations. Drivers started to see unfamiliar signs at the seven intersections and newspapers and TV channels were used to announce the new application. On blogging websites with traffic and transportation content, EDS was being discussed down to the finest details. The results were noticeable: violations at the pilot locations decreased by 85% within one year. The purpose of the scheme, however, was not to generate revenue, but to implement a dissuasive system to ensure the safety of all road users.

The clear safety benefits have been an important milestone in deciding to roll out use of the system throughout the city.

HOW DOES THE SYSTEM WORK?

As in similar systems, after capturing images of violating vehicles, the license plate is determined by the core software and the fine is then applied by the relevant authorities.

Where the system differs from others is in the efforts that have been taken to reduce the rate of mistakes. This has been achieved by integrating the enforcement system with the signal controller.

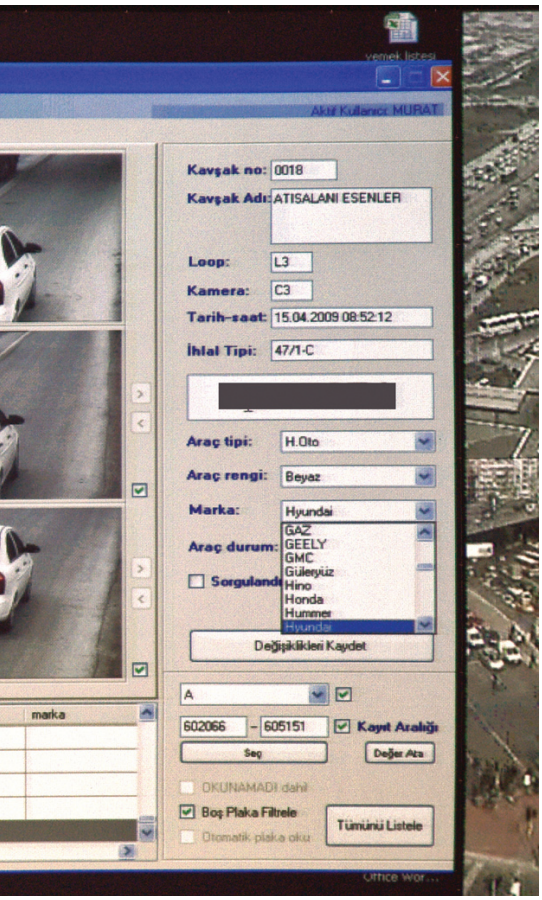
Violating vehicles are determined with high-resolution cameras and sensors and the moment of violation is recorded as a five-second video and still images. The images are transmitted to the control center in real-time, the license plate is queried from the database, and the penal action is taken.

The purpose of the project has always been to create a system with seamless notification to violating drivers, to demonstrate the continuity of enforcement. A number of technical features help to ensure this. The system offers 24-hour uninterrupted MPEG-4, H.264 formatted video records at the intersections and (due to the use of infrared technology) can capture license plate photos in all lighting and weather conditions.

It uses TCP/IP-based (GPRS, RF, GSHDSL, wireless, fiber) remote control and management technology and can simultaneously display live images of 64 separate locations from a single screen.

RESULTS AND FUTURE OUTLOOK

The studies carried out in the transportation departments of various universities in Turkey have proved that the level of service (LOS) has improved and the number of accidents has decreased when EDS is applied at signalized intersections. This has



ALPR is a valuable ITS tool that can be integrated with EDS

A smart surveillance system is keeping traffic moving in Istanbul

Drivers are clearly informed that the new EDS is in place

prompted the opportunity to more widely deploy the system's yellow-box application, which has pleased those drivers who were having difficulty in joining a main road from a secondary road. The system inspects the lanes at main arteries and eliminates the assumption that drivers on the main road always have the right-of-way. A similar success has been achieved on another long-standing issue: drivers now entering the protected left-turn lane and then proceeding straight on are also starting to be punished.

The most important supporters of EDS are the pedestrians crossing the streets. As the level of safety at intersections has increased dramatically, pedestrians are even adding new lists of demands. Discussions are under way about whether to decrease the clearance intervals at the pedestrian crossings where the system is installed.

COUNTING DOWN TO CHANGE

Another factor in the success of the system is the use of the reversed countdown added to the signal lamps. These are to ensure drivers wait patiently at intersections while on their journey through a metropolis with around 1,500 intersections. The signs show the remaining green time and enable drivers to fix their approaching speed without passing the stop line. The operation of these devices is integrated with the signal controller, so they become a component supporting EDS.

Although EDS is a relatively new system, it is already finding new applications beyond red light violation. Many subsystems have been developed from the main structure. All systems can be managed from the control center with a single interface, which facilitates the increasing of diversity. Hard shoulder enforcement is one such application, whereby loop detectors are used to prevent the illegal use of the hard shoulder. Arterial speed enforcement is another useful tool; here, the system calculates average speed via LPR and violating vehicles are first warned by VMS and then automatically punished. Parking is also a key area for EDS – the system continuously scans an area to automatically detect vehicles preventing the flow of traffic by double-parking or by violating the left-lane rule in no-parking areas.

The road network in Istanbul requiring public service has widened, with the decision made five years ago to expand the jurisdiction of the city to the provincial border. Decision-makers are now realizing the potential benefits of increasing the capabilities of EDS for a sustainable and effective technological structure. ■

For more information, please contact Isbak by calling +90 212 294 29 00, emailing info@isbak.com.tr, or alternatively visit www.isbak.com.tr

Amman in motion

A citywide urban traffic control system is proving its worth in Jordan. Adaptive traffic signal control and CCTV surveillance are providing the kind of results – reduced travel times and faster incident response – that all busy cities would welcome

by Husam Musharbash, Traffic Tech Group (Middle East/Gulf)

Jordan's capital city, Amman, is a bustling area, densely populated by both visiting tourists and local residents. Consequently, it suffers from the same traffic issues as other metropolises in developing nations – the most pressing being the ever-increasing levels of congestion.

