traffic
TECHNOLOGY INTERNATIONAL

April/May 2011

WWW.TRAFFICTECHNOLOGYTODAY.COM

Project updates on DSRC for e-screening, traffic prediction models, and more

Coming soon
Ford's Mike Shulman on the Model Deployment of 5.9GHz

Dark age or green utopia?
Why a US$10 gallon will usher in more (not less) congestion

Secure network

From terror attacks to natural disasters, the all-hazards tools to protect your critical infrastructure

PLUS

Ron Fagan going solo
"I was the first person to stand up at IBTTA and say that AETC is not for everybody"

Dual in the town
Solving our mobility problems with two autonomous and universally accessible travel networks

Fuel's gold?
Contemplating how V2X communications can save fuel and reduce CO_2 emissions

Measure it. Manage it. Improve it.

RZ-4 Advanced™

Wide Dynamic Range

Advanced video detection camera enhanced with wide dynamic range technology

The RZ-4 Advanced Wide Dynamic Range camera combines Iteris' best-in-class all-weather performance with **Wide Dynamic Range (WDR) technology** – using the advanced imager technology to handle extremes in light and dark and severe glare conditions.

- Delivers optimum detection in the most challenging lighting conditions
- Optimized to work with Iteris' advanced detection algorithms
- Quick-click connectors and adjustable camera mount streamline installation and minimize setup time
- Simplicity, ease-of-use, and reduced life-cycle costs

Innovation for better mobility

ITERIS®

Learn more at:
www.iteris.com

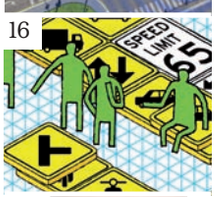
In **This** Issue

Cover story

40 Secure network

Strategies to protect our critical infrastructure

Louise Smyth talks with authors, experts and a handful of technology suppliers to find out how ITS can better prepare us during emergencies



In **This** Issue


70 **ADEC**'s data acquisition with video verification

Foreword

Unashamed to admit I was one of the two billion or so people who watched the recent Royal Wedding, I found myself musing not over the dress (which was lovely), their first kiss (like a pigeon pecking the pavement) or the content of the Best Man's speech, but the enormous security operation that ensured the occasion proceeded without a hitch. Amid the excitement of the buildup were real concerns about threats from Islamic extremists, Irish republican paramilitaries, and anarchists, who had hijacked recent protests against austerity measures. With one million people taking to the streets, London's transport network and its emergency preparedness was under the spotlight.

I flicked between watching events unfold online while looking for updates on the devastating tornadoes that swept across the southeastern USA. About 48 hours later, the Bin Laden news came down the wires. Embassies around the world raised their threat levels for fear of reprisal. And all this as we near the 10th anniversary of that horrific day in September 2001.

The fact that these three events all occurred days apart and that this issue has a major article on Homeland Security (*p40*) and ITS's role in that equation is, not for the first time during my tenure, pure coincidence. The passing of Bin Laden is merely the end of a chapter and many agencies accept they will have to be ever more vigilant in the years to come. The chance of another 9/11, 7/7 or Madrid bombing has not faded – although the transport system, parts of which are relatively easy targets, is undoubtedly better prepared.

Ryan Fries, co-author of *Transportation Infrastructure Security Utilizing Intelligent Transportation Systems* – and one of several security experts interviewed for our cover story – agrees this is true up to a point, although he does offer a note of caution. "I don't want to say that we've become complacent, but I think a lot of the emphasis on the need for security investment post-9/11 has diminished," he says. This is a particular concern given budgetary restraints being faced by all and sundry, which is why Fries recommends good-quality risk-assessment planning that can pay huge dividends in identifying where best to invest technologies such as intelligent surveillance, incident detection, ALPR, etc, to protect our critical infrastructure.

Malevolent acts including terrorism account for just 6% of all evacuations in the USA, though, with natural (58%) and technological disasters (36%) much more likely. Following a hurricane, tornado or earthquake, the ability of first responders to get to the scene quickly but also to guide citizens away from danger zones is crucial to successful emergency operations. And this is where ITS technologies really come into their own.

Nick Bradley
Editor, Traffic Technology International

Who's **Who**

Editor
Nick Bradley
nickbradley@ukipme.com
Deputy editor
Louise Smyth
l.smyth@ukipme.com
Proofreaders
Aubrey Jacobs-Tyson, Frank Millard

Art director
James Sutcliffe
Art editor
Ben White
Design team
Louise Adams, Andy Bass, Anna Davie, Andrew Locke, Craig Marshall, Nicola Turner, Julie Welby

Production manager
Ian Donovan
Production team
Carole Doran, Lewis Hopkins, Cassie Inns, Robyn Skalsky

Circulation
Adam Frost

Publication director
Mike Robinson
m.robinson@ukipme.com
Publication manager
Franco Crismann
f.crismann@ukipme.com
Australasia business manager
Chris Richardson
c.richardson@ukipme.com
+61 4207 64110

CEO
Tony Robinson
Managing director
Graham Johnson
Editorial director
Anthony James
Finance director
Rob Kirke

Traffic Technology International
UKIP Media & Events Ltd,
Abinger House, Church Street,
Dorking, Surrey RH4 1DF, UK
Tel: +44 1306 743744
Main fax: +44 1306 742525
Email: traffic@ukintpress.com
www.ukipme.com

