

traffic

TECHNOLOGY INTERNATIONAL

Updates
on INTERSAFE-2,
WSDOT's Smarter
Highways, and
InnovITS
Advance

August/September 2011

Informed debate
Separating fact from fiction
in speed enforcement

A round of applause
The IBTTA reveals its
class of 2011 in Berlin

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Logical progression

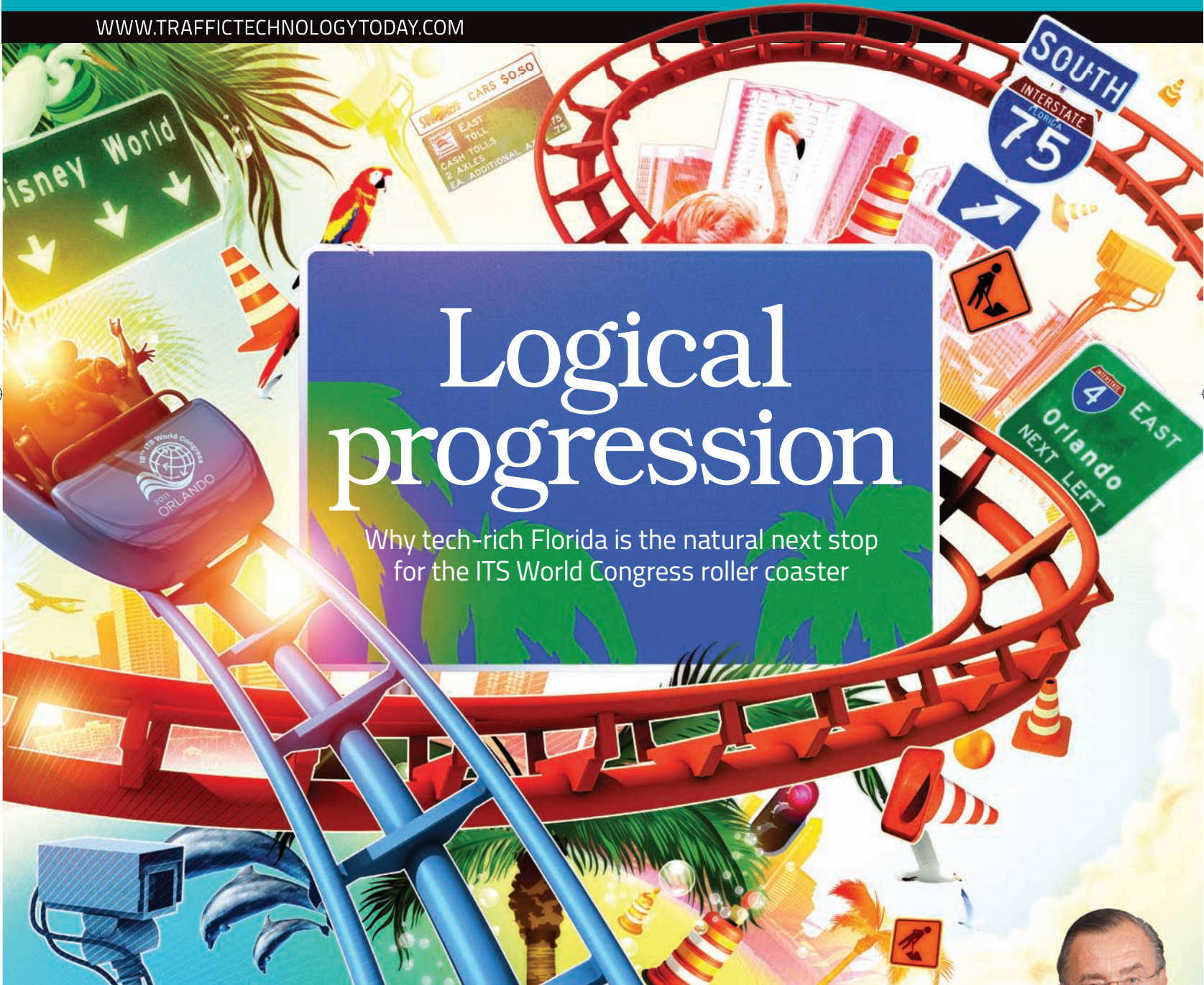
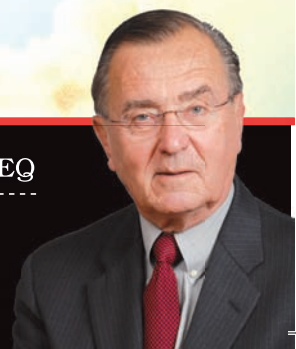
Why tech-rich Florida is the natural next stop
for the ITS World Congress roller coaster

PLUS

➔ | A perfect harmony
How the 'city as a platform'
concept could improve
vehicle-pedestrian interaction

➔ | The rebound effect
Yvonne Hübner on the unintended
and unexpected consequences of
various carbon-reduction strategies

➔ | Harry Voccola, NAVTEQ
"After various different names
we all now agree that the right
concept is 'connected vehicle'"



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Cover story

50 The main attractions

All aboard the ITS World Congress roller coaster
 In honor of the 18th edition of this ever-popular event, we present 18 highlights from the exhibit hall, some must-see conference sessions, and exclusive interviews with the people that make the show happen

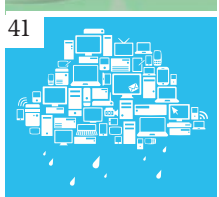
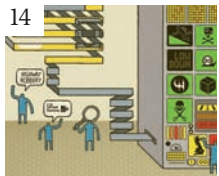


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Foreword



It's now more than five years since *le grand fromage* called me into his office to discuss me taking over the reins of his flagship magazine, a conversation I recall very clearly. "There's no other publication I've launched where you will feel such an affinity with the subject – good traffic management is something that affects us all yet you won't even register it," he said. "Bad traffic management is something that will drive you mad."

The latter, he suggested, was something he saw too much of in the UK so he subsequently spent 45 minutes telling me what he thought we should be adopting, including ramp metering – which is now being widely rolled out. He was also adamant that much safer cars, automated only where necessary, were a part of our collected futures. A phrase that went way above my head at the time but one I would quickly hear more about – albeit different terminologies – was 'connected vehicles'.

These weren't things he dreamed up off the cuff – they're the exact same ideas he focused on in the launch issue of this magazine in 1993. Strangely, though, he dismissed the adage that you can't build your way out of congestion, suggesting that, where feasible, you still can.

It was not at all planned, but while putting this issue together, I was reminded of that initial meeting. Our article on the £370 million Hindhead Tunnel proves that adage wrong (p48). The son of a Royal Naval officer, I can remember the extra 20 or so minutes (at least) you would have to add to every trip from Portsmouth on the south coast to anywhere in the east as a result of the congestion that would build on the A3 through the Hindhead bottleneck. So the Highways Agency deserves a big pat on the back for speeding up that particular journey. Built on time and to budget, the tunnel is packed with innovative technologies and has shaved off almost a third of the journey time, too.

On that same theme, it was great to hear about another traffic management success story, this time in Seattle, Washington State (p45). It's a little early for Morgan Balogh, a traffic engineer from regional operations, to provide any hard data about I-5's Smarter Highways, based on the ATM scheme on the M42 in Birmingham, but anecdotally they're already seeing improvements.

And for a glimpse of the future, look no further than the report on INTERSAFE-2, the fruits of which could bring safer cars and intersections tantalizingly close to reality. Enjoy the read!

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SEEING IS BELIEVING



According to results revealed in the German In-Depth Accident Study (GIDAS), around 43% of all traffic accidents occur at intersections. Swarco, one of the 11 partners in the INTERSAFE-2 project, believes enhanced communication between traffic signals and vehicles could lead to a 50% reduction in such accidents. Swarco's traffic signal reacts by adapting the phase period – if a vehicle approaches too quickly, the driver is subsequently warned by a soft brake pressure and visual and acoustic signals within the vehicle. This not only has a safety benefit, but also ensures a smooth traffic flow with reduced waiting periods, fewer exhaust emissions at intersections, and therefore lower fuel consumption. Additional information about street conditions (wet, icy, etc) can also be factored into the equation.

Emergency backup

Although at the research and development stage, the applications demonstrated as part of the INTERSAFE-2 project could eliminate a huge number of accidents at traffic intersections. **Lloyd Fuller** reports on the life-saving potential

Photographs courtesy of BMW, Volkswagen & Volvo Trucks



Although it seems that barely a month goes by without the final results of one EC-funded, multi-million-Euro project or another being unveiled, the return on investment for which is sometimes open to debate, there are reasons to be positive with INTERSAFE-2, particularly as the focus is solely on the most troublesome of all black-spots.

Intersections account for anything between 30-60% of all injury accidents and up to a third of all fatalities, mainly due to their inherent complexity and the fact that a variety of road users converge at once. However, in May 2011 demonstration vehicles in Wolfsburg, Germany, kitted out with all manner of advanced electronics, sensory and communications technologies, provided a glimpse of what could be on the horizon. In all, four assistance and safety applications were shown at the home of Volkswagen, including right-turn assistant, left-turn assistant, intersection assistant, and red light violation/ignoring right-of-way.

Left-turn assistant

"With the left-turn assistant, we've developed something that helps drivers when turning off left by alerting them to the risk of not seeing oncoming traffic," reveals Arne Purschwitz, project manager at BMW Group Research. According to the German Federal Statistics Office, inattentiveness when turning off a road or performing a U-turn is one of the leading causes of accidents on Germany's roads, so this concept is designed specifically to address the issue. "It can even prevent collisions by automatically applying the brakes," the BMW man states.

In the demonstrations, a BMW 5 Series was rigged up with sensors that detect that the vehicle is entering the left-turn lane, with the car registering the driver's desire to turn off. A positioning function within the vehicle navigation system provides a fix on the car to within a distance of 1m, while a mono camera registers the turn-off lane markings and lane borders on the road. When the left-turn assistant is activated, three laser scanners mounted at the front of the 5 Series map the area up to 100m ahead of the vehicle, picking up not just other cars and trucks but PTWs, too.

"If the sensors detect vehicles approaching from the opposite direction but the car continues to move into the intersection, the left-turn assistant activates an automatic braking input in a low-speed range up to 10km/h to prevent a crash," Purschwitz says. "At the same time, a warning sound and relevant warning symbols in the head-up display and instrument cluster advise the driver of the reason and the intervention."

This automated action is triggered deliberately without a prior warning since at that stage a rapid response is required to stop the car



Automatic pilots

As the 11 members of the INTERSAFE-2 team were packing up their equipment in Wolfsburg, 17 partners from the automotive and scientific community were just unloading theirs in Borås, Sweden. The HAVEit project, featured in the January 2010 edition of *Traffic Technology International*, highlighted technologies aimed at automated driving, with several demonstrations that are tantalizingly close to reality. "In view of increasing traffic density, the growing flood of information available to drivers and the rising average age of the population, highly automated vehicles will characterize the future of mobility," Reiner Höger said at the event. "Automation will relieve drivers of some of the stress of driving as it guides them through traffic more efficiently, using more environmentally friendly technology." The HAVEit project coordinator suggested that we might not have to wait so long for such technologies to hit the streets. "The aim was to develop ideas that we could actually implement within the foreseeable future – series production in the next five to 10 years."



BMW also demonstrated the possibilities to improve the safety of PTW riders. "The BMW R 1200 GS motorcycle and 5 Series exchange information on the type of vehicle, its position and speed, as well as dynamic data such as its steering angle and whether the indicators are activated," reveals Udo Rietschel, a development engineer on the project. "The motorcycle's safety system then uses the data to determine that the car driver planned to turn left and move in front of it. An algorithm then calculates the vehicles' trajectories and decides if a collision is likely."

GENEVA,
aka Galileo/EGNOS
Enhanced Driver
Assistance, is a VW-
backed safety project
using GNSS. First results
will be revealed later
in the year

“It’s changes on the passenger sides of trucks that drivers do not see – pedestrians and cyclists, in particular, are really in danger here

heading into the intersection and posing a risk to oncoming traffic. “If the driver had to react to a warning first, the car would career straight into the collision area, meaning a crash would no longer be avoidable,” Purschwitz adds.

The left-turn assistant works at speeds up to 10km/h. The automated braking function doesn’t trigger dramatic deceleration from high speed, but instead is considered a system to prevent the car from moving off or continuing along its path. As soon as the driver engages the brakes, the braking input triggered by the left-turn assistant is disengaged and the car is ‘released’ again to continue normal driving. The driver can always override the function, for instance if the car needs to be maneuvered to the side of an intersection to make way for an emergency vehicle.

BMW was one of several partners involved in the €6.5 million INTERSAFE-2 project, €3.5 million of which was funded by the European Commission. Other members included the project coordinator, SICK, IKA, Inria, NEC Europe, Swarco, TRW-Conekt, VTT, the Cluj-Napoca Technical University, VIT, Volvo and, of course, Volkswagen. Based on V2I communication, VW’s contribution – the intersection assistant – provides drivers with information not only about the visible surroundings, but also about objects that are hidden from view.

“Our own accident research shows that as far as intersection crashes are concerned, it’s actually miscalculations of speed and distances especially – plus a failure to observe red lights or stop signs – that cause these types of accidents,” suggests Professor Jürgen Lehold, head of Volkswagen Group Research.

Based on a VW Passat CC, the prototype built by Volkswagen Group Research was equipped with five assistance functions developed specifically for intersections: left turn, right turn, intersection crossing, red light and stop sign assistants. If drivers break any of the appropriate rules of the road, the functions warn them in three stages of escalation: first an audible warning, then a visual one, and finally a haptic jerk on the brake.

The equipment deployed at intersections on Breslauer Straße and Wohlbergstraße for detecting pedestrians and vehicles consisted of laser scanners, infrared sensors and WLAN as the communications technology. The technology was tested for a future intersection assistant over prior months using specially equipped prototype vehicles.

Right-turn assistant

Volvo Technology’s role was to develop an in-truck solution with Volvo Trucks – a blind-spot assistance system on the passenger side to allow for safer right turns. Malte Ahrholdt was the project manager and was in Wolfsburg to



A blind-spot assistant system on the passenger side of cars can be used to alert drivers of cyclists when they are turning right

explain how it all works. “It’s changes on the passenger sides of trucks that drivers do not see – pedestrians and cyclists, in particular, are really in danger here,” he says. “Our system therefore provides alerts to what’s happening on this side of the vehicle.” By fitting laser scanners and ultrasonic sensors that monitor the area, the system can detect and warn the driver if a pedestrian or a cyclist gets too close for comfort.

“We are working on all fronts to improve safety – with enhanced information and advanced technology such as reversing cameras and lane-change support,” adds Carl Johan Almqvist, traffic and product safety director at Volvo Trucks. “Even so, what this event has proved is that there are other things we can do to improve the situation still further, and the right-hand turn has been identified as a particularly relevant safety issue.”

The V2I communication system that allows the roadside infrastructure to ‘talk’ to each other in real-time came courtesy of NEC Europe. The system comprising LinkBird-MXTM platform and V2X software allows traffic signal controllers to transmit their current signal phase of red or green and time changes to approaching vehicles, warning of potential red lights and aiding safer and more efficient driving.

As it’s a research and development project, none of the technologies demonstrated in INTERSAFE-2 are imminent for production, although BMW is confident a variant of its left-turn assistant could be on its vehicles by 2016. If all the systems were to be deployed, however, it could provide a positive safety impact of up to 80% with respect to injuries and fatalities at intersections, which in Europe alone would equate to a total safety benefit of up to 40% of all injury accidents and 20% of fatalities. ○

In 2009, there were 33,808 fatalities on US roads, of which 7,043 (20.8%) were intersection or intersection-related, according to the FHWA



Accidents at intersections are often the result of drivers miscalculating speeds and distances



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Time for action



Roads that Cars can Read recommends that the roads and motor industries should target improved signing and marking on the 10% of Europe's roads where the majority of travel and the majority of deaths are concentrated, often involving higher speed crashes.

"The majority of European deaths are on national roads and busy regional roads outside towns," says EuroRAP's chairman John Dawson. "The single carriageways are Europe's killing fields. We should focus this decade on ensuring the quality of the signing and marking on these busy open roads whether or not the technology needs it."

"We now need a full survey of the quality of signs and markings to measure the real variation in signing and marking across borders and define the working tolerances that are acceptable."



“A century after the cat's eye was invented, technology is again driving this rethink of how the road ahead can be read safely

Roads that cars can read

New working tolerances and quality standards are needed to ensure Europe's roads can be read by ADAS on the road. **Leanne Keeble** finds out why change should start with lane marking and speed sign recognition

Main image courtesy of Audi

Four years ago in an article about advances in the sphere of road markings, *Traffic Technology International* asked experts involved in lane-departure warning systems and pavement road markings whether or not they were going to sit around the table at some point in the future. It stands to reason that for ADAS such as lane assist to be effective, a good-quality road marking is a prerequisite. It was therefore interesting to hear that two heavyweights in road and car safety, EuroRAP and Euro NCAP, joined forces at the end of June to call on the motor industry and the highways sector to work together for this aim.

In a consultation document, *Roads that Cars can Read*, EuroRAP and Euro NCAP assert that the condition of road signs and markings could be the greatest hurdle in reaping the benefits of new in-car safety technology.

According to the report, technologies now arriving in new car showrooms are forecast to save thousands of European lives as they trickle down into universal use. Increasingly cameras and sensors are used to read the road ahead and help the vehicle react early if it is heading into danger. However, obscured signs or faded road markings are hard to read whether using the naked eye or an in-car camera. The new report surveyed six countries to probe how signing and marking practice still varies in Europe after half a century of international conventions.

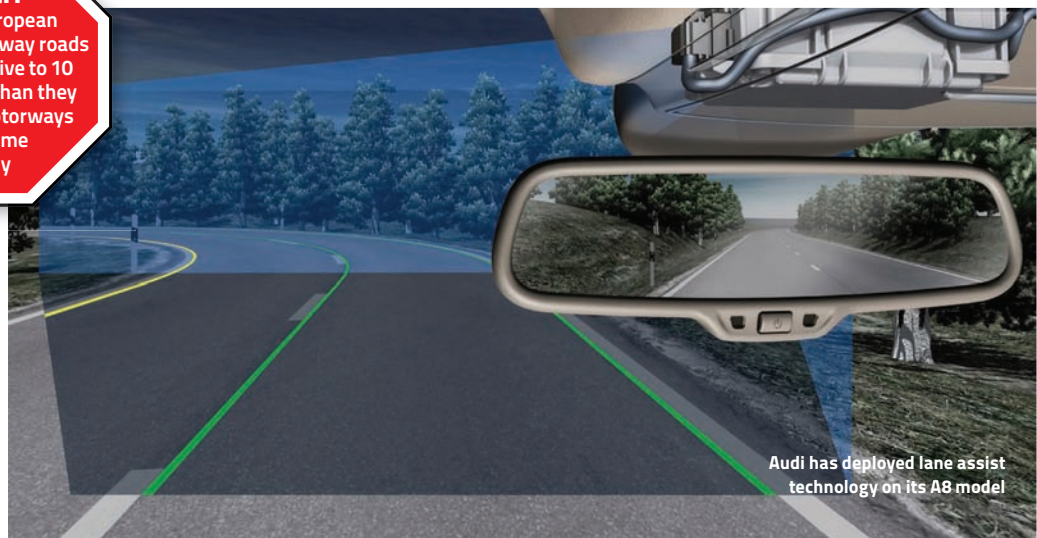
"Huge sums have been spent developing technology that is

revolutionizing the safety of our vehicles," says John Dawson, chairman of EuroRAP. "But little attention has been given to the quality of basic signing and marking with which drivers currently have to cope. We've found no country that systematically measures the quality of signing and marking being achieved. A century after the cat's eye was invented, technology is again driving this rethink of how the road ahead can be read safely. The key lesson is that what is good for humans is good for machines."

Roads that Cars can Read recommends that the roads and motor industries should learn to work on new designs together by focusing on helping drivers with two early technologies now offered in new cars, 'Lane Support' and 'Speed Alert'. Lane Support reads lane markings to work out the position of the vehicle within the lane and steers drifting vehicles back on path, a common origin of crashes. Speed Alert, meanwhile, allows drivers to choose warnings when exceeding posted roadside speed limits.

Michiel van Ratingen, secretary of Euro NCAP says: "More than a quarter of road deaths involve running off the road. Lane Support provides a warning that's as physical as hitting a rumble strip. It is estimated more than 2,000 deaths annually can be prevented with this technology in Europe alone."

"The consequences of missing a change of speed limit have become more serious in recent years," van Ratingen concludes. "Speed Alert protects drivers from missing a speed sign." ○



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always one step ahead

Safety first

John Challen was at the opening of the innovITS ADVANCE test facility, which promises to bring intelligent ITS products and services that might otherwise never reach the market



Preemption and fuel-saving techniques can be examined looking at the environmental costs of holding up an HGV in traffic, as opposed to passenger cars. Looking specifically at emissions reduction, innovITS customers can investigate the environmental impact of limiting – as well as maximizing – traffic flow.

(Above) The innovITS ADVANCE facility has now officially opened

Around
700 deaths and serious injuries could be prevented on UK roads if all cars were fitted with automatic emergency braking, a recent study found

Billed as the world's first purpose-built facility for the development, test and validation of intelligent vehicle technologies, innovITS ADVANCE has opened its doors in the UK's Midlands. Funded to the tune of £10 million (US\$16.2 million) by the UK government, the new facility has been created by innovITS in collaboration with TRL and MIRA proving ground, the latter being the location for the new development.

The culmination of a four-year project, innovITS ADVANCE offers a range of specific features, such as a virtual city, which is claimed to replicate the network connectivity of any type of street environment from the skyscraper-heavy Lower Manhattan or London to mixed suburban locations. It also offers a range

of communication networks, allowing system developers to prove out their equipment using GSM, 3G, and WiFi among others. A range of cameras and sensors around the site also provide the opportunity for customers to record their tests, and also monitor what vehicles are on the tracks at a given time.

Driving forces

"Collision avoidance and similar applications of pedestrian detection were the key driving forces behind the development of this facility and will, therefore, be one of the most popular applications to be used," reveals Phil Pettitt, CEO of innovITS, highlighting the advantage of being able to conduct tests in a private, controlled environment. "To find out if the systems work properly, developers have to examine failure modes and look at various ways



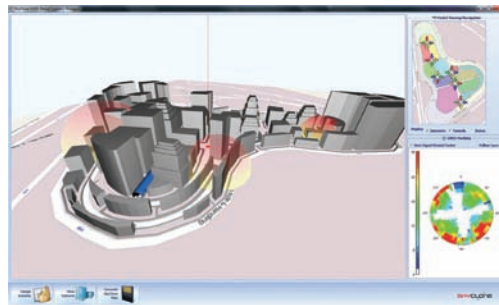
innovITS operates its own GSM network, negating the need to find and use different radio networks. "We are also working with Vodafone to deliver our 3G system, which is the first thing a lot of people look for," Pettitt says. "Customers also like the fact that, as a private test space, we can pick and choose what communication systems to turn off, to see what effect it has on the systems under development. That is something that wouldn't be possible on a public road."



Access control work at innovITS ADVANCE allows traffic efficiency evaluations to be made. "People are talking about schemes that use traffic control software to understand how many people are in a vehicle," Pettitt explains. "We can devise tests that allow you to start looking at people and goods input, rather than vehicle input, which is ultimately what you want to maximize."



Vehicles are monitored around the site using an HD video system that provides a reference point to give a GPS-independent definition of exactly where the test vehicles are. Pettitt says: "When working at collision points, the video lets you know where the vehicles are, compared with what the in-car systems say."



“The whole point [of innovITS ADVANCE] is to provide a facility that allows people to test more quickly and more effectively, and we anticipate that it will become a magnet that generates a cluster of activity

For every
Euro invested into ESC, society would save between €3.5 and €5.8, a net benefit of €10-16 billion a year for full Europe-wide penetration

(Top) The central multi-lane boulevard (Above) SkyClone technology as used at the facility

the communications or location information has been compromised to see what levels of performance can be attained from the whole system. Reliability issues are also important to explore here, too."

Other applications listed include navigation, cooperative active traffic management, eco-driving and access control and preemption. Above and beyond these items, Pettitt says the facility has the ability to offer extra testing services such as electric vehicle charging.

innovITS is currently viewed as the center of excellence for ITS in the UK, but Pettitt believes this new test site makes it possible to go one stage further and expand on an international level. "The whole point [of innovITS ADVANCE] is to provide a facility that allows people to test more quickly and more effectively, and we anticipate that it will become a magnet that

generates a cluster of activity," he continues. "It is an emerging industry but in the mid-term it is expensive, so there won't be many facilities such as ours. But we would be interested in talking to anyone around the world about setting up a chain of these centers." He highlights the full range of vehicle development opportunities available at MIRA as a further pull for potential customers.

Pettitt also reveals conversations have taken place with other ITS organizations, which while expressing some interest are not ready to commit just yet. "In the early stages, we had conversations with ITS Japan, as it has a smaller facility looking to achieve something similar as us, but I don't think they have the same range of communications systems," he explains. "They have visited the site and were very impressed with what they saw." ○

Poles apart

As far as good months go, July wasn't bad at all for Kapsch. The company's Polish truck-tolling scheme, viaTOLL, kicked off successfully on July 3, implemented on behalf of the Polish Directorate for National Roads and Highways (GDDKiA). The scheme was implemented in record time, according to Michael Schnitzer, Kapsch TrafficCom's sales director, and is expected to contribute €100 million to the Polish Finance Ministry by the end of the year. Then, the day after announcing the E-ZPass contract, news filtered out of Kapsch's Vienna offices that it had secured a deal to implement an ETC system on nearly 100km of roads in Portugal for ASCENDI – a total of 38 toll stations for multi-lane free-flow traffic. The project will be completed in phases between October 2011 and October 2013.

E-ZPicking for Kapsch

After securing what could be one of the biggest ETC contracts in tolling history, Kapsch has well and truly cemented its position in the US market. **Nick Bradley** speaks with **Peter Samuel** about what could lay ahead

Images courtesy of Weimin Liu & Katie Lips

One of tolling's longest running sagas had a happy ending in July – for Kapsch TrafficCom at least – when the E-ZPass Group selected the Austrian company's US subsidiary, Kapsch TrafficCom IVHS Inc, as the vendor for the 10-year technology and services contract. There are 21 million transponders in use throughout the 14-state E-ZPass region, comprising 24 toll agencies, making it the largest interoperable tolling network in the world. E-ZPass processed an amazing 2.3 billion transactions in 2010 and has 12 million registered account holders – double the figure of 2005. What the deal essentially means is little in the way of disruption to E-ZPass users, as the award sees a continuation of transponders, readers, and ancillary equipment that was supplied by Mark IV before Kapsch acquired the company in December 2010. This factor has, by all accounts, been key to the decision.

Best price, high accuracy

E-ZPass's executive director, PJ Wilkins, stated in a press release that Kapsch received the highest overall score and offered the most competitive price. He said: "Evaluation elements included technical and non-technical criteria, as well as estimates for operating and transition costs."

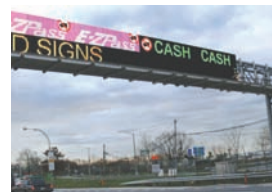
Somebody who has been following events closely is *www.tollroadsnews.com*'s editor,

Peter Samuel, who was typically all over the story. The first thing we asked was why the selection process had been so procrastinated? "Few of the toll agencies in E-ZPass had any compelling reason to hasten the process," Samuel states. "The 1990s gear from Mark IV (now Kapsch) works well – it collects billions of dollars accurately and without fuss."

What has surfaced since the deal was announced is that 5.9GHz was ruled out quite early on by the selection committee, despite Kapsch being a proponent of the technology. "5.9GHz is never going to be sponsored or implemented by the US toll industry – it's a great technology but way more capability and expense than is needed for ETC," Samuel feels, before going on to praise the virtues of passive sticker tags. "The chips are being mass produced and cost cents each. Once these amazing little chips are packaged in the sticker with an antenna and security algorithms, they'll do at least as well as the active boxes with their batteries."



The E-ZPass deal will see the continued use of existing transponders, readers, and ancillary equipment



The Port
 Authority of New York and New Jersey has selected ETC Consultants to implement its RITE back-office system on its four bridges and two tunnels

“People tell me the two offerings were technically very similar in their performance”

So while they're celebrating in the offices of Vienna, things might be a bit more subdued in Hummelstown, Pennsylvania – the home of TransCore, which was in the hunt for the E-ZPass deal right to the death. "It's a blow because it's about half the toll tag reader business in the USA, but it is [TransCore] a very innovative company," Samuel adds. "It's the leader in sticker tags by a mile, and supplies the huge and growing markets in Florida, Texas, and elsewhere. People tell me the two offerings were very similar in their performance. Price was one of Kapsch's big pulls."

Indeed, on that note, on his website Samuel states that the Kapsch offer was for transponders to be sold to IAG tollers for US\$8.90 each compared to the US\$20.95 price the tags are currently acquired for. TransCore apparently quoted US\$11.37 a transponder.