Over the past 15 years, much work has been done to transform dozens of the city's roundabouts and signalized intersections into grade-separated intersections. Such measures have made a positive impact within the locality of each intersection. However, improved traffic management was needed throughout the whole city. In 2007, the Greater Amman Municipality (GAM) decided to build a new traffic control center and start with the two main building blocks of a wider ITS solution: an adaptive traffic signal system and a CCTV surveillance system.

The contract for the Amman central traffic management system was originally issued in two tenders: one for the design, supply and installation of an adaptive traffic signal system, and the other for the citywide CCTV system. As both projects were awarded to Traffic Tech, and in the absence of a fiber-optic network, an innovative approach was devised to operate both the real-time traffic signal control and the CCTV cameras on 512Kb VPN communications lines leased from the local telephone company.

The project included the connection of 96 intersections to the Sydney Coordinated Adaptive Traffic System (SCATS). This system operates in a real-time adaptive mode by automatically monitoring traffic at all approaches to intersections and adjusting cycle times, green splits and offsets every cycle to suit the current conditions. It also provides an adaptive green wave at successive intersections to reduce the number of times drivers have to stop.

Dome cameras monitor the traffic conditions in Amman

Operators can better manage signalized intersections

A centralized system makes life easier for traffic managers

The project also included the installation of 1,200 inductive loop detectors (one per lane) at each of the intersections near the stop line, as well as 40 PTZ dome cameras at critical intersections. A control room has been equipped to help manage all operations centrally, with plans to turn the building into a fully fledged TMC in the future.

SCATS is an advanced traffic signal system that is installed in more than 100 cities worldwide. Amman has been using SCATS-compatible controllers since 1993, so implementing the new system was a relatively inexpensive and painless process.

The Amman SCATS has resulted in measurable improvements in traffic flow within the city and has proved to be a valuable tool with regard to getting traffic data in real-time and improving traffic management strategies.

For the CCTV surveillance side of the project, IP-based dome cameras from Bosch were purchased. These cameras needed to be able to transmit high-quality video within the limited bandwidth of the 512Kb VPN lines shared with the SCATS system. To manage the CCTV system, Genetec's Omnicast IP video management software was selected.

A technical challenge occurred when work began on the communications system. The initial tender specification required the use of analog phone lines for connecting the field controllers to the central computer system. However, after the tender was awarded, the phone company informed Traffic Tech that they no longer provided analog lines. Several alternative communications options were studied and tested, including GPRS. After testing both SCATS and the CCTV system on the same line and achieving excellent results, 512Kb digital VPN lines were selected.

REAL RESULTS

As well as improving traffic flow and travel times, the Amman central traffic management system has benefited the region in other ways. In terms of economic impact, less time stuck in traffic is valuable to the drivers who use these roads on their daily commute. A before-and-after travel-time study conducted by GAM on one corridor along Shaker Bin Zeid Street revealed that travel times decreased after SCATS implementation from a high of 30 minutes to 10-15 minutes.

The environmental benefits are also worth mentioning, as roads authorities are finding that 'going green' is becoming a critical part of their remit. Reducing both journey times and the amount of stops per journey is helping the city to reduce harmful emissions.

One final benefit is to the traffic managers. The ability to monitor traffic and incidents in real-time from a well-equipped control room makes their job far easier. The CCTV recordings also prove invaluable when investigating incidents. ■

For more information, contact Husam Musharbash at Traffic Tech Group (Middle East/Gulf) by emailing ttg@traffic-tech.com, or alternatively, visit the company's website at www.traffic-tech.com

The eyes have it...

Machine vision technology is thriving in many industrial markets, although progress in the ITS sector has been slow to truly advance. However, today's sophisticated systems can offer a whole range of traffic management benefits – often by using just one sensor

by Steve Hearn, Stemmer Imaging, UK

With the continuing evolvement of intelligent traffic systems, there is also an increasing requirement to collect more data. Vehicle characteristics such as type, make, model, and potentially color are useful for tolling and security systems, as well as for gathering statistics for further analysis. In the past – if it was actually possible to collect such information – it was achieved using dedicated hardware for each piece of data.

Today, it is quite common to have sensors to detect the presence of moving vehicles – often loops embedded within the road, other magneto-resistive sensors, radar, or optical sensors such as lasers. But such methods often don't provide the necessary detail to produce highly accurate results (e.g. for vehicle classification) and are affected by occurrences such as shadows.

Such limitations can be overcome by using optical technology proved in other high-tech markets, such as machine vision. The ever-decreasing cost of high-resolution cameras means that these are now cost-effective for use in traffic systems and – when combined with object recognition software – can detect and track targets within the scene using a single sensor. Detailed vehicle information (such as the license plate) can be gathered, along with information about the general lighting and road conditions, which can contribute to consideration of maximum speed for the area under observation. Machine vision technology is already widely used in traffic systems such as ALPR, speed detection and tolling, but often the cameras are only used to capture images with very little analysis other than LPR taking place.

The traffic sector can enjoy benefits by using systems that have been tried and tested in the machine vision and image-processing market

The use of advanced software techniques is critical in many traffic, security and safety systems

TECHNICAL EVOLUTION

Machine vision cameras have until now found it difficult to cope with the ranges of lighting within the scene. But the latest more sensitive devices are capable of overcoming these challenges and – when combined with software either within the camera or on the host system – can fine-tune settings to provide an optimum image for any further analysis of the scene. As trends in the consumer photographic market drive sensor performance forward rapidly, this allows industrial markets to benefit as well.