Traffic Technology International, ISSN 1356-9252. Published eight times per year by UKIP Media & Events Ltd, and distributed by US Mail Agent, Clevett Worldwide Mailers LLC, 7 Sherwood Ct., Randolph, NJ 07869. Periodicals Postage Paid at Dover NJ, 07801. Postmaster: Please send address changes to Traffic Technology International, 19 Route 10 East, Bldg 2 Unit 24, Succasunna, NJ 07876

published by UKiP

Member of the Audit Bureau of Circulations
Average net circulation per issue for the period January 1–December 31, 2010 was 17,423
Annual subscription US$153/£73
USPS Periodicals Registered Number **012-893**

ISSN 1356-9252
Traffic Technology International

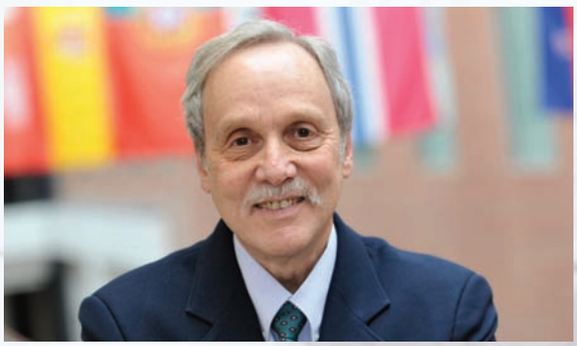
Printed by William Gibbons, Willenhall, West Midlands, WV13 3X, UK

Road tested

AVT cameras have passed the road test. Deployed in the most sophisticated ITS systems around the world, they feature up to 205 fps, remote lens control, and up to 16 megapixels. They've outmaneuvered the competition with advanced triggering, strobe, and synchronization features, flexible programmability, and up to 240 MB/s of continuous image transfer. With long-range connectivity options and a robust housing, you'll never worry where to park them. To find a model for your next traffic control system, make your first stop **www.AlliedVisionTec.com/RoadTested.**

S E E I N G I S B E L I E V I N G

Drivers could be alerted if their vehicle is on path to collide with another vehicle at an intersection, when a vehicle ahead stops or slows suddenly or when a traffic pattern changes on a busy highway. They could also warn if there is a risk of collision when changing lanes, approaching a stationary or parked vehicle, or if another driver loses control.



"I think the research and innovation group is one of the most exciting places in the automotive industry because we're working on the future of personal transportation," says Mike Shulman. "There is just so much new technology now being developed around the world, and the excitement of bringing that into an automotive environment presents rewarding challenges."

Final fantasy

The general public may regard the concept of vehicles constantly talking to each other and the infrastructure as science-fiction, but as Ford's Mike Shulman reveals to **Nick Bradley**, those in the know are genuinely excited about its real-world potential

Photography courtesy of Ford & USDOT

This technology has the potential to augment vehicle navigation systems to enhance safety by helping people who are distracted, drowsy or cannot see the traffic light as a result of a visual obstruction. Ford's research is helping to identify the kinds of warnings that drivers may find both more effective and easier to understand.

Depicting the traffic intersection of the future, an ad campaign from IBM a few years back showed cars hurtling across at high speed from all directions – seamlessly, safely, perfectly orchestrated. It was nothing more than a clever mix of editing and special effects, of course, although experts in the world of automotive safety and intelligent transportation systems feel at least a part of that vision will become a reality – and perhaps sooner rather than later.

Vehicle-to-vehicle and vehicle-to-infrastructure communications, or V2X, is a well-oiled topic and has been researched, demonstrated and trialed for several years already. The ingredients to make it happen, dedicated short-range communications (DSRC) with a sprinkling of GPS, are proven and commercially available. What's different now, though, is that there seems to be a genuine impetus among legislators to take the research to the next level – potentially all the way to full-scale deployment.

Peter Appel from the USDOT's Research and Innovation Technology Administration (RITA) echoes the sentiment. "The potential for this technology to save tens of thousands of American lives demands that we move forward quickly," he says. "Roadway safety isn't just a transportation issue – it's a matter of public health. Nothing hammers this home more than the grim reality that crashes are still the leading killer of those aged between four and 34. Beyond the deadly toll on the youngest Americans, almost 2.5 million people were injured in crashes in 2008 – the status quo simply isn't acceptable."

The panacea?

The potential of DSRC and GPS as the enabler of V2X has long been regarded by car makers as the panacea to traffic fatalities. Mike Shulman, Ford's technical leader in its Active Safety Research and Advanced Engineering Department, has been working on the technology behind such intelligent vehicles for almost a decade. Shulman is also the progam manager of CAMP, the Crash Avoidance Metrics Partnership, established in 1995 through a Ford-GM partnership that aims to research concepts that could consign traffic accidents to a thing of the past.

"Similar to a lot of the work that has been conducted in the passive safety arena on anthropomorphic dummies and barrier-test procedures – where OEMs collaborate pre-competitively to a stage where they can take ideas in-house and work with suppliers to develop bags and

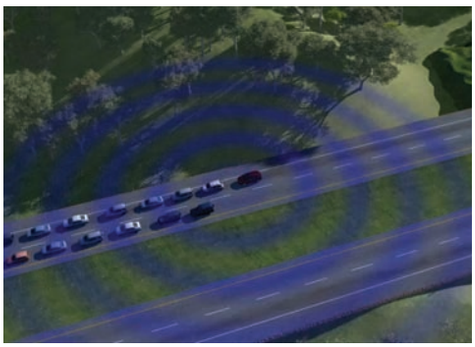
Safe and secure

USDOT can hardly contain its excitement about the life-saving potential of a V2X network. On his official blog recently, Ray LaHood, US Secretary of Transportation, noted comments from Deputy Assistant Secretary Brodi Fontenot, who was treated to a demonstration in the Ford system. "I wasn't comfortable knowing that we were being driven deliberately into the most common situations where crashes occur," Fontenot said. "But each time, the vehicle alerted the driver – way in advance of his ability to see the danger on his own."