Samuel guesses that the supply of new readers and services would be at least the price of the transponders, making the entire contract worth around US\$800 million. That's not too shabby at all considering Kapsch only paid US\$70 million for Mark IV. ○

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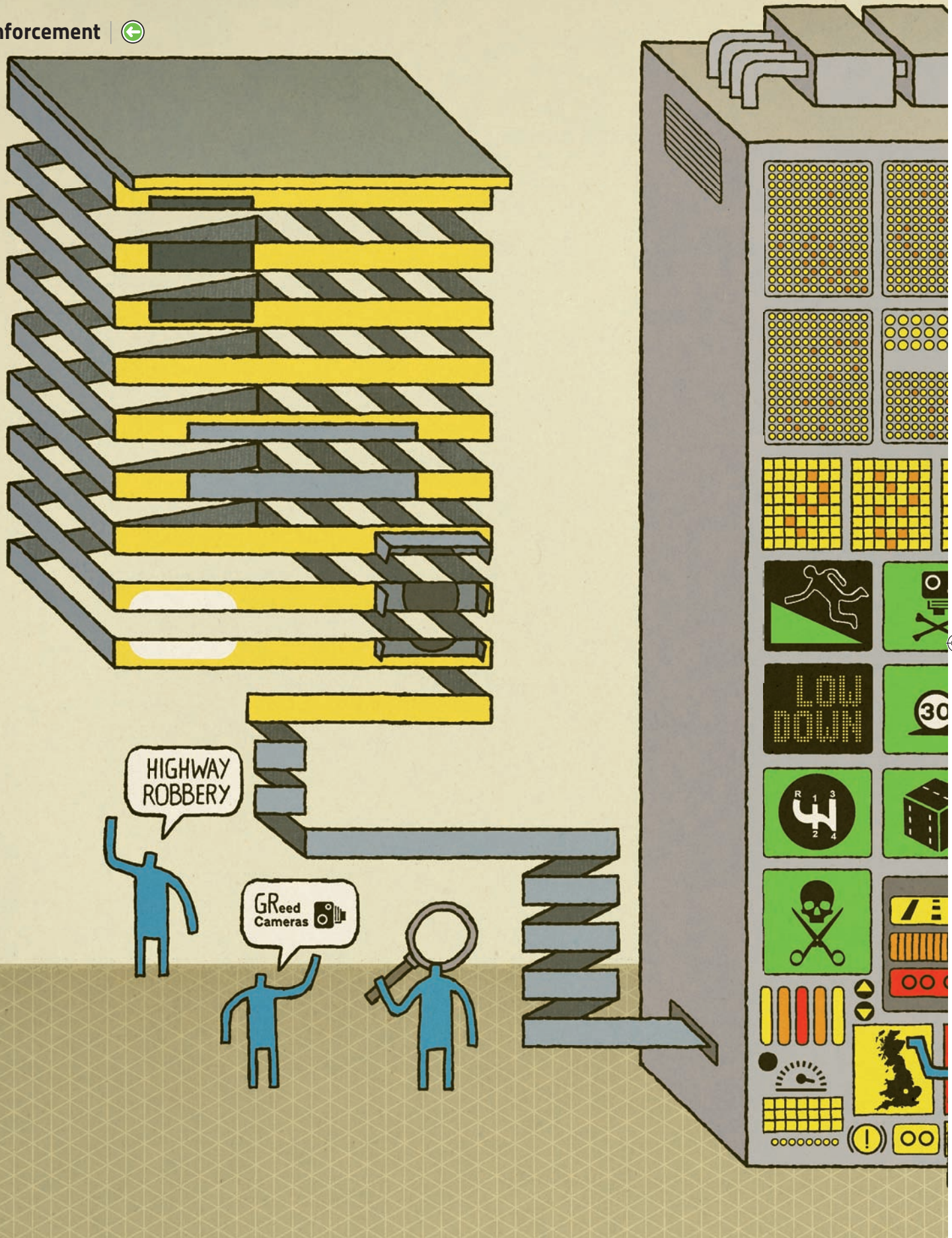
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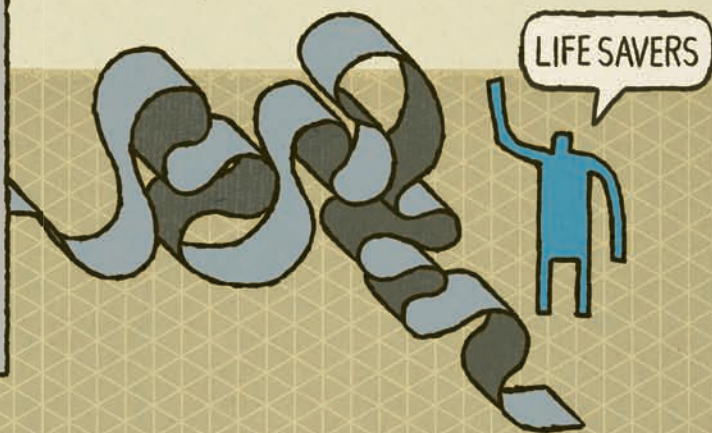
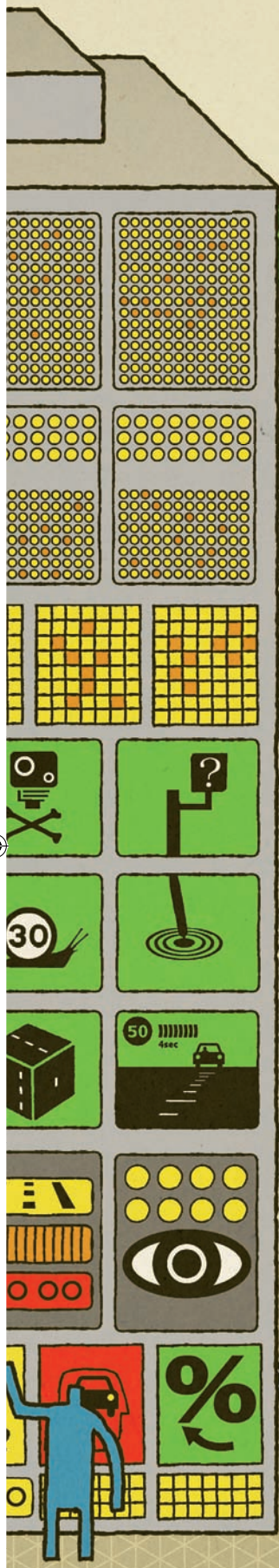
Always a passionately debated subject – particularly in the current climate of austerity measures – **Louise Smyth** assesses the latest findings for and against spot-speed cameras

Illustration courtesy of Tim Ellis

In November 2010, the RAC Foundation published a report entitled *The Effectiveness Of Speed Cameras*. In January 2011, the Association of British Drivers (ABD) published its rebuttal, *A review of The Effectiveness of Speed Cameras*. Wildly contrasting in their views, at the heart of both papers was one simple question: is there any proof that speed cameras actually work in a beneficial way?

The author of the RAC Foundation's report, Professor Richard Allsop, concluded that 'Yes, they do'. But his opposition, the ABD's Roger Lawson, argued that the evidence supporting Allsop's view was too flawed to be at all conclusive.

Allsop's report was a 'review of evidence', in that it was not new research but an evaluation of existing data. This alone lit the touch paper for the ABD. "Basically, Professor Allsop's report is bad science," believes Lawson. "It was presented by the RAC as if it was an unbiased, independent analysis of the science of speed cameras and their effect on road casualties and it's nothing of the sort. If you look at the studies that he used, many of them haven't even got the fundamental controls. Even basic things such as comparing one location with another have not been conducted. If the RAC had really wanted to do a proper scientific study, it would have conducted a



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randomized trial in which it took a number of similar roads and put a speed camera on one and not on another and then compared the results over several years.”

Randomized trials

Although Professor Allsop concedes that a randomized trial would have been beneficial, he rejects the notion that he is in some way responsible for this not occurring: “Roger Lawson might ask why a randomized trial was not done at some point but there’s no way that I could have done a new trial,” Allsop says. “I was asked to do this job in the middle of August and report by the end of September – actually it took until a good way into October because it developed in various ways. But there’s no way that I nor anybody else could have conducted a new experiment producing new data in that timeframe. If you wanted to do a controlled randomized trial, it would have been a job costing hundreds of thousand of pounds and it would have taken several years. If the ABD asks why this wasn’t carried out, I think they really mean ‘Why was this not done in about the year 2000?’ when the government was first considering how to accelerate speed camera enforcement. The national rollout of cameras occurred in 2000-2005. At that point, if there had been real doubt in people’s minds about whether the cameras were having the effect that they seemed to be having, a controlled trial would have been possible to design and carry out then. But it would have delayed the benefit of having them.”

And it is indeed a significant ‘benefit’ that Allsop believes the existing data shows. His paper, drawing on a four-year evaluation report, concludes that speed cameras create a “substantial improvement in compliance with speed limits” and states that “collisions and casualties decreased substantially at the more than 4,000 sites covered by the four-year evaluation”.

Yet Allsop is the first to point out that this reduction is not solely attributable to the camera rollout: “There is a problem that arose which is addressed in my report

“The problem is that quite a lot of the cameras were introduced at sites that had identified themselves over the recent previous period by having unusually high numbers of collisions and casualties

Richard Allsop, professor of Transport Studies, University College London, UK



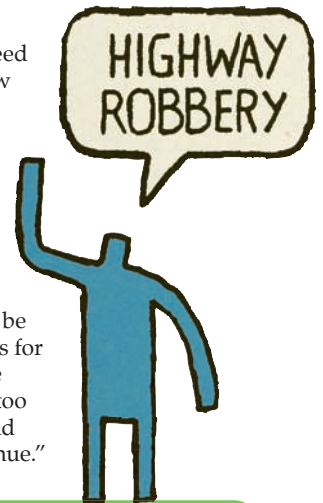
at some length. When the evaluation was carried out – which was as large an evaluation as there has ever been of a road safety initiative in this country – the phenomenon of regression to the mean was not adequately allowed for. That left it uncertain as to how much of the casualty reduction at camera sites was due to the cameras.

Casualty reductions

“I don’t think anyone disputes that the numbers of collisions and casualties at the camera sites in the period after the installation of cameras was very substantially lower than in the period before the installation,” Allsop continues. “The problem is that quite a lot of the cameras were introduced at sites that had identified themselves over the recent previous period by having unusually high numbers of collisions and casualties. When you identify sites on that basis, if you did nothing at all they would improve because they’ve just had an above average period, then they’ll go back to having an average period and so hence there will be an improvement. Estimating that effect was not properly addressed in the large-scale evaluation.”

Ultimately, Allsop’s finding was that speed cameras save lives, although the ABD’s view on this is, “Great, show us the evidence!” Lawson says: “There is no evidence in the RAC report that a scientist would accept, in that there may well be an impact but the confidence limits are such that you couldn’t be sure there is an impact.”

Lawson is clearly passionate about this cause, although his view is not as extreme as to suggest that all speed cameras should be switched off. “I think there are justifications for some spot cameras in specific locations,” he says. “The problem is that there have been too many sites where they are inappropriate and where they were used just to generate revenue.”



Speed cameras have always prompted strong feelings, with some being burnt or vandalized by anti-camera vigilantes



➔ | Removal of revenue-generators

In Australia, the trend for spot-speed cameras being switched off is also being observed but this time not due to funding cutbacks. In July 2011, New South Wales roads minister, Duncan Gay ordered that 38 cameras across the state be switched off after an

audit found that they were not improving safety.

The decision was taken following a report from the state’s auditor general, Peter Achterstraat, which found that while “overall speed cameras change driver behavior and improve road

safety”, 38 of the existing 141 fixed speed camera locations had not reduced crashes.

“There has been community concern that some cameras are purely revenue raisers and this audit has allowed us to identify them and ensure they are removed,” Gay noted.



Looks matter

As traffic management becomes more integrated with urban planning, the aesthetics of ITS equipment – particularly speed cameras – has been put under the spotlight

The appearance of an enforcement camera can be key to its effectiveness, according to Geoff Collins from Vysionics. “No-one looks at a camera and thinks ‘Wow, that looks great!’ They’re more likely to be thinking ‘I hope that doesn’t flash me,’” he says. “Consequently, the majority of cameras are designed to be effective and resilient to the efforts of the anti-camera mob. Visual appearance is key to achieving compliance, as drivers see them and that makes them modify their behavior; it isn’t the aesthetics that achieves that.”

“Our SPECS cameras are mostly operated in the UK, where their being conspicuous is considered to be very important,” Collins explains. “This does sometimes conflict with authorities’ needs however. We were recently asked to make an installation as unobtrusive as possible, while being conspicuous to drivers!”



Vysionics is currently working on new systems that Collins says will “present a strikingly different design concept”, allowing the SPECS average speed approach to be applied in a number of different ways.

Peter Hill, director of UK Operations at Truvelo observes the point that legislation often affects how the manufacturers can design their products: “In the UK, the existing fixed roadside camera posts and housings have been around since the early 1990s. It is not a practical option to revamp the design every so often because the post/housing combination has been through a testing program as part of the Home Office Type Approval process. It wouldn’t be worthwhile to repeat those tests for purely aesthetic reasons.”

Hill also explains why it’s legislation that means all the cameras on UK roads are a distinctive yellow color: “The previous government suddenly introduced a

“Speed cameras are no longer functional only ... They represent the whole idea of modern urban management

requirement to make the camera housings more conspicuous. The most cost-effective way of converting the several thousand housings already at the roadside was to apply yellow reflective sheeting to the front and back. The alternative option for new installations was to use yellow paint.”

Despite working within strictly regulated parameters, Hill has been involved in recent design-related developments. “Our latest generation D-Cam digital speed and red-light camera presented the need to redesign the housing as well as the opportunity to redesign the post. The result is our



Truvelo’s latest system has a facelifted post and housing

IntegraPost, a streamlined, modern-looking structure that also incorporates added protection. The housing part remains fixed and integral with the top of the post, but the floor acts as a shelf for the camera and slides down when the door is open to waist level for access to the camera.”

In countries where legislation is not so obstructive to form, greater advances are being made with regard to how speed cameras look in relation to their environment. Dr Marcos Michaelsen, head of technique and operations for Jenoptik Traffic Solutions is extremely proud of the progress his company has made in this arena. “The design of public places has a decisive influence on people’s well-being,” he feels. “Our red dot-awarded TraffiTower

outer housing is the realization of the vision of a product that serves society by contributing to improved safety while blending into its environment as a sculpture. The design does not regard the function as a restriction, but as an opportunity to create a new archetype of traffic surveillance unit.”

His optimism is not tempered by asking how challenging legislative requirements are to designers such as himself: “Industrial design has always been a creative challenge between restrictive conditions from technology through to economics,” he



The distinctive SPECS cameras – a familiar site on UK roads

explains. “Meanwhile ecology and sociology play an increasing role, too. A color confinement, such as in the UK legislation, would just be another piece of the puzzle.”

Jenoptik believes its work on the aesthetic element is paving the way for others as well. “Following the introduction of TraffiTower, the issue of ‘design in traffic law enforcement’ was picked up by the entire industry,” Michaelsen says. “The leading thought seems to be the visual positioning of the product through outstanding product characteristics, which might not always be a positive contribution to a better public design and clearer streets.”

Jana Stein, product manager for Vitronic’s PoliScan range agrees that vendors are now starting to use the looks of their products as a selling point. “The modern design of our system is an important reason for customers to choose it,” she says. “The pole’s sleek, elegant and inconspicuous design fits into any urban environment. Many communities use it as a symbol for their modern road safety initiatives.”

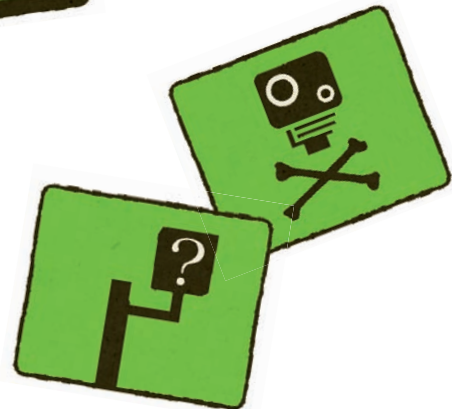
Stein ensures that Vitronic’s products can meet both practical and aesthetic requirements by offering flexibility in the range: “The PoliScan unit is available in several different housings. Although a city design housing is available to provide a high degree of aesthetics, other housings focus on a simple, versatile design for highways.”

With Vitronic seeing great demand for its cameras, Stein is keen to stay on top of the trend for effective yet attractive products. “Speed cameras are no longer functional only. They represent the whole idea of modern urban management.”

(Left) Vitronic is embracing the trend for effective and attractive systems



➔ | Speed Enforcement



“It was presented by the RAC as if it was an unbiased, independent analysis of the science of speed cameras and their effect on road casualties and it’s actually nothing of the sort

Roger Lawson, Association of British Drivers, UK



Contrary to what you may think of someone with an anti-camera stance, Lawson is actually in favor of more research into the effectiveness of speed cameras: “A randomized trial would be well worth doing, but I think you’ll find that the advocates of cameras won’t want to do it.”

New research

Allsop would also welcome some new research, particularly as he’s keen to discover the bigger picture with regard to spot-speed: “All the evidence we have is concerned with what happened at the camera sites,” he says. “I think even the strongest supporter of cameras has to accept that it’s possible that there may have been effects on driver behavior away from the camera sites.”

Another element of the bigger picture is the relationship between the speed camera rollout and driver behavior in relation to the 30mph limit in general, which was the limit on the majority of roads where cameras were deployed. Allsop says: “In the mid-90s, we had a situation where at a 30mph site where people had a free choice of speed – ie. they weren’t slowed down by congestion and were just choosing their speed on a



The US perspective

Speed cameras aren't as plentiful as red-light cameras in the USA, but that doesn't mean that the idea of using photo enforcement technology isn't gaining momentum. In fact, there is every reason to believe Americans will be seeing more speed cameras in coming years – especially in schoolzones and workzones.

Communities with speed cameras have more than doubled from 35 in 2008 to 93 in 2011, according to the Insurance Institute for Highway Safety. New additions this year include Prince George's County, which announced plans to deploy 100 mobile speed cameras near school sites, and Montgomery,

Alabama, where neighborhoods, schoolzones and construction zones will get speed cameras. Montgomery is the first city in the state to be approved for speed cameras under a 2009 state law. Response has been more rapid in the state of Washington, where 11 communities have activated cameras since 2007. At least six of those cities use cameras in schoolzones and have found speeding violations dropping dramatically. Renton reports a 34% decrease, while Lake Forest Park reports a 61% reduction.

Camera popularity is again noted in a recent poll from New Jersey. Released in July 2011 by the National Coalition for Safer Roads, results showed 67% of

600 registered voters favor speed cameras. Schoolzones top the list of preferred locations with 74%, followed by construction zones at 59%.

But how dangerous are our schoolzones? Safe Kids USA reported in 2009 that one of every six drivers in such areas is distracted. A national survey found two-thirds of drivers exceed the posted speed limit in schoolzones during the 30-minute periods before and after classes.

Workzone crashes injure one person every 13 minutes, and kill someone every 12 hours. Speeding was a factor in 30% of fatal workzone crashes in 2008, according to NHTSA.

What might surprise people is that four out of every five people killed in workzones are drivers or vehicle occupants – not workers. Cameras are helping to protect drivers from themselves.

▪ By Sherri Teille, ATS



relatively open road, typically three quarters of people would exceed the 30mph limit in that situation, and many of them by a large amount. Now we have a situation where fewer than half would exceed the limit and a very small amount would exceed it by large amounts. That is a massive change in driver behavior. We do not know whether that has been affected by cameras or not. But most of the change took place over the five-year period in which cameras were rolled out from being relatively few in number in particular places to being the general expectation around the country. This is of course not conclusive – it could have been coincidence – but it is one of the biggest changes in driver behavior in all the time that we've been studying it."

Compelling benefit

Of course, the most compelling benefit that speed camera advocates cite is their impact on KSIs, although an interesting trend is occurring in this area. Due to the lack of funding available for camera enforcement in the UK, a number of safety camera partnerships have switched their cameras off entirely or reduced their hours of operation. The latest road safety statistics, however, show the lowest KSI rate ever recorded on UK roads. So, if all spot-speed cameras were turned off, would we really miss them? Allsop is adamant that we would. "This is not an area of precision so it had to be an estimate, but our estimate was that speed cameras saved in the region of 50 to 100 lives a year when the number of deaths was what it was in the early years of the century," he explains. "Now that the death toll has reduced it would be a correspondingly

Distinctive yellow sheeting is used in the UK to make cameras conspicuous



smaller number. In relation to the national total we're only talking about one tool in the whole range of road safety tools. But if the death toll were to increase again in line with the tendency to bounce back during economic recovery – and with money being cut back from road safety – then a small but non-trivial part of that increase would be a contribution from the reduced operation of cameras if there is a continued, sustained significant reduction in camera deployment.

"The whole tremendous improvement we've had over the past 30 or 40 years has come about not by a few silver bullets – it's come about by looking at all sorts of ways of saving 0.5% here, 0.5% there, 0.25% here – sometimes a whole 1% from one source," Allsop concludes. "If we're prepared to say, 'We'll give up these 80 lives because we don't like the idea of cameras, and we'll give away another 50 because we don't like the idea of reducing the alcohol limit', we're making the job of keeping the number of deaths constant or falling increasingly more difficult by throwing away these opportunities for reduction. That's what taking away the cameras does." ○

Highland frames

In Scotland, recent figures have shown a reduction in casualties at camera sites. *Key Scottish Safety Camera Programme Statistics, 2010*, published in July 2011, reveals that KSIs at speed camera

sites between 2008 and 2010 was around 63% lower than in the three-year period prior to speed camera enforcement. During the pre-enforcement baseline period, an average of 341 people were killed or

seriously injured per year across the camera sites, and this fell to 127 per year for 2008-2010. The figures relate to 164 fixed, 205 mobile and 41 red-light cameras located across the country.

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On a break from a busy schedule packed with calls to political figures, **Harry Voccola** discusses connected vehicles, convergence, and collaboration

Interviewed by Louise Smyth

Although bashful about revealing his age, Harry Voccola does admit to “being around a long time” – long enough to see some revolutionary changes in how technology affects our daily lives. Following a thorough grounding in IT while in the US Army and at IBM, Voccola’s first foray into transportation was when he joined the New York City Department of Transportation (NYCDOT) in the 1970s. “That was in the early days of computers and bringing technology into the public transportation space,” he recalls. “The industry was just starting to realize the strategic value of accelerating the introduction and deployment of technology – transportation was almost begging for it to address its issues and inefficiencies!

“I left NYCDOT in 1978 and then went to Lockheed to run its Information Management Services, Transportation Systems and Services division, at which I was responsible for some of the earliest ETC systems in the USA and for bringing automation such as weigh-in-motion technology to a number of departments on the commercial motor vehicle side.”

Despite his impressive resume up to that point, it was perhaps the role that Voccola took on when he left Lockheed that has

In the early days of bringing technologies into the public transportation space, the industry was almost begging for technology to address its issues and inefficiencies

ultimately defined his career, joining a relatively small company called NAVTEQ in 1995. The rest, as they say, is history.

“I’ve seen NAVTEQ transform from a kernel of an idea in a few visionaries’ minds to a major leader in the navigation space,” Voccola says. “I initially ran sales and marketing but my role quickly evolved; today I am senior vice president, Government Industry Relations.”

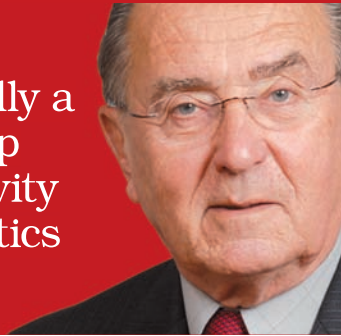
The job title alone denotes the political sphere that NAVTEQ is operating in – not something you’d necessarily expect for a company that, to put it somewhat simplistically, sells road maps. So what does ‘Government Industry Relations’ actually involve? “A lot of it has to do with government strategy – how we deal with government, and how we can be most

effective in bringing these technologies into major government activities,” Voccola explains. “Not a day goes by when I’m not having a discussion with either legislators or their staff, at the federal and state levels, or with principals within operating agencies. There are two main parts to my job. The first is seeing how we can evolve our products and capabilities into areas that have strategic governments. The second is more on the political awareness side; what laws are being introduced, how money is being spent, and so on.”

The merits of associations

As if that wasn’t enough to keep him occupied, something else that takes up a great deal of Voccola’s time is his work representing NAVTEQ’s interests on the

The Electronic Horizon is basically a very accurate map of the road, with the connectivity bringing dynamic characteristics



boards of a variety of trade associations. He's had a long affinity with various bodies (he made sure Lockheed was one of the founding members of ITS America) and is currently on the ITS World Congress's Board of Directors, having served as chairman in 2005. "They bring networking of similar-minded or interested organizations – both public and private sector," Voccola says, citing the benefits that associations offer. "They have some influence on standards for the industry, they educate legislators and policy-makers, and many serve the public well by making things happen faster."

More recently, the NAVTEQ man has become known for his work with the Connected Vehicle Trade Association (CVTA). The organization has been up and running for six years and without so much as a whiff of 'IntelliDrive' or 'VII' always under the same name, as Voccola is keen to point out. "I think it's fair to say that some of the early founders and members of this movement saw the connectivity as being inevitable," he says. "From the outset, we were working with the auto industry and some of the electronics and communications industries. Convergence has been a term used for a long time – but we could see it actually starting to happen and be accepted. There have been lots of different names over the past few years but finally everyone has come to agree that the right concept is 'connected vehicle'. The term itself inside and outside a vehicle stream has a mindset. We at the CVTA would like to accelerate the acceptance of the concept and grow the market and accelerate deployment."

Holding annual meetings geared toward this aim, conference presentation topics are fairly consistent – funding, the state of deployment, and public acceptance – and all are inextricably linked, in Voccola's opinion: "When you talk about acceptance, you know that on the public side there's always the issue of if there's going to be infrastructure on the road, where is the funding coming from? And we try and break funding down into a couple of points at these meetings and get our speakers to be very specific and address where the installation and

maintenance money is coming from. On the private side, we try to get them to talk about business models. If you're going to provide traveler or safety information, what kind of business models do you see? And what have been your experiences?"

"We think the connected vehicle that everyone saw a couple of years ago – the networking, the deployment – would be funded primarily by governments," Voccola continues. "Now we see more and more private sector activities coming into play and we're seeing convergence; all the vehicle connectivity that exists today is really starting to converge."

To illustrate that point, Voccola references pay-as-you-drive (PAYD) insurance. "Europe is a little bit ahead of us there so we're trying to be the convening force in the USA to bring the players together – the insurance companies and the technology providers – and make them aware of what's going on around the world and have them just be a forum to exchange ideas and opportunities. PAYD insurance will grow much quicker in the USA in the coming years as so many vehicles will be connected. After that, we see the whole issue of two-way communications to vehicles for traveler information as the next big commercial area. There will be a pretty big network out there and the initial deployments will be on the mobility side – traveler information, convenience, improved congestion – rather than on safety, which is a little more sensitive and needs a lot more certainty to the technology."

Convenient option

It's no real surprise that the latest business models are focusing on commercial/consumer applications over safety – you only have to look at the success of NAVTEQ to see how many consumers are willing to pay for convenience. This may simply be human nature: if someone said you could pay a one-off fee to get to your destination either more quickly or in a far safer vehicle, which would you choose?

But it's not only about convenience – NAVTEQ has quickly caught onto the idea

that saving money is an enormous pull for consumers. "Now we have solutions such as eco-routing, consumers are being offered products today that tell them how efficient their route is in terms of fuel consumption," Voccola explains. "The consumers pay for that but they also see a return on it. That business case demonstrates that the market is ready for connected vehicles."

NAVTEQ is also working on solutions that will entice the burgeoning electric vehicle market, too. "We are working on products (data) that use maps to extend the range of the battery charge," Voccola reveals. "If you know you're coming to a hill, you can identify when to start charging the battery sooner, which will extend life. There are also some simple ideas, such as maps including the location of charging stations, in doing so providing psychological comfort and removing paranoia about batteries running out [range anxiety] before you reach your destination!"

Of course, none of this suggests that Voccola doesn't eventually see safety as being a big seller for connected vehicles – quite the opposite in fact. NAVTEQ is poised to become a safety pioneer with its 'Electronic Horizon'. "It is always helpful for the vehicle to know what's in its surroundings, whether that's on the lane on either side of it or in front of it, and this goes beyond line-of-sight," Voccola says, outlining the ethos of the concept. "It ensures that the vehicle knows that just beyond its line-of-sight that traffic is at a complete stop or there's a hazard. It can then make the appropriate adjustments to anticipate or avoid a collision or take those kinds of actions. The Electronic Horizon is basically a very accurate map, or map database of the characteristics of the road, with the connectivity bringing dynamics characteristic of the road network. So not only will you have a map that shows you there is a 4ft, 20° turn ahead, but the traffic information can also show you that there's a slowed vehicle at that turn. We have a patent on the Electronic Horizon and we're working on 3D centimeter-accuracy collection and display of the road network and all the road geometry and furniture."

Always aware that such progress is incremental, Voccola is particularly excited about the next 'increment', which will be the connected vehicles on display at this year's World Congress on ITS in Orlando, Florida. "We have already seen demonstrations of a crashless car by US car companies, but the connected vehicles at the World Congress will be a real-world deployment, with better communications reliability. This will be the vision of the next generation of connected vehicles brought to life!" ○

Solutions

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Taste of victory

In our annual feature, **Timothy Compston** meets the delighted winners of this year's Toll Excellence Awards

Illustration courtesy of Anna Davie

The IBTTA's Toll Excellence Awards continue to bring into sharp focus the most innovative developments and practices taking place in the worldwide tolling industry. Ahead of the 2011 Awards ceremony, to be held in Berlin this September, *TTi* spoke to the organizers and award winners for an exclusive inside track on the projects that have captured the imagination of the judging panel.

Undoubtedly, the winning entries are setting the pace in a diverse range of areas, including an agency-wide conversion to all-electronic tolling; a leadership development program to prepare employees to face future growth challenges; the creation of a communications management tool to improve roadway safety; a campaign to inform the community about the benefits of open road tolling; and the alignment of various technologies to improve the delivery of real-time information to customers.

Pat Jones, executive director of IBTTA believes that there is much that toll road operators can learn from this year's successful entrants, which come from providers in Europe, North America and South America: "The message has to be that

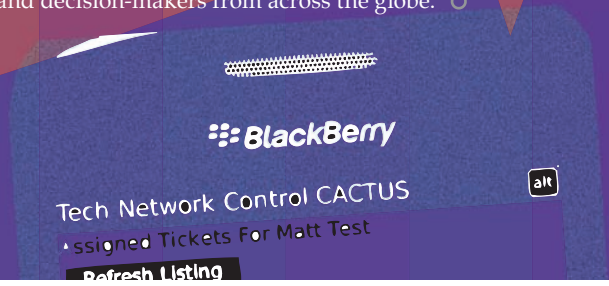
if you want to operate more effectively, develop future organizational leaders and provide enhanced service and value to customers, it's in your interests to pay attention to the 2011 winners."

Looking at the trends exemplified by the victors in the Administration, Customer Service, Operations, Social Responsibility and Technology categories, Jones believes that what stands out ultimately is the focus on delivering better service to customers. "Service is a common thread through all of the entries and what we have also found significant this year is that most of the winners have relied on some aspect of social media to advance their goals", he feels.

Crowning glory

The award recipients will be officially recognized during a special ceremony at IBTTA's Annual Meeting and Exhibition, taking place September 11-14, 2011 in Berlin. As well as the individual categories, the prestigious President's Award – which honors the best of the best – will also be announced on the first morning.

Beyond the Toll Excellence Awards, IBTTA's Berlin event offers the opportunity for delegates to participate in three days of technical sessions on interoperability, tolling infrastructure around the world, communications, and environmental/social responsibility. "In Berlin, the toll industry's thought leaders will be able to discuss the most pressing topics in our industry," Jones concludes. "Delegates from more than 20 countries on six continents will be in attendance and every discipline and role in toll facility operations and governance will be represented. This is the ultimate networking event attracting hundreds of toll industry experts and decision-makers from across the globe." ○



i | Winner

CCR Group

Leadership Development Program

The CCR Group is one of the largest highway operators in Latin America, overseeing a rapidly expanding 2,437km network. With a fast-track growth strategy in place, which sees the group acquiring, on average, one business per year, and employee numbers soaring to 7,000 at the last count, it became ever more critical that the group was in a position to develop the right leadership skills at all levels of a geographically expansive organization. Employee development is a key issue for toll road providers worldwide and in the case of the CCR Group, as Antônio Linhares, corporate development director explains, is being addressed through the implementation of a pioneering Leadership Development Programme (LDP).

"The big difference with our LDP is that it is tailored very much to our specific requirements," Linhares says. "The LDP is an ongoing development process as opposed to an isolated and generic training program. This is not an MBA or a product offered by the market to a number of companies."