Extracting more detailed information from an image offers a number of benefits, with improved safety an obvious one, such as in detecting speed or adverse weather. The ability to classify type of vehicle also allows toll road users to be automatically charged at a variety of rates. Improved statistics, meanwhile, allow better road-planning decisions to be made and could reduce the cost of collecting this information in the first place. And data such as vehicle color, make and model has obvious security benefits.

A huge number of transport applications exist where vision technology can be successfully used, but there is a big gap in the knowledge of end users and operators as to what can be achieved. A meeting of minds could enable innovation to thrive. ■

Vehicle make/model classification, vehicle taxation class recognition, and accurate ALPR can all be achieved in challenging lighting conditions

Please contact Stemmer Imaging by calling +44 1252 780000, emailing s.hearn@stemmer-imaging.co.uk, or alternatively visit the company's website by logging on to www.stemmer-imaging.com/traffic/

Integrate intelligently

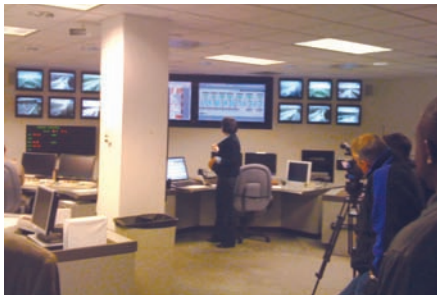
As technological advancements enable new approaches, road weather information solutions are becoming an integral part of intelligent transportation systems – improving traffic flow and overall safety on the roads across the world

by Paul Bridge, Vaisala, USA

Developments in technology and communications are allowing for new ways of securing both road safety and smooth maintenance operations. A prime example of this is in-situ observation technologies, where the development of non-intrusive sensors, for instance, has taken some major leaps forward in recent years. Together with traffic cameras, data management systems and mobile communications, the intelligent combination of in-situ observation systems (such as present weather detectors, wind sensors and weather cameras) address a variety of hazardous road conditions. For example, Nevada in the USA has connected Vaisala's road weather sensors to flashing beacons to generate automatic warnings for drivers about ice on the road.

In Galicia, Spain, the Piedrafita Trafic Centre uses a Vaisala IceCast system to forecast the occurrence of icing, and to organize efficient winter management measures. Combining information from thermal maps, meteorological stations, 24-hour road surface temperature forecasts, and measures from road meteorological stations and the AEMET atmospheric forecasts, road management operators are able to pinpoint at the beginning of an afternoon where and when icing will occur during the night.

The state of California has implemented an extensive fog detection and warning system on a stretch of the California Highway south of Fresno. The area is particularly prone to dense fog, at times reducing visibility almost to zero. Combining several solutions from different suppliers,



Nevada's operation center relies on Vaisala's latest road weather sensors

Delivering weather warnings directly to drivers helps make smarter systems

the system monitors current conditions on the highway, processes the data to determine possible actions, and then communicates the information to traffic management as well as directly to drivers.

Vaisala's visibility sensors were chosen to provide measurements for the system. Twenty-one stations were installed every 0.5 miles, covering the freeway in both directions. To ensure that conditions are observed as they are seen by those on the road, the sensors were installed at driver eye-level. The data is transmitted wirelessly to TMC personnel, but the system also generates automatic messages for VMS and other information systems.

BLACK ICE WARNINGS

The Calder Freeway in Victoria, Australia, runs through an elevated area that is subject to frost and black ice during winter. To improve safety, the local road authority installed a combined bridge deck heating and ice warning system on a 28km stretch of the freeway between Gisborne and Kyneton.

Within this area, there are 13 dual carriageway bridge spans, all fitted with heater coils below the road surface. When hazardous conditions are detected, the heater coils are activated automatically by Vaisala road weather stations located at each of the bridge sites. The local warning sign is activated and an alarm is sent to the TMC to enable the alert to be distributed to other warning signs, personnel within the road authority and the media. The system can also be controlled remotely by the local road authority's approved contractor and the TMC.

Automatic activation is based on input from Vaisala remote road surface state sensors on each bridge deck, embedded temperature sensors on the deck and road, and an algorithm to control the heating level.

INTERNATIONAL GUARDIAN

Non-intrusive sensors form the heart of Vaisala's Guardian RWIS. The system is made up of two surface-state and temperature sensors (measuring frost, rain, snow, slush and black ice) and a weather camera. The sensors use laser spectroscopy and emit infrared wavelengths that gauge critical pavement information during all types of weather. The system can be augmented with atmospheric sensors to measure visibility, type and intensity of precipitation, barometric pressure, wind speed, wind direction and solar radiation. It can also be used for forecasting and thermal mapping.

Although the Guardian and other Vaisala road weather systems can be installed as a complete solution, the RWIS instruments can also be smoothly integrated into other technologies. Designed to be modular, the data they produce can be made available in such a format (e.g. xml) that an integrator or end-user can take it and use it as the backbone of any traffic management system.

With weather stations installed in many countries globally, Vaisala continually builds on its experience of delivering solutions to combat the effect of many different types of adverse weather, from poor visibility to high winds. Increasingly this data is being integrated into systems to deliver information straight to the traveling public. ■

For more information, please contact Vaisala by calling +44 121 683 1243, emailing rachel.adams@vaisala.com, or alternatively visit www.vaisala.com

On the right track

Locating public transport vehicles in real-time and getting this information back to the host system for analysis and action are key components of any public transport ITS solution. Delivering this requires capabilities not widely seen in the AVL sector today

by David Panter, Sigtec, Australia

Accurately locating public transport vehicles is well known to be a difficult task. Stops in high-rise urban areas, within shopping centers, and along leafy suburban streets – along with operations that run 24 hours a day in all weather conditions and temperatures – are all factors working against a good positioning solution. Current GPS technology makes this easier and is almost universally used as a primary source of location information. However the location accuracy of a GPS system is dependent on many factors, including the receiver chip set, placement of antennae, shadowing of signal, and reflections from buildings. Locating vehicles using GPS alone is normally fine for tracking trucks and cars, but public transport needs a more refined location solution to be able to announce to passengers that buses are approaching bus stops, or to quickly clear signs as buses depart from stops. Accurate and timely location information is also essential to achieve public transport priority at intersections.