"One of the most attractive aspects of this technology is its low cost," LaHood says. "When these vehicles go into production, we expect the safety enhancements to add no more to the cost of your car than the seatbelts we take for granted today."

Administrator Appel added: "Each extra vehicle on the road equipped with this makes everybody on the road safer."

The EU- funded project INTERSAFE-2 could provide a positive safety impact of 80% in respect to injuries and fatalities at intersections in Europe



Of the 350,000 intersections in the USA, probably 150,000 to 200,000 would have to be rebuilt before they could handle the new technology

belts, etc – we wanted a similar organization for active safety," says Shulman. "We recognized early on that V2X is a cooperative system – a Ford has to send messages to vehicles from other OEMs, so we tried to get as broad a participation as we could." With Ford and GM leading the pack, Honda, Toyota and Mercedes were next to sign up. "Engineers from the companies come together at our office to plan activities, conduct joint tests, etc. There are now eight of us in total, after Volkswagen-Audi, Nissan and Hyundai-Kia also came on board."

A great deal of Shulman's work with CAMP has been focusing on a common architecture and standards, potentially bigger challenges than getting cars to talk to one another. "We're finalizing the standards right now," he says. "Exactly what the messages will be; how accurate the data elements need to be; how much latency there needs to be in each of the fields, and so on. In the USA, the lowest level is 802.11p but there's an intermediate IEE 1609 standard for security and at the upper level we have SAE J2735, which defines the message sets. We're also trying to finish up the J2945 for minimum performance standards."

Blind-
spot detection will be on 25% of cars globally by 2016. In the USA each year, 450,000 crashes result from drivers missing vehicles in their blind spots

Although the teamwork has been important, naturally each of the car makers has been pursuing their own applications. "There have been three phases for us at Ford. The first began in 2002 to look at the technology and convince ourselves that DSRC could be ready for mass-deployment. The second phase from 2005 was to build real applications and focused on what message sets you would need to enable these applications, as well as aspects such as security and positioning."

Smart thinking

One of those applications was the Smart Intersection. "This transmits several data elements to the test vehicle, including a digital map of the intersection, six extra maps of the surrounding stop-sign intersections and crosswalks, lane-specific GPS location, as well as traffic light status and timing information," Shulman says. Once the information is received, the vehicle's collision avoidance system will deem whether the car can safely cross the intersection or if it needs to stop before reaching it. If it determines the need to stop and senses that the driver is not decelerating quickly enough, visual and audio warnings are issued.

"We finished on the Smart Intersection project in 2008 as well as various other V2V initiatives and in 2010 we entered our third phase. Everyone in the USA got really excited about the results coming out of the various projects so last year NHTSA published its strategic roadmap, stating that it wanted all of the project research completed as quickly as possible so that it could initiate a rulemaking process in 2013. This is the milestone that everyone's working toward.

"We're taking all of the applications that we've been building, integrating a real driver interface and we're going to run six driver clinics around the country, bringing in around 100 naïve test subjects selected by age and gender. We'll put them into various different scenarios on a closed track and obtain specific feedback. What did they think of the system? Did the warning come on at the right time? Did they understand the warning? Did they comprehend what it was trying to tell them? We'll also be conducting performance testing in different

Private investigations

Just as researchers in the USA are keen to ensure the privacy and security of their own V2X initiatives, so, too, are their European counterparts. Frank Kargl is the associate professor at the Distributed and Embedded Security Group of the University of Twente. He is also the coordinator of the PRESERVE project – or 'Preparing Secure Vehicle-to-X Communication Systems' – which aims to address the challenges of secure and privacy-friendly communication between vehicles.

Kargl explains the challenges that he and his team will face. "The main one is to conduct frontline academic research to solve a number of important but still open research questions, while at the same time designing and building a security subsystem that is robust and scalable enough to be deployed and tested in FOTs with hundreds of vehicles.

"The EC and auto industry operates on a very ambitious time schedule, with first standards being ready by 2013 and actual products being available in the second half of this decade. If we fail to come up with a convincing and well-tested solution to V2X security and privacy within this timeframe, this could mean that deployed systems will fall victim to attacks.

"If this happens, customers might even refuse adoption of those life-saving systems. Having an excellent set of partners, I am sure that PRESERVE will come up with a solution that will allow a secure and privacy-preserving deployment of V2X."

TrafiCam X·STREAM

STREAMLINING TRAFFIC AT INTERSECTIONS

MAIN GOALS

- To reduce vehicle waiting time
- To increase traffic throughput
- To create smoother flowing traffic
- To reduce vehicle CO_2 emissions

MAIN APPLICATIONS

- Vehicle presence detection at signalized intersections
- Stop bar and advance detection
- Streaming video

MAIN BENEFITS

- All-in-one sensor (camera + detector)
- Above-ground sensor
- MPEG-4 image compression
- IP-addressability
- Direct visual feedback
- Easy installation
- Quick configuration
- Reliable detection 24/7

Interested in how this intelligent sensor can improve efficiency at intersections in your city?