Linhares continues: "The LDP was developed entirely by CCR with the conceptual support of the Dom Cabral

Foundation, using all of the knowledge that the DCF has regarding the company, which is the result of nearly 10 years of us working together."

A unique feature is that CCR's professionals are an integral part of the process, often being involved as instructors, which allows them to share their experiences and insight on the company with colleagues.

The LDP began in September 2010 and completed its first cycle in February 2011. During that time, approximately 200 executives from a broad range of leadership levels participated in training modules, which covered Corporate Governance, People Management/Organization, and Financial Management.



Antônio Linhares,
corporate
development
director, CCR

This also included bi-monthly workshops with top management.

"In terms of measurable benefits, we expect that an enhanced working climate will be reflected in better delivery and, consequently, evaluation of our services by highway users. Although we are already highly rated, with an 86% approval level, this can, through initiatives such as the LDP be improved still further," Linhares says.

Putting the LDP into a wider context, Linhares sees it as a way of ensuring that the CCR Group is prepared for the infrastructure growth opportunities that are likely to be realized through the evolution of Brazil's economy, as well as the hosting of the FIFA World Cup in 2014 and the Olympic Games in 2016.



 | **Winner**

North Texas Tollway Authority (NTTA)

Conversion to AET



Clayton Howe,
assistant
executive
director, NTTA



NTTA's award-winning project focused on a major transition to all-electronic tolling (AET). When completed in December 2010, the three-year conversion project became the largest tolling system in the USA to make this move, eliminating the need for cash collection across roughly 65 miles of toll roads, bridges and tunnels.

Says Clayton Howe, assistant executive director, operations at NTTA: "The Operations award is a real boost to everyone at NTTA. The latest Toll Excellence Awards accolade follows on from the Customer Service and President's Awards we secured in 2010."

Howe highlights that economics was very much a consideration in instigating the move to AET: "We saw the rate

of customers choosing ETC as their preferred option reach 84% which left only a small minority of drivers that were still actually paying with cash. The cost benefit of keeping traditional toll booths, across 188 locations, was simply not there any more; in fact it was costing close to what we were actually collecting."

Mobility was another factor. "From an operations perspective there was an 'infrastructure deficit'. We basically had to look at how to get more cars through the same amount of real estate and believed that AET would be a key process to deliver this."

Of course with any change there was the challenge of how

to work with NTTA's employees. "Many of the people in our cash collection process had been with the agency for a long time. We made strenuous efforts from the start to help employees and in the end almost 400 – out of 522 – were transitioned successfully to new roles. By contrast, the rest of the process was relatively straightforward such as changing lane technology to enhance video collection."

Howe hopes that NTTA's experience will help others across the industry: "As the first organization of our size to convert an existing facility with this volume of transactions – 1.4 million a day – we have been very open about our approach.



Operations

To date nearly 50 public and private organizations have spent time with us or been given the documents we prepared."

In terms of concrete benefits realized, Howe says: "Accidents have decreased by 16%, travel times have reduced by 12%, operating costs have fallen by 11% and, we have seen satisfaction levels rise by 7%."

 | **Winner**

Pennsylvania Turnpike Commission

PTC Communications Management Suite



Carl DeFebo,
Pennsylvania
Turnpike
Commission



The Pennsylvania Turnpike Commission (PTC) is leading the way on customer service with the roll-out of a powerful Communications Management Suite (CMS). This web-based solution showcases the major gains that can be realized through effective integration,

whether it be enhancing the quality and speed of information gathered or facilitating tailored communication with customers and internal staff.

The new CMS project reflects PTC's firm commitment to customer service and innovative

technology. "Two areas we have been focusing on are getting back to basics with customer service and leveraging technology to the best of our ability," explains PTC's Carl DeFebo.

The three integrated elements of the CMS comprise: the Customer Assistance Center Ticketing Utility System (CACTUS), TRIP II and REPORTS. CACTUS is a customized ticketing system that interfaces customer inquiries and trouble reports with PTC depots and functions. TRIP II builds on an earlier program to inform customers of travel conditions by adding capabilities such as a Facebook presence, an interactive map



Customer Service

and the integration of customer comments with CACTUS. The final element deals with reports from the Road Crews. This is web- and phone-based – for instance using a BlackBerry app to input information – enabling maintenance staff to provide information on the weather and roadway, even while on the move.

DeFebo comments: "A good example of how things have changed for the better is that previously it might have taken 25 minutes to take the details of an incident on the roadway and get it in the hands of reporters and the public: now the same process can happen in 30 seconds.

DeFebo is keen to stress that while other agencies may use some of the technologies employed by PTC, what is distinctive with the CMS is how it is all brought together. "Everything comes from the same central repository, so avoiding disparate messages or miscommunication."

Call Ticket # Ack. On Scene Assion Date

i | Winner

ASF/VINCI Autoroutes

Copilote



Bruno Roux, project manager, ASF

With technology playing an ever more pivotal role in the smooth running of today's toll roads, not surprisingly, this category of the Toll Excellence Awards is becoming increasingly hard fought. The entry that caught the attention of the judges for the 2011 award was from ASF/VINCI Autoroutes.

The free iPhone application developed for the winning project certainly reflects the phenomenal growth in the importance of smartphone technology, which, when deployed, enables operators

of highway infrastructure, such as VINCI Autoroutes, to communicate expeditiously with their customers in a timely and targeted fashion. The award-winning 'app' is part of a wider focus across VINCI Autoroutes' large-scale network, which extends to 4,300km across Europe, on new media, including websites, mobile sites and even web-based motorway radio.

Explains Bruno Roux, project manager at ASF: "The VINCI Autoroutes iPhone application brings several major innovations

to the market. Specifically, virtual and personal VMS (Variable Message Signs) - which can be shown on a customer's handset throughout their trip - and a virtual emergency phone directly linked to road operators and speed alerts. The key point here is that all of these features introduce a more personalized and cost-effective way of providing traditional road services, which are instantaneous and closer to the customer, and take full advantage of the iPhone's GPS

functionality. No longer is the customer simply an anonymous driver. Maps can now be readily generated for users based on the real-time knowledge of the road operator. We are also looking to collect information generated by our customers to enhance our awareness of traffic conditions."

In terms of what other toll road providers can take from VINCI Autoroutes' experience, Roux stresses the advantages of the convergence of content and tools: "Operators can now

communicate and collect more real-time information based around a simple, user-friendly infrastructure that, crucially, has the capability to readily evolve to meet changing demands."

Considering the impact of the initiative, Roux highlights some of the metrics that demonstrate the widespread take-up by VINCI Autoroutes' customers: "Since the launch of the application we have witnessed a rapid expansion in the number of downloads (up to 130,000 after six months), growth that is accelerating on the back of a high-profile press campaign. In fact VINCI Autoroutes ranked first amongst free applications for navigation on the popular French app Store and, significantly, in the top 10 of all categories for several weeks. Alongside this quantitative data there has been positive feedback from customers who are now better equipped to plan their journeys, so enhancing safety, reducing stress and improving mobility as they can take account of conditions on the highways."

Technology



 | Winner

Miami-Dade Expressway Authority

MDX ORT Outreach campaign



Cindy Polo-Serantes, Miami-Dade Expressway Authority

Now, more than ever, toll road agencies need to keep the community they serve informed and on-side when they are seeking to embark on major projects. A good example of how to accomplish this vital social responsibility through innovative thinking, is the work undertaken by Miami-Dade Expressway Authority (MDX) in Florida. MDX recently implemented an Outreach Campaign to communicate the benefits of open road tolling (ORT), which sought to target the millions of drivers that potentially could be affected by the move.

Cindy Polo-Serantes, communications manager at MDX was the driving force behind the campaign: "I think that what has made our campaign stand out is the way we sought to be innovative from the start. We wanted to treat the conversion to ORT almost like a major product launch and really stretch the boundaries in terms of the magnitude and the ambition of the marketing and public relations campaign."

According to Polo-Serantes, the environment in which toll road operators have to communicate their message has changed greatly in recent years: "Drivers are now seeking and receiving information in many different ways, so it was critical that we took this into account."

As well as briefing elected officials, Polo-Serantes

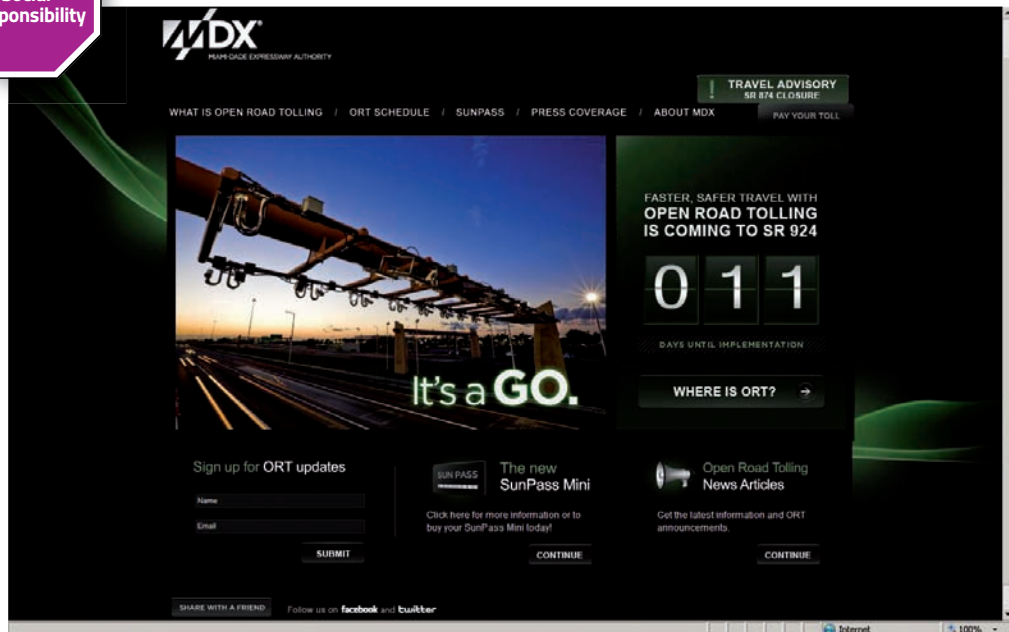
stresses that MDX really looked to take the campaign to the masses, speaking to drivers through every possible medium – whether that was traditional billboards, mobile billboards, toll booth wraps, leaflets at booths for those still paying tolls by cash, adverts in newspapers, radio and television spots, an informational video and a new website, MDXORT.com, to act as the hub of the campaign.

"The philosophy of the campaign was that whilst you as a driver may not necessarily

like what we are doing, or even agree with it, we will ensure that you know exactly what is going on. We focused specifically on two messages: how the conversion would benefit drivers, by creating a safer roadway, and that MDX understood the community would have questions and had set up a dedicated website to address these."

When it comes to gauging the true impact of the campaign, Polo-Serantes is extremely pleased with the results that occurred following the

transition to ORT: "There were no accidents associated with the conversion of the three key roadways, which demonstrates that drivers were well prepared for the change in traffic flow. The campaign website received 100,000 visits during the three-month conversion period and US\$400,000 worth of publicity was generated in the media. Sales of the Sun Pass (the county's method of collecting electronic tolls) also doubled, which demonstrates that the public recognized this as the best way to ease the transition."



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On the rebound

There are many pitfalls when setting transport policies. **Yvonne Hübner** discusses some of the unintended and unexpected consequences of different carbon-reduction strategies

Image courtesy of Tomml

Any transport strategy needs to provide reliable and efficient networks, reduce congestion and emissions, and further improve safety and accessibility. However, tackling one of those issues can impact negatively on any of the others.

Just how conflicting the different priorities are reveals the conflict between adding capacity to the transport network and the need to reduce carbon emissions. The *Eddington Transport Study* of 2006 stated that “the performance of the UK’s transport networks will be a crucial enabler of sustained productivity and competitiveness”. Furthermore, the report estimated that current levels of congestion on the road network could cost the UK economy £7.8 billion (US\$11.3 billion) of GDP each year. Seen in isolation, this would suggest that we need to build more roads and increase transport levels. However, the *Stern Review on the Economics of Climate Change* estimated that it would cost the world economy at least 5% of GDP each year to adapt to the consequences of unabated climate change. Given that 90% of emissions from UK transport comes from roads, this would suggest that we should limit access to our networks.

The human factor

Transport policy becomes even more complex when we take human behavior into account. Daniel Khazzoom and Leonard Brookes used the term ‘rebound effect’ for energy efficiencies, stating that “with fixed real energy prices, energy-efficiency gains will increase energy consumption above what it would be without these gains”. In other words, the total production or running cost goes down when the energy efficiency of a process is increased, which often leads to an increase in energy use in other areas.

Increasing fuel efficiency in vehicles, for example, means that driving the same distance becomes cheaper. As a result, drivers tend

to drive further. In its report *The rebound effect: an assessment of the evidence for economy-wide energy savings from improved energy efficiency*, the UK Energy Research Centre suggested that the long-term rebound effect of fuel efficiency improvements in vehicles was between 10% and 30%. Other research groups found that some of the potential fuel savings were translated into either vehicle weight or increases in engine power. The Volkswagen Golf LS, for example, weighed 780kg in 1975, while newer models such as the Golf Edition weighed 1,174 kg in 2003.

There is also an indirect rebound effect. Changing to a more fuel-efficient car means that drivers can save money on fuel when they continue to drive the same distance. They can then spend the money on luxury goods or holidays, which often have a larger carbon footprint attached to them. It is difficult to estimate the indirect rebound effect for transport, although there are suggestions that it could be as high as 120%.

However, Kenneth A. Small and Kurt van Dender from the Department of Economics at the University of California have demonstrated that the price elasticity for vehicle miles driven and fuel consumption in relation to fuel price has decreased over

the years. Price elasticity of demand describes how sensitive consumers are to the price of goods or services. Consumers are prepared to pay almost any price for an item if the demand is inelastic. The demand for a good or service is said to be elastic, if even small changes in price mean that people buy much more or less of it. A reduction in the demand elasticity for miles driven or fuel consumption might be due (among other factors) to an increase in dependency on the car.

Fuel for thought

On the other hand, drivers are still sensitive to fuel prices. The Department for Transport in the UK found that an increase in fuel prices by 10% resulted in a decrease in traffic volume of about 1%, and drivers reduced their fuel consumption by 2.5% within one year. Similarly, the AA/Populus asked AA members about their responses to high fuel prices. In 2011, 29% of drivers said that they had made a conscious decision to travel less by car as a result of the cost of petrol/diesel; 14% said that they had to cut back on other areas of spending because of the cost of petrol/diesel. The percentage who said they had to do both was 20%, with 37% of drivers saying they did neither.

In a different survey, the AA and Populus asked whether people had changed their driving style in response to the high fuel prices. Some 43% of respondents said that they accelerated more gently and tried to avoid braking, but maintained the same cruising speed in order to save fuel, while 6% of respondents said they tried to drive 5mph more slowly on motorways and dual carriageways as a fuel saving measure. A further 13% tried to drive 10mph more slowly and 3% tried to drive 15mph more slowly on these same roads in order to conserve fuel. But 34% of respondents said that they made no changes at all. This suggests that ITS such as road user charging or motorway tolls could contribute to the reduction of carbon emissions from transport, and avoid rebound effects.



Rebound effect in traffic safety

Numerous studies have looked into the rebound effects associated with road design and vehicle safety features. Wider lanes, larger vehicles, seatbelts, airbags, etc. tend to encourage what has been termed 'intensive' driving that offsets a portion of the motorists' own safety gains and increases risk to other road users. According to various research, perhaps one-third of potential safety increases may be offset by increased driving intensity.

Airbags, for instance, would prevent 3,000 vehicle occupant deaths a year if there was no change in driver

behavior. But due to the rebound effect, only 2,000 lives would actually be saved.

Dr Leonard Evans from the International Traffic Medicine Association contends that safety devices such as airbags have had an insidious and deadly effect on driver behavior. "We see Americans collectively driving a couple of miles an hour faster because of a false sense of security. And that increase in speed more than washes away the alleged benefit of airbags."



to an increase in dependency on the car

It is also important to look at all sectors when judging the environmental benefits of different schemes. Working from home or shopping online can contribute to the reduction of carbon emissions, but not as much as many people think. For example, Patricia Lyon Mokhtarian, a specialist in the application of rigorous quantitative methods to the study of travel behavior, estimated that the contribution of working from home to the reduction of vehicle

A reduction in the demand elasticity for miles driven or fuel consumption might be due (among other factors)

Schemes designed to reduce congestion can have a knock-on effect in other areas

miles traveled might be as little as 0.6% when taking into account all the rebound effects. People who work from home may, for instance, make additional trips for shopping that they would have otherwise added to the commute, or vehicles are used more by other members of the household as a result of them being available. Homeworkers often have to heat or cool their homes during the day, while company offices are also heated or cooled.

Similarly, shopping online has been shown to reduce carbon emissions, but only under certain circumstances. Delivering items to individuals rather than shops means that each item is individually wrapped, increasing the packaging required. H. Scott Matthews and Chris T. Hendrickson demonstrated that roughly the same energy was used when distributing bestsellers worth US\$1 million in metropolitan areas through online orders or conventional shops. Another research group, however, found that online deliveries were better for the environment if one online order replaced 3.5 traditional shopping trips.

The world has become highly complex and it is often difficult to see the whole picture. These examples show how important it is to take unintended consequences into account and to make allowances for rebound effects when calculating the environmental benefits from different measures. This is a chance to demonstrate the value of ITS in realizing policy goals. Technologies such as active traffic management, variable speed limits, RUC and real-time travel information can help address a number of policy issues. ○

• The full version of this report can be found at: <http://tinyurl.com/3trntfn>

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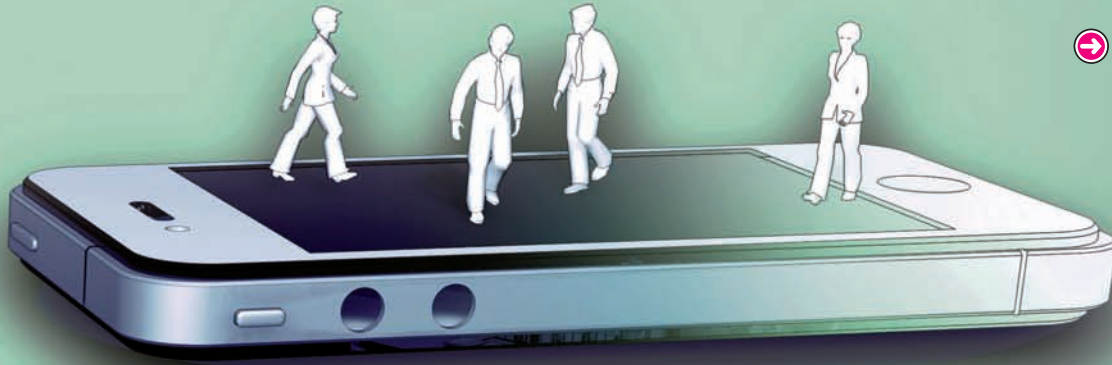
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A perfect harmony

As **Jon Sorensen** reveals, moves are afoot to implement a framework for 'the city as a platform', to improve communication between vehicles and pedestrians

Illustration courtesy of Jason Cook





The concept of connected devices is not a new one. Essentially the vision entails a richly integrated environment where people, systems, and infrastructure are continuously interconnected, thereby facilitating real-time data and information exchange between all connected devices. It's a concept that's been kicked around by futurists and technology wonks for a few years, yet to most people the idea still seems truly Orwellian.

But in recent years the concept of connected devices has started to gain significant traction, primarily in direct response to oncoming challenges facing the modern city, and bolstered by technological advances that have emerged in recent years. As a result a sea-change is underway, and we are starting to see the

implementation of a framework for 'the city as a platform', which will utilize city systems and infrastructure to implement an over-arching, connected-devices platform.

Most eyes in the transport community have been trained on the connected-vehicles aspect of the connected-city model – most notably vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) connected devices. There is no doubt that current testing and rollout of V2V and V2I concepts and technologies is initiating a transformational

era in transportation. However, much less has been made of the other transport-related interfaces also emerging within the connected-city environment.

New interfaces

One of the more important components of the new city platform will be the continued integration of people with city systems and infrastructure. This will include the integration of pedestrians. Rollout of the vehicle-to-pedestrian (V2P) and pedestrian-to-pedestrian (P2P) subsystems is well underway. Smartphones and new vehicle technologies are enabling pedestrians and drivers alike to understand the real-time conditions of their mobile environment. Future services will provide vehicle-pedestrian warning systems, as well as tools and services that facilitate a safer and more harmonious coexistence of pedestrians and vehicles within the urban environment.

Another essential component to the new connected-city model, and a valuable resource for the transport systems that operate within the city, will be the implementation of a cloud-based interface. Vehicle-to-cloud (V2C) and infrastructure-to-cloud (I2C) networks will facilitate centralized, large-scale data aggregation, processing, and warehousing, and provide an important resource for data and information exchange within the urban environment. The V2C and I2C models will enable the development of a wide range of applications and services, from tools and services focused on optimizing operations and management of transport systems, to implementation of enhanced, high-definition real-time traveler information systems. The cloud will also be an important delivery vehicle, by establishing a highly accessible, data- and information-rich environment for application developers and service providers. It will also provide a rich data set for transport operations professionals, planners, and researchers, greatly enhancing the operator's real-time (and historical) understanding of the operational environment.

The new city platform will also integrate pertinent transport infrastructure with relevant transport systems. This will enable autonomous data and information exchange between systems, including traffic management systems, transit systems, toll facilities, and central operations facilities. The infrastructure-to-infrastructure (I2I) interface will not only enable the ability to understand real-time conditions of transport systems and the infrastructure that supports and interfaces with them, but also provide autonomous exchange of system metrics and real-time data and information between all integrated

transport systems. In addition, autonomous data and information exchange between static urban elements such as drawbridges, street signs, and roadways will optimize the efficiency and safety of all transport systems within the integrated platform.

The city platform will also enable enhanced interfaces between citizens, public transport agencies, and private businesses. Citizen-to-X, Business-to-X and Government-to-X will connect people to the city's data and information systems in real time. Business-to-X and Citizen-to-X will enable the development of new applications and services across all integrated transport systems, and provide opportunities for generating revenue streams in the public and private sectors. This interconnected ecosystem will provide a fertile platform for the development of new tools and services for existing customers, and generate new opportunities for emerging segments.

City as a platform

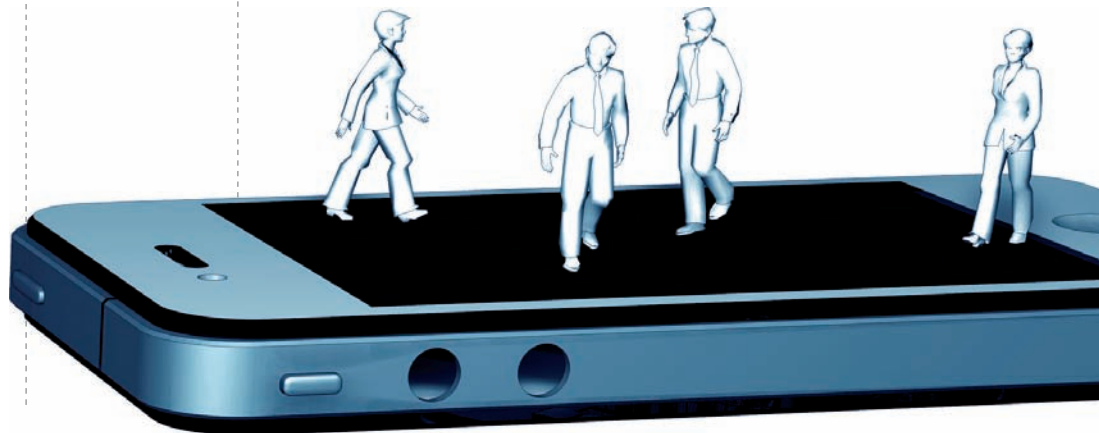
The rapid proliferation of new sensor technologies such as GPS devices, smartphones, and RFID tags has provided game-changing resources to the transport community, and the predicted trend is for continued rapid instrumentation of the built environment. In April 2010, Ericsson CEO Hans Vestberg, in a meeting with shareholders, stated that by 2020 there would be approximately 50 billion devices connected to the internet – a five-fold increase over the next 10 years

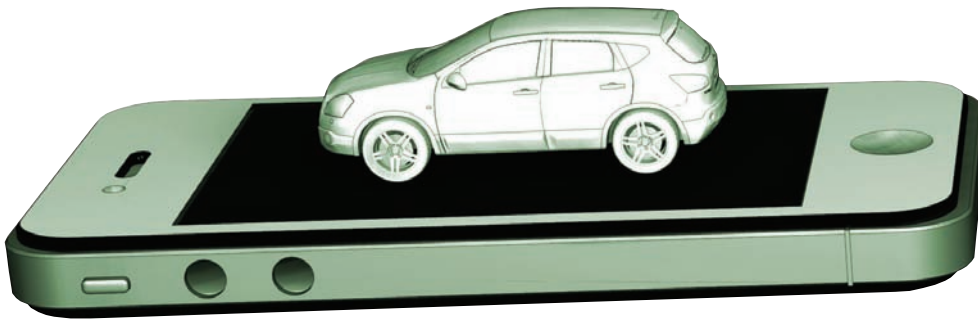


Future services will provide vehicle-pedestrian warning systems, as well as tools that facilitate a safer, more harmonious coexistence of pedestrians and vehicles within the urban environment

(and a driving factor for IPv6). As a result of this explosive growth, the information technology community is quickly shifting its collective focus to addressing how public and private entities can and will interface with the new 'internet of things', and how the entities will ultimately operate and manage the subsystems that support these connected devices.

The functional capabilities of the new connected city are best realized when an over-arching, city-wide network of systems is implemented. A city platform will require several key ingredients in order to achieve optimized success. The new urban operating system(s) should include an open and accessible framework that is built on open-architecture, open-data, and open-source principals. The open platform will reduce accessibility barriers by minimizing proprietary constraints, and enable the private sector to develop new transport solutions.





The new city platform must also include automated data and information exchange between connected devices. The semantic web (Web 3.0) represents the next generation of the internet, and is best illustrated by the web's current transition from a web of 'pages' to a web of 'data'. Semantic technologies implement machine-readable (semantic) metadata to web content, thereby enabling automated agents to search, process, and develop meaning from web-based (connected) data, all without the need for human queries.

The platform must also be easily mined to provide access, value, and wisdom to the public. The true value to a platform will be found in the citizen's ability to attain value from city information. As a result, the data must be actionable and easily accessed and understood by the general population.

Challenges

The road to a fully instrumented, connected, and integrated transport network will be very challenging. In all likelihood the rollout will be highly fragmented, with implementation occurring at a glacial pace. However, cities such as New York and Chicago have recently announced a formal plan to implement city platforms, and thus, change is underway.

Consensus-building and buy-in, although well underway, will prove to be a preliminary barrier to achieving critical mass. Rollout will also require negotiation of numerous physical and social 'motes and silos'. Existing, standalone systems will require some re-engineering to upgrade and integrate with a city perspective. Policy and governance will be critical to the success of the interconnected city.

As always, privacy and network security concerns will need to be addressed. A rich, interconnected urban environment will vastly increase the number of network access points and, in turn, raise questions from those responsible for or concerned with privacy and security issues. The rapid emergence and expansion of new data sources will also generate issues

related to structure. Some estimates have the rate of growth of unstructured data far outpacing the growth of structured data over the next 10 years, increasing chances

of discouragement based on the potential rats' nests associated with data overload.

But possibly the greatest challenge ahead will involve (as always) the human elements, most notably the user interface, and how humans aggregate, process, analyze, and interact with the impending data monsoon, and how cities will effectively operate and maintain these new network components. Ready or not, the transition is underway, and the benefits associated with the new data and information resources will greatly impact our cities, as long as we are properly prepared to maximize the potential. ○

• Jon Sorensen is ITS project manager, Atkins North America. Email him on jon.sorensen@atkinsglobal.com or follow him on Twitter: @ITSWorld

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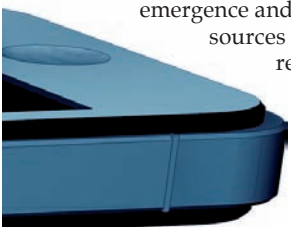
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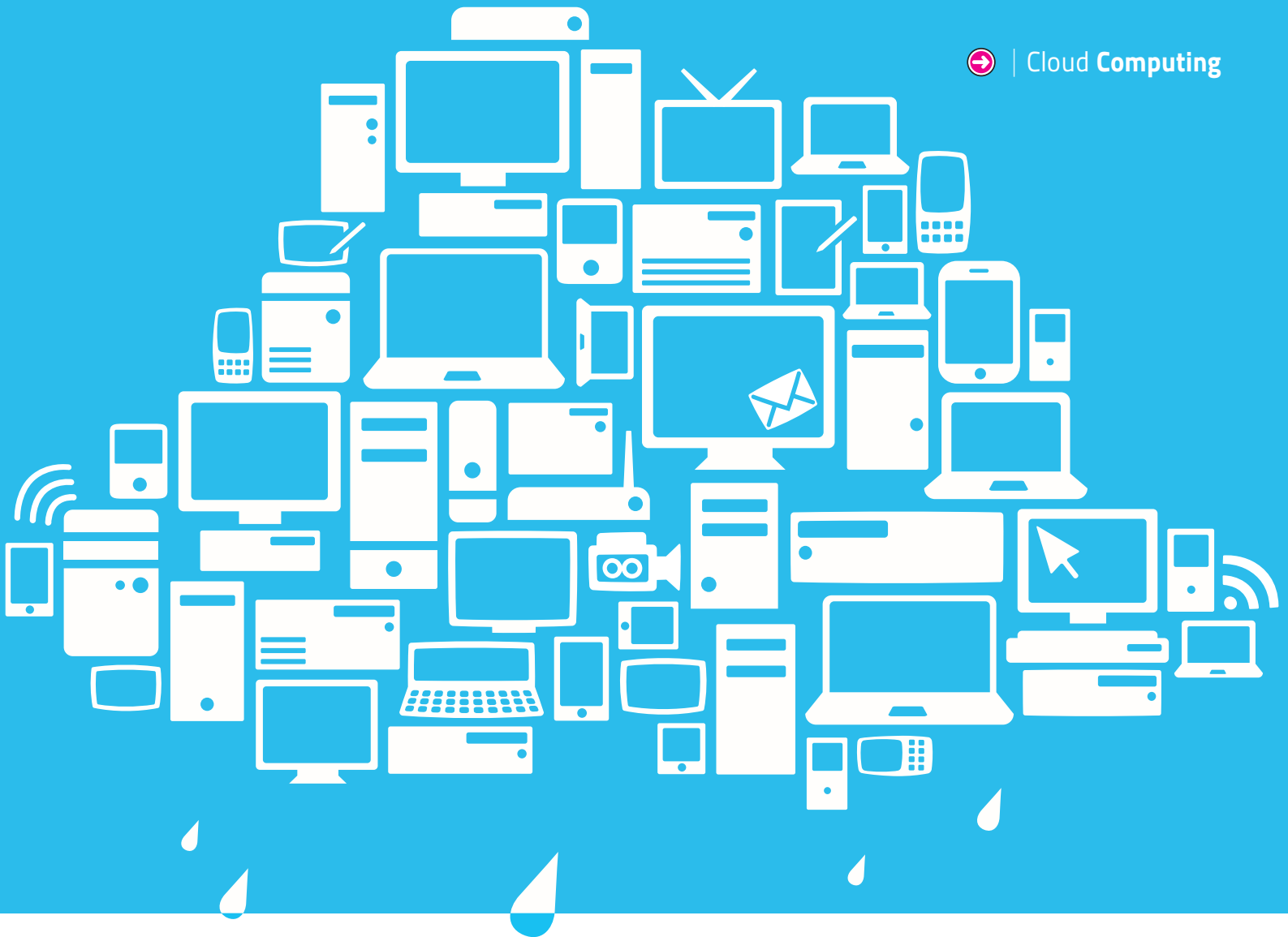


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Silver lining

Cloud computing has the potential to revolutionize the way the industry deploys ITS.