Latest-generation bus-tracking systems, such as Sigtec's RAPID system, commonly use a 16-channel GPS as well as secondary sources such as the odometer and route matching to track buses and trams to within 1m as they move along their route. The accuracy of the location solution and the accurate time source offered by the GPS system allow the data to be used as proof of arrival. It also allows for operational performance against the schedule to be accurately monitored and reported.

If information is not accurate and in real-time, then it is worthless and confusing

Public transport today demands a sophisticated location solution to benefit both passengers and traffic managers

Route-based services such as buses and trams offer one set of challenges. Flexible services such as taxis have different needs. Advanced taxi dispatch systems such as Sigtec's Dispatcher 8 product link the GPS to full vector maps to locate the taxi, and offer turn-by-turn navigation to the driver. Sending the location and metering data back to the central server allows automatic dispatching of the nearest cab, reduced waiting times and improved fleet availability.

COMMUNICATIONS STRATEGY

With the location of the vehicle accurately determined, the next task is to get this information to the central server for processing. The communications medium is often presented as a simple decision, based on existing hardware or a vendor's own technology. Many technologies often have little trouble handling small numbers of vehicles and so perform adequately in trials. But when it comes to a full-scale production environment, it is the reliability, latency and maintainability of the communications that can often make or break a solution.

For buses and trams, Sigtec often recommends GSM GPRS digital communications as the preferred medium, or higher specification 3G services where they are available. GPRS has been shown to be a highly cost-effective communications medium that is well matched to the demands of public transport operations.

Radial bus and tram routes converge on the city center and orbital routes service major shopping centers, universities, and other significant traffic generators. In all of these cases where there is a higher concentration of people, there is a higher concentration of GPRS cell sites. Consequently, a natural match exists between public transport demand for communications resources and the supply of commercial cellular data capacity.

GPRS is not perfect or without its own occasional outage and the ability of a vehicle-tracking system to cope with short-term loss of communications should be a major selection criterion for transport operators.

The value of real-time location information derived from vehicles diminishes over time. So the longer communications are down the greater the impact on the system. Experience in these systems and knowing how they impact on service delivery allows vendors to design in protections.

Having located the vehicle and sent this information to a central server, it is then important to do something with this information. Putting the vehicle location on a map is perhaps the easiest part of the solution. Fixed route operations such as buses, trams and trains and variable route

systems such as taxis have very different requirements for their back-end systems. Having experience in both types of system gives an edge to governments as they try to deliver multi-layered, multimodal solutions.

GETTING THE HARDWARE RIGHT

There are many traps inexperienced companies can fall into when it comes to hardware. The result of not understanding public transport is that the in-vehicle equipment can often barely do the job for which it was intended. Even worse is that the hardware might work when first installed and then begin to fail after only a short time in the field. Hardware failures require site visits and use spares inventory but a degrading device may have a long period of intermittent failures with ongoing poor performance and multiple technician visits. Eventually, the hardware is identified as faulty and replaced, all too often with the same model with the same design flaws.

With ITS and vehicle tracking now maturing, the market can no longer accept this approach. In any design, the processor and memory needs to be appropriate for the task at hand and for some future needs. For vehicle equipment, there are additional functions that should be part of the design.

Software-controlled switches allow the power to peripheral devices to be cycled under application control. With poor quality vehicle power, large temperature, and moisture variations and high levels of vibration, the ability to reset third-party devices without having to power-off the vehicle adds to a solution's availability.

Having lots of digital and analog signal lines for control as well as communication to other devices is essential. Ethernet, CANbus and USB all complement the need for five or six RS-232 and RS-485 signaling lines.

Hardware needs to be designed for real-world environmental conditions. An AVM system is far more than just a GPS unit with modem and when done well, the hardware is designed to cope with the rigors of temperature, vibration, water and dust. ■

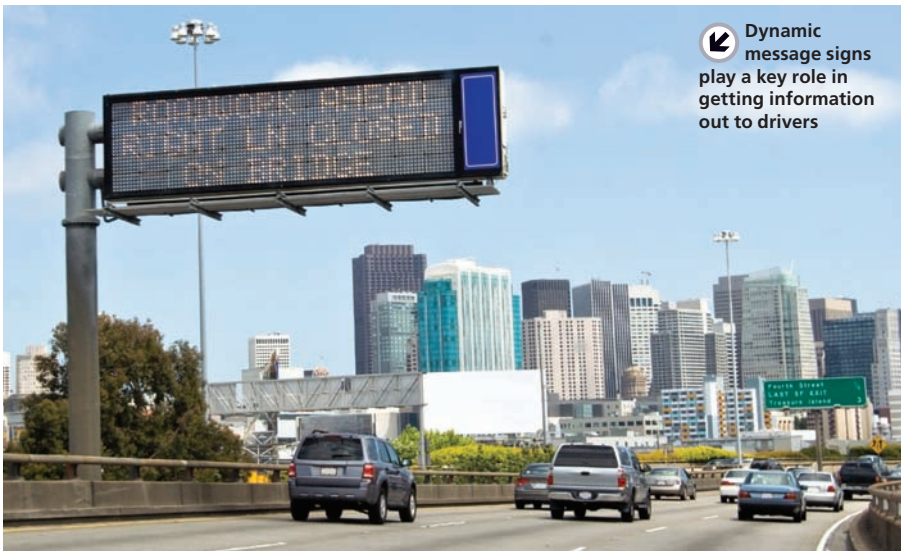
To find out more information, please contact Sigtec by calling +61 7 3039 2524, emailing dpanter@sigtec.com, or visit the website at www.@sigtec.com.au.