REQUEST A TRAFICAM X-STREAM INFORMATION KIT

Send an email to traficam@traficon.com and receive a free gift!

WWW.TRAFICON.COM
WWW.TRAFICONSENSORS.COM

TRAFICON
TRAFFIC VIDEO DETECTION

Once the in-vehicle computer receives data indicating a hazard, it can instantly warn drivers through visual and audio alerts

> You have to reassure the public about the privacy aspects – it's not about tracking or issuing speeding tickets; it's a technology that can save your life

parts of the USA, in mountainous regions as well as in urban areas.

"One of the goals of the driver clinics is to build public awareness. In general, when you talk to people about these concepts, they say 'You're gonna put what in my car!?' But once they understand that it's all built around existing technologies you already have in your laptop or phone and that it's just another pair of eyes to give you 360° support, they come around. You have to reassure them about the privacy aspects – it's not about tracking, it's a technology that can save your life."

Other OEMs will be conducting their own similar investigations and all of the data extrapolated will then be used by NHTSA for its own cost-benefit analysis from which it can support its regulatory procedures.

A safety milestone

The big event on the horizon – the litmus test for the smart car generation – will be the Cooperative Safety Pilot Model Deployment. "NHTSA's going to pick one region in the USA and all of the OEMs are going to bring in the vehicles they've been working on. We'll instrument the infrastructure and bring in other vehicles such as trucks, buses and so on. There's going to be around 2,500-3,000 vehicles in total running around for about a year and we'll test it all out and establish if the standards are truly ready for a regulation."

So after years of papers, POCs and public demonstrations, a truly cooperative system finally appears to be so close you can almost touch it. Shulman, however, is keeping his feet on the ground. "One of the problems is that even if NHTSA was to require this on all new vehicles starting in a certain model year, it's going to take a long time to penetrate the fleet," he warns. "So one of the ideas is to develop an aftermarket device that can be retrofitted."

The business case for a device solely for a safety application is contestable, so the technology could potentially incorporate other mobility applications including tolling. It could also act as a traffic probe to provide information to traffic management centres, and be disseminated and redistributed to vehicles as congestion information.

But what does this all mean for existing crash-avoidance technologies such as radar, cameras, etc? "We don't see it taking over any time soon from these types of technologies," Shulman says. "We'd like to move from an era of warning to eventually an era of control. If I give a driver a warning and he doesn't react, can I take some control and mitigate the crash to try to avoid it? If a radar is 'seeing' something and the V2V message is consistent with that, you're more likely to have confidence in the alert."

Shulman does, however, believe there are vital differences between the two technologies. "You can put a radar on a car but the field-of-view isn't really wide enough to establish if another car has run a red light or a stop sign. V2X gives you 360° coverage over about 300m – radar gives you some information about range, relative velocity and angle to target, but with DSRC the target is literally talking to you: here's who I am; here's my mass, my bumper height, my position, speed, brake status, where I'm going, where I've been. It's a wealth of information that you can do so much with."

So what exactly is the life-saving potential of a network of connected, intelligent vehicles? "NHTSA says it thinks it can address 81% of all vehicle-to-vehicle crashes involving unimpaired drivers. People regard vehicles talking to each other like it's something out of science fiction, but this isn't *The Jetsons*." A Hollywood remake of that particular 1960s cartoon has apparently been in the offing for a while. V2X, though, could be hitting the streets much sooner."

arvoo.com

Solutions

FOR A MOVING MARKET

ARVOO Imaging Products BV is an innovative developer and manufacturer of high performance electronics for demanding Intelligent Traffic Systems (ITS). ARVOO delivers ITS products – camera's and embedded systems – based on 15 years traffic systems knowledge and experience in state of the art hardware solutions.

ACCESS ANPR ALL-IN-ONE ANPR IN-CAR ANPR

CAM301 ANPR Reader

The CAM301 ANPR Reader offers a camera, ANPR processor and UMTS antenna in one housing! The world's unrivaled plug & play all-in-one ANPR solution.

MANUFACTURED IN THE NETHERLANDS

5.9GHz DSRC hits the roads

"When New York State Inspection Personnel stop every truck on the road for a safety inspection, typically only 20% are found to have significant safety/permitting issues," explains Joseph Tario from NYSERDA. "FHWA, FMCSA, NYSDOT, the New York State Thruway Authority, the New York State Police, and federal and state homeland security are all interested in identifying (screening) that 20% to maximize their inspection effectiveness and subsequent enforcement impact. Safety is the primary concern."

"Although we appreciate the value of safety, NYSERDA is primarily interested in not unnecessarily curtailing the other 80%. Our motivation in this project is to reduce transportation energy and emissions, while fostering NYS economic development."

"We're excited that the USDOT is soliciting aftermarket devices and roadside equipment for the safety pilot that will be running in parallel with our NYSERDA pilot project for commercial vehicle e-screening," enthuses Justin McNew, vice president, ITS Strategy & Commercialization, Kapsch TrafficCom Inc. "We see the commercial vehicle market segment as an early adopter of technology and solutions that be used in connected vehicle applications for mobility, safety and the environment."