Denis Boulanger puts his head in the clouds to find out what the new technology can offer the business of traffic data collection

Illustrations by Brandon Laufenberg and Bastien Bouchard

According to Joseph Sussman, chairman of the USA's ITS Program Advisory Committee, the current economic situation is affecting the progress of ITS. "Funds for transportation projects in general, including ITS, are under great pressure, making existing systems maintenance challenging and additional equipment installation and services less likely," he said recently. Public authorities are therefore starting to explore new business models that will avoid large capital expenditures yet still attain the promise of ITS. The new models will benefit greatly from advancements in the new trend of virtualization and cloud computing.

Cloud computing

Cloud computing refers to the on-demand provisioning of computational resources (data, software, and computing) via a computer network, rather than from a local computer. A common short name for this kind of computing service is 'the cloud'.

In the past, data and software had to be stored and processed at or near the computer. Later, the development of the local area network (LAN) allowed for a

system in which multiple CPUs and storage devices could be organized to increase the performance of the entire system. In an extension to that concept, cloud computing fundamentally allows for a functional separation between the resources used and the user's computer, usually residing outside the local network, for example in a remote data center.

The innovative effect of cloud computing on the technology industry has been dramatic. The advantages of cloud computing services are versatility, scalability, performance, and maintenance costs. Cloud-based applications and services may support any type of software application or service in use today.

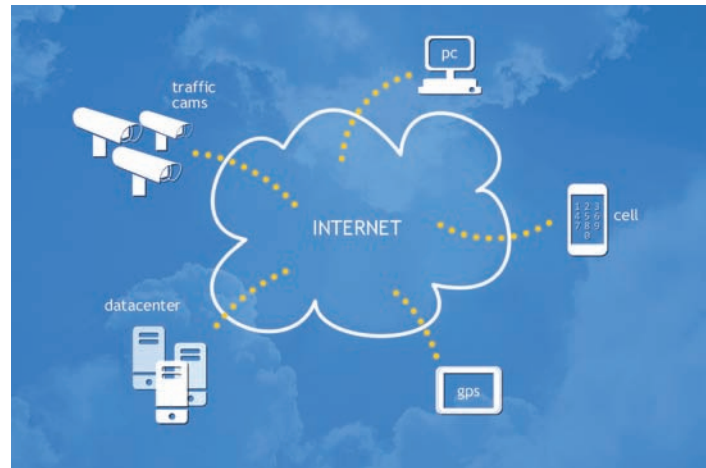
Video analytics is an example of a service that can benefit from this new architecture by 'virtualizing' the hardware required to process live video streams. A solution proposed by RealTraffic Technologies (RealTraffic) is essentially a client-server application that uses the full potential of a computer network located on a 'private cloud' (LAN) or in a larger data center. It offers a versatile software solution compared with other technologies that require specialized hardware. Compressed live video stream can be sent directly to the cloud system and processed by RealTraffic's optimized software. The output data stream (speed and flow) is then made available directly from the web and displayed using any web or mobile application.

Traffic flow control

As an example of cloud-based integration, the County of Santa Clara – Roads & Airports Department (DEP) in California recently started a new project for traffic signal synchronization. The aim is to optimize traffic flow by real-time monitoring and analysis of flow and by adapting traffic signal programs at more than 100 intersections, each equipped with up to four CCTV cameras. Video streams are transmitted through a fiber-optic communication infrastructure to the TMC.

To leverage the existing camera network, Santa Clara's project manager favored a video analytic solution for traffic data collection, rather than other technologies that required additional hardware in the field. After testing several video analytics systems, Santa Clara selected RealTraffic's solution. The project manager was pleased

Cloud computing is already a huge trend in the software industry – and could revolutionize ITS



The innovative effect of cloud computing on the technology industry has already been dramatic

that in addition to better performance in vehicle counting during night and peak-hour conditions: "RealTraffic offered a software solution that is versatile, easily scalable, and easy to update."

Data provided by the company's software will be processed on a 'private cloud' (LAN) of computers and subsequently sent via the web to an A-PeMS system. This web service helps manage real-time traffic data collection from many sources, and gives access to several performance-management tools to monitor trends in traffic. An optimization program is then used to evaluate the best control program for each traffic light, resulting in optimized traffic flow.

A new start-up company called MetroTech Net Inc (MetroTech), based near Atlanta, Georgia, is working on a new concept for arterial traffic management and data collection. According to CEO Christian Kotscher, the ability to connect video cameras to computer networks and the internet has increased flexibility and accessibility in the collection and distribution of traffic data. However, although this enables camera installation in more locations, the availability of network ports and cabling is still a limiting factor when deploying such a vast number of video cameras.

A wireless mesh network or commercial wireless datacards can eliminate issues associated with locations that are too difficult or expensive to wire. Combined with the efficiency of video analytics from RealTraffic, the smart-camera wireless grid known as IntelliSection "could become an important tool for traffic management authorities," says Kotscher. Images, traffic information, and applications will all be available through the cloud.

In the software industry, cloud computing is the prevailing trend. Next, new technologies in traffic data collection systems could revolutionize the way we deploy ITS. Innovation in wireless communications will also expand the potential. As performance increases, moving ITS to the clouds will be a common strategy. ○



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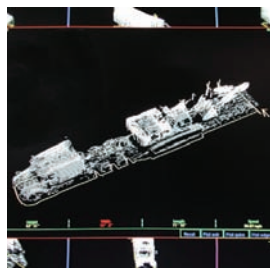
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Smooth operator

Washington State DOT's **Morgan Balogh** tells **Nick Bradley** why there's something for everyone – and all pockets – in Advanced Traffic Management schemes, as deployed in the Seattle area

Images courtesy of Washington State DOT

Anyone who's been to Birmingham in England and Seattle in Washington will know that the two cities share little in common. Traffic congestion, though, is one binding agent and is what prompted the US Federal Highway Administration (FHWA) to fund several executives from a number of DOTs to fly to the UK's M42 and other European countries to see Advanced Traffic Management (ATM) in action. Although Washington State DOT's (WSDOT) Morgan Balogh was not one of those few lucky jet-setters, the fruits of that 2006 fact-finding mission have nevertheless put a smile on his face.

Smartly does it

To much fanfare, WSDOT launched its own twist on ATM, Smarter Highways, on I-5 in August 2010, and continues to roll it out on other busy freeways in the state, including I-90 and SR 520, the three of which are key

Active traffic management tools have proved effective at reducing collisions and improving traffic flow in Europe, including the Highways Agency's Managed Motorways project in the UK

routes into Downtown Seattle. "What we saw in Frankfurt, Copenhagen and Birmingham were strategies such as hard shoulder running, variable speed limits, lane control and ramp metering all rolled into one package to create smoother, safer and more efficient traffic flow during peak periods," reveals Balogh, a traffic engineer with WSDOT's regional operations. "We've had ramp metering here for 30 years, but we wanted to learn about some of the other techniques to see what we could adapt to our own specific needs."

ATM is a fledgling concept in the USA, so new that standards are still yet to be finalized by the FHWA. Minneapolis was the first US city to adopt some of the components of ATM, although as Balogh reveals, even the system in Minnesota differs to the one in Seattle to some extent. "We don't have hard shoulder running yet, like the M42, although this would definitely have some added benefit when funding allows us to do more," he explains. "What we do have, though, is lane control and variable speed limits (VSL). We're warning motorists of incidents upstream that could have an impact on safety – stalled cars, an accident, or even just heavy traffic.

"The transition speeds smooth traffic and give road users time to switch lanes in a safe manner," Balogh continues. "To add to the complexity, though, we have a mixture of general purpose lanes and 2+ and 3+ HOV lanes for buses and car-pools, so in effect we've got

different speed limits in different lanes at any one time. They need to work in tandem because you don't want a situation where you've got traffic at near-standstill in the general purpose lanes while HOVs move at 60mph. Something else that separates us from schemes in Europe is that we carry the speed limit right the way through a congested area, whereas other systems we've witnessed slow you down from 60 to 50 and then to 40mph before switching off completely. Carrying the speed limit through gives us more variability and we get to provide more adjustment right through the busy area. Setting one speed for all our lanes simply wouldn't work for us."

First steps

I-5 was WSDOT's first foray into ATM, although the concept has since been extended to the SR 520 and I-90 bridges – all in all about 41 miles of freeways. As with many cash-strapped states, increasing capacity by adding more lanes wasn't on the cards. "To add lanes would have cost billions and likely required the construction of new bridges and tunnels, which probably won't happen in my lifetime."

ATM doesn't exactly come cheap either, though, and in Seattle required upward of 300 new gantries and five times the number of signs than you might find on a traditional freeway, in addition to all the necessary sensors, communications and software. Balogh describes the financing model of ATM on I-5 as an "interesting concept" as it was deemed a congestion mitigation tool to ease some of the traffic pressures resulting from improvements to the I-5 tunnel under Downtown Seattle, so funds came from the tunnel project coffers. Thereafter, a federal grant helped to pay for the work on I-90 and SR 520, a sure sign that the FHWA will loosen the purse strings for strategies that it feels deliver a return on investment.

Nearly a year after going live on I-5, concrete data about the effectiveness of ATM in improving safety and relieving congestion is still being generated, although Balogh and his colleagues in operations believe, anecdotally, they have seen a difference. "The most important thing is that the users are heeding the information on the signs and are acting accordingly. When we post an alert that a lane will be closed a mile or so ahead due to an accident, they're following the guidance. That gives us much better control around collisions. Previously, you'd just get a wall of traffic build up with cars getting to the scene of the crash then trying to change lanes, which created knock-on situations, whereas now they have the time and distance to sort themselves out. People are definitely driving more cautiously, mainly because I think

The new signs post variable speed limits that will warn drivers of backups ahead and smooth out traffic as it approaches a lane-block incident



we're not only telling them to act, but why they need to act. Hopefully by October/November, we'll have some firm data on accident statistics, which is something that the local media are very interested in. Visually, though, we're seeing much fewer conflicts."

Balogh feels that one of the sub-contractors that supplied the signage and gantries deserves a special mention. "As a result of the work that was already ongoing on the tunnel, we needed to deploy



Whenever you do anything on the freeways, it's just ridiculously expensive so often you don't get to do things like this at all

ATM quickly," he reveals. "We put together a design-bid-build project due to the time that it takes to manufacture gantries and did a design-build project for the signs and communications. We created a prototype and discussed with Telegra some of the changes that we felt needed to be made – fabrication aspects such as temperature, how we control the sign, waterproofing, etc. They worked with us really well to develop a sign that does the job."



Up to the standards

There has been much interest from other US states since Smarter Highways went live. "We've been to Fairfax in Virginia and they're keen to deploy it near the Washington DC area, and we've also been to New York to see how they can make use of it," says Balogh. "We've also had interest from Portland

in Oregon, California and Florida – there's a lot of folks out there intent on pursuing components from the scheme.

"ATM is something that the FHWA is promoting, but one of the problems we found was that because we were at the leading edge, we didn't have any standards to guide us, so we worked

closely with FHWA to come up with standards the best we could. In effect, we were setting the groundwork for all future deployments to follow. Standards are really important because you need that consistency across the states – you don't want each deployment to be different and states coming up with their own symbols, etc."



For the most part, Balogh is happy to report that the Smarter Highways project went smoothly from beginning to end, although he does admit to being filled with both excitement and trepidation when the system was switched on for the first time. "Whenever you do anything on the freeways, it's just ridiculously expensive, so you don't often get to do things like this," he says. "Our TMC operators were brought in right from the outset and their feedback went into the final product, so we knew we had built something they were confident could be used well on the roadway. It's also difficult to test a system like this because you might be posting information on the roadway that road users will follow. We therefore developed a series of coded messages that were meaningless to motorists but proved to us that everything was working.

"And there's always issues with software, right?" Balogh says while laughing. "At first, our speed jumped around a little too much for our liking, so we had to adjust our smoothing algorithms – it was just a question of finding the right balance. We're getting data every 20 seconds to post a message every minute, so when your system is that responsive you're always open to anomalies and too much variability is one of the side-effects. What's really neat is that because it's so responsive, we're getting data about an incident before it's been called via 911 into state patrol or we even know about it in the TMC. At the same time, though, you might get data about something that doesn't require any action at all, such as a slow truck. Such issues were all part of establishing that balance."

Scalable to your problem

Adamant that ATM was right for Seattle, Balogh is looking forward to adding other components in the future, including hard shoulder running, which might get its first airing in the city of Everett, north of Seattle. That said, the traffic engineer realizes that the "whole hog" as deployed on Birmingham's M42 might not be right for everyone, although it does impress him greatly. "There's a lot of opportunities and ways of deploying the numerous components of ATM, so other states considering it need to look at how these new approaches [for the USA] can help to solve their problems," he concludes. "If you don't have funding to do lane control and put up the gantries, you can still look at junction control, for instance. The beauty is that you can scale it to your problem. And with ATM, you'll find some excellent approaches to getting you out of a hole." ○

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Tunnel vision

Taking an in-depth look at the Hindhead Tunnel, **Timothy Compston** reveals some of the technological advances, safety features and techniques employed in this innovative scheme

Images courtesy of Highways Agency

As well as being the longest non-estuarial road tunnel in the UK, the 1.8km-long Hindhead Tunnel is a key element in a 6.5km dual-carriageway bypass scheme that has diverted the A3 to address a major bottleneck on the main arterial route between London and Portsmouth, and reduce typical journey times by an estimated 20 minutes. As well as being recognized for the care taken to minimize the environmental impact of the tunnel, as it runs under a Site of Special Scientific Interest, from a traffic technology perspective the Hindhead Tunnel showcases a number of major innovations to enhance operations and road user safety.

Incident detection

A key element of this high-profile project is undoubtedly the way that high-frequency radar has been specified for incident detection, in preference to a video-based solution. This RIDS (radar incident detection system) is the first full-scale operation of this technology for a UK tunnel.

Dr Stephen Clark, co-founder of Navtech Radar, explains how his firm's solution has been deployed: "The operational role of the radar is to automatically detect and classify objects and, if certain incident parameters

This innovative tunnel project will cure a notorious bottleneck

are met, to issue an alert, highlighting where in the tunnel something is actually taking place via the SCADA control system, so objects of interest can be brought to the operator's attention and the closest CCTV image provided to confirm what is going on."

Looking in more detail at the radar, Clark confirms that six units have now been provided for each bore of the twin-bore tunnel. "This is actually quite a lot considering the size of the tunnel, but the design called for overlapping coverage so there is considerable redundancy built in," he says.

Being line-of-sight, having several radars also means that the solution is able to take account of the fact that there is a curve in the two bores, so ensuring that they are completely covered.

66

Certainly people have used radars in tunnels before but not, crucially, to scan an area, as in this tunnel

Dr Stephen Clark, co-founder, Navtech Radar, UK



"Significantly, a single radar's long range, which can provide detection of man-sized objects at up to 700m (350m in either direction) means that fewer sensors are required in the tunnel environment compared with other measures," Clark continues.

Radar ready

The Navtech Radar man believes Hindhead marks a step-change for the application of high-frequency radar detection in tunnels: "Certainly people have used radars in tunnels before but not,



Passive aggressive protection

According to the Highways Agency and the designer of the scheme, Mott MacDonald, major safety measures implemented at Hindhead include an average speed enforcement system to help prevent traffic accidents, the radar incident detection system (RIDS), and a directional sound beacon system to guide people to each cross passage entrance in the event of low visibility.

These active systems have been supplemented

by passive measures. One example is the way physical features of the tunnel and carriageway have been tailored to support the safe use of equipment. In the case of the tunnel's emergency points (containing an emergency roadside telephone, fire extinguishers and fire alarm call point button) these are located within safety niches along the nearside verge and set back within cross passage entrances along the offside verge.



crucially, to scan an area – it has tended to either be for counting traffic or for speed enforcement. For these requirements you are looking at lower frequencies and at very specific spots. This contrasts with Hindhead in which a high-frequency radar was required for area scanning."

During operation, the radar scans and the resulting data goes to a processing system that is looking for any changes. Clark stresses that, unlike a Doppler radar, which is limited to objects moving, a key advantage of this system is that it is equally capable of detecting things that are stationary – such as debris – and moving objects, so it is more flexible. "It has the ability to follow everything that goes through the tunnel. Unlike video-based solutions it can see through dirt and grime, potentially has a lower false alarm rate, does not require regular cleaning and has lower maintenance requirements."

In terms of the way that objects are classified, Clark says that the radar being used at Hindhead can categorize these as person, debris, slow, stopped or reversing vehicle. "Parameters are configurable at commissioning," he explains. "To generate an alarm to an operator a typical scenario might be the detection of a vehicle that is moving at less than 15km/h for more than 10 seconds, which would be an indication that there is a problem."

Clark confirms that the process of implementing the radar has gone smoothly: "We have an established interface with the SCADA, developed for the project by PDS (P. Ducker Systems), so it was just a case of the right protocols being written to integrate the radar."

Paul Ducker, the founder of PDS, is also enthusiastic about the potential of the radar solution, seeing it as one of the most innovative aspects of the tunnel's systems that PDS was tasked with overseeing: "Early indications are that the radar for incident detection will live up to the initial expectations of significantly reduced false alarms in comparison with CCTV-based AID."

Members of the public were able to walk through the tunnel prior to its opening

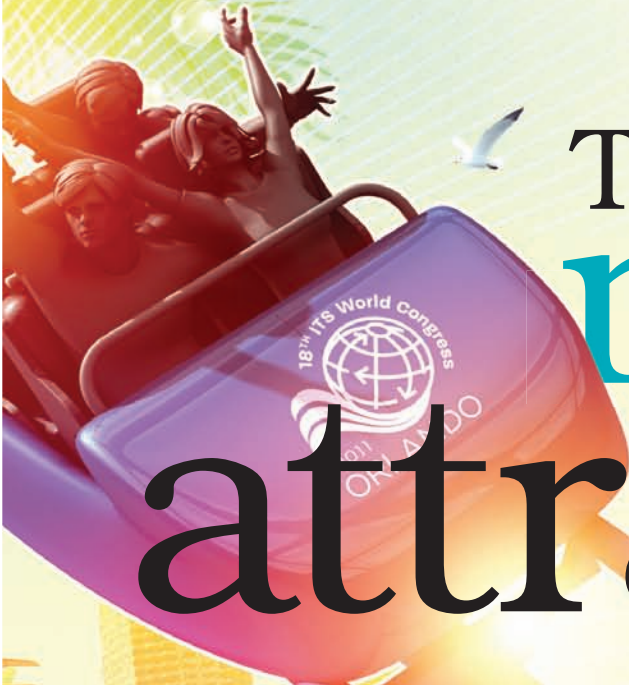
In addition to the radar, PDS was responsible for the effective integration and commissioning of all of the tunnel's key systems. This had an important practical advantage, as Ducker outlines: "Having all of the systems under our control meant that we could connect and configure much of the hardware off-site well in advance of the installation and, more significantly, not on the project's critical path."

Already the scheme has had a positive impact on traffic flow as Paul Arnold, project manager of the Hindhead Tunnel for the Highways Agency, confirms: "Since opening on July 27, the Hindhead Tunnel has proved its capability in improving journey times through what used to be a congested junction."

Prior to the completion of the scheme, traffic flows on the A3 at Hindhead were 30,000 vehicles per average day, which is forecast to increase to 36,000 now that the tunnel is operational. According to the Highways Agency, the predicted growth will come mainly from traffic presently rat-running to avoid the A3/A287 traffic lights, before returning to the A3 corridor. "Our work to return the old A3 to nature and to improve the new A333 through Hindhead continues, but we are delighted with the result so far," Arnold concludes. ○



The main attractions



Move over Disney and Universal Studios: for one week only in October, intelligent transport will be Orlando's big pull. **Louise Smyth** and **Nick Bradley** pick out some of the must-see sessions and technologies from the 18th World Congress on ITS

Illustration courtesy of Magictorch

Patrick McGowan is a little nervous about this year's World Congress on Intelligent Transportation Systems, the 18th instalment, taking place this time around at the Orange County Convention Center, Orlando, Florida, October 16-20, 2011. "We're ahead of schedule and that worries me," laughs the ITS World Congress chairman. "I'd be worried if we were behind schedule, and now I'm worried that we're ahead of the game!"

With 10 weeks to go until the show doors open, though, this small luxury gives McGowan and his 300-person-strong team the time to fine-tune all aspects of the event. "Our main goal is making visitors' all-round experience a wonderful one," he says. "From the minute they touch down at the airport they'll see ITS technology in action; and from the time they arrive at their hotels, they'll be



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presented with a list of educational or networking activities. We have thought about everything, but until it's all over I suppose I'll continue worrying about every little detail."

Despite the attention to detail, McGowan has managed to juggle the massive undertaking that goes with organizing a World Congress while still doing his day job as president of Telvent Transportation North America. He would consider the act a success if visitors depart from Florida having seen and heard things they never would have seen and heard before. "It's about providing them with information that they simply won't get anywhere else," he says. "We've set up the environment with the right type of people and topics to make that happen. What's also key is they get to talk to their peers, not only from across the USA but from around the world. The World Congress only happens once a year and it's invaluable."

"At the moment, we have 16 transport ministers confirmed to be attending from countries far and wide," McGowan adds. "We also have CEOs from a wide variety of blue chip companies, investment banks and institutions, a whole financial industry looking to come – people who we've never seen attend before. ITS has always been a growing industry and people have been taking notice, but this year it appears that everything is converging. You've got government folks in Washington and elsewhere realizing that ITS is a way out of the financial travails they've been facing, whether that's from a financing-the-infrastructure standpoint or simply as a way of keeping the economy moving."

The numbers game

Based on pre-registrations and general keen interest, McGowan suspects there could be around 10,000 people attending, putting it up there with the 2006 World Congress in London. "Everyone we've spoken to says they're coming – and in large numbers," he confirms. "I haven't spoken to one person who has told me they're not, or a company that says they're not sending anyone."

This will no doubt be music to the ears of participating exhibitors, which spend vast sums of money in the hope of seeing a return. Might McGowan's predictions also signal a healthier DOT presence than in the past few years? "Things appear to be a little bit easier for DOTs than they have been in years gone by,

so although they haven't previously been able to travel, eventually they will have to start attending conferences such as this," he says. "It seems to me there's no better place to start than the World Congress – it's the one that everybody wants to come to!"

McGowan doesn't think for one second that just because it's the World Congress, the biggest event in the ITS calendar, that people will book their flights and pack their golf clubs and sunscreen regardless. Content still remains king in his opinion. And he's pleased to report a stellar lineup to whet the appetite. "If you remember what we did in New York in 2008, we had demonstrations of V2X on 11th Avenue, with people shepherded onto



Louise Smyth speaks with Jesus Martinez, Florida's go-to guy for all things ITS

"What I'm most looking forward to about the World Congress coming to Orlando is not only discovering the latest technologies but also meeting my peers – both domestically and internationally," says Jesus Martinez, president of ITS Florida. "No matter where we are from, we are all very similar in the problems we're trying to solve. ITS is a strong unifying force and you always learn something new or meet someone new at these events."

Martinez's current day job is principal engineer at the Southwest Research Institute (SWRI) but he's been involved in ITS since 2001, working at Florida DOT first as an IT manager and then as ITS Administrator for Southeast Florida. Throughout his time in the industry, there has been one constant: "One of the things I'm terribly familiar with is traffic! We're known in Florida for lots of traffic. So a lot of the things that come to mind when we're discussing issues or trying to propose new technologies is how can we try to alleviate the constant congestion that we have here."

A further challenge is that a lot of that traffic is comprised of tourists, i.e. drivers unfamiliar with the area's roadways. "We get tons of tourist traffic all year round," Martinez says. "Since 2002 we've been extremely aggressive in deploying advanced traveler information systems – the 511 and corresponding traveler information websites – which we've done with an eye on tourists. If people are going to come here then we don't want a significant proportion

of their time spent in traffic. I personally managed the 511 system for southeast Florida for almost six years while I was at FDOT and I know just how important it is."

And how important is ITS in general to Florida? "Very important," Martinez insists. "Hundreds of millions is being invested," he reveals. "ITS won't solve your recurring congestion to a great extent; there are tools such as ramp metering that are successful in increasing capacity, but typically ITS here is more focused on dealing with non-recurring congestion, whether a disabled vehicle or an accident to clear."

To showcase one example of an innovative ITS project in Florida, Martinez is keen to mention a particular highlight of the World Congress. "We are going to be deploying roadside equipment on several roadways in central Florida and for the first time in the USA we will be showing a deployment of Connected Vehicle technology. We've enhanced the SunGuide ATMS software so the Orlando area TMC will be able to receive information from vehicles that are equipped. It's not like using a roadway as a testbed; these are widely traveled roads that will be equipped, and it's new and exciting."

Martinez also mentions the importance of the networking side of events such as this: "We've got an event on Monday night at Seaworld that will be a great opportunity for people to get to know each other. It's a beautiful facility and I'd encourage people to attend."

buses to show them how vehicle-to-vehicle and vehicle-to-infrastructure advances are going to help," he recalls. "We're doing things a little differently in Orlando. We'll have 26 separate demonstrations where people can get into the vehicles themselves and experience how the multiple applications enabled by this new stream of technology will change transportation and lives as a consequence. People will have one-on-one time, they'll be able to talk to the experts giving the demonstrations. It's going to be a very close and



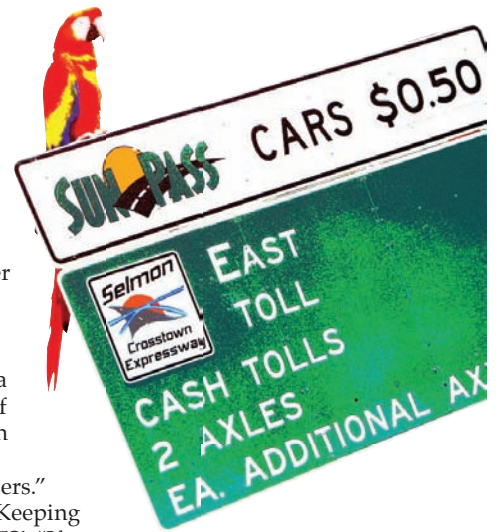
upfront presentation. "You'll be amazed at how far programs such as IntelliDrive have come in the three years since New York," McGowan continues. So knowing just how far these cooperative systems have advanced in a relatively short timeframe, how close does the Telvent man think we

are to shelving such demonstrations and actually starting to deploy something? "The technology is here; we could get it out there today if we had the financing and political will," he insists. "If you get the politicians and the general public on board, all of a sudden it's much more close to being a reality. The World Congress provides a very important role in making that deployment happen." This year's event will also see the general public welcomed on the final two days of the event as a way to measure public acceptance of what could be on the horizon.

In addition to IntelliDrive, now under the USDOT's Connected Vehicle umbrella, McGowan has some other technology-based attractions up his sleeve that will showcase the magic of such smart systems. "We also have a road pricing demonstration, with some presentations on congestion charging and possible VMT solutions, while we'll also be staging an environmental plaza in which people can see how ITS technology can improve general quality of life by reducing emissions through efficient driving and routing. We'll also be showing attendees the next generation in travel information, where they'll be able obtain immediate real-time travel information anytime, anywhere."

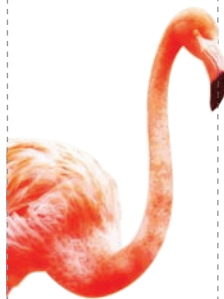
Demonstrations aside, what makes the World Congress a simply must-attend event is the conference. "One of things we have tried to do this time is attract much higher-level policy speakers to generate some intense debate on transportation in the economy," McGowan says. "I suppose the unique thing about the Orlando World Congress is that it could not have happened at a better time. If you take a look at the economy, we appear to be moving out of

a crisis – and hopefully not into another – so we're going to see a big increase in freight and people moving around. But transportation infrastructure hasn't grown over the past few years to cope with the demand that we're going to face. Transportation technology allows us to cope with that extra demand. We can show you all of the intelligent ways that you can utilize your network to make it work better for you and your users." Hence the theme for this year: 'Keeping the economy moving through ITS'. "If people are sitting in traffic traveling down a single roadway when other roads in your network have capacity to cater to that demand, you're not running your infrastructure efficiently," McGowan suggests. "By using technology, you can move people more efficiently, faster, safely, economically and make environmental improvements all at the same time – that's core to the theme."



One of things we've tried to do is attract much higher-level policy speakers to generate some intense debate on transportation in the economy

Pat McGowan, ITS World Congress chairman, USA



Orlando, Florida, is therefore a pretty logical setting for such a high-profile technology gathering. It's a major economy in itself and one of the fastest-growing states in the USA. "They recognize that technology is one of the ways to manage a network and they've invested a huge amount of money in ITS. Orlando is the perfect location for this conference. During the call for proposals, one of the things the Board of Directors recognized was that Florida has been a very strong advocate for ITS. From the state DOT to local tolling and transit agencies, they're aggressive when it comes to intelligent solutions and strategies. I think that was a key point for us when we selected Orlando. And it's made all the difference in the world while trying to organize the event – the people we've dealt with, from local government all the way up – they couldn't have been more cooperative. They're helping to make this event a success, too."

It's obviously important for McGowan and his team to put on a memorable show, particularly as the next time the ITS World Congress roller-coaster cruises into the USA will be Detroit in 2015. Does he anticipate any significant differences between now and then? "There's no doubt that the market will have grown a great deal," he says. "If you look at where we were 10 years ago to where we are now, the difference is remarkable. Traffic will undoubtedly have increased a great deal also and as a result so, too, will our need for technology to help us through the challenges that extra VMT will create. There's no question that technology is key to our path forward. Maybe this year's World Congress is the first step back on that path. The economy has been through a difficult period and we're not out of the woods yet, but a lot of people are viewing this year as a growth year. There's certainly a lot more zest and energy about from what I can see, so I'm feeling really positive." ○

i | TIME Management in Wisconsin

Tuesday October 18, 8.30am-10.00am

Steven Cyra, HNTB, USA

In 1995, the Wisconsin Department of Transportation (WisDOT) initiated the Traffic Incident Management Enhancement (TIME) program to improve the safety and efficiency of the freeway system in Wisconsin, and to emphasize the importance of incident management in overall system operations. Over the past 15 years, TIME has matured into an on-going, sustained, statewide incident management program.