Power tools in ITS

Integrated wired and licensed wireless networks are an engineered systems approach to enabling safety and mobility on the roads, while the selection of the right technologies and partners is paramount to the successful long-term deployment of ITS

by Barry Einsig & Greg Henderson, Harris Corporation, Public Safety and Professional Communications, USA

The goals for virtually every transportation agency around the world are similar – the continuous improvement of roadway safety, reduced traffic congestion, and reduced greenhouse gas emissions for private automobiles, freight carriers, and public transit. To support these efforts, critical information must be transferred between the driver/vehicle, the roadside, and the TMCs through the use of ITS technologies. Such technologies are at the heart of applications such as traffic cameras, traffic counters, highway advisory radio (HAR), variable message signs (VMS), variable speed signs, AMBER alert signs, dynamic message signs (DMS), remote weather information systems (RWIS), and many others. The value of these applications has been proven in most cases over the limited areas in which they have been deployed. Two of the main constraints to their broader deployment have been a lack of dedicated funding and the utilization of a unified secure wired and wireless network to support communication.



Dynamic message signs play a key role in getting information out to drivers

TRANSPORTATION'S TOOLBOX

To meet the needs of these expanding ITS networks, there is an increasing demand for engineered, secure, assured communications networks. Today's transportation officials have a growing number of choices when evaluating communications technologies for ITS. Rather than focus on individual communications technologies and their individual strengths and weaknesses, they will be better served in engaging communications partners that can enable these networks based on a single unified network that can support all of the ITS technologies within their strategic plan.

Utilizing the first step in the Engineered Systems Approach – regional architecture – the decision must be made as to whether these ITS field devices and applications would be better served operating firstly over a public network, such as a carrier network. Perhaps a private network designed, built, operated and maintained by the agency might be suitable? Or a shared-use enterprise among other users with a common interest, such as public safety or other municipal, state or regional agencies? Once the decision to use a public or private network is made, the next step is to determine the type of relationship that will be in the best interest of the primary operating agency.

DMS can display AMBER alerts as well as traffic messages

If the decision is made to use a carrier-based network, many of the next decisions are made for the agency by the carrier. Decisions such as the type of backhaul network, RF design, site location, level of redundancy, capacity, technology, lifecycle migration and level of integration are made by the carrier in support of the applications for the agency for both wired and wireless systems. The choice of carrier networks can seem economical at first, but they often fail to meet the long-term needs of an agency (i.e. coverage and reliability). Further, as ITS systems become ubiquitous, the operational cost of carrier networks becomes very high.

If the decision is made to utilize a private network, then the agency has the opportunity to collaborate on the decisions relating to the choice of backhaul network, RF design, site location, level of redundancy, capacity, technology, lifecycle migration and the level of third-party agency integration.

By making the decision to create a long-term strategic plan in collaboration with a proven provider of assured communications

networks, agencies can protect their initial investment in network deployments. They can create a secure unified network to support all of the ITS applications, including video, and anticipate the ability to adopt new wireless technologies as they become available and have an application on the unified ITS networks. One of the major technologies that can be enabled by wide-area ITS networks is Dedicated Short Range Communications (DSRC). Although pilot systems for DSRC are under way, the ability to deploy a wide-area licensed, designed and assured communications backhaul network will enable the rapid adoption of DSRC as well as the mobility and safety applications that will ride over that network.

Many DOTs have fiber networks that cover a large part of their roadways, and which can be leveraged to provide ITS backhaul networks. However, the endpoints of the fiber network often do not extend to the location where the ITS devices need to be placed for optimal system performance (i.e. the location of a VMS sign should be placed far enough ahead of an exit to allow drivers to make decisions based on the data). To extend the range of these fiber networks, there are two secure and reliable 4G wireless technologies that can be used – Worldwide Interoperability for Microwave Access (WiMAX) and Long Term Evolution (LTE). Although LTE shows great potential and will be trialed in live networks within the next year, the availability of LTE equipment and spectrum for private networks are several years removed from large-scale deployment.

The other 4G technology available today, WiMAX (based on the IEEE standard 802.16), is available in licensed spectrum such as 4.9GHz. These networks are currently being designed and deployed by several large transportation agencies in the USA to be integrated with ITS applications, including video, VMS, HAR, etc. As part of a unified network architecture (including fiber, microwave and WiMAX), agencies are extending their ITS networks to the roadside, using all of their standard network security design parameters and protocols, such as the capability to pass network traps and IP tagging from the TMC to the roadside and back again. Some are even beginning to take the next step by adding WiMAX to their fleet and transit vehicles for network access, situational awareness and incident response.

Creating safer intersections is a priority for all traffic managers

ITS AND THE WIMAX ADVANTAGE

The WiMAX protocol at 4.9GHz has a number of advantages for ITS. Licensed only for use by public safety and service organizations, interference is greatly reduced and reliable connectivity is ensured during emergencies. In addition, WiMAX provides users with different Quality of Service (QoS) levels, allowing them to set priorities and match the quality of transmission with the type of service demanded to ensure that all applications can perform as expected. This is a key tool for ITS managers, who rely on real-time video and data during incidents.

Harris Corporation's Public Safety and Professional Communications business unit supplies assured communications systems and equipment for public safety, federal, utility, commercial and transportation markets, with products ranging from IP voice and data networks to multiband, multimode radios, and public safety-grade broadband video and data solutions.

Harris has combined the power of WiMAX with its VIDA (Voice, Interoperability, Data and Access) network to create VIDA Broadband, and in doing so enabling fast, secure broadband access to mission-critical applications with QoS across coverage areas. As it uses a scheduled protocol combined with AES encryption and certificate-based authentication – all on the 4.9GHz frequency band – critical communications are provided without the interference and lack of security that typifies many other wireless technologies.