Commercial break

Kapsch's **Steve Sprouffske** and NYSERDA's **Joseph D. Tario** contemplate the environmental and economic benefits of e-screening of commercial vehicles using 5.9GHz dedicated short range communications

The fatal crash rate for large trucks is 2.4 deaths per 100 million VMT – more than 50% greater than the rate for all vehicles on the roads

The USA is entering the early stages of a transportation capacity crisis. The past several decades have witnessed steady growth in VMT, particularly in commercial vehicle (CMV) transportation where trends show the current CMV safety inspection program is generating three million manual inspections per year with a 73% violation rate.

The Federal Motor Carrier Safety Association (FMSCA) and FHWA forecast increases in CMV traffic will strain capacity and adversely affect highway safety, mobility, and the environment over the next 25 years. Although transportation infrastructure capacity is static, traffic continues to grow so the need to be more efficient using technology is critical to meet growing demand. Failure to do so will result in congestion, upward pressure on CMV transportation prices, and less reliable trip times as carriers struggle to meet delivery windows. Dependence on foreign oil use is also disproportionate in the USA, meaning higher costs and more market volatility.

Congestion additionally impacts air quality and global warming. Studies by the Environmental Protection Agency (EPA) suggest that increasing average arterial speeds from 10mph to 20mph, for example, reduces HC emissions by about 40% and NOx by roughly 20%. The Energy Information Administration predicts that transportation sector CO_2 emissions will grow faster than residential, commercial, and industrial CO_2.

If truck numbers and VMT grow each year as expected, then the planning of transportation improvement projects affecting goods movement requires forward thinking. Utilizing existing infrastructure and technology, such as 5.9GHz DSRC, will enable a suite of transportation services to improve energy efficiency, goods movement and the environment. These are expected to include truck parking, routing, WIM virtual weighstation and payment applications – all of which will positively impact the nation's surface transportation system.

Targeted solution

With financial support from the New York State Energy Research and Development Authority (NYSERDA), Kapsch TrafficCom Inc has teamed with the New York State Department of Transportation (NYSDOT) and the New York State Thruway Authority (NYSTA) to develop, demonstrate and commercialize an in-vehicle, aftermarket device to enable electronic screening (e-screening) of CMV inspections to increase trucking efficiency, reduce emissions and stimulate economic growth. The in-vehicle device, or OBU, will enable high-speed communication between CMVs and roadside equipment (RSE) – and from the RSE to the vehicle – to provide real-time information to transportation agencies and the CMV drivers. The device will use the emerging 5.9GHz DSRC.

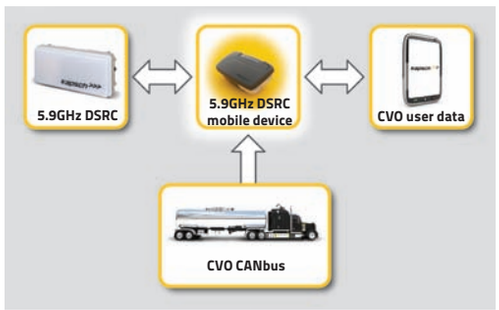
Based on open standards to enable interoperability, 5.9GHz DSRC provides a mechanism for advanced electronic and mobile screening. Unlike cellular or satellite service, it

provides real-time data transfer from the vehicle to the roadside as well as increased cost-savings for drivers of commercial and private vehicles as it avoids monthly service provider fees for access to the roadside. It also allows for nationwide interoperability for all states and all manufacturers, uses universal standards and prevents proprietary technology from diminishing the potential of the system such as has been seen with the existing ITS Program.

In the near term, the device will support a broad range of wireless transportation applications including energy-efficient CMV e-screening and more efficient and safer routing information. It can also deliver applications for traffic congestion, road hazards and other travel condition services helpful to traffic operations and to drivers of non-commercial vehicles in making informed decisions in order to maximize energy efficiency while traveling within New York State's transportation network.

Statewide and nationwide benefits

New York State carries 5.3 billion tons of freight in the USA, contributing to a very healthy state economy. Large truck travel on certain highways can present safety issues, due to narrower highway lanes, steeper grades, narrow or non-paved shoulders, and close proximity to other conflicting traffic (e.g. parked cars, driveways) and to pedestrians. The travel patterns of large trucks and local/regional economic development, environmental and safety concerns are evident in the Finger Lakes region of the state, one of the premier economic



engines as a result of its agricultural and wine industries and its tourism destinations.

If a CMV equipped with a 5.9GHz DSRC device is traveling along a 50-mile stretch of roadway or corridor, you can achieve a great deal with just one RSE that can be configured to transmit and receive different information based on its location along the corridor. For example, for a truck traveling on the Long Island Expressway toward the NYC Metropolitan area, the driver can receive information about successful transmission of e-screening WIM data as he/she passes by a virtual weighstation. If, however, there is more than one RSE along the same transportation corridor, that same driver may receive multiple information streams in key locations on their route. For example, the driver can receive information about a truck parking reservation, a payment transaction, weather and/or safety conditions, routing information, or can even receive e-screening information at a toll station while making a toll payment.

All of these services may require secure transaction capability or probe data collection, which is a capability of the DSRC medium and critical to applications that will require data from localized points of entry at weighstations, truck stops, and tolls to support in-vehicle signage.

Secondary benefits of such an infrastructure include corridor-level traffic flow information for corridor planning, transportation engineering, and fleet management. The current fixed infrastructure traffic sensing system (TSS) provides static data capture of speed volume and occupancy that may take longer periods of time for traffic management centers to isolate and locate traffic trends and problems. In the case of DSRC, data capture occurs within minutes if not seconds – and occurs throughout the entire corridor instead of at selected points or zones. This data capture method results in a smoothed or flow-type traffic picture that continually fluctuates as the stream of data flow occurs.