The WisDOT TIME program is an excellent example of how a sustained incident management program can evolve to serve as a foundation for more comprehensive transportation operations, especially those associated with emergencies. The pre-established relationships among key personnel that enable multi-agency, multidiscipline coordination for traffic incident

management are often the very same that are required for effective work zone safety and mobility and emergency transportation operations. Formal TIM programs strengthen and even broaden the relationships that form the basis of a more secure surface transportation system during any situation.

A number of key products have evolved with the maturation of the TIME program. For example, over 20,000 copies of the Department's Emergency Traffic Control and Scene Management Guidelines have been distributed to responders throughout the state, considerably improving incident management safety and consistency. Another example relates to TIM planning for highway improvement projects where incident/crisis communication plans and



enhanced public safety dialogue are now regular components of work zone Transportation Management Plans (TMPs). Finally, TIME program lessons learned and relationships were leveraged in the development of WisDOT's Emergency Transportation Operations (ETO) plan, which better prepares the Department to respond to regional and statewide emergencies such as severe weather.

TIME continues to thrive and is part of the operational culture for WisDOT and many of

its public safety partners who recognize the positive benefits to traveler and responder safety, transportation system efficiency, and economic vitality and are committed to continually looking for ways to improve and enhance traffic management activities and the TIME program.

The TIM guidelines proved their worth during a June 2009 incident on US 45 in Milwaukee county. A semi-truck on its side blocking all four lanes of southbound traffic was quickly moved to the shoulder, and two lanes were safely opened to traffic.

i | Congestion pricing in developing countries

Monday October 17, 3.30pm-5.00pm

Carl J. Hamilton, Centre for Transport Studies, Sweden

While congestion in rich countries is an expensive inconvenience, congestion in developing nations kills. When commuting into the city is not possible, life in shanty towns becomes the only way to access the urban job market for

the striving poor, with social and health problems soon following.

Congestion pricing has proved successful in improving the traffic flow in Singapore, London, and Stockholm, to the benefit of residents there. But to assist the



dire situation in the developing world, the same solutions as used in those cases are not fully applicable. In the existing congestion pricing schemes, anyone who does not pay the charge will be identified by a three-step process: the vehicle is photographed by LPR equipment; the identity of the liable owners is determined by database lookup; and the debt is collected by a collection agency, which can express a credible threat of sanctions and collect the debt in a cost-efficient manner. In most poor countries, the last two steps are lacking or only working with limited efficiency: not all vehicles and citizens are registered in an up-to-date database; and there are no cost-efficient ways of ex-post debt collection.

A similar challenge is experienced in international motorway truck tolling in Europe.

As much of the traffic is transit traffic from other countries, the road agency is often unable to look up a vehicle's owner and issue a request for payment. Instead one has to trust that the vehicle itself is sufficient collateral for the debt, and enforcement staff retains it by the road until the debt is paid in full.

In a computer simulation, I have developed a strategy for how the operator of a congestion pricing system can make use of the same enforcement mechanism in a dense urban environment, with no need for vehicle database or ex-post collection. The model is based on recent research in economics of crime, tax evasion, and corruption, in order to realistically predict driver behavior, reach a low-cheating equilibrium, and minimize enforcement costs.

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i Safety applications of AVI and real-time weather data on freeways

Monday October 17, 3.30pm-5:00pm

Mohamed Ahmed, University of Central Florida, USA

Real-time crash prediction research attempted the use of data from inductive loop detectors, however, no safety analysis has been carried out using traffic data from one of the most growing non-intrusive surveillance systems; the tag

readers on toll roads known as Automated Vehicle Identification (AVI) systems.

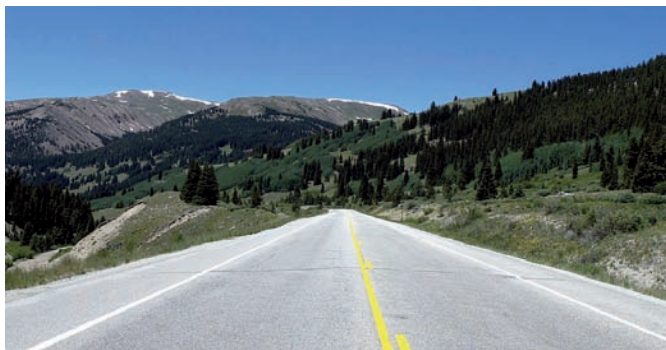
While the most common application of AVI systems is electronic toll collection and travel-time estimation, there is a promising traffic safety

application in the context of active traffic management systems. The operation-based management of expressways and toll roads can benefit from the collected data not only to ease the congestion and enhance the operation but also to provide warnings of increased risk situations.

A study by University of Central Florida, funded by Colorado DOT, examined the usefulness of traffic data collected from the AVI system on a 15-mile stretch of the I-70 in Colorado and weather data in a real-time crash prediction. Ten-minute average speed at the crash segment during five-15 minutes prior to the time of the crash, as well as the average visibility during one hour prior to the crash time are found to be the most significant factors affecting the crash likelihood on freeways.

The risk for a crash increases 6.5% for each unit decrease in the ten-minute average speed, and it increases 37% for each unit decrease in the average visibility measured over one hour before the crash time. The developed statistical framework has the capability of monitoring the traffic and weather conditions and detects the turbulence in the traffic and any reduction in the visibility that may lead to a crash in real time.

The achieved classification accuracy from the model using AVI data is comparable to previous models used inductive loop detectors data. The findings of this study illustrate a promising real-time safety application for one of the most widely used and already present ITS systems, with many possible advances in the context of advanced traffic management.



i A distributed systems architecture in Sweden

Tuesday October 18, 8.30am-10.00am

Andrew Green, Nicander, UK

Managing road traffic to optimize throughput and maintain safety is a challenging task – incidents, roadworks, and equipment failures conspire against these goals. ICT has long been employed to assist. The author considers requirements for a modern traffic management system and describes a framework architecture based on the principle of a common user interface integrating a number of cooperating distributed systems – a framework used for the Swedish National Traffic Management System.

A modern traffic management system has a number of different requirements. It should appear to users as a single integrated system; contain expert knowledge and information to give effective decision support; and empower the operator with

reliable monitoring and control tools. It should also: clearly display relevant information on the network status; alert the operator to disturbances and advise on actions to take; assist the cooperation between interested parties; and be reliable, configurable and flexible to accommodate new functions and devices.

A framework architecture that meets these needs will include a number of components. Firstly, multiple systems: the overall system should be built from separate specialized components. Next is distribution: systems, databases, and devices should all be deployed at the most appropriate locations. Integration comes next: multiple systems are integrated via common communications standards, by a common user interface and by



a common abstracted model. Virtualization is another key component as it has benefits for cost, maintenance, and reliability. Meanwhile redundancy at multiple levels ensures high availability. Graphical Displays are also crucial: these should be clear and intuitive and make use of modern GIS software. Expert systems are a necessity as they can embody the core business logic for decision support and act as a supervisor for managing subsystems and devices. A road network model is equally

important: the core of any ITS system is its underlying network model, which should provide the right abstracted levels.

Databases for maintaining configuration, static, current, and historical data are key components too. A final point is simplicity: however sophisticated under the hood, it should appear simple to its users.

The NTS architecture is designed around these principles, combining many local systems and four regional control centers into a single integrated system.

CAR-2-X communication: the DRIVE C2X framework

Monday October 17, 1.00pm-2.30pm

Andreas Festag, NEC Laboratories Europe, Germany

There is no doubt that future vehicles will be able to 'speak' about hazards, road traffic, energy efficiency, and road accessibility. They will inform other vehicles of obstacles and traffic jams, advise on green light optimal speed, and warn drivers



about high accident risks. WLAN and 3G/4G cellular networks have the potential to proliferate in coming vehicle models.

WLAN-based systems use the IEEE 802.11p standard in the 5GHz band for ad hoc communication among vehicles and also with roadside stations. After a decade of R&D, WLAN-based vehicle communications have entered the pre-commercial phase, where major field-operational tests (FOTs) are carried out worldwide. One of them is DRIVE C2X, a pan-

European project that assesses the system's impact on road safety, traffic efficiency, and driver behavior.

Unlike WLAN-derived systems, cellular communications rely on a mobile network infrastructure. Originally developed for voice and user-centric communication, today's networks are suitable for packet-oriented and machine-to-machine communication. 3GPP's long term evolution (LTE) relies on a fully IP network architecture and promises downlink peak rates of at least 100Mbps with delays of less than 10ms. LTE's quality of service, all-IP session management, and flexible billing may also be beneficial

for vehicular scenarios with cellular systems.

While WLAN-based vehicular communication technology is mature and ready for wide-scale deployment, its commercial introduction has been slowed down by economic factors. However, LTE is already being rolled out, but enhancements and proper implementation of its features are necessary to make it suitable for safety-oriented vehicular communication. Rather than compete for the same use cases, the two technologies can complement and benefit each other by enabling new services and enriching existing ones through their synergies.

A decade of floating vehicles

Tuesday October 18, 4.00pm-5.30pm

Yanying Li, Ertico, Belgium

In 2000, when I started my PhD study, the research topic given to me was using GPS-equipped floating vehicles for journey time estimation and incident detection. Back then, I had serious concerns on the future of my research. Floating vehicle data requires large numbers of equipped vehicles and frequent communication between vehicles and a central computer. Accuracy of the data depends on sample size, type of vehicles, characteristics of road network, speed of traffic flow, etc. The data can also include considerably large number of outliers. Floating vehicles therefore represented low accuracy and high cost. However, since 2000, floating vehicle data has become one of the fastest growing applications in ITS. The rapid growth of GPS-based personal navigation and vehicle tracking devices has been providing the potential to recruit large numbers of individual vehicles as floating vehicles without much additional investment. Floating vehicle



data has been proven as a cost-effective means of travel time collection and congestion monitoring. The data can be used to generate real-time information and be accumulated to build a historical database. Much research has been carried out to study the minimum sample size and improve the accuracy. After the 10 years of development, the data has been established as a mature technology and is widely used by both public and private players. This presentation will review the development of floating vehicle data and its current applications to provide an understanding of the processes from concept to mature technology and eventually, the move on to mass applications.

Enhancing commuter travel

Monday October 17, 3.30pm-5.00pm

Patrick DeCorla-Souza, FHWA, USA

The problem in US metropolitan areas is that we are wasting precious road capacity during rush hours because most seats in vehicles on our highways are empty. If we fill those seats with people who are now driving alone, i.e. get more people into carpools and transit, we could use our highways more efficiently and reduce congestion.

The solution we suggest is to massively increase use of carpooling and buses for trips between residential suburbs and employment centers throughout the metro area, using a three-pronged strategy: create a network of free-flowing HOT lanes by using existing lanes (i.e., convert regular lanes to HOT lanes); create an expanded express bus system that would use the HOT lanes to provide speedy connections



from suburban park-and-ride lots to all major employment centers; and encourage slugging to help reduce peak loads on the express bus system. More people would shift to carpools and transit, increasing the number of people carried on the converted HOT lanes. This would reduce congestion on the remaining regular lanes. Many of the new transit and carpool riders would be former solo drivers who have left their cars at home or at park-and-ride lots and no longer clog the regular lanes. And these two options would reduce commuting costs and provide new choices for all as gas prices keep rising.

With regard to funding, several proposed new HOT lanes costing billions are expected to be supported through voluntarily paid tolls. A regional system that uses one existing regular lane in each direction as a HOT lane could support many billions more in investment, including new lanes at bottlenecks, an express bus network, new park-and-ride lot, new bus stations and support for a national slugging system.

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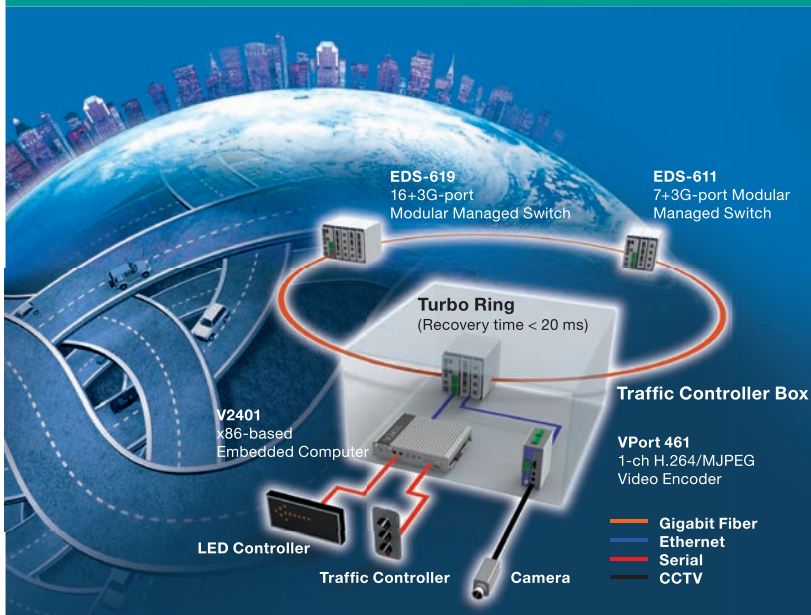
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i | Satellite tolling for Slovakia: concept and first results

Tuesday October 18, 1.30pm-3.00pm

Christoph Wondracek, Siemens, Austria

Slovakia's decision to introduce a truck tolling scheme based on satellite in 2008 became a success story for the operator and the government. In January 2009, the contract was awarded to the operator SkyToll, which chose Siemens as the main contractor for the complete satellite-based tolling solution. Within just 11 months, Siemens set up the tolling solution, including the on-board units (OBUs), their tolling applications and the back office solution.

The road network that had to be covered by the tolling solution currently consists of 1,800km and 570km of motorway. With a traditional microwave-based system, around 2,300 toll gantries had to be erected in order to follow a fair usage-based principle. For construction and bringing power and communication to these sites the investment would have exceeded the budget for the solution. And just including the 570km of highways would have resulted in an excessive amount of diverted traffic on the

first-class road network as most of the motorways have been constructed parallel to the first-class network to decrease the traffic load on urban roads.

After more than 18 months of operation of the GPS-based tolling solution in Slovakia, a number of advantages have been figured out. Firstly is upgradeability and cost efficiency: additional roads and road segments were added to the scheme. It also transpired that certain roads can be removed and added later on without any time delay or difficulties. The easy handling of changes in the structures of the charged road network was a winning point for SkyToll.

Flexibility was the next advantage. A comprehensive pricing model depending on parameters such as road type, vehicle category, and working days versus weekends has been set up. The concept is that roads with high traffic density can set higher tolls in order to sift demand from peak hours to off-peak hours.

Roadside infrastructure was another advantage. Fixed installations of roadside equipment is kept to a minimum as these are only used for enforcement. Currently, six enforcement installations on motorways and about 40 portable sites on the first-class road network are in operation, being supported by 30 enforcement vehicles resulting in about 70,000 enforcement contacts on a daily basis.

The next benefit was maintenance costs of roadside equipment. As the number of fixed installations is just needed for enforcement and installed at selected sites, maintenance costs are kept to a minimum, which therefore has a positive impact on the business case.

Theft prevention was another advantage that was discovered. In times of high raw material prices, roadside equipment is prone to be stolen – whether this is tolling equipment, cables or the diesel generators used at sites without power supply landlines.



Finally, investing into the future for interoperability was a key advantage. The Slovak satellite-based tolling solution, consisting of GPS, GSM as well as DSRC for enforcement, now shows that it will be the first one in Europe with an active interoperability case. Negotiations between the Austrian toll operator ASFINAG and SkyToll are currently being undertaken in order to accept the Slovak OBU on the Austrian road network as well as the Slovakian one. This will be then the leading example of interoperability within Europe and will therefore completely fulfill the European idea of one OBU for various operators and numerous countries.

i | Development of incident management performance measures

Tuesday October 18, 8.30am-10.00am

Jeff Hochmuth, Wilbur Smith Associates, USA

The Illinois Tollway has operated ITS devices for several decades. Recently, new measures were taken to help demonstrate how the tollway's incident management program is ahead of national averages in response times and impact minimization.

In 2002, the Tollway opened its traffic and incident management system (TIMS), which manages ITS devices including CCTV, DMS, and real-time traffic information. By 2003, TIMS was integrated with the existing CAD system.

Vast amounts of data are produced by both the TIMS and CAD systems daily. This in turn has created an ever-increasing number of inquiries from managers and executives. The demand for answers served to highlight a common problem; despite the large amounts of available data, useful information from that data was not readily available. The Tollway and the traffic engineer (Wilbur Smith Associates) set out to determine what could be

done with all this data to better respond to questions.

The industry was reviewed to understand how other agencies were using similar data. Over 100 different performance measures were identified. Wilbur Smith identified 26 existing reports and 23 new ones that best matched the tollway's needs. Most have already been implemented.

Many of the reports required a baseline – a defined 'normal' condition – for which to compare incident conditions. Wilbur Smith used the available sensor data to create and validate segment-level daily speed profiles.

By comparing daily and average speed profiles near



crashes, the tollway can now accurately determine the measured impact of incidents. The tollway and Wilbur Smith can now complete many of the new reports, including directly calculating measures such as vehicle-hours of delay and identify secondary crashes. With these new tools, the tollway can make more informed decisions on a variety of issues.

Incident management: a gateway to regional transportation operations

Tuesday October 18, 8.30am-10.00am

Richard Beaubien, Hubbell, Roth & Clark, USA

As early adopters of ITS technologies, transportation agencies in Metro Detroit quickly realised the need to involve a wide range of partners with similar interests to ensure safe and efficient traffic movement. This recognition led to the establishment of a traffic incident management program and a regional concept of transportation operations to organize both transportation agencies and public safety partners to promote safer, more efficient operations.

The Metropolitan Detroit Traffic Incident Management Coordinating Committee brings together the partners who operate the metropolitan transportation system so they can coordinate their operations and share real-time information on transportation system performance.

The Michigan Department of Transportation (MDOT) has deployed an extensive system of ITS technologies on the freeway system in Metropolitan Detroit. Increasingly, these technologies are being used to manage traffic incidents. The traffic incident management program provides an organizational structure that makes the freeway system operate more smoothly. Tools used by MDOT for traffic incident management include CCTV cameras, dynamic message signs (DMS), a freeway courtesy patrol, and partnerships with public safety agencies.

Because many of the elements for regional transportation operations are present in the Metro Detroit Incident Management Coordination Committee, it was used as a stepping stone to a concept of



regional transportation operations for Metro Detroit. The Regional Concept of Transportation Operations for Metro Detroit built upon the relationships with local government developed with the Traffic Incident Management Program. The resulting action plan objectives are being implemented by existing committees in Metro Detroit, such as the Arterial Traffic Management Committee, the Freeway Operations Committee and the Regional Transportation

Operations Coordinating Committee.

Metro Detroit has recognized the importance of engaging local governments as ITS systems were employed. Public safety personnel, particularly first responders, see the benefits of sharing information about transportation operations. Road agencies have welcomed their involvement, providing public safety partners with video images and responder safety workshops.

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i Market model for GNSS tolling

Wednesday October 19, 3:30pm-5:00pm

Brian Michie, Eroad, New Zealand

No economist would support the creation of a monopoly to supply a technology-based service, yet this is the outcome that has prevailed for electronic truck tolling schemes. Although limited in number, national HGV tolling is characterized by inflexible solutions provided by monopolistic providers. Not only do corridor-based schemes require high cost and intrusive infrastructure, they are incapable of supporting multiple policy objectives or value-added services. International experience also shows that project delays, litigation, and cost overruns are common. With this track record, it is not surprising that electronic truck tolling has not become widespread, despite strong policy and revenue drivers.

From a technology perspective, rapid developments in the GNSS and mobile sectors, and convergence with web-based eCommerce tools, means that direct road charging of HGVs should be economical and ubiquitous. What is missing is a change in the procurement model away from the winner-takes-all tender to a market model, whereby the government sets the rules and competing toll service providers (TSPs) collect tolls and offer value-added services. TSP equipment and back-end systems are certified

by the government, and the system is operated and enforced via a regulatory framework.

The market model is not just grounded in economic theory. Experience in New Zealand shows that the technology to implement GNSS tolling is proven and cost-effective.

Secondly, it is possible to incentivize the private sector to bear the risks required to develop and operate a GNSS tolling platform. Because there is no requirement for roadside infrastructure, the underlying costs associated with the OBU hardware, data transmission, and web application are low, estimated to be well below 5% of gross revenues. Furthermore, the ability to deliver regulatory and commercial services with the same platform helps to lower both agency and client costs.

The New Zealand arrangement also shows that it is possible to operate and enforce an electronic and paper-based RUC regime side-by-side, creating different options for HGV users. A dual system lowers political risks because it is not seen as coercive, and helps overcome privacy concerns, technology risks, and scheme costs. From the users' perspective, the ability to choose between competing providers encourages an innovative and service orientated culture.



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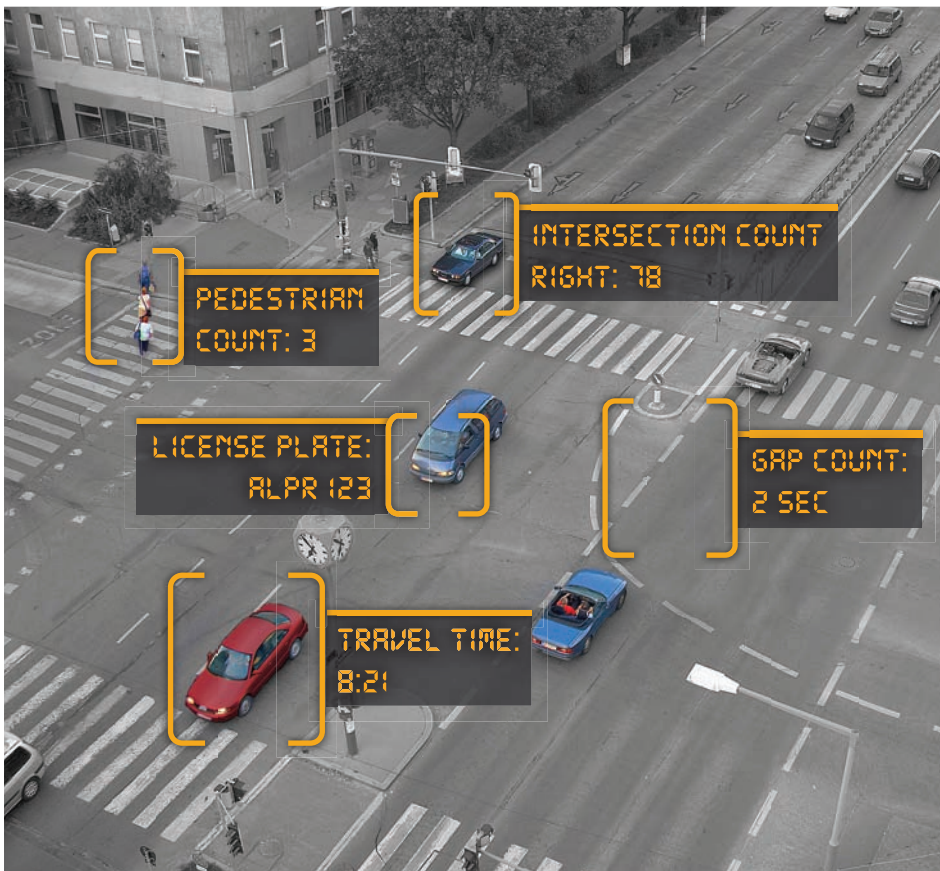
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Synchronized thinking

CitySync
Booth 1649

1 Lawson Noble, CitySync's CTO, will be sharing the company's latest news with visitors to the ITS World Congress. The UK market is currently big business for CitySync and the number of applications of its ALPR technology is growing. Noble cites two recent trends that the company is responding to: "There has recently been a focus on level crossings, as reports show that there are over 3,000 incidents of level crossing misuse each year, with many thousands risking their lives. The damage caused to railway equipment and by delays incurs huge costs. ALPR automatically



records any vehicle that passes through a closed level crossing. Another problem today is cable theft at unattended railway sites, with thieves stealing copper signals and catenary cables; again, ALPR is the solution."

As well as promoting its latest news – including a new team member – CitySync will be showing off its popular JetCam Fox HD camera.

Get real!

RealTraffic Technologies
Booth 1470

3 Denis Boulanger, president of RealTraffic Technologies, highlights his company's latest news: "We have developed a new technology that can use the existing camera network to measure traffic without installing additional sensors on the road. The new video analytic software service, based on cloud computing, can transform any video network into sensors. Video streams are transferred to our datacenter and processed in real-time by our core processing engine. We also provide a video-stream hosting solution to broadcast video over the internet or on cell phones. This complete solution can be easily integrated into TMCs."

The company has also been busy winning contracts, as Boulanger



reveals: "We have recently signed our first important contract with the Santa-Clara Roads and Airport Department (California) for the deployment of a LAN version of our solution. The goal is to optimize traffic flow by real-time monitoring and analysis of flow and by adapting traffic signal programs at more than 100 intersections, each of which is equipped with up to four CCTV cameras. Traffic data will be provided by the RealTraffic video analytic system. Recent tests by the Santa-Clara County showed excellent counting accuracy (+96%). Our software outperformed other video analytics systems, especially at night and in rush hour conditions."

Recognition in the field

Perceptics
Booth 1220

2 ALPR expert, Perceptics, will be showcasing its latest successes in a number of ITS applications. Orlando Carrasco, president, highlights two new advances: "We have created a USDOT number reader, which uses the same OCR found in our ALPR systems. This technology is primarily deployed at weigh stations and integrates

with our ALPR systems to provide a full commercial vehicle identification. We will also be releasing some new configurations of our ALPR technology specifically designed for the ETC sub-market."

The company also has a lot of news to promote, including a new deployment in the ITS World Congress state. Carrasco says: "Through our value-added reseller, Mettler Toledo, our ALPR systems were recently put in place in several key locations in Florida."

He continues: "We have distributors around the world and have recently deployed our license plate readers, container code readers and under-vehicle inspection systems to places such as the UAE, Saudi Arabia, Brazil, and Mexico."



Visionary approach

Miovision
Booth 2326

4 "Video is taking on many new roles within traffic management to help increase the efficiency of networks. Video can act as the eyes on the road to supplant traditional methods of data collection, and network performance measurements with a simpler, more accurate and more reliable method," says Cam Davies from Miovision. He continues: "Our products use the versatility of video and web-based software to help transportation professionals around the

world improve their road networks."

On display in Orlando will be Scout, Miovision's new portable system. Davies says: "Scout makes ALPR data collection and automated traffic counts easy at any location by combining video data collection with portable, temporary-install camera units."

Miovision recently helped Missouri DOT to improve its traffic data collection program. Davies explains: "We helped MoDOT reduce the labor hours previously allotted to data collection by 84% – savings of 1,400 hours in the field and a projected 33% of their costs in 2010."



Data protection

International Road Dynamics

Booth 1448

5 IRD is using the World Congress to showcase its compact, low-power iSINC Lite data collection electronics as well as talk visitors through some of the company's latest success stories.

IRD's Randy Hanson says: "We are seeing increased interest in higher quality traffic data, broad use of WIM for toll roads for weight-based tolling and overweight enforcement in both developed and developing countries, and the use of WIM for real-time enforcement using ALPR technologies."

Responding to these industry trends has seen IRD win a flurry of new contracts recently. These include domestic projects such as multi-year traffic data service and maintenance contracts with New York State and Indiana State, as well as projects further afield, such as toll and traffic operations and maintenance of the Dehli-Agra national highway in India.



TTi out in force!

Traffic Technology International

Booth 1877

7 Don't forget to come and pick up your copy of the industry's favorite magazine! *TTi* is celebrating the ITS World Congress with one of its biggest ever issues, coupled with the biggest circulation the industry has ever seen – we're printing 30,000 copies of our October/November issue.



The *TTi* team will be manning our booth for the duration of the event and we look forward to receiving your feedback on the magazine, ideas for articles, and of course, discovering all of your latest ITS news.

Illuminating thinking

Jai Traffic Solutions

Booth 1614

6 Frank Long from Jai Traffic Solutions will be on-hand at the ITS World Congress to present the company's latest releases in its Viscam family of products. He explains: "The all-in-one (AIO) system includes our full range of camera resolutions housed with our newly patented trigger system and onboard illumination. These products combine all of our traditional interface and internet functionalities along with a sleek design and added capabilities."

Long details two recent applications of this solution: "The Viscam AIO system has been designed into several large-scale HOT lane systems in California and traditional ORT/AET tolling systems in Texas."

Long ensures that Jai is well positioned to respond to customer needs by keeping a close eye on current trends. He's noticed two increasing trends recently: "Color image capture for the use in vehicle fingerprinting and identification has increased the level of system performance in the area of ALPR and therefore has become a part of the requirements for several major projects that have been recently awarded. Trigger redundancy has also become a hot topic, to ensure that system operation is uninterrupted by any occurrences in the lane that could lead to leakage or revenue loss."

Long will be talking visitors to his booth through some recent successful projects that Jai has been involved with. He's especially keen to promote one of these in particular. He says: "The Viscam hardware and VRS software systems have been deployed and tested at the SR520 Bridge in Washington State. The current automated read rate is in excess of 95% with an accuracy of <0.5%. This will allow for an on-time start to the tolling at this location later this year."



Networking opportunity

Sensys Networks

Booth 1857

8 "For the World Congress, we will be introducing several new additions to our VDS240 wireless vehicle detection system," says Amine Haoui, CEO of Sensys Networks.

As well as showing off these new additions, the company's booth and the Mobility Village demonstrations will also

showcase the recent deployment of Sensys Networks' arterial travel time (ATT) system along Orlando's busy International Drive. Haoui comments: "The ATT system provides Orange County's Transportation Agency with a permanent solution for accurate, real-time performance measures using flexible, cost-effective wireless sensor networks. Delegates will view real-time traffic conditions delivered via SNAPS 2.X, our extensible



platform for all vehicle detection applications. Version 2.X incorporates extensive feedback from our customers, delivering an enhanced user interface for remote network management and real-time system performance validation."

The company is donating the International Drive ATT deployment for permanent use by Orange County and Florida DOT as part of its ongoing commitment to advancing ITS technologies.

Camera action

Allied Vision Technologies
Booth 1239

9 Allied Vision Technologies (AVT) will be showcasing the Prosilica GT, a new range of industrial cameras specifically designed for outdoor applications such as ITS. Laurette Perrard explains: "These cameras boast a number of features such as extended temperature, P-iris and DC auto iris lens control and sensitive sensors that make them an ideal camera component in an ITS system. We are seeing more and more GigE machine vision cameras widely adopted by tolling and traffic enforcement systems. These are replacing cameralink and analog interface solutions in favour of cable length, off-the-shelf hardware and plug and play capability. This is pushing machine vision camera manufacturers to evolve these products to better suit the outdoor environment both in terms of adapting to changing lighting conditions and ambient temperatures."