With more than 500 miles of turnpike highway and over 188 million vehicles per year, the Pennsylvania Turnpike is an essential artery for commuters, tourists and freight traveling through the Keystone State.

The Pennsylvania Turnpike Commission has worked tirelessly to make travel faster and safer for a growing constituency of travelers, work crews, police and other first responders. In addition, the Turnpike Commission is charged with helping to protect neighboring towns and cities from hazardous materials spills and other potential disasters. With knowledge of the potential WiMAX technologies on the 4.9GHz band, the commission has deployed and is expanding a VIDA Broadband ITS network to support a variety of applications, including surveillance video, HAR, VMS, and RWIS.

THE FUTURE OF ITS

Although ITS systems are still relatively new within transportation infrastructure, use of standards-based, licensed, assured communications (both wired and wireless) will enable the broader distribution of technologies that can enable the goals of all participating agencies – safety, mobility, and sustainability. Today, the combination of private fiber- and WiMAX-based networks at 4.9GHz is providing agencies with the ability to deploy ITS networks. In the future, as the 700MHz public safety spectrum becomes available for deploying wide-area 4G public safety networks, 700MHz LTE networks can be integrated into these ITS networks to allow for increasing coverage and mobility to the ITS applications. ■

To find out more, contact Harris Corporation by calling +1 717 565 1209, emailing barry.einsig@harris.com, or visit the website at www.harris.com

The green screens

As this case study from Barcelona shows, LED-lit cubes deliver many benefits. Providing control rooms with outstanding visualization of the traffic environment, these easy-to-maintain displays also go easy on the environment

by Daniel Kugel, eyevis, Germany

Acesa Abertis, the Spanish motorway operator, has recently modernized its operations center's facilities in Granollers, Barcelona, incorporating the latest technology to deal more effectively with road conditions on its 542km motorway network, where the average daily traffic intensity is 30,000 vehicles. The new layout and technical improvements are designed to promote the optimum use of available resources, which have needed to be enhanced as a way to manage the motorway network more efficiently on a 24/7 basis.

Permanently staffed by a rotating team of communications coordinators and a head coordinator, the center manages all road services on motorways – incidents, roadworks, special operations, coordinating its own and external resources, etc – and provides information on road conditions to customers and private users as well as to official bodies. In 2008, the center dealt with more than 400,000 calls and a total of 80,578 incidents – 40.1% of which were for mechanical assistance, 14.8% were roadworks, 12.8% were obstacles on the road, 6.2% down to traffic, and 5.4% resulting from accidents.

The control room at Acesa Abertis's Barcelona TMC in Spain

TECHNICALLY SPEAKING

For the visualization of this data, a large, double-height control room and a new videowall from eyevis were integrated. The viewing system's horizontal screens dominate the new control room, and consist of 21 EC-50-SXT+ 50in cubes in a 7x3 array. The cubes have a display resolution of 1,400 x 1,050 pixels, upon which images from all of the cameras in Acesa's network can be viewed. Additionally, it can receive images simultaneously from up to 140 IP cameras at different points on the motorway.

The recent development of cubes using LED technology means that the operating costs for videowalls in control rooms can be reduced greatly. Indeed, the lamp lifetime for the cubes – according to the producer's mean time between failure (MTBF) – lies between 6,000 and 10,000 hours. The MTBF of the LED lamps is stated as being more than 55,000 hours, or continuous operation for more than six years. Also, the use of LED light technology parts that can wear out – such as color wheels and traditional lamps – are no longer necessary. This leads to potential savings for the end user, while wastage of expendables in control rooms can be reduced, making the LED cube an environmentally friendly solution. Furthermore, compared to standard lamp/color wheel systems, the LED cubes have a shorter turning-on and start-up sequence.

The LED-lit projection engine provides real flicker-free representation without rainbow effects and therefore a more ergonomic and fatigue-free observation. Enhanced color and brightness stability results in almost no color and brightness drifts over the lifetime of the system, while a new adjustment tool automatically aligns and readjusts the color and brightness values of all cubes in the videowall, so resulting in a homogeneous image representation over all modules.

Available with screen diagonals from 50in to 70in and resolutions of SXGA+ (1,400 x 1,050 pixels) up to full HD resolution (1,920 x 1,080 pixels), these new eyevis LED cube series are especially designed for applications that require reliable 24/7 operation, particularly those in the traffic market. The use of digital light processing (DLP) technology ensures there is no damage to the display, such as 'ghost' images or burn-in effects, even with continuous static images or fixed patterns. Indeed, in numerous tests and comparisons conducted by eyevis, the DLP technology has been shown to be the most reliable for visualization systems in continuous operation, with the DMD chips providing a lifetime of about 150,000 hours – a MTBF of 650,000 hours. ■

For more information, please contact eyevis by calling +49 7121 43303 0, emailing henique@eyevis.de, or alternatively please visit the company's website by logging on to www.eyevis.de

The safety of roads, tunnels and motorways depends largely on the availability and readability of the data and information in the control center

A new force in town

Coupled with the fact that intersections are among the most dangerous locations on the road, the problem of red light runners has added to an already complex situation. Advanced enforcement systems can go a long way in improving safety however

by Lucas Göbel, Vitronic, Germany

Traffic signals are positioned at intersections to protect drivers, cyclists and pedestrians – yet red light runners pose a threat to the safety of them all. As growing numbers of authorities around the world are discovering, it is possible to minimize the number of intersection crashes by deploying red light enforcement systems as an integral part of traffic safety schemes.