• Steve Sprouffske is a senior system engineer for Kapsch TrafficCom Inc, based in Carlsbad, California. Joseph D. Tario is senior project manager at NYSERDA in New York

> "Unlike cellular or satellite service, DSRC provides real-time data transfer from the vehicle to the roadside as well as increased cost-savings for drivers of commercial and private vehicles as it avoids monthly service provider fees for access to the roadside

Drivers
who text are 20 times more likely to be in a truck accident than those who pay attention to the road, according to the FMCSA

The live streaming web platform

WebLynx

New !

THE AUTONOMOUS
WEBCAM
FOR THE ENVIRONMENT
AND INFRASTRUCTURE

Applications

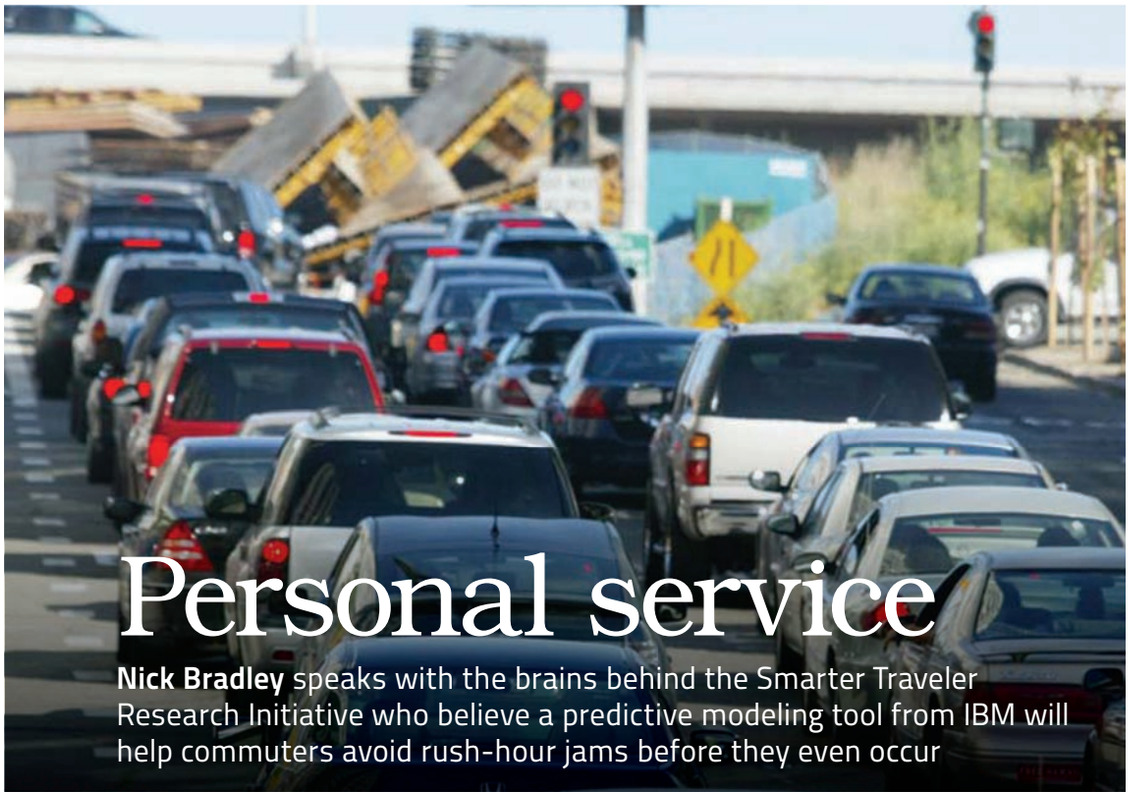
- Construction sites surveillance
- Road surveillance
- Law enforcement
- Rivers and canals surveillance
- Pipe-lines surveillance
- Industrial sites surveillance
- Forests surveillance
- Fauna surveillance
- Tourist promotion

The pros

- No wire connection
- Eased installation without any trench
- Moveable device
- Integrated picture management
- Easy maintenance
- Immediate access to videos on the Internet
- Easy interface with third systems

neavia technologies

Europarc - 3, allée des Rochers - 94000 Créteil - France
Tél. +33 1 45 13 05 90 - Fax +33 1 49 56 96 28
www.neavia.com



Personal service

Nick Bradley speaks with the brains behind the Smarter Traveler Research Initiative who believe a predictive modeling tool from IBM will help commuters avoid rush-hour jams before they even occur

With some of the world's most congested roads, California seems the perfect testbed for a new predictive modeling tool that IBM's John Day believes will help commuters avoid rush-hour congestion as well as allow DOTs to better understand, predict, and manage traffic flow. Day is the program manager for the Smarter Traveler Research Initiative, a collaboration between the 'Big Blue', Caltrans, and the California Center for Innovative Transportation (CCIT), a research institute at the University of California, Berkeley. "Data from road sensors already helps to build aggregate views about how the road network looks," he says. "But we wanted to go a step further and provide very personalized forecasts for individuals."