AVT has recently been contracted to supply a large amount of cameras to a major international ITS integrator based in Europe. Perrard comments: "We were able to win this contract by being the first camera company to market with the Sony ICX674 EXview device featured in our GX1920 camera."

Recognize this...

Inex/Zamir
Booth 1229

10 There will be several points of interest on the Inex/Zamir stand, as company president, Jim Kennedy, reveals: "We will be showing our newest digital cameras, engineered solely for LPR. The newest of our digital camera/illuminator offerings covers the entire width of a lane with a portion of the shoulder on either side. We will also be showing our latest data mining techniques, which greatly reduce any requirement for human review on questionable LPR results. Our PTL (Public Transportation Lane) system, which automatically captures and records vehicles illegally entering/using bus lanes, will be on display too."

Kennedy will be on-hand to talk visitors through some of his company's recent success stories, including one particularly apt for a Florida show: "We have recently completed the supply and implementation of phase two of the Miami-Dade Expressway through ETC Corp."

"ETC has also just signed the contract for the PANYNJ toll upgrade project for the six river crossing leading into New York City from New Jersey and Inex will be supplying the LPR violation equipment for these crossings: George Washington Bridge, Goethals Bridge, Bayonne Bridge, Outerbridge Crossing, Lincoln Tunnel and Holland Tunnel."

Kennedy adds: "This recent award highlighted our ability to read front and rear plates on the same transaction event. One of our important features is the ability to



transition from a triggered mode to a self-triggering mode in the event of a loss of communications with the lane controller. This guarantees no loss of revenue should there be a network failure. In either the triggered or self-triggered configuration the system will still capture multiple images of varying contrast levels allowing for much improved results from the ALPR engine."

Share the fun

Avego
Booth 1770

11 As the official Transportation Partner for the ITS World Congress, Avego will be providing attendees the opportunity to get hands-on experience of using the company's latest real-time ridesharing and bus management solutions. Jonathan Guard, director of strategic partnerships at Avego, explains how visitors can take advantage of this opportunity: "Firstly they can use the free Avego shuttle which will be operating round trips back and forth from the airport to the convention center during the event. They can also download a smartphone app 'ITS Travel' for the congress, which provides real-time and scheduled information on selected local Lynx bus services, which will have Avego's Futurefleet mobile data terminals installed for the congress, as well

as information on other travel options for attendees. Finally, visitors can have fun booking free rides in the evening to Disneyland and other local attractions using our real-time ridesharing application: sign-up at www.itsworldcongress.org/freeshuttle."

Inside the Exhibit Hall, the Avego team will be offering demonstrations of its Real-time Ridesharing, Futurefleet and Vanpool solutions.

Guard feels the timing of an ITS World Congress in the USA is particularly apt. He says: "Real-time ridesharing aligns with the goals of the Obama Administration to promote livable communities and to provide Americans with sustainable transportation options. Already we are beginning to see the USDOT recognize the value of real-time or dynamic ridesharing. In 2010, Santa Barbara was awarded an FHWA Value Pricing grant to conduct a



pilot project. FHWA is also actively soliciting proposals for additional pilots and has sponsored webinars and study groups to examine the benefits of this technology. At a time when Congress considering severe cuts to highway and transit funding, policymakers will need to look at ways to better utilize existing transportation capacity - through innovative technology solutions such as Avego's real-time ridesharing."



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Keeping the Economy Moving

Bright outlook

Vaisala
Booth 2040

12 "In the road weather sector we are seeing an increased desire for complete solutions. Customers no longer want several different systems all with their unique strengths and capabilities. They want a single solution that is cost-effective, and provides them all the tools necessary to carry

out their operations. The demand is also increasing for lower-cost solutions to solve weather issues. The challenge is finding answers that meet those needs at a lower cost," says Jon Tarleton from Vaisala.

Proof that the company listens to the industry's demands will be seen at the World Congress with the launch of its latest road weather software suite. Tarleton explains: "The suite was designed

by our customers, and will allow us to offer a Maintenance Decision Support Systems (MDSS). MDSS is the next level in road weather operations by providing recommended actions to lessen the impact of weather. Operational experience is still vastly important, but this tool allows supervisors to make their decisions more accurately. The



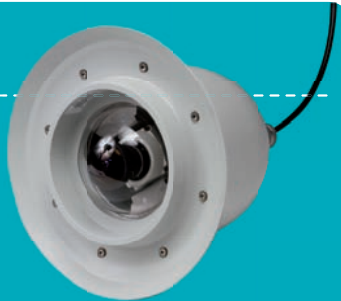
suite is modular, so an agency can configure a software specific to their needs. Until now, no other company has been able to offer the entire road weather package."

Smarter thinking

Aldis
Booth 2365

13 Visitors to the Aldis booth will have the opportunity to see several new products, as Brian Shockley explains: "The newly released GridSmart version 3.0 is the latest evolution of the system's intuitive user interface and offers functionality such as point-and-click drawing of detection zones, full intersection pan/tilt/zoom capability from a single camera, SCATS compatibility, and the industry's first four-way streaming panel from a single sensor. Also in the booth will be the new GridSmart Reports software, providing user-friendly access to the rich traffic data collected by the GridSmart system, as well as simple reports on traffic counts, turning movements and more."

In addition to its growing product offering, Aldis' customer base has been expanding as well. To help



manage this growth, Dr William Sowell has joined the company in the role of executive vice president, and Aldis is opening a new European office under the leadership of Julian Cooke.

Shockley will be on-hand in Orlando to tell visitors more about the latest deployments for Aldis, including a recent win in San Leandro, California: "GridSmart was installed to replace an aging video detection system from a leading competitor. The previous system used four cameras to provide detection at a busy intersection: Gridsmart was able to provide coverage with only one camera. It's a modest contract win but this strategic account demonstrates our unique value proposition."

Model of good behavior

TSS
Booth 1460

14 Alex Gerodimos, will be manning the TSS booth in Orlando and offering live demos of the recently released Aimsun 7. He comments: "The star feature in Aimsun 7 is, without a doubt, the hybrid simulator. Combining the mesoscopic and microscopic simulation approach, hybrid provides the perfect blend of speed and accuracy for modeling large, congested urban and highway networks."

2011 has been an extraordinarily busy year for TSS, with three offices now in operation (Barcelona, New York and Paris), a multitude of events and new projects in San Diego, New York, Toronto, London and Melbourne.

Gerodimos explains one of the reasons TSS is seeing a greater demand than ever for its solutions:

"With economic and environmental issues deservedly at the top of the agenda and traffic congestion on the increase worldwide, emphasis is shifting away from expansion and onto running infrastructure more efficiently. As a result, we are witnessing significant market interest in the use of simulation in real-time for supporting traffic operations. A number of cities worldwide have evaluated Aimsun Online and are now asking for TSS's help to alleviate congestion and reduce pollution.

"The San Diego Association of Governments (SANDAG) is working with Delcan as the prime contractor to design, build and implement an Integrated Corridor Management (ICM) demonstrator in San Diego, California. The project is part of a US DOT program to end gridlock in urban areas. The focus of the demonstration phase is the Interstate 15 (I-15) corridor: a heavily congested north-south interstate corridor, where the system is scheduled to go live in November 2012. At the heart of ICM is the Decision Support System, a 'smart' traffic management system that will use Aimsun Online to evaluate traffic management strategies in real time."



Added intelligence

TrafficVision
Booth 1757

15 "Our team will be busy on the exhibit floor conducting live demonstrations of TrafficVisionTMC," explains Ray Keys. "This is our new accurate and cost-effective traffic monitoring solution that turns your existing cameras into intelligent sensors capable of detecting a wide range of real-time incident



detection data, including wrong-way drivers, stopped vehicles, pedestrians, and occupancy."

Keys adds: "We have had significant interest in our autocalibration feature, which enables the user to move their PTZ cameras and continue to collect data without manually recalibrating the camera."

Keys will be sharing the latest feedback from his customers with visitors to the TrafficVision booth. He says: "We have received solid feedback from existing system deployments. In addition to TrafficVisionTMC's dynamic on-board features, because of its flexibility to process multiple video feeds from a variety of cameras, customers also realize the added assurance of integration with future technology advancements, helping them navigate the ever-changing traffic industry."

Software showcase

Intelligent Devices Inc
Booth 1464

16 Bryan Mulligan, president of Intelligent Devices Inc (IDI), explains what his team will be up to in Orlando: "We will be demonstrating how our suite of central software products – Intelligent NETworks, Intelligent WEB and Intelligent Control – can interface with a variety of different manufacturers' field devices through the NEMA NTCIP Interoperability Showcase, which we are coordinating. "This showcase will demonstrate how multiple vendors of equipment can



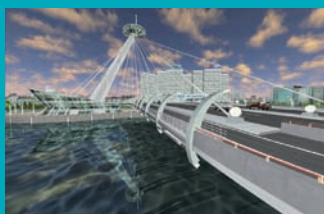
talk to different central systems from multiple suppliers, using the NTCIP protocols."

The IDI team will also be manning their stand to share the company's latest news, including an interesting contract for the Department of Homeland Security for systems integration at the Nogales border crossing to Mexico.

Simulating growth

Forum8
Booth 1739

17 A new product will be shown on the Forum8 stand, as Brendan Hafferty reveals: "We will be officially launching Version 5.2 of our 3D visual interactive simulation software, UC-win/Road. Version 5.2 enables the incorporation of a number of new features, including: VR-Cloud, a distributed UC-win/Road system across the cloud from a single system server; point Cloud data modeling; and Video wall, where animated video can be embedded into a UC-win/Road 3D citymodel environment as a 3D object."



Hafferty is set for a busy time at the show: "Forum8 will also be signing a partnership agreement at the ITS World Congress with SimCraft and will be displaying one of SimCraft's Drive Simulators on the Forum8 booth running UC-win/Road. The same software is used by major vehicle manufacturers such as Toyota and Subaru."

Hafferty attributes the growing demand for Forum8's solutions in part due to the trend for better communications between different players. He says: "There is an increasing demand among consultancies and DOTs and other similar organizations for their transport plans to be made more 'understandable' by non-transport professionals, especially during the public consultation process. We have seen this in two recent projects where our 3D interactive software was used most successfully by two state DOTs in the US."

Walk on the wild side

Point Grey
Booth 1200

18 "At the World Congress we will be showing our upcoming Zebra2 family of high-performance CCD cameras for ITS applications," explains Point Grey's Michael Gibbons. "The Zebra2 is a hybrid HD-SDI and IP camera designed for traffic and surveillance applications. The dual-interface provides both HD-SDI and 10/100/1000 Base-T connectivity, allowing a single multipurpose camera to be deployed in a variety of different environments."



HD-SDI is useful for streaming high-quality uncompressed video with low latency, while the PoE GigE interface can be used to connect the camera to any IP network."

Gibbons outlines how this new range came to market: "The Zebra2 builds on our extensive experience in ITS applications. In markets such as Asia, ITS designers have been taking advantage of machine vision technology especially for demanding applications such as ALPR. Much of the Zebra2 was designed based on feedback gained from the success of the original Zebra, which was used extensively in the Shanghai World Expo in China. That was a huge event that hosted millions of visitors to China over six months. Thousands of Zebra cameras were deployed to track and zoom in on people and cars to acquire facial and license plate data, as well as provide video of traffic flow and pedestrian movement."

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FORUM 8

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The chairman of the International Road Federation, **Kiran K. Kapila**, thinks India needs to go back to basics by addressing the four Es

Interviewed by Mridu Khullar Relp



A self-confessed workaholic, K. K. Kapila, chairman of the International Road Federation (IRF), starts his day before 08.30hrs and finishes after 20.00hrs. His phone is always ringing – and it’s a rare moment when his mind isn’t occupied with his work. Work that, while seemingly intellectual, can also mean the difference between life and death.

Nearly 10% of the 1.3 million deaths due to road accidents worldwide occur in India. According to the World Health Organization, India has 125,000 fatalities and at least 2.2 million serious injuries each year. Kapila, the first non-European to be elected to the post of chairman of the IRF and who is also chairman and managing director of Delhi-based Intercontinental Consultants & Technocrats, therefore hopes to mobilize individuals and organizations in the direction of road safety. “The first thing I feel has to be done is that this world, which has adopted the United Nations Decade of Action Plan, should be able to achieve the target set in the UN resolution – to reduce road crashes and accidents by 50% over the next 10 years. If we see a steady decline when we do a mid-term review after five years, that would give me the highest satisfaction. And that’s what I’m relentlessly working toward.”

In 2001, the Planning Commission of India undertook a survey and estimated the



The number of cars that has been added and is continuing to be added on the roads is far too large for the Indian road system to take

social cost of road accidents to be Rs 55,000 crore. Calculated today, this figure would be in the realm of Rs 90,000 crore. “This is because the people who die are primarily the bread-earners of the family,” says Kapila. “They are still young, have been educated or are going to be, and some of them are already working after education in good institutions.” India’s Planning Commission estimates that the country loses 1.5-2% of its gross domestic product due to road accidents.

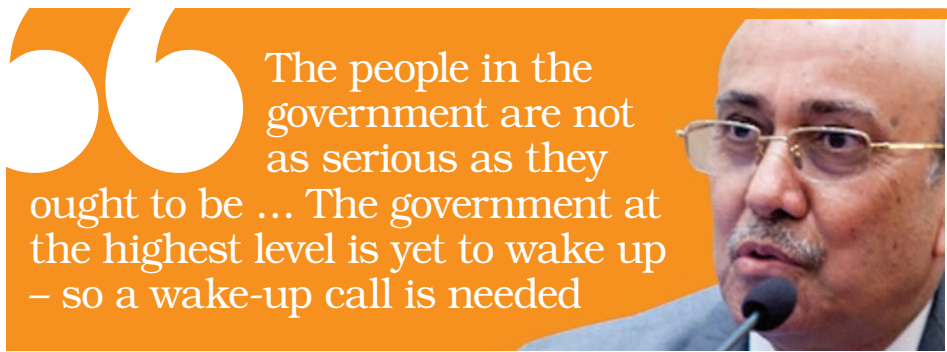
“If there is a plane crash, you’ll find that people talk only about that for the next seven days,” Kapila continues. “But in terms of traffic fatalities, you have the equivalent of one jumbo jet crashing in India every single day with zero survivors, yet nobody is talking about it!”

The IRF’s first task is to stop the numbers from increasing, and then focus on their reduction. Despite the work that has been done over the past few years, the numbers haven’t stabilized, due to the increase in

road length, speed and the number of vehicles, and the lack of driver training.

Rapid development

In the meantime, road transport is developing rapidly in India because other modes of transport haven’t been able to cater for the demand. “If we had sufficiently developed intermodal transport, then road transport would not have been under such tremendous pressure,” Kapila states. “The number of cars that has been added and is continuing to be added on the roads is far too large for the Indian road system to take, particularly in urban areas.” This leads to congestion and adversely affects road safety. And as there is no reliable transport system within cities – metros in several cities are still stuck in Phase 1 – people have to rely on individual transportation for getting around. Kapila does, however, note the positive impact of all the road-building, including the jobs and opportunities that have been created both



The people in the government are not as serious as they ought to be ... The government at the highest level is yet to wake up – so a wake-up call is needed

by construction of roads and by the flourishing automobile industry.

The IRF works on four modules: road safety, environment, PPP and financing, and intelligent transport systems and services – all of which, Kapila says, are interlinked. All of the modules, if properly utilized, lead to improved road safety. In order to achieve its goals, the IRF works on the four Es – Engineering, Emergency Services, Enforcement and Education.

Engineering

A large part of road safety is making sure that not only are roads and highways properly engineered but also the vehicles that run on them have all the road safety features in-built in them.

“We had set up a committee in collaboration with the Ministry of Road Transport and Highways, and there were representatives from the Indian Roads Congress, the Central Road Research Institute and other stakeholders that are knowledgeable in the field of road safety,” Kapila explains. “And in April last year we proposed measures that should be taken on Indian roads to make them more forgiving.” These include providing underpasses, overpasses, road assistance and proper entries and exits from the national highways.

However, Kapila feels that in their desire to make projects viable by private-public partnership, the authorities try to cut costs in certain areas. “If you want to reduce cost, you can’t reduce costs on the basic road system, so where do you do it?” he asks. “You reduce costs on underpasses, on overpasses, on services lanes, but they’re all absolutely necessary for traffic safety!”

The actual vehicles must also be safe: “Safety measures within vehicles is a challenging part because it does add to the cost, and the vehicle manufacturers are forever trying to reduce costs,” Kapila suggests. “I have been appealing to the auto industry to provide all the safety measures that would help to save lives.” He advocates that rather than advertising that a particular car provides the best miles-per-gallon,

he feels it would help if manufacturers advertise their cars in terms of safety benefits. In fact, Kapila has offered an award at next year’s annual meeting of the Society of Indian Automobile Manufacturers to the group that offers the most safety features in its cars.

Enforcement

The IRF continuously interacts with the government, both central and state, particularly with the Ministry of Road Transport and Highways. “Together we have made an appeal, a resolution that we will collaborate to reduce road fatalities by 50%,” Kapila says. “This program was launched under Kamal Nath [the former Union Minister of Road Transport and Highways] quite some time before the Decade of Action plan was launched.” But for IRF’s measures to be implemented and for the laws to make a difference, enforcement is essential. This is one of the weakest links in India’s road safety plan, with the government and traffic agencies often accused of corruption and laziness. “The people in the government are not as serious as they ought to be,” Kapila feels. “Those people manning various positions in the government have varying degrees of seriousness about the issue. That seriousness

needs to be aroused further. The government at the highest level is yet to wake up – so a wake-up call is needed!”

Education

The majority of experts agree that education is the only way to bring lasting road safety. None of the other three Es – Engineering, Emergency Services and Enforcement – can do the job if road users are not adequately educated. “The government of India agrees that we should have this subject taught in schools, so we’re now preparing the curriculum,” Kapila reveals. “We should publish road safety symbols on the inside front and inside back covers of all textbooks. Children will see the road signs each time they open their books and will become more familiar with safety messages.” Teaching children is important, Kapila feels, because when this generation reaches driving age they will have learned to be more careful, something the current generation has not.

Education is not only limited to schools, though. In association with the Ministry of Road Transport and Highways, the IRF has been advocating road safety through 120 newspapers around the country. Road safety films are also being screened in cinemas, while safety hoardings have gone up in various locations – 100 in Delhi alone.

There are also several small non-government organizations working on road safety in India today. “Most I’ve seen have had some personal incident happen to them and they’ve taken up a pledge and started working in this area,” Kapila says. “But there is a need to synergize the energy of all these groups, a need to cohesively work together and identify who can do what best. I’m trying now to have them work under the IRF India umbrella so the effort bears the best fruit. The best results can be achieved only if it is a cohesive movement.”

Emergency services

Unlike in countries in the West, India doesn’t have one central emergency phone number; 11 states in the country have the standardized 108 but the rest do not. “We’re trying to reach a point where we have only one number for the entire country,” Kapila reveals. “We’re working on it, so maybe it will be a year from now.”

Traditionally, one of the major problems for accident victims in India

has been that bystanders and passers-by have been reluctant to take any injured parties to hospital for fear of harassment by the police. However, a Supreme Court directive now assures citizens that if an accident victim is taken to a hospital, the victim cannot be refused treatment, and the person responsible for bringing the victim into the hospital cannot be questioned. Kapila says that following the distribution of posters

in hospitals and elsewhere about these rulings, there has been a marked difference in accident care.

“We also have a provision in the Motor Vehicle Act that states that all drivers of commercial vehicles should be trained in first aid trauma care,” adds Kapila. “Now, that hasn’t happened yet. But if it happens properly, then we would effectively have a very large fleet of trained people who will be able to address this issue.”

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A clearer picture of road operations

With the potential to sense incidents and deliver accurate alerts, video-based automated incident detection (AID) allows officials to visually diagnose any situation for the best response. In a tunnel, for example, knowing within seconds when and where these events occur can enable a quick emergency response that results in lives being saved and keeps a singular incident from becoming a congestion nightmare. Operators armed with timely information can minimize congestion, detour traffic, and prevent additional catastrophes from occurring. With the ability to increase public safety and reduce the costs of incidents and their resulting clean-up, AID is a win-win for government agencies, commuters, and taxpayers.

The question, though, is what is the best way to assess a situation and take appropriate action? Most traffic officials would agree that there is no substitute for

Fast, accurate detection of incidents is critical for emergency response



AID makes existing cameras much smarter

actually viewing an incident to make a quick and smart decision about the response action. Although non-video sensors are used on many roadways, they can only gather and report 'data'. They are useful for gathering a small quantity of information in a bit/byte format, such as the presence of a vehicle or a CO₂ count.

However, the best way to gather real-time information

about incidents is using video detection cameras, which can collect a video feed from their field of view in a tunnel, on a bridge or highway, and stream that video to a remote PC, often with a full-color image. The viewing screen can be located at a central traffic management center (TMC) or even the desktop of a law enforcement agency or fire department. If the cameras have the 'intelligence' to process the images, an alert

can be sent to a TMC operator who can make a determination about the proper course of action based on a given incident type. These can include debris, stopped vehicles, wrong-way drivers, and errant pedestrians. Debris on the road with vehicles can be a deadly combination with any type of traffic, and incident detection systems have the potential to detect anything from a small object that has fallen off a truck to a package that may contain explosives.

Proven success

Video sensors have been successfully used for over a decade in the detection of vehicles at stop bars and roadways. They are an advanced replacement for inductive loops, and offer the value-added bonus of surveillance in addition to standard detection capabilities. Loops are very obvious in aesthetic terms, and the

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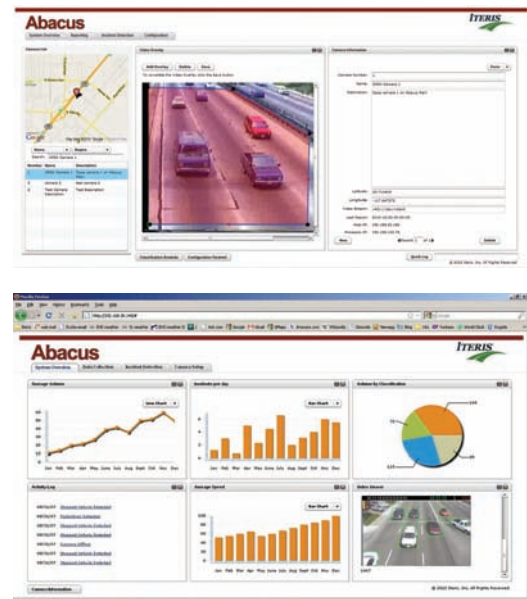


i | Need to know?

Advanced video-based situational awareness to ensure traffic flows freely and safely

- > Advanced image processing technology to detect vehicle presence, count, speed, occupancy, and other traffic data used in traffic management systems
- > Systems to capture and analyze video images through sophisticated algorithms, providing accurate vehicle detection in a flexible and easy to implement package
- > A powerful toolkit for mitigating roadway congestion by modifying traffic signal timing or detecting incidents quickly

The Abacus system collates and displays a wealth of valuable traffic data



mechanical disruption of the road surface directly contributes to its degradation, which reduces the road life expectancy.

When loops need to be repaired or replaced, lanes must be closed and traffic redirected. The operating difficulty with embedded loops is knowing the 'availability' of the sensor – i.e. having confidence that it is functioning or otherwise. Most loops do not have self-diagnostic circuitry, nor do they have the means to generate a fault code.

All of these requirements add to the increasing costs of relying on loops, and these costs and congestion issues are changing the detection choices of the traffic control industry. Video detection, by contrast, can be configured and serviced remotely using detector management software, and installed at the street level using a bucket truck to avoid the closure of the road.

Traffic agencies and operators of tunnels, toll roads, and

bridges are under increasing pressure to improve the flow of traffic, reduce greenhouse gases, and minimize the risk of fatal accidents and injury collisions. Only a visual acknowledgement of an incident can help operators determine whether they should turn on the fire suppression system, send firefighters to the scene, or detour traffic with VMS. This is the true value of video-based AID.

The use of these AID techniques also provides a powerful capability to collect traffic data at the same time. Vehicle speeds, traffic flows, flow density and vehicle classification can be collected by the same video sensor and analysis system that is performing incident detection. This data can be fed into traveler information, performance management and decision support systems to significantly improve operational management and investment decisions.

Unfortunately, change often does not occur until a newsworthy event takes place where lives are lost, people are injured or high maintenance and rebuilding costs are incurred. Catastrophic events incite public outcry and blame is often placed on government officials for not protecting the public. Government agencies should be proactive and justify the decision to acquire AID with the lives that can be saved, the congestion that can be prevented, and the damage that may be averted.

It is easy to see why video-based AID is emerging as the number-one choice of traffic engineers for knowing what the true conditions are on a roadway and having timely information to act upon it. Loops and radar have their place, but they cannot tell an operator if a vehicle is engulfed in flames inside a tunnel – information that can make a critical difference.

Video as a future-proof technology

Manufacturers of high-quality video traffic detectors, such as Iteris, have proved that this technology provides significant benefits to the traffic agency, drivers, and the environment that should not be overlooked. Specifically, Iteris' Abacus 2.0 leverages existing PTZ camera assets, making them 'smarter' to perform real-time incident detection and data collection. Traffic authorities would be wise to investigate the benefits of video detection for their next data collection, incident detection, or traffic signal project. And for managing tunnels, bridges, or highways it's an absolute must. ○

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Crafting a camera for traffic applications

Machine vision systems can greatly assist traffic management and vehicle enforcement by automating processes such as traffic counting, speed monitoring, and license plate recognition. Most proposed systems, however, set out to utilize video cameras originally developed for security, surveillance, and industrial control applications. But a camera specifically designed to address traffic application needs can greatly reduce the cost and complexity of machine vision in ITS.

Design concerns

To be cost-effective in ITS applications, machine vision systems must address several practical design concerns. Such cameras must tolerate wind, rain, heat, and cold, for instance, with minimal or no protection

Need to know?

Examining the merits of the latest machine vision cameras for traffic management applications

- > Why existing camera technologies may fall short in the demanding ITS sector
- > A system that helps to reduce system cost and complexity while simultaneously boosting performance
- > Built-in image processing with image filtering, image compression, and triggering
- > Advanced networking capabilities to simplify ITS network management



Machine vision cameras designed purely for ITS offer great benefits

in order to keep installation and maintenance costs down. The cameras must also capture useful images under a wide range of illumination conditions, from full daylight to the darkest night. Furthermore, the illumination may vary rapidly as a result of the headlights of passing traffic, glare from reflections, etc.

The vision system design also needs to address the cost of installation and maintenance. Triggering options, for example, should avoid the need for in-lane sensors in order for the vision system to be a cost-effective replacement for traditional traffic metering systems. The network design also needs to be cost-effective and able to handle dozens of cameras while being as simple as possible to establish, maintain, and enhance.

Although system proposals utilizing cameras originally intended for other applications

may have some features that address ITS concerns, such as ruggedized construction, there are other aspects that are sub-optimal. Typical security installations, for instance, utilize only a handful of cameras compared with the network the ITS must employ. Security cameras, therefore, typically lack features supporting very large installations.

It is well within the capability of top camera developers to craft a camera that directly addresses the needs of machine vision in ITS applications, helping reduce system cost and complexity while boosting performance. For example, intelligent image capture can help maximize the useful information content of images while minimizing the amount of processing needed to extract that information. An auto-exposure, auto-gain system could adjust with each video frame in order to maximize the

capture of usable images in the presence of rapid lighting changes such as light flashes from passing reflections. Similarly, the region of interest (ROI) that the camera uses to determine exposure should be movable, to decouple metering from camera positioning. A camera's ability to perform pixel-level flat-field correction can help compensate for uneven lighting across the camera's field of view, simplifying information extraction during subsequent image processing.

The camera can also provide some image processing of its own. Image filtering, for instance, can help eliminate noise that might otherwise reduce the speed and accuracy of information extraction algorithms such as ALPR. Image compression can reduce the network bandwidth needed to transfer images, simplifying network traffic management and lowering network performance demands. The built-in image processing can also provide a means of triggering image acquisition without external signal sources, by performing motion detection on data from the image sensor to determine which images to capture.

Need for onboard storage

To avoid missing critical information when self-triggering through motion detection, the camera should incorporate onboard image-storage capacity, which allows the camera to retain pre-trigger images so that trigger timing becomes less critical. Storage also allows retention of images until the network requests them, rather than automatically sending them, which helps simplify network management and future system expansion.

Advanced networking features built into the camera can further simplify ITS network management. Multicast capability, for example, allows a camera to send images to multiple host processors with a single message, saving time and bandwidth. Use of multiple processors on the same image can lower the cost of image processing through parallelism, or allow dedication of processors for different information-extraction purposes to simplify software design. Other useful camera networking capabilities include the ability to receive broadcast commands, multicamera synchronization for coordinated image capture, and support for the IEEE 1588 timing protocols that allow time-stamping of images with sub-microsecond accuracy.

A camera for ITS should also be optimized for remote operation. A ruggedized and compact construction helps reduce installation cost. Network control of all features as well as an ability to receive power over the network further simplifies installation and reduces cost. An ability to remotely control camera pan and tilt can also be useful, allowing repositioning without field service calls.

Teledyne Dalsa is launching its Genie TS Series of cameras with all these attributes and more. An extension of the company's ruggedized Genie family, it will be one of the first camera platforms specifically optimized for ITS applications.

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eric.sampson1@btinternet.com

The schoolgirl waitresses in the excellent tea room in Thirsk have just finished their annual examination ordeal, and it occurs to me that the older generations really ought to share their agony. So here is my exam paper for *TTi* readers. Answer either two odd-numbered questions and three even, or two even and three odd. The best response in fewer than 3,000 words will receive a bottle of Champagne or malt whisky if preferred.

Q1: The price of oil has fallen suddenly by a large margin and consequently the pump prices of petrol and diesel have dropped by 40%. What lasting impact might this have on the government's decarbonization/air quality targets and industry's cost base and growth?

Q2: The price of oil has risen suddenly by a large margin and consequently the pump prices of petrol and diesel have risen by 40%. What lasting impact might this have on the government's decarbonization/air quality targets and industry's cost base and growth?

Q3: We seem to be wasting our current deficit and austerity crisis by applying the agony relatively equally. We could instead recognize that transport infrastructure has been under-funded for years and have some more radical rearrangements of funding – for example halving the spend on rail and deploying it on roads. What changes to funding of transport infrastructure could be made that would ensure that we use the current situation to focus on fundamental issues, rather than tinkering at the edges?

Q4: Subsidizing rural transport, especially rail, is expensive and

“ | Eric Sampson

generates little obvious benefit – it would, for example, be cheaper over five years to close all railways in Wales and Scotland and give all adults over 25 money to buy a car. Why not do this? How else might we cut the costs of rural transport, reduce expensive subsidies, and make the system more efficient/provide more effective transport solutions?

Q5: Figures on the Office of National Statistics website show that the 'economies' of London, the South East and the South West are net 'exporters' of wealth, and areas in the rest of the UK are consumers. Given that good infrastructure supports industry and wealth creation, why not cut local transport funding to these 'consumers' and transfer it to London and the South West/South East in the overall national interest?