With regard to the technology used in such applications, the latest advances in laser-based enforcement are proving to be highly popular. A company with a tremendous amount of experience in the field is the Wiesbaden, Germany-headquartered Vitronic, whose latest offering, PoliScan*redlight*, it claims is the only non-invasive laser-based red light enforcement system available on the market.

At the heart of the PoliScan*redlight* system is a Light Detection and Ranging (LIDAR) system, which scans the road area many times every second, then constructs an accurate image of the traffic situation and creates a virtual stop line. All vehicles present in the scan area are tracked and violations are attributed to specific vehicles. As a result, up to three lanes can be enforced from a single system. Drivers traveling parallel, overtaking, tailgating, or even changing lanes are all captured. This non-invasive system reduces costs and disruption to traffic flows, meaning that in-road loops are entirely redundant.

If a driver is caught driving through a red light, two digital photographs of the vehicle are taken – one of the vehicle crossing the stop line and another when the vehicle is in the middle of the hazard zone. These images are stored along with other case data, the case file is digitally signed to prevent data manipulation, and encryption allows secure transfer to the back-office for further processing. Using a remote camera, photographs of the rear of vehicles can also be taken. To be valid before a court of law, each case includes vehicle and lane identification (for multiple/simultaneous violations), the time, date and location of the offense, time into red, and more. The case file is then encrypted to prevent unauthorized access.

Drivers traveling parallel, tailgating or changing lanes at intersections can all be captured

Vitronic's Poliscan*redlight* system can operate without the need for in-road equipment such as loops or piezo sensors

The LIDAR unit can also be upgraded to provide combined speed and red light enforcement. PoliScan*red+speed* operates in the same way as PoliScan*redlight*, but also offers permanent speed enforcement, whether the lights are red or green. Vehicles can be captured traveling in excess of 250km/h (155mph), irrespective of the time of day, weather conditions or even traffic density.

FLEXIBLE THINKING

PoliScan*redlight* permits a wide range of enforcement scenarios. With the standard system, it is possible to monitor a single intersection with up to three lanes of traffic. In addition, a second measurement and documentation unit can be mounted in the same pillar, allowing two separate intersections to be enforced from a single location. Photographic evidence for red light violations can be adapted to suit local requirements. Photos from the rear are captured using a remote camera which is connected to the measurement unit via a LAN/WLAN connection. The remote camera, meanwhile, can either be installed in a separate pillar in front of the traffic light or, if space is limited, onto a regular pole.

The system's robust housing means it is suitable for mobile speed enforcement as well as stationary speed and red light enforcement. A mobile speed enforcement system is mounted within the housing and is certified for red light and speed enforcement. It can be installed in the front or rear of a patrol vehicle or mounted on a tripod. No on-site calibration is required, so the system can be set up within a matter of minutes. Certified for unattended use, this therefore removes the possibility of human error from the measurement result. After the necessary mobile speed enforcement has been conducted, the system can be remounted in the dual-purpose housing where the local storage module automatically reinstalls the system for stationary red light and speed enforcement. ■

For more information, please contact Vitronic by calling +49 611 7152 361, emailing lucas.goebel@vitronic.com, or visit the website at www.vitronic.com

Taking remote control

501 Redflex Traffic Systems has announced the debut of its REDFLEXSpeed Mobile TAG (Tow And Go) violation-monitoring system – a mobile speed violation monitoring system with enhanced security features that make use of non-intrusive vehicle detection technology.

This field-proven technology is controlled and operated by Redflex's new state-of-the-art Remote Operations Center (ROC), which the company claims is the first of its kind in the USA, and offers cities and states the next generation in mobile speed enforcement monitoring to build upon the current fleet of Redflex mobile speed units. The ROC can remotely monitor speed enforcement equipment from a centralized location/HQ anywhere within the country, allowing for unattended duration deployments in the most demanding environments. The Tower feature allows for situational flexibility through an additional or standalone video surveillance or enforcement operations in targeted areas. Customers can also leave this new system unattended for up to 1,000 hours.

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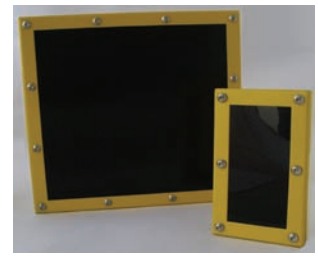
www.redflex.com

> "It is inexcusable that something that is achievable – that will lead to such great results – could be hampered by human nature and government silos"
>
> see page 60

Do you see the light?

502 Vision Light Tech's new VTR2 is, the company believes, the brightest LED traffic strobe lighting available on the market. VTR2 LED strobe lights are designed for ALPR solutions, offering a very high-intensity source of infrared illumination using the latest high-brightness LED technology.

The Netherlands-based company Vision Light Tech released the new system recently, and says the technology is designed to meet the evolving ITS market. The VTR2 lights offer a 10x increase in infrared intensity compared to the original VTR1 light, which is currently deployed in average speed applications across Europe.



Intensity, strobe length, and triggering of the light are fully configurable via Ethernet or RS232 up to a maximum rate of 65Hz. Packaged within an IP66 enclosure, the lights are suited to outdoor use and a range of lens options, which allows them to be configured to cover one lane or several lanes depending on individual application requirements.

CONTACT

Vision Light Tech
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www.vlt.nl

Eyes like a hawk

503 Surveillance specialist iOmniscient has made several announcements showcasing its latest news in recent times. First is a new product, IQ Hawk, which allows the convergence of detection and identification capabilities in a single camera.

The IQ Hawk system performs accurate 'detections' using the company's range of IQ Series products. When an event occurs, the system digitally zooms in automatically, and by utilizing iOmniscient's identification software, it can identify a person or vehicle. While the digital zoom is performed on one target, the system continues to detect on the original view, with the capability to perform multiple detections on large numbers of events simultaneously. For each event, it can identify people and vehicles involved in real time, reading license plates and picking out people, all with one camera.