Learning process

Data ingested from these embedded inductive loops – as well as from sensors at toll booths, bridges, intersections, and GPS probes in cell phones – helped researchers to build a historical database that shows what happens to the network based on very small anomalies, and what happens to the network later on when bigger problems occur. The project called for IBM's analytics expertise in the large-scale modeling space, fostered at its Watson Research Center in New York. "Rather than just provide aggregate predictions, we wanted to take the data and personalize it, adding to the analytics the capability to learn people's routes over time – where they like to go, which roads they like to travel, and at what times they do that. Once you have that data, the idea is to run very specific predictions for that particular route at that given time and deliver the relevant information to people just before they leave for work or get into their cars."

Despite the fact that fewer than a dozen of his research colleagues in the San Jose area were involved in the project, Day is nevertheless encouraged by the preliminary findings and is looking forward to taking things to the next level. "We'd obviously love to have a much bigger pilot with thousands of vehicles, but even with this sample the results were revealing. In one instance, we picked up a small delay on a major artery very early on that seemed out of the ordinary based on normal traffic patterns. The cause of the delay turned out to be an accident that 20-30 minutes later resulted in major delays. If you notice such anomalies developing in the network early and you have a prediction that suggests conditions are likely to get worse, you can suggest alternatives to commuters, such as recommend a nearby mass-transit station and, by the way, there's a train running on time and there are 42 spaces left in the parking lot."

Such a multimodal approach to reducing congestion is key to IBM's overall Smarter Traveler strategy, as well as for DOTs such as Caltrans. "For us, multimodal isn't about getting all or even 50% of travelers off the road," Day

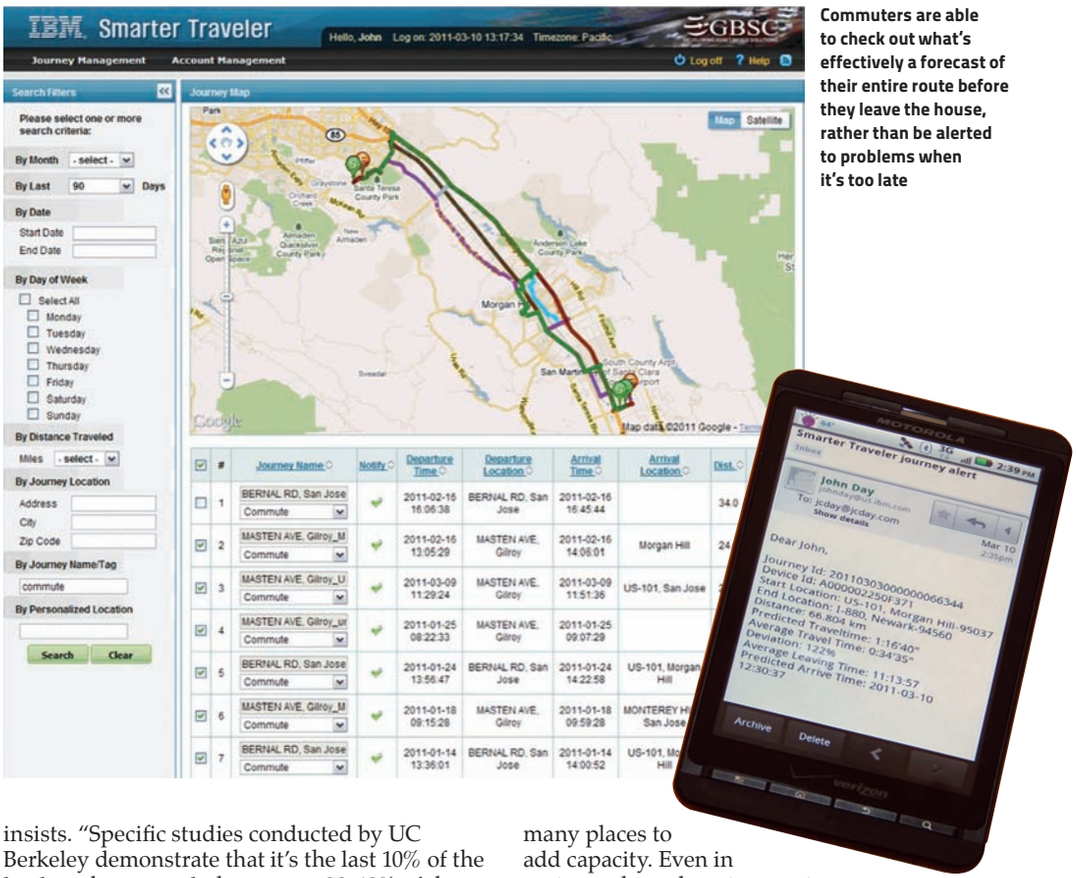
Predict and serve

The Traffic Prediction Tool is IBM's patent-pending technology for predicting traffic flows and speeds on road segments. It has already been tested in Singapore where the Land Transport Authority has worked with IBM and others to develop technology that will provide one-hour traffic predictions. The tool provides the characteristics – such as volume and speed – that best describe the traffic state into the short- and medium-term future. The technology makes use of adaptive statistical techniques in conjunction with automated error correction for multiple time horizons.

In 2009, Chicago and Washington DC surpassed Los Angeles in the amount of time that motorists were stuck in traffic during peak travel periods

(Main) **California's traffic congestion has the potential to reach near-crisis levels in the not-too-distant future**

> If you can just get 15% of the folks to drive halfway and then get onto a train, it could have a dramatically positive effect on overall traffic



Commuters are able to check out what's effectively a forecast of their entire route before they leave the house, rather than be alerted to problems when it's too late

insists. "Specific studies conducted by UC Berkeley demonstrate that it's the last 10% of the load on the network that causes 30-40% of the delay – they've got some beautiful charts that show this clearly happening. If you look at a typical crunchpoint for traffic slowdowns, an interchange for example, you can quite happily have 6,000 cars an hour passing through. Add another 400 cars, however, and it really goes off the chart. If you can just get 15% of the folks to drive halfway and then get onto a train, it could have a dramatically positive effect on overall traffic throughput."