Q6: Better transport tends to emerge from evolution not revolution. What might we do to give a series of small 'nudges' to traveler behavior to reduce congestion, improve safety, reduce emissions, improve air quality, etc?

Q7: We tend to buy transport provision focusing on the fixed costs and ignoring the variables. For example, we 'own' cars, rail or bus season tickets, etc. Would a better transport world be one where we bought a selected volume of end-to-end transport services? How could we change from the current regime to a service one?

Q8: Managing just about every transport network becomes easier – and better for everyone – if future demand is known. How might we persuade travelers to trade some privacy for anonymity and give us early warning of their intention to go from A to B at time T by mode M?

Q9: The UK population is steadily aging and the social and financial advantages of keeping older citizens mobile, especially using personal travel, have now been accepted. Current designs of systems are not very well adapted for older users. What types of technologies could effectively address this?

Q10: The rail network is much safer than the road network, yet calculations of the value of a life in rail yield a figure four to five times larger than the road equivalent, which, it is argued, 'proves that the railways are too safe'. How might we reduce rail safety expenditure?

The best response in fewer than 3,000 words will receive a bottle of Champagne or malt whisky if preferred

Professor Eric Sampson, Newcastle University/ITS-UK, UK

Intelligent Ethernet networks

The continuous increase in traffic density and the number of vehicles on our roads has stimulated the need for including variable message signs (VMS) in traffic systems. The top priority of modern highway management is to provide real-time communication between the highway operator and highway users in the case of inclement weather conditions, accidents, traffic jams, congestion, etc.

A variety of devices for monitoring and controlling traffic can be found along our highways. The objective is to connect them in a reliable and flexible future-proof network that adapts to rugged environmental conditions and changing traffic patterns.

A typical ITS deployment includes color displays, programmable text displays (VMS), road outstations, road weather information stations (RWIS), overhead detectors, and surveillance cameras (CCTV cameras with MPEG encoders). Information from all of these devices needs to be transmitted bidirectionally to and from a control center that operates around the clock. In the control center, the entire highway is monitored on huge screens and advanced traffic management and control software takes care of the data flow.

The VMS provide drivers with information about speed limits, traffic jams, and other warnings related to road conditions, for example relating to climatic influences where the RWIS survey the environmental conditions in different locations along a highway. When these weather stations send their reporting data to the control center, the management and control software, based on pre-defined algorithms, initiates the update of the VMS with the

| Need to know?

The backbone of ITS schemes, Ethernet networks are key to improved operations

- > How best to manage the data exchange between numerous traffic management devices, the traffic management center, and drivers
- > The role of a star network in creating reliable and future-proof networks
- > A range of networking solutions from a company with many years of experience in the industrial Ethernet arena

appropriate information. All update information is again displayed on large screens in the control center, matching the signaling with the respective highway segments, ensuring a most correct information flow.

The color displays and VMS, like the detectors and RWIS, connect to roadside outstations along the route. These outstations are integrated in an optical fiber communication network, with industrial Ethernet switches operating in single mode, and in wide temperature ranges from -40 to 75°C. Single-mode optical fiber is an optical fiber designed to carry only a single ray of light. Single mode fibers do not exhibit dispersion resulting from multiple spatial modes. They are also better at retaining the fidelity of each light pulse over long distances than are multimode fibers. The wide operating temperatures ensure stable operation under changing conditions from frost to extreme



(Above) VMS are a key component of modern traffic management
(Left) The TMC displays ITS data on large screens


heat, without the need for cooling or heating systems inside the outstations.

A star network

By deploying all devices in a star topology, every communication node in the network is directly linked to the control center. A star network consists of one central switch, hub or computer, which acts as a conduit to transmit messages. This consists of a central node, to which all other nodes are connected, providing a common connection point for all nodes through a hub and reducing the chance of network failure by connecting all of the systems to a central node.

CCTV cameras with MPEG encoders are also deployed in a star topology and linked to the control center. This connection is made with media converters that convert the camera signals and send them to the industrial Ethernet switches via single mode.

The control center is the communication junction where all lines join together. Gigabit modular managed Ethernet switches aggregate all star topologies in a redundant ring topology and link them to the control center's LAN. With a ring topology, the network recovery time can be reduced dramatically, ensuring safe operation. For example, Moxa's Turbo Ring is a proprietary self-healing technology that enables fast fault recovery of less than 20 ms (at a load of 250 switches).

Moxa's range of networking solutions is the right choice when it comes to devices and installations that are sufficient for the critical automation system behind an ITS. 

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Portable ALPR for data collection

Better and more detailed traffic data results in better engineering decisions – it's that simple. Complexity usually enters the picture at about the same time as budget discussions.

The unfortunate reality is that most traffic-improvement projects are forced to rely on a ratio of quality data versus the cost of acquisition. When increasingly complex data such as license plates is required, the gap widens even more. Manual data collection and ALPR cameras can be used, but a great deal of time and training are required for both, and most ALPR cameras are permanently installed and have high initial setup costs.

The gap between quality and cost is being addressed by companies such as Miovision Technologies. The company is using video data collection to bridge that gap and bring high-quality data to collectors at a

i | Need to know?

Why Scout is set to become one of the industry's most versatile and accurate VCUs for data collection

- > Small enough to fit into a car, Scout can be deployed by one person in less than 10 minutes
- > 5.6in LCD screen and easy-to-navigate menus make scheduling your recordings easier than ever
- > Can be set up securely against almost any street furniture to collect video for all your traffic studies. Tripod Add-On permits use where no street furniture is available



READER ENQUIRY NO. 504

(Left) Miovision's Scout camera
(Below left) The portable unit is pole-mounted



low cost and with minimal time involvement. Video is an ideal medium for use in data collection as it can provide a vast amount of data, yet is relatively inexpensive to collect.

One of the company's most recent projects has been to expand the applications of ALPR technology with a new line of temporary-install, portable cameras designed to collect video for ALPR studies, gap studies, and volume counts. The main aim of Miovision's portable system is to simplify camera installation while keeping the capital cost and operational costs low.

New to market

In June 2011 Miovision began shipping a new ALPR-capable

video collection unit called Scout, an upgrade to its previous unit. Scout is a non-intrusive camera and DVR unit designed to collect plates at a single index point, or to be set up in a network to capture plates and vehicle classifications for origin-destination (O-D) studies, travel-time studies, parking studies, and license plate reports.

Travel-time studies and O-D studies are useful to define travel behavior and travel patterns within an area by time of day and mode of travel.

Typical O-D studies and travel-time studies, however, are resource heavy and require a great deal of time and training to collect the data. Many O-D studies are achieved through tag-on methods or manual license plate transcription on-site or from recorded video – methods that are susceptible to human error without any audit trail to verify data.

Bluetooth data collection is a well-known alternative to manual O-D and travel-time studies and can be effective. However, the dataset produced is incomplete when compared with more sophisticated ALPR technology, which produces a more complete dataset.

Miovision's portable ALPR system aims to solve these problems while lessening the load on human resources and mitigating human error. Replacing tag-on methods, floating car techniques, and Bluetooth sampling with time-stamped license plate recordings produces irrefutable datasets with a corresponding video record to observe traffic patterns and behavior.

If this type of method sounds familiar, it's because Miovision has been doing the same type of roadside automation of traffic data collection and reporting at intersections, roundabouts, and road segments since 2007. Being the end-to-end hardware and software designer, developer, and manufacturer gives the company a competitive edge to identify emerging traffic data collection needs and respond to customer requests with feature-rich products that simplify complex data collection. ○

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Cameras designed for next-generation traffic applications

The demand for lower system costs is a growing and widely acknowledged trend in the ITS industry. The challenge this presents for system designers – particularly those developing automatic license plate recognition (ALPR) solutions – is to meet this demand for reduced cost without sacrificing overall performance, robustness, or accuracy. In many cases, simply maintaining current performance isn't enough. The requirement for reduced cost is often paired with other improvements such as better image quality or higher processing rates. To meet these needs, designers are increasingly looking toward experts involved in machine vision to provide the cameras necessary to build the next-generation of low-cost, high-performance ALPR systems.

To understand how machine vision cameras can be used in ALPR systems, it is important to first understand some of the basic requirements of machine vision. Such applications typically require high-quality images with little noise and no distortion, fast frame rates (typically 30fps or more), and short millisecond-long exposure times that minimize motion blur. Most machine vision cameras must also be able to interface with a light source, such as a set of LEDs, using a built-in general purpose I/O (GPIO) connector. To read the barcode on a bottle of pharmaceuticals that is being conveyed along a factory line at high speed, for example, a machine vision camera needs to be able to capture a clear, properly illuminated image of the barcode – frozen in time – that vision software can process and decode. These imaging



(Left and below right) The BeagleBoard is a USB-powered computer that easily connects to Chameleon cameras (Below left) Access control is one example of an ALPR application

Need to know?

Ideal cameras for demanding imaging applications in the advanced traffic management market

- > Understanding the requirements for machine vision applications – and how these are remarkably similar to those for ITS
- > How machine vision cameras provide superior image quality
- > The merits of CCDs and CMOS sensors
- > The trend for greater functionality on the camera side is set to increase when the next generation of ALPR systems are created
- > How the rack-mounted industrial PCs used in systems today will gradually be replaced by low-cost embedded systems



requirements are remarkably similar to those for reading a license plate or capturing a driver's face.

A matter of quality

The image quality provided by traditional solutions – either inexpensive CCTV security cameras or digital consumer cameras – is no longer sufficient for many applications. To address this, ALPR system designers are increasingly looking toward machine vision cameras that use CCD image sensors, such as the Chameleon from Point Grey. CCDs are known for their low noise, superior dynamic range and high sensitivity. They also use



an electronic global shutter, which is critical in avoiding the distortion that can occur when using a rolling shutter sensor to capture images of fast-moving objects. In addition to CCD, there are a significant number of new CMOS offerings, many of which incorporate global shutter technology, perform at levels approaching those of CCDs, and cost significantly less. CMOS sensors aren't susceptible to smear either, which is often a problem when capturing images of a vehicle with its headlights on.

Next-generation systems are looking to push as much functionality into the camera as possible in an effort to reduce

overall system cost and minimize complexity. ALPR applications often require a flash or strobe light to illuminate the scene, the license plate, and/or the driver's face. In traditional systems an external hardware controller might handle this, triggering the flash via a hardware signal. Cameras such as the Chameleon, however, can send an electrical trigger signal to the light source over its GPIO interface, accurately synchronizing illumination and image exposure. Similarly, basic image processing functions such as white balance, sharpening, and gamma-correction are increasingly being supported by the camera rather than software.

Machine vision cameras have a part to play in reducing other system costs, with the host computer being an integral part of any intelligent traffic system. Most ITS solutions today use a PC – often rack-mounted industrial versions – but many are looking to a future where low-cost embedded systems are more common. The BeagleBoard is a USB-powered, low-cost, fanless single board computer that integrates an ARM-based OMAP processor, DVI output to connect to a display monitor, and a 10/100 Ethernet interface. A Chameleon camera can easily connect via USB 2.0 to a BeagleBoard, running Linux and Point Grey's FlyCapture software, to form a powerful image-processing system that can be constructed at low cost.

With thousands of units deployed in parking gate control and toll collection applications throughout Asia and Europe, low-cost, high-performance cameras such as the Chameleon serve as proof that cameras designed for machine vision applications will play an important part in the next generation of ALPR systems. ○



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Do Smart Cars allow us to have dumb roads? As silly as this may seem, I pose it as a serious question. Raging arguments on the state and financing of our roads occur all around the world. There are debates over national debts; there are debates over the specter (and in some countries the reality) of increased privatization and tolling; moreover, there are debates over policies and schemes to increase fuel taxes or impose time-of-day-, mileage-, and location-based road user fees.

I am resolutely a technologist, so all this is dull background. So let's bring it to the foreground. It is interesting to consider whether smarter cars can enable some of these policies, particularly when we consider the declining state of the infrastructure in many nations, to include mine (a fact translated very poignantly and on a near-daily basis to the suspension of my car).

Let's start by assuming dynamic pricing schemes to tax and control how many and when drivers use our roads. Sure, smart cars could be part of this. The "smarts" would be in relatively low fidelity geolocation capabilities, which would mean provision of a rudimentary GNSS solution, a map with dynamic attributes such as pricing as a function of time or space and a means to place the location of the car, these dynamic

attributes and a map. Easy. But what if the road was truly dumb, such that the dynamic attributes are not locally available? That is not a problem, because this scheme could be enacted in the virtual cloud, far from the road. And if there was no cloud? Then how would authorities transact payments? Road maintenance could rapidly decline. Conclusion: smart cars need a minimal amount of road intelligence, even if that intelligence is deep in the cloud.

OK, let's progress to the all-important topic of safety. If traffic signals are not operational, well, we could all be British and have roundabouts; however, except in Great Britain, that would cause major reinvestment. But there are technology visions where intersections communicate with cars. If intelligent and communicating intersections were not in the offing (because roads are dumb), could cars communicate and collaborate amongst themselves to "reserve" slots at intersections? While interesting, this would require 100% market penetration and 100% reliability as well. I submit that this combination is highly improbable. I submit also that I would not want to be a pedestrian in this world. Indeed, safety considerations predicate some intelligence in the road. Politicians beware: you cannot cut road financing to this extent.

Now, let's assume the completely degenerate state where in the name of deficit reduction or some other sacred political cows, there exists a world of fallen bridges and pavement deterioration that render driving as we know it impossible. In this (near?) future, a car would have to be incredibly smart. And there is a movement afoot for smart, path-planning robotic cars. This may be a solution. Oxen-driven carts would also work.

This columnist's final conclusion: very dumb roads would require very smart cars, plus well-fed politicians and other well-fed working animals.

There is a movement afoot for smart, path-planning robotic cars. This may be a solution. Oxen-driven carts would also work

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The interoperability conundrum

READER
ENQUIRY
NO.
506

Whether you're a road user or a road operator, all stakeholders welcome faster expressway network development and the introduction of new tolling technologies. But such trends raise challenges, not least in terms of interoperability management to provide easier-to-use services for customers. As an organization with a broad overview of the market, C-S Communication & Systems is well placed to address the issue of the future of interoperability.

Peer-to-peer models

With traditional toll plazas, precisely where your customers were from was neither here nor there; they just paid their tolls and continued on with their journeys. With the advent of ETC technologies a decade or so ago, however, concessionaires have been confronted with a new business model from an operational standpoint – the problem of billing non-registered users from other states or other concession



(Above) Schemes such as E-ZPass are the first step to US interoperability (Left) The advent of ETC to replace cash booths has presented concessionaires with an entirely new business model

networks. In free-flow conditions, it becomes particularly problematic when customers venture outside an area if there is no agreement in place between concessions, while operators may also find recovering unidentified ETC transactions from other concessions difficult. The only solution to collecting the missing payments remains to ask the operator owning the user account (peer-to-peer model) or to use a centralized system (interoperability hub) that manages all ETC transactions in the interoperable area. Peer-to-peer models were essentially the first step on the road to interoperability and have raised a real and contracted cooperation between operators, which from time

to time are even competitors. On the other hand, the interoperability hub is a global effort of cooperation to recover payments due as well as to provide a framework for adding other services.

French operators, for instance, once worked under a simple peer-to-peer model by asking other toll system operators if they could identify all their transactions, which would subsequently be reciprocated with the unidentified transactions in their equivalent system.

The Association of French Motorway Companies is mandated to create and monitor these peer-to-peer contracts between French toll operators. This information exchange works but is still limited and



does not support new features such as account management, information consolidation and other value-added services. Not only that, what happens if the number of operators increases? Exchanges, reconciliations of transactions, and collections of invoices will all be exponentially more complex.

The US picture

Interoperability in North America is a major issue and all the stakeholders involved understand that it is not only a technology issue. Whatever the tag technology in use in a US state, drivers should be charged anywhere, although this is not yet the case. The ATI project (Alliance for Toll Interoperability) is the first step toward gaining an

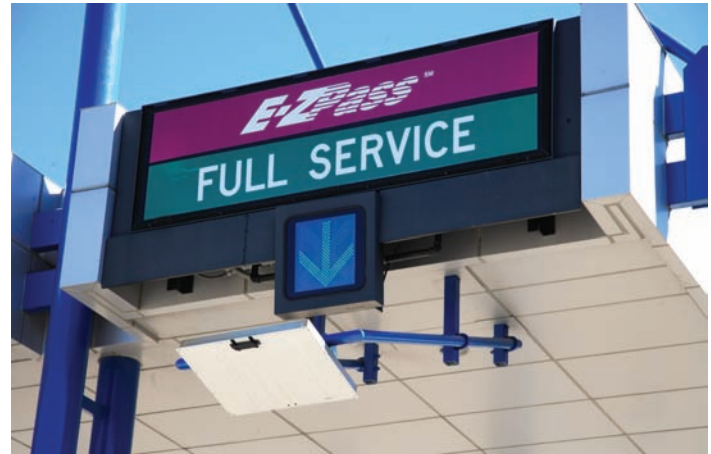
i | Need to know?

How an interoperability hub could resolve some of the headaches of a traditional peer-to-peer model for toll system management

- > The management solution to issues with interoperable toll networks in the USA and Europe
- > Open platform with the capability to embrace other value-added services
- > Resolves problems associated with the complex process of recovering all the payments due to each operator and to the different service providers

interoperability platform that allows for the exchange of information, account data, and other valuable services with a full recovery between the toll networks and interstate, especially with the fast-growing development of ORT lanes. At this time, interoperability does not exist in most of the country.

New offers of additional services for road users are on the horizon, including emergency calling, contactless cards used to pay for petrol and parking, etc. These applications would use the same device or OBU for toll payment that was distributed by the toll service provider. For this reason, a real distinction between toll charger and toll service provider is beneficial. In the past, the operator performed both roles. CS offers a hub interoperability system able to interact with the toll service provider and all of the toll chargers.



(Above) ETC interoperable free-flow toll gantries on the M50 ringroad in Dublin, Ireland

If someone uses a tag in another road network serviced by a different provider, then the toll collector needs reconciliation with the toll service provider. A prime example of where this happens well is in Portugal, where every operator needs to work with one toll service provider. The Portuguese toll service, Via Verde, provides tag owners with one OBU that can be used to pay for parking, gas stations, access control and even fast food. So, in this case, every toll charger now deals with Via Verde (the toll service provider) to identify the tag owners, and it has opened the door to new services based on the tag as payment and supports the business model.

The EETS model

The European initiative EETS (European Electronic Toll Services) uses this business model. The ultimate aim of EETS is one OBU, one contract, and one statement. On the technological side, all antennae in Europe need to be EETS-compatible. This means that every antenna must have the capability to read any tag and once a tag is read, the operator then needs to find the right tag owner – which is where the interoperability hub comes in.

This is a step that for the first time will allow trucks to go anywhere from east to west through Europe with one tag. Within a few years, EETS' interoperability plan will expand to cover light vehicles, so a European interoperability hub would certainly address some of the issues associated with the complex process of recovering all the payments due to each operator and to the different service providers.

Hence why the hub will certainly be an essential system to manage these EETS transactions. It means that one central system would be used to reconcile all the transactions of customers who use a single tag to pay for various services from different providers. The operator will improve leakage recovery and the customer benefits from receiving only one invoice. ○

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On the pulse with high-resolution imaging

READER ENQUIRY NO. 507

In situations where ALPR providers require a supplementary light source to extend the working range of a system or where ITS system providers are imaging license plates that are non-reflective/difficult to image due to the color of the text or background, the VTR2 LED strobe lights from Gardasoft prove ideal.

Slovenia's Iskra Sistemi has been using the VTR2 strobe lights to create an innovative solution to open road tolling. The country's motorway users currently pay for road use by purchasing a sticker known as a vigneta, which is mounted onto the inside of the vehicle windshield. The vigneta can be valid for seven days, one month, or a year, depending on the type purchased.

Up until now, checking the validity of the vigneta has been a purely manual process, with the issuing authorities benefiting from five mobile teams who set up road checks around the country for a period of around three hours at a time. They filter the motorway traffic down to a single lane and then manually check each vehicle as it passes through. But Iskra Sistemi has now developed a fully automated solution to not only read the license plate of the vehicle but also check the validity of the vigneta.

Measuring 80 x 55mm, this proof of payment for road use can be located anywhere on the windshield. Its orientation can

| Need to know?

VTR2 high-power infrared LED strobe lights for intelligent traffic-monitoring applications

- > Designed to offer the growing ALPR market an OEM LED strobed illumination source
- > A range of wavelengths and various beam angles mean the lights can be configured to meet the spectral needs of the imaging system
- > Fast repetition rate for high frame rates, and IP66 enclosure for outdoor installation
- > VTR2 is proving integral to the vigneta validation system on Slovenia's motorways

vary as well (sideways or upside down, for example), which poses a hurdle to overcome. A further technical challenge is that multiple vignetas may be present on the windshield if out-of-date vignetas have not been removed.

Automatically analyzed

To resolve these issues, Iskra Sistemi employs a single high-resolution 11MB camera to capture a single image of the entire vehicle and its license



Photograph courtesy of Iskra Sistemi

The VTR2 strobe lights are ideal for demanding ITS applications

plate. The high resolution then allows the image to be automatically analyzed to look for vignetas on the windshield. Once located, these are checked for validity.

With vignetas valid for one month or one year, it is necessary to read the 8mm-high text on the vigneta. But vignetas that are valid for only seven days offer more of a challenge. The start date is dictated by 5mm-diameter holes punched in the vigneta.

As already stated, imaging such intricate details through the windshield of vehicles typically traveling at +100km/h requires camera technology with a high-resolution sensor. In conjunction with exposure times of around 1ms to 'freeze' the vehicle image, a very high-intensity light source is also a prerequisite to enable sufficient image quality so that the vigneta can be analyzed, especially during hours of darkness.

Iskra is using the VTR lights to help capture high quality vigneta, vehicle and license plate images

Images courtesy of Normatcom





Photograph courtesy of Iskra Sistem

Example of the windshield-mounted vigneta in use in Slovenia

Iskra Sistemi tested various light sources to try and provide sufficient illumination for the high-resolution imaging. Gardasoft VTR2 850nm lights were selected because they offer the most intense source of light, combined with a high degree of control and flexibility. Using the latest LED technology coupled with the company's proprietary control technology, the pulse-to-pulse light output is extremely stable and repeatable, which ensures that each acquired image is of optimum quality to enable all vignetas to be captured and analyzed.

Improved operations

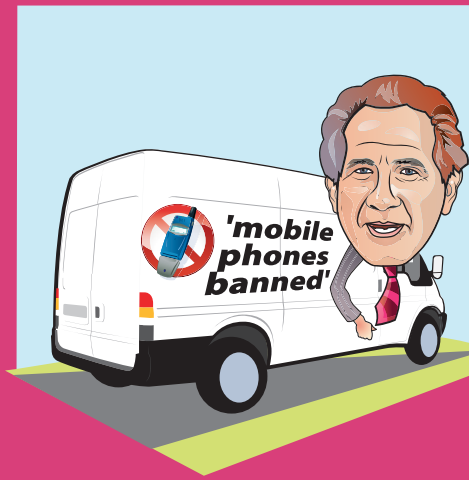
With the system now operational, checking the validity of vignetas is no longer a manual process which, in the past, restricted the flow of traffic at mobile checkpoints. Moreover, vehicles can now be checked 24 hours a day, seven days a week – instead of being limited to a period of around three hours when the mobile team was deployed.

The next phase of the project is to roll out the technology to other parts of Slovenia, as well as nations elsewhere that deploy similar schemes, including Switzerland, Austria, Bulgaria and the Czech Republic. ○



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Driver distraction is an important risk factor for road traffic injuries. There are different types of driver distraction: internal to the vehicle, such as tuning a radio, or using a cell phone, and those external to the vehicle, including looking at billboards or watching people on the side of the road. However, legislation across the world mainly focuses on the use of cell phones – with hands-free being permitted in many countries. A recent WHO report suggests that handheld phones are commonly used by up to 11% of drivers.

It is well known that using cell phones can cause drivers to take their eyes off the road, their hands off the steering wheel, and, more significantly, their minds off the job of driving a vehicle safely. However, a recent TRL report shows that even hands-free technologies impair drivers to the same level as the current UK drink-drive limit. This 'cognitive distraction' can impair performance in a number of ways: longer reaction times, impaired ability to keep in the correct lane, shorter following distances, and an overall reduction in awareness of the driving situation. Using a cell phone for text messaging while at the wheel seems to have a particularly detrimental impact on driving behavior. The WHO report suggests that young drivers are more likely to use a cell phone while driving than older drivers, and are particularly vulnerable to the effects of distraction

“ | Adrian Walsh

given their relative inexperience behind the wheel.

Many businesses now ban all cell phone use, regardless of whether it is hands-free or hand-held. One such company is 3M, a champion of the UK's Driving for Better Business campaign. It was one of the first companies to introduce a complete cell phone ban, impacting all of its 3,500 UK employees including 800 company car users. The ban was introduced with little enthusiasm from employees, with just 19% supporting the prohibition. Since then, however, support for the ban – which is reinforced through regular communications – has greatly increased.

A recent 3M survey showed that in July 2008, 56% felt negatively toward the ban; that figure has reduced to just 35% feeling negative, and the percentage feeling positive stands at 38%. With 95% of respondents saying they observe the ban 'most or all of the time', the new rule has also influenced employees' use of their personal cell phones while driving. Although 37% never did use a cell phone while driving, 48% have either stopped doing so or have reduced their use. Just 15% of respondents continue to use their personal phone while driving, as they did before the ban, according to the survey.

It is a hard message to get across, but the 3M program shows that companies can make a difference. 3M and others have gone even further – they make a strong business case for good management of those who drive for work.

“ It is a hard message to get across, but the 3M program shows that companies can make a difference. 3M and others have gone even further – they make a strong business case for good management of those who drive for work

Adrian Walsh, director, Roadsafe, UK

Versatile digital enforcement system

Having identified in the early 1960s that piezo-electric sensor technology could be utilized for highly accurate speed measurement, Jo Gebert set up Truvelo in 1966 to exploit the discovery commercially.

Today the company's products include the D-Cam family. This range comprises digital speed and/or red light cameras that utilize various speed-measuring sensor technologies. Versatile and cost effective, the D-Cam is a dual-capability speed-only or speed/red-light camera, capable of providing front or rear speed enforcement using a single image, and red-light enforcement by means of two images. Up to four traffic lanes can be covered, depending on the sensor technology used for speed measurement. All this is achieved with just one color megapixel camera.

The system can be moved from site to site as required, and can even be switched from a speed site to a red-light site by virtue of its dual-role capability. It can also store up to 100,000 encrypted and signed images on its internal hard drive. There is no roadside cabinet containing vulnerable electronics. Images are sent to the back office via an ADSL line or via a 3G/HSDPA connection. Where necessary, such as upon failure of the ADSL line, images can be retrieved from site onto a laptop. One back-office server handles 30 D-Cams as standard but can be scaled up for larger projects.

The system uses a unique patented secondary speed-verification method whereby the primary speed measurement can be verified using a single image instead of the traditional two images. The vehicle is photographed always in the

| Need to know?

Nearly 50 years of expertise in speed and red-light enforcement have gone into the new D-Cam, which has many unique features

- > Images taken with D-Cam provide authorities with all the necessary information for prosecution purposes
- > Exceeds the most stringent standards of data security by providing authorities with tamper-safe electronic signatures and data encryption
- > Through optimum use of current networking technology, D-Cam has simplified system setup and downloading of data
- > Constant vehicle photo position simplifies setup on-site, and speed verification tasks in the back office

same position and recorded over visible verification markers together with time and distance data imprinted onto the single picture. All required evidence for independent secondary speed verification is captured on this single image, which greatly reduces back-office image validation and processing times.

Better connected

D-Cam can also be connected to a variety of different sensors, identified by the product's name. D-Cam P, for instance, uses piezo sensors for lane-specific speed measurement and red-light applications, together with vehicle classification, whereas D-Cam I utilizes



(Above) A stationary unit in situ (Left) One image captures all the evidence needed for verifying driving offenses

inductive loops for lane-specific speed and/or red light applications together with vehicle classification. Non-intrusive, lane-specific lasers are used for speed and/or red-light applications without vehicle classification in the D-Cam L product, while D-Cam R uses a non-intrusive, multi-lane, multi-target, digital tracking radar for speed and/or red-light applications together with vehicle classification.

Easily deployed in a mobile situation by mounting on a tripod at the roadside, D-Cam can also be operated from inside a suitable vehicle. Such flexibility maximizes operators' use of the investment. Again

there is a choice of sensors, which dictates the name. D-Cam MP uses temporary installed piezo sensors for speed and/or red-light applications without vehicle classification, while D-Cam ML uses non-intrusive, single-lane laser for speed applications without vehicle classification. The D-Cam MR uses a non-intrusive, multi-lane, multi-target, digital tracking radar for speed applications with vehicle classification.

If speed and red-light enforcement equipment is permanently installed at sites with high accident rates, statistics have proved that the occurrence and severity of accidents is reduced. Once the



The front of two different versions of the D-Cam system

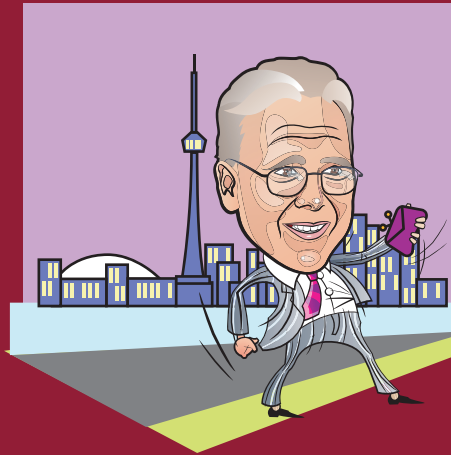
desired results are obtained, the equipment can be removed from its permanent location and reinstalled at another site.

Truvelo Manufacturers has successfully installed 84 D-Cam systems within southern Africa, and is currently in the process of installing the last 13 of 25 systems in the eThekweni Metro in Kwazulu Natal, where during a nine-day trial run conducted at an intersection, 581 red-light violators and 4,113 speeding motorists were caught. The cameras are being installed at intersections notorious for accidents, where speeding and driving through red lights is the major cause of accidents.

Truvelo has recently been awarded another contract for 10 permanent D-Cams and four mobile cameras in another large municipality in South Africa to begin in September 2011. ○

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The Greater Toronto Area has experienced a noticeable increase in all-day conferences and hefty consulting reports about road pricing and infrastructure funding. A decade ago it was once every few years. Now it's monthly. Each of these conferences and reports carries the same message: our transportation infrastructure is inadequate, crowded, and crumbling. And our purse is empty. Although this is true of large cities, more often than not Toronto has it worse than many – its population is growing especially rapidly and we have not invested at the rate we should have over the past quarter century.

A June 2011 report from the Toronto Board of Trade points out that the full bill to refurbish and operate transportation infrastructure in the GTA over the next 25 years – US\$100 billion, before overruns – is a figure 22% greater than the combined cost of the Big Dig, the Channel Tunnel, and the Three Gorges Dam.