The company's next announcement is the integration of its IQ Series video analytics product range with AXVIEW's range of surveillance cameras. iOmniscient has the internationally patented ability to perform complex detections in crowded scenes with an in-built Nuisance Alarm Minimization System (NAMS). The technology is critical for effective surveillance of crowded public areas such as airports, railways, roads, and public buildings. AXVIEW's range of surveillance IP cameras are developed with the consumer in mind and the company is one of China's leaders in CCTV surveillance applications.

Another new software product has also been announced. The company hopes that IQ Face will revolutionize the way facial recognition is performed, by detecting multiple faces in a crowd and simultaneously recognizing their identity from one or more large databases.

CONTACT

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On-ramp to success

504 Similar to many other Australian cities, Melbourne has been battling the growth in traffic congestion as increasing vehicle numbers choke the main arterial roads and freeways in peak travel periods. In 2007, VicRoads decided to investigate ramp metering to regulate the flow of vehicles onto the freeways in peak times.

Transmax implemented the coordinated ramp metering trial system on a 15km section of the Monash Freeway (M1) in April 2007. With coordinated ramp metering, throughput of traffic onto the freeway can be automatically controlled and adjusted to maximize traffic flow and minimize congestion, so improving the overall performance of the road network. The trial used the HERO/ALINEA ramp metering algorithms, developed by the University of Crete (*see p58*).

In December 2007, Streams was installed to manage six ramps that were previously being metered in isolation, failing to take account of changing traffic conditions on the freeway. This provides an integrated approach to traffic management throughout the whole network, including freeway management, traffic signal management, and incident management. The system exceeded expectations by reducing delays, improving reliability and increasing traffic throughput. Before-and-after studies demonstrated peak hour freeway flow increases in excess of 10% and average speed increases of 20km/h during the peaks. The daily economic benefits (travel time savings and vehicle operating cost savings) have been estimated at approximately A$94,000 per day. Consequently, the payback period relative to the pilot cost of A$1 million was just 11 days.

Streams is developed and supported by Transmax and will be on display at Intertraffic 2010.

CONTACT

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Q The use of ALPR in ITS is expected to double over the next five years. What technological advancements do you predict will improve these systems in the future?

A "The obvious advance is super-intelligent miniature ALPR cameras.

New densely populated IR-sensitive sensors will be able to monitor three or more lanes of traffic at night. New parabolic LEDs being developed will evenly illuminate 10-12m of road width. New tiny low-power multicore DSP processors will be capable of handling the huge increase in resolution required (up to 12 x PAL). New multifunction ICs will combine 3G, GPS, WiFi/WLAN onto one small device. Remote inductive power will run the cameras without physical connection. These five advances will combine to produce an intelligent wide-angle ALPR camera the size of a current small block camera. For ITS this means one ALPR camera covering several lanes, no roadside processors, no cables, and minimal installation costs. Good news, eh?"

Lawson Noble
CTO, CitySync, UK

A "Improvements in the accuracy of the systems, reduction in camera size, and reductions in cost have all contributed to the increased adoption of ALPR in recent years. Our focus at PIPS will continue to be the advancement of our technology for better performance and user adoption, and to enable more cost-effective solutions for various markets. We believe there are real opportunities to increase the impact of these solutions. Today, many providers offer components of a solution with little to no interoperability across systems deployed. The burden falls on the integrator to pull it all together as these solutions often operate in isolation of one another. Moving forward, consolidation of system components and greater interoperability of the solutions deployed will drive cost reduction while improving the overall experience for all stakeholders – including the traveler."

Brian Shockley
director of marketing, PIPS Technology/Federal Signal, USA

A "I can't answer what the next step might be, but operationally I can see what law enforcement's desire would be. Smaller and more effective units with better ease of integration into your current operational requirements would be gratefully received. If we could integrate a piece of equipment into our standard platform in the cruiser without having to provide specialty rigging or outfitting of the vehicle, that would be a great benefit. Also, although we understand that this technology is expensive to create, maintain, and update, we'd love to see the cost come down!"

Scott McCallum
system analyst, Pinellas County Sheriff's Office, USA

A "We believe our current systems are already extremely technically advanced, but we always strive to deliver improvements – particularly in response to feedback from our customers. Our R&D department is working on a number of advances. In the near future, we hope to see smaller and smarter ALPR cameras. Another priority is to achieve better integration with the end-user's equipment – to create mobile units that are even easier to install in police cars. Improving the software/OCR engines to achieve even higher recognition levels (in all weather and lighting conditions) is another factor that all vendors who want to progress in this arena are working on."

Nate Maloney
director of marketing and communication, Elsag North America, USA

A "I think license plate recognition is already pretty advanced, but I know there is more to come. The data standardization across vendors is going to be a big thing, so that agencies can share information. License plate recognition provides so much more benefit with wireless, but on that side it's not so much the vendors that need to make improvements. As more law enforcement agencies get wireless and can go real-time, we can issue things such as AMBER alerts immediately. License plate recognition has that capability, it's just that our vehicles don't have wireless.

I think geofencing – being able to identify when a vehicle is in a wrong place at a wrong time (sexual offenders in a school zone, for instance) – is another big software advance on the horizon.

I think advancements in the cameras themselves are also important – making them smaller, for one. The cameras use infrared so at night you can see a reddish glow, so as technology advances hopefully that could be diminished to allow more covert operation."

Heather Whitton
computer programmer analyst, Cincinnati Police Department USA

TTi READERS ARE INVITED TO ANSWER THE BURNING QUESTION FOR THE JANUARY ISSUE:

As technologies become proven in one sector, their applications evolve and they find use in other areas. How can the ITS industry benefit from the technology and experience found within the machine vision industry?

email answers to traffic@ukintpress.com

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