This same report identified several 'funding tools', the top five of which were road pricing, congestion pricing, fuel tax, regional sales tax, and parking surcharges. These lean heavily toward fees on automotive use, although the rebuild is heavily transit-oriented. The report suggests that these could raise US\$1

billion per year – or about half the capital expense required for the 25-year plan.

There are important differences among the five tools listed. The most effective for managing gridlock is congestion pricing; the least effective is the sales tax. Congestion pricing is politically the most incendiary; the least controversial is probably sales taxes or parking surcharges. But the biggest issue is fairness. Congestion or road pricing are often said to be unfair to lower-income families. But is road pricing worse than a sales tax for poorer families?

This problem was looked at recently by Lisa Schweitzer from USC and Brian Taylor from UCLA (Access, spring 2011), albeit in the context of pure road funding. As we choose among funding tools, we should weigh their observations.

As a funding mechanism, sales taxes are collected pennies at a time and hidden in many transactions, making it virtually impossible to see what one is paying for roads. Sales taxes make the poorest households worse off, because the people in these households are paying something while driving little – certainly much less than people from richer households. This makes increasing regional sales taxes to fund roads doubly regressive.

Road use fees, which can be made fully transparent, take money from only those that use the roads – i.e. mostly middle- and higher-income families. Schweitzer and Taylor found that switching from tolls to sales taxes shifts the burden from users to non-users and away from middle-income people onto both the rich and the poor – i.e. road tolls are better than sales taxes for the lowest-income families (although they increase pre-existing access barriers).

How any of us pay for good urban transportation is a very complex social issue – hence the burgeoning industry in conferences and consultant reports, and the dearth of workable solutions.

As a funding mechanism, sales taxes are collected pennies at a time and hidden in many transactions, making it virtually impossible to see what one is paying for roads

Bern Grush, principal, Bern Grush Associates, Canada

Moving the pole to position

READER ENQUIRY NO. 509

The need to provide more information to road users has increased the deployment of variable message signs (VMS) and advanced motorway indicators (AMI) on the road network. Along with the deployment of these signs has come a need for maintenance. This typically involves lane closure and the use of cherry pickers, with operational costs per sign running into several thousands of pounds per year. Add to that the risks of working at height and disruption to the traveling public and it is evident that the current scenario has much room for improvement.

Maintenance costs can be more significant than capital costs to national road agencies. Anything that can be done to reduce ongoing costs allows further investment in other parts of the infrastructure. With the human and financial costs of injuries to roadside operatives already too high, further reduction of risk is a major benefit.

In 2010, a solution that provided reduced costs of operation, reduced risk to operatives and the potential to limit road user disruption was implemented on the M4 VSL scheme in South Wales. The idea was to make the sign available to the operative by bringing it into a safe working area accessible from ground level.

To deliver on this idea, Crown International developed the VMC Pole – a wind-up/wind-down cantilever pole that can be used for mounting VMS, CCTV, speed-monitoring equipment and other traffic management apparatus. The solution enables the pole to be swung into a safe working area off-road and allows equipment mounted on the pole arm to be lowered to a safe working height.

Mark Stacey, Crown's MD, says: "Often technology is seen

too much in terms of electronics – bits and bytes, if you will. However, there are real benefits to be found through focusing on the operation of basic hardware itself through changing the paradigm. The same thinking went into the gantry solution we delivered to Network Rail."

Mounted off-carriageway, a single operative can attend site, access the pole and having unlocked the safety handles, wind the pole round away from carriageway and then lower the sign. In operation it is expected that this will take around two minutes. It is projected that the operative is on-site no longer than 15 minutes for routine maintenance, removing the need for traffic control measures, which again reduces the risk to roadside operatives and traveler disruption.

Having produced a solution that reduces lifetime costs, it is important that the solution itself does not add additional maintenance costs. Using sealed-for-life, self-lubricating components wherever needed, and degreasing and regreasing some components in higher specification grease has achieved this. Visual check and

Need to know?

The VMC pole offers safer access, less disruption and lower costs

- > A revenue-saving venture of potential millions, already implemented by the Welsh Assembly
- > The inbuilt safety features remove the risk of it being inadvertently lowered over the carriageway
- > Zero exposure of work force to a live carriageway by eliminating the need for traffic control measures



The VMC Pole helps with an array of traffic management tasks

occasional greasing is all that is required under normal conditions. These operations can be performed while visiting the site to perform scheduled maintenance on the sign.

Assessing the benefits

Cost-benefit analysis is favorable, with returns on investment versus existing mounting structures showing positive returns after five years (based on independent analysis).

As part of the M4 VSL scheme, the VMC Pole helped deliver a project for a fraction of the cost of a similar sized project using more traditional technology. The scheme is expected to save the Welsh Assembly Government £40 million (US\$65 million) over a 30-year life.

Stacey believes that there are key opportunities being missed in the way we think about highway design. He explains: "Every time I drive past a large gantry with its array of multiple signs, I wonder why we need to tell drivers in all four lanes the same speed information. I

know we could achieve similar information provision with a single roadside post, such as the VMC. This would dramatically cut the cost of capital but also ongoing maintenance costs across road networks. The potential savings are in the tens of millions. We already have the VMC design being scaled up to mount larger signs or span multiple carriageways. Equally, a lightweight version principally for surveillance equipment can be made available.

"We are planning for further implementations as we see particular relevance to managed motorways schemes and also to major trunk roads. Both will need highways to remain open as much as possible. The VMC provides the ideal solution," he concludes. ○

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Certification for speed enforcement success

Speed enforcement has long been a contentious issue. Although sections of the public consider speed cameras merely as revenue-raising tools, many studies show that fatalities drop at locations where speed cameras are installed. Yet governments seem to be on the back foot justifying these programs due to the hysteria whipped up by either the media or opposition political parties. Currently, the two largest states in Australia have their respective Auditor Generals investigating their speed enforcement programs due to public pressure and politicking.

So what can governments or jurisdictions do when confronted by the media or opposition political parties? The first step is to ensure confidence in the speed enforcement program and the technology in use. This can be achieved with an independent certification program that includes laboratory testing against the manufacturer's specifications or standards, site acceptance testing and a rigorous routine verification program.

The role of annual laboratory certification in this testing program can be underestimated and the reasons for certifying a device after it has been decommissioned can be overlooked. Laboratory testing provides a controlled environment that allows a trained calibration engineer to put the device through its paces using equipment such as spectrum analyzers, radio anechoic chambers, and laser delay generators. This leads to scientific results that are both repeatable and traceable to international standards.

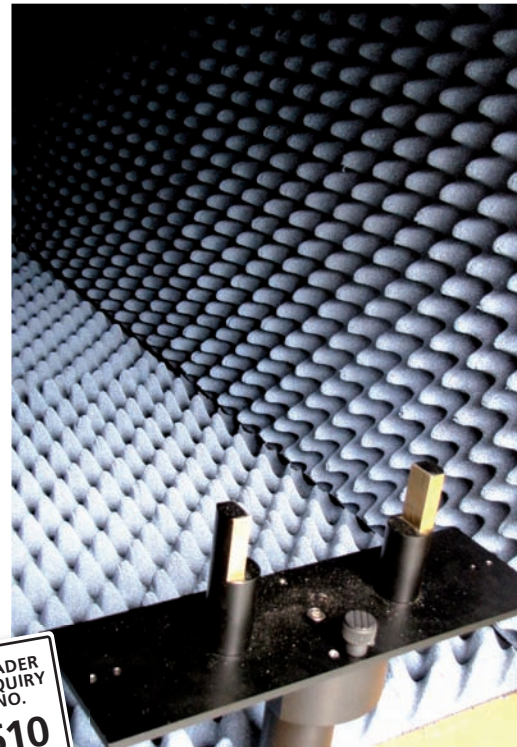
The critical starting point for jurisdictions is to select a laboratory that is independent of both the device manufacturer and the jurisdiction authority or government. The next step is

to confirm that the laboratory has ISO/IEC 17025 accreditation.

The ISO/IEC 17025 standard assesses the competencies of technical personnel, effectiveness of the quality management system, and that test methods are validated, proficiency-tested against other laboratories, and are fit for purpose. Knowing that accreditation has been bestowed by a specialist technical assessor is a major step for ensuring governments feel confident about their programs.

Consumer confidence

Once a laboratory has been short-listed, it is time to confirm its scope of accreditation: does it cover the specific areas of testing required, does the reported uncertainty of measurement meet the needs of the jurisdiction, and does the laboratory have signatory status in the required areas? The final step before selection is to visit the laboratory and go through its testing regime first hand. Building up a relationship



SGS has established its laboratory as a Center of Excellence

with lab personnel is beneficial toward an enforcement program's success. The laboratory will be able to offer more than just reported results. It can help investigate future technologies, application issues of specific devices, and give information on trends such as frequency drift or a radar's power deterioration over time.

So why is this certification a must? Only in a lab environment can you investigate and measure power levels accurately, confirm that the critical transmission lobe position of a mobile radar antenna is correct, simulate vehicle speeds to a high degree of accuracy, and confirm that the device is in good electrical condition. This is only a sample of what can be performed in a lab, yet it is what gives jurisdictions the confidence to confront the media and defuse the misinformation with scientific evidence.

By using an independent, accredited lab, governments can rest assured that the technology is sound and the results are accurate, allowing them to focus on political, not technical issues.

Taking a global perspective and to assist its clients further, SGS has established its laboratory as a Center of Excellence for speed enforcement equipment within the SGS group. It is accredited and holds signatory status in the four speed measurement technologies: radar, lidar, inductive loop, and piezo. This allows SGS to be at the forefront of R&D through a worldwide collaborative information exchange program. ○

i | Need to know?

Speed enforcement programs: why annual laboratory certification is an absolute must

- > The importance of accuracy and reliability of technology as a basis for improving confidence in the enforcement program in place
- > Governments are bowing to external pressure, which is not necessarily in the best interest of the public
- > Rigorous testing necessary to dispel public fears fanned through media speculation

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Safe operations in Croatian tunnels

The Zagreb-to-Macelj motorway is part of Croatia's Pyrenean road route. Known locally as the A2, among European routes it is classified as 'E-59' and connects the northern and central parts of Europe with its south-eastern section. Stretching from the Jankomir interchange (part of the Zagreb ring road) up to the Trakošćan interchange (Slovenian border crossing at Macelj), the 60km-long motorway is divided into three pieces, from south to north: Zagreb (Jankomir interchange) to Zaprešić (7.4km); Zaprešić to Krapina (34.7km); and Krapina to Macelj (17.9km).

The longest part of the motorway passes through a flat region while the section from Krapina to Macelj passes through a mountainous area. The Krapina-to-Macelj section consists of two new interchanges (Đurmanec and Trakošćan) with two toll stations, six tunnels and nine viaducts, all of which were constructed between 2005 and 2007 before opening to traffic in May 2007.

Infrastructure on this section including viaducts, bridges and tunnels represents 32% of the total length. A 3.7km-long stretch was built with one carriageway for bi-directional traffic and features two tunnels and three viaducts. Infrastructure on this bi-direction 'half motorway' comprises 82% of the total subsection length.

Ownership

Autocesta Zagreb-Macelj has been the concession company managing the motorway since 2004, having been awarded the contract by the Republic of Croatia. The Zagreb-to-Macelj motorway is a typical example of a public-private partnership (PPP) infrastructure project, with Strabag in this case acting as the private partner and



project sponsor and the Republic of Croatia as the public partner.

The concession company contracted with Transroute International (today Egis Road Operation) for the operation and maintenance services. Egis is responsible for motorway operation, including toll collection and routine maintenance, while the concession company is tasked with heavy maintenance, including resurfacing (approximately every eight to nine years) improvements, replacements and construction repairs. The Republic of Croatia remains in charge of maintenance of parallel roads, overpasses and underpasses.

Tunnels on the Zagreb-to-Macelj motorway have been in use since May 2007. Here, maintenance works is divided into works on a tunnel itself and



(Main) The TCR watches over the tunnel 24-hours a day (Left) The evacuation gallery

works on the tunnel equipment. Work on tunnels includes tunnel inspection, tunnel cleaning, and construction maintenance of the tunnel. Inspections are conducted periodically (seasonal and annual), while there are also general tunnel inspections, as well as extraordinary inspections. Periodical inspections include the visual

inspection of the tunnel, while seasonal inspections are conducted after the winter and summer season (prior to and after the tourist period). Seasonal inspections evaluate the traffic safety and effectiveness of tunnel equipment, the aim being to recognize certain characteristics that might indicate damage.

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Emergency exits at various locations ensure safe evacuation in case of an incident



i | Need to know?

How traffic management operations are ensuring safer journeys on Croatia's Zagreb-to-Macelj motorway tunnels

- > Analyzing the management of safety and the control of risks
- > Why proper planning and implementation of maintenance work is an essential component of tunnel operations
- > How technology helps to ensure quick and effective responses from tunnel staff and the emergency services in case of a tunnel incident



Supervision and monitoring

Supervision and management of the tunnels is in the main carried out from the traffic control room (TCR) located in the maintenance and operations centre at Krapina (O&MC Krapina). Various technologies in the TCR – manned by two operators 24/7, 365 days a year – provide active control over devices installed in tunnels.

Further supervision is provided through regular daily patrols through the tunnels (nine regular patrols during a 24-hour period). As detailed in the June/July edition of *Traffic Technology International* (p48), a fire brigade is stationed in the O&MC Krapina. Each of these supervisory services, including the fire brigade is designed to work as a team, with special emphasis on coordination

and communication between personnel.

The TCR is fully equipped with the monitoring system and tools that enable complete and permanent surveillance. These include the TCR traffic-monitoring systems and counting stations, RWIS stations, video, CCTV and recording systems, and public address and radio broadcast systems to guide users in the case of an incident in the tunnel. All the systems are centralized by a SCADA system and are located in such a way as to allow unobstructed operation of both TCR operators during incidents.

Two operations personnel always remain in the control room (referred to as 'K1' and 'K2') working in 12-hour shifts. K1 is the shift leader and is responsible for the SCADA system, while K2 works on the traffic system. Both K1 and

K2 are also responsible for monitoring the road through video surveillance, with alternating shifts between the two operators every 30 minutes. The main issues for the operators include managing accidents and congestion (particularly during the tourist season) as well as winter service.

The cameras and video surveillance system ensure visual control of the traffic flow along the interchanges as well as the motorway itself, especially in the tunnels. Some of the cameras are equipped with automatic incident detection for things such as wrong-way driving, stopped vehicles, etc.

Dynamic signalization

The VMS (variable message system) has active portals on the opened sections of the

motorway, which are used to display information to the drivers regarding weather conditions, temperature, incidents, accidents, traffic diversions, roadworks, etc. All of the VMS portals can be controlled and operated both automatically as well as manually. In the automatic mode used for managing portal signalization, information collected from meteorological stations is transferred, analyzed and used so that proper indicators can be displayed on the VMS regarding visibility (fog), humidity, wind and ice conditions. ○

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Safer crossings for Australasia

With rising volumes of vehicle and pedestrian traffic throughout the world's cities, pedestrian safety at signaled crossings has taken on a new dimension.

The latest crossing strategy to be introduced has been termed PUFFIN (Pedestrian User Friendly and INtelligent), and utilizes the latest detection and signaled technologies in the large number of existing installations. The concept is seen as an enhancement of current systems, and in excess of 10,000 facilities have been successfully introduced worldwide.

Research has shown that PUFFIN facilities with pedestrian wait area and on-crossing detection not only reduce delay for vehicles and pedestrians but also greatly reduce accident rates. A recent study showed a 19% reduction in accident rates when existing crossings were converted to a PUFFIN strategy.

The importance of a near-side pedestrian signal cannot be ignored. The signal presentation automatically brings the approaching traffic into the waiting pedestrians' field of view, thereby creating a safer user environment. The signal unit can be adjusted for optimum performance and viewing angle. For awkward locations, the unit can also be supplied with a directional field of view facility to avoid the potential for conflicting signal presentation to the traffic. Usually the near-side signal contains the crossing demand button together with sounder and tactile indicators for those with impaired sight or hearing.

The current pedestrian crossing facilities installed in Australia and New Zealand, however, utilize a separate push button tactile and sounder in a single unit. Such systems

Need to know?

An expert in signaled crossings is improving safety in Australia and New Zealand

- > The PUFFIN strategy has a proven successful track record in reducing accidents and increasing traffic flow efficiency
- > How the latest generation of detectors is enabling existing crossings to be upgraded
- > A company with a long history in the field is now bringing its expertise to New Zealand and Australia

operate on a timed cycle basis with no further pedestrian or vehicle interface. These systems could easily be upgraded to PUFFIN status by incorporating pedestrian near-side signal, wait area, and on-crossing detection units within the existing facility.

In a large number of such crossings, above-ground detection units covering the on-crossing area have already been installed. The function, following phase initiation, is to extend the all-red time until the crossing is clear of pedestrians, reducing this time to a minimum. In contrast, the wait area detector only allows the phase to be initiated provided there are pedestrians waiting to cross. Should the zone be vacated during the request to cross period, the demand is canceled, thereby avoiding unnecessary traffic flow interruption. It is therefore only a small step to introduce a wait area detector and near-side



AGD is bringing the proven PUFFIN strategy to new markets

signal to achieve the full value of the PUFFIN concept.

Configuration challenge

The most difficult technical hurdle is to meet the need for a configurable wait area zone of detection. This is necessary to cover the wait area zone variations dictated by site topography and tactile paving arrangements. It also has to be possible to detect pedestrians in the zone, day and night, in all weathers, and have a very high shadow rejection capability to avoid false detections.

Configuration of the zone of detection is achieved by using a detector with either Livewire connectivity or Bluetooth capability via a palm or similar PC. This facility enables the zone to be set up or adjusted at ground level as required, without the need for patrolling of the zone to define the limits.

This has been a major breakthrough, making it easy to install and commission sites

with a single engineer in a relatively short time.

During September and October of 2011, AGD Systems will be installing an operational PUFFIN demonstration facility at its Dural, Sydney site. This will double as a training facility for application and installation engineers, where methods for achieving optimal performance at various configurations can be demonstrated. Trial sites are being installed in Australia and New Zealand to demonstrate the effectiveness of the system.

AGD has over 10 years' involvement in PUFFIN strategy deployment, and 18 years' experience in detector and signal design and development. ○



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The right approach to weigh-in-motion

Founded in 1995, the Czech company Camea has featured in many Eureka Programme projects, such as the UNICAMNET project on 3D visualization of traffic situations in large environments, and has participated in two large ARTEMIS EU international projects (RECOMP, R3-COP) on embedded computing.

From the beginning the company developed camera systems designed for visual quality inspection in industrial manufacturing processes. The experiences gained in this field were then applied in developing ITS systems. For example, the UnicamD2 unit, with advanced night vision for traffic installations, exploits many technologies used in other industry applications. In 1995 Camea was the first company in the Czech Republic to develop fully automatic systems for red-light violation monitoring and (in 2003) section speed control.

The company has further enhanced its product portfolio by developing an enforcement version of a weigh-in-motion (WIM) system that enables high accuracy weight and speed measurement of vehicles.

This year Camea proudly introduced UnicamWIM, a new type of certified scales system for weighing control of high-speed vehicles. Certificate type approval was issued by the Czech Metrological Institute in May 2011 valid until May 5, 2021, which means it is now possible to fine carriers directly at the place of violation on the basis of data from UnicamWIM without having to outweigh on stationary scales. The checking and outweighing control of a single vehicle previously took an average of one hour. UnicamWIM can now monitor all vehicles in the traffic flow in real-time. Although the enforcement version of the system is legislatively approved

only in the Czech Republic and is waiting for implementation regulation, when this is achieved, the company hopes the Czech Republic will set an example for other countries.

Certifiably good

Camea's Type Approval certificate allows it to install the UnicamWIM system all around the Czech Republic. The law then allows the certified scales to initiate administrative proceedings to prosecute carriers and drivers of overloaded trucks. UnicamWIM automatically takes an image of all overloaded trucks over a specified weight limit.

The high weight of overweight vehicles significantly reduces their maneuverability and they have longer braking distances, producing a danger to other road users as well as the infrastructure itself, and it is the taxpayer who ultimately pays for the subsequent destruction of road surfaces and damage to bridges. Return on investment

Need to know?

The latest advances from a shining light in weigh-in-motion technology

- > How the Czech Republic is providing inspiration to other countries in the rapidly evolving WIM sector
- > New system from an expert in the field
- > The impact of the system receiving Type Approval certification
- > How the technology at the heart of the system creates a solution that is suitable for enforcement



The UnicamWIM system captures all of the parameters needed for enforcement

in WIM is estimated at one to two years.

The UnicamWIM system works 24-hours a day without the need for human operators and its operation is not affected by weather or lighting conditions. The system consists of piezoelectric pressure sensors, inductive loops located directly in the road surface, and recording equipment. The system measures the moving vehicle's individual axle load, total weight and speed. If the weight exceeds the limit, the camera takes a video recording.

The system works as follows: all the sensors are installed in the road pavement with two inductive loops installed one behind the other in each lane. The loops are used for the detection of vehicles (separation, spacing, speed, length and classification). Precise quartz/piezoelectric weighing pressure sensors are installed on the road. Signals generated by the sensors upon their exposure to the vehicle's tires are measured. Weights of all axles are determined, the vehicle's speed

is measured and its gross weight is calculated.

Typically, there are two sensors per one lane installed across the direction of travel. This setup allows independent weighing of individual wheels. The system has also GPS-based precise timing synchronization.

Documentation cameras capture images of the passing vehicle triggered by the WIM sensors. Overview cameras document the entire vehicle by taking a wide-view image from the side. Front or rear (depending on legal restrictions in the country where installed) cameras acquire overloaded vehicles' license plate images, which are processed by ALPR software. The system can be also equipped with VMS displaying the vehicle's actual weight and the weight limit. ○

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Dual-radar speed enforcement

READER
ENQUIRY
NO.
514

The trend for radar-based detection is a worldwide phenomenon in ITS. Speed enforcement in particular is benefiting from the latest advances in radar technology.

Developed for use in fixed camera, vehicle- or tripod-mounted mobile systems, the latest dual-radar system from Redflex offers enhanced capabilities in speed detection compared to traditional single-radar systems.

When a vehicle enters the Doppler radar beam of a traditional single-radar system, the speed is calculated from the frequency change of the radio wave as it bounces back from the moving vehicle. Radio waves bouncing off the target vehicle onto other objects can present detection difficulties and distort the calculation. These interference problems mean that traditional radar systems can only be installed in light traffic applications and in open spaces, to avoid reflection issues from other objects. The limited application of traditional radar wasn't aligned with the users' needs, as police forces still have to be able to enforce in built-up areas with heavier traffic. This need has led to the development of the new system.

Without interference

The dual-radar system eliminates the interference problem as its complex filtering algorithms detect and remove reflections, enabling it to be installed in built-up areas such as inner-city roads and under heavy traffic conditions. The combination of a speed radar and tracking camera software enables the system to enforce multiple vehicles in either direction, improving its effectiveness in comparison to traditional radar and lasers.



Tripod-mounted enforcement systems are a valuable tool in police forces' armory

Dual radar has the ability to track and identify target vehicles in specific lanes, thereby providing independent vehicle speeds. Unlike laser systems that must be mounted low to the ground, meaning vehicles in lanes further away can be blocked by vehicles traveling close to the system, the Redflex system can be mounted higher due to its wide vertical beam, which enables all lanes to be enforced despite blocking

traffic. All radar data for the detected vehicle is saved within the incident file and the data can be analyzed at any time, especially if the result is later questioned. These improvements in lane discrimination and incident accuracy have improved incident detection rates and prosecution comparable with in-road detection methods.

The all-weather capability of system is another advantageous

Need to know?

The latest generation of radar-based speed enforcement systems, offering greater flexibility and accuracy

- > The merits of a dual-radar system compared with single radar systems and laser-based systems
- > Lasers must be set at one height (low to the ground) and the narrowness of the laser beam means that enforceable locations are limited. In contrast, radar gives police forces an almost unlimited choice of locations as its broad vertical beam means it can be set at nearly any height

feature. Unlike scanning laser products, the dual radar is unaffected by conditions such as rain, fog or dusty conditions. This versatility allows police forces around the world a new degree of flexibility in their enforcement programs. Studies have shown the benefits that photo enforcement has to the community; decreased accident rates and severity, along with reduced road trauma costs. The new dual-radar system will contribute to changing the behavior of even more drivers. ○

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A mountain climbed by going under

A new 6.5km urban road tunnel system has been built between Hof HaCarmel, Rupin Interchange and Krayot in Haifa, Israel. It features a traffic management system (TMS) designed by VIA Beratende Ingenieure. The TMS controls: lane control signals, barriers, variable message signs (VMS), interaction with traffic lights on adjacent junctions, interaction with toll plazas, integration of facility management system (FMS), connection to external municipal VMS, and connection to radio station. Design for the MMS control system was also part of the project: this included TMS and FMS in an integrated GUI. Being the first tunnel project of that kind in Israel, VIA also shared its experience for testing and training of operations.

The location of Haifa, around the Carmel Mountain, generated its own problems in the city because all traffic heading north had to pass through Haifa via a small corridor between the coast and the mountain. Consequently this coastal road was usually congested during peak hours.

The Carmel mountain features both residential and commercial districts, including Haifa University, shopping malls, and hotels. Hitherto, these places could only be reached on smaller roads winding up the hill. Therefore the idea to build a tunnel not only through the mountain but also uphill is not new. After a long period of planning and various drawbacks, construction finally started in 2006 as a privately financed BOT (built-operate-transfer) project, and it opened for traffic on December 1, 2010.

The tunnel system consists of four tubes, each with two lanes,



 | Need to know?

An innovative tunnel project in Israel that other countries can use to gather inspiration for their own systems

- > The position of the Carmel mountain pushing southbound traffic toward Tel Aviv along a narrow corridor next to the coast led to congestion
- > The system features four dual-lane tunnels, total length approx 5.5km
- > TMS automatically activates measures for speed harmonization and congestion control
- > Flexible and intuitive management software

and is made up of two sections: two 3.2km-long dual-lane tunnels stretching from the Carmel Beach to the Rupin Junction in the middle of Haifa up the Carmel hills, and a set of 1.65km tunnels with a steep 6% slope from Rupin Junction down to the checkpoint in Krayot. The Rupin interchange with six exits and entries is located near Haifa's Grand Canyon shopping mall in a natural canyon previously used as an illegal landfill site, the removal of which, together with



READER ENQUIRY NO. 515

(Far left) The Rupin Interchange (Left) Inside the tunnel control center

other measures, has reduced the environmental impact of the new junction. There are toll plazas at both ends with both ALPR systems and tag readers, collecting tolls for individual sections used by the driver.

Tunnel equipment follows European guidelines and common practice for tunnel safety with some specific solutions due to Israeli legal and operational framework conditions, such as the use of all-in-one lane control signals, showing both lane control arrows and crosses as well as speeds and warnings. This combination of signs in one display device created the need to completely re-design rules and priorities known from European tunnels.

Technology in operation

Operators at the tunnel control center at Krayot are monitoring the system 24/7. The TMS automatically activates measures for speed harmonization and congestion control. More than 5,000 types of FMS data (for example: fire

alarms, toxic gases, visibility, video detection alarms, congestion alarms) are connected to the TMS for semi-automatic triggering (to be confirmed by the operator) or automatic reactions, including: closures of tunnels, displays on VMS, and messages to toll plazas, municipal traffic control center or Haifa radio. In addition to these pre-defined reactions, which are defined in a matrix according to individual conditions of the various elements, there are special programs that allow the operator to create and activate tailor-made reactions – or save them for later use. But these programs are also automatically checked against any violation of rules and priorities, giving the operator efficient support for a safe reaction at any time. ○

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With less funding available for new schemes and fewer deployments of spot-speed cameras, is there a future for speed enforcement?



A "I personally think that advisory speed limits – as they have in Germany – are a much better solution to managing speed, and in a libertarian world that's the best way to have reasonable speeds. If you want to have a sensible traffic system, you need to educate people and only enforce specific laws if they're really necessary."

Also, evidence has shown that vehicle activated signs (VAS) are effective in reducing speeds, which suggests that speed management, not speed enforcement, is the key to tackling this issue. The key point is that they are a fraction of the cost of speed cameras. The initial cost is much less, so you don't have the operational costs associated with a back-office and possibly thousands of people employed in processing prosecutions. In total, VAS are enormously more cost-effective but provide similar levels of benefits to enforcement in terms of accident reduction."

Roger Lawson

London region coordinator, Association of British Drivers, UK



A "Time-over-distance systems are a fairer, more efficient way of reducing speed on the whole and you would expect their deployment will progressively increase unless authorities are so starved of money they can't afford to do anything at all. But we would expect it to increase, and this will reduce – but not remove – the need for the fixed cameras or highly localized mobile cameras. However, there are different situations that must be considered. In some cases, the phenomenon of excess speed contributing to collisions, which is the starting point for thinking in terms of installing a camera at all, is concentrated very locally, and other times it's distributed over a long length of road. In Northumberland, where I live, for example, the A68 that runs through hilly country is a road where risk from excess speed is distributed over very long lengths of rural road – not concentrated at particular sites. On the other hand, the A697 is a two-lane, two-way road that has two particular villages along it with 30mph limits, and before those villages had cameras, life was hell as a proportion of drivers made little attempt to slow down going through them – now almost every driver slows down as they know there's a camera there. Here, a fixed camera at the appropriate location is absolutely the best technique."

Professor Richard Allsop

professor of transport studies, UCL, UK



A "Dare I say it, but this is actually the wrong question. What we need to think about is speed management, of which enforcement is a part."

The new UK government proposals that offer first-time offenders an educational intervention in place of points on the license have the potential to fund current – if not enhanced – enforcement. The problem with spot-speed cameras is that they are effective only in a limited location – they mark a place where a collision or series of collisions has occurred. However, they will not control speeds around the network as a whole.

Time-over-distance cameras are far more effective in managing both speeds and traffic flows. Drivers also perceive them to be fairer since they do not punish the genuine lapse or failure to spot a speed limit change. What we need is to remind drivers that speed choice can lead to greater likelihood of crash involvement."

Robert Gifford

executive director, Parliamentary Advisory Council for Transport Safety, UK



A "As all technology must do, speed enforcement is simply moving with the times. The advent of average speed enforcement (also known as time-over-distance) has led to the treatment of entire sections of road, rather than specific points, with high levels of compliance bringing additional benefits such as smoother traffic flow and reduced pollution and road noise."

Technological evolution means that the latest generation of average speed enforcement cameras can be deployed across wide areas at significantly lower costs, with networked cameras and wireless data transfer bringing reduced operating costs. Without capital purchase funding available, police and safer roads partnerships are turning to alternative funding mechanisms, such as leasing, to spread the cost of upgrades.

In summary, I think that it is definitely safe to assume that speed enforcement – particularly average speed enforcement, such as the SPECS system – will be a feature of our road network for some time to come."

Timo Thornton

account manager, Vysionics, UK

Readers are invited to answer the Burning Question for the October/November 2011 issue:

What notable technological and strategic advances do you predict in the field of road weather management in the coming years?

email answers to:
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