According to TTI's *Urban Mobility Report*, congestion costs in the USA have continued to rise from US$24 billion in 1982 to US$115 billion in 2009

The cost of congestion

It wouldn't be too bad for travel time savings, fuel consumption, and emissions either. According to the *2010 Urban Mobility Report*, published by the Texas Transportation Institute, every US traveler wastes a week of their lives sitting in traffic congestion, 28 gallons of gas, while each will lose around US$808 over the course of a year. The problem is particularly acute in San Jose where drivers waste a cumulative of 10 million more annual hours sitting in jams, and suffer a 15% longer commute delay per peak-time traveler.

"What we're hearing from customers is that the more intelligent use of what they've got is their primary focus," Day continues. "They're so constrained in terms of space that it seems that this kind of a solution has to be part of the equation – there simply isn't the space in many places to add capacity. Even in regions where there is capacity, there isn't the funds available to build more lanes.

"Putting together an end-to-end solution that was compelling, safe, intelligent and would scale to any geography was fun but brought some interesting challenges," Day says. For instance, the pilot revealed a great deal about people's travel patterns, which led to specific technical hurdles for Day and his colleagues to overcome. "If you take a journey from A to B, from home to work, to a commuter it's the same journey, but there could be so many permutations to that journey – they might stop for gas or groceries or drop the kids off at school. They don't see the journey as any different, but when you're looking at the data it's a completely different trip and you have to take that into account and automatically and intelligently decide which are the same trips and which aspects differ so you're not providing people with information about road segments they're not going to use."

Other challenges include privacy and public acceptance considerations. "One of the things we built into this was giving individuals control over their data," Day says in response. "If they're willing to share their data so the system can learn their routes, it was imperative to allow them to access it so they can manage it – if they don't want specific data in there, they can delete it. This was critical to acceptance and people subscribing to it."

The best solutions of Intelligent Transport Systems

On-Board Equipment

Electronic Road Pricing System

Automatic Vehicle Classiffication System

Automatic Toll Collection Machine

Automatic Ticket Issuing Machine

Since 1964, Mitsubishi Heavy Industries, Ltd has been the world leading system integrator in the field of Toll Collection System and Intelligent Transport System. We have been offering the best solutions to realize vision of the clients with the state-of-the-art technology. We can provide with our valuable comprehensive one-stop services including planning, design, manufacturing, installation and commissioning for our reliable machine and system integration of wide variety of ITS and Toll Collection Facilities. Furthermore we are recently expanding our business into much wider ITS area, such as system integration of smart community/mobility to realize the safe and eco-friendly motorized society in the world.

MITSUBISHI HEAVY INDUSTRIES, LTD.

Our Technologies, Your Tomorrow

MITSUBISHI HEAVY INDUSTRIES,LTD.
INTELLIGENT TRANSPORT SYSTEMS DEPARTMENT
TRANSPORTATION SYSTEMS & ADVANCED TECHNOLOGY DIVISION
1-1-1,Wadasaki-cho, Hyogo-ku, Kobe-shi, Hyogo, 652-8585, Japan
TEL:+81-78-672-2974
URL http://www.mhi.co.jp/en/products/category/intelligent_transport_system.html

Dual in the town

Mark A. Delucchi's new proposal for discrete road systems for high-speed vehicles and low-speed modes of transportation seeks to enhance sustainability without compromising the benefits of motor vehicle use

We complain about suburban sprawl, pollution, and traffic gridlock, yet many of us live in single-family homes, and most of us drive automobiles. We bemoan the loss of 'community' yet choose to live in faceless suburbs. We think we want more 'livable cities' but are unwilling to sacrifice the perceived benefits of a suburban lifestyle to have them.

For decades, city planners, transportation planners, and policy analysts have struggled to reconcile what we say we want with what we actually choose. By and large, they have failed. Around the world, car use has grown unabated. When people get wealthy, they buy cars and live in bigger homes further away from central cities. Nothing short of outright prohibition or economic catastrophe – not high gasoline prices, not better public transit, not better zoning – has stopped this trend. The result is a host of seemingly intractable problems: unacceptable congestion and fatalities, environmental degradation, ugly infrastructure, social fragmentation and insularity, and cultural impoverishment.

The plan explained

To address these problems, we take what we believe is a distinctive approach. First, we start by accepting that many people want to live in single-family homes, in relatively low density, and to be auto-mobile. We design a town that accommodates those preferences, yet at the same time offers qualitative improvements in safety, aesthetics, travel pleasure, infrastructure cost, social organization, pedestrian space, and so on. Second, in order to accomplish this we separate travel according to the kinetic energy of modes, because many transportation problems are attributable at least partly to the high kinetic energy of fast, heavy motor vehicles. Finally, we develop a particular land use and transportation infrastructure layout that accomplishes what we want.

We design a city with a dual-road system, based on the complete separation of high-speed, high-mass vehicles from low-speed, low-mass vehicles on a citywide scale. Instead of having a single road system that serves everything from 50 lb children walking at 2mph to 150,000 lb trucks traveling at 65mph, we propose to plan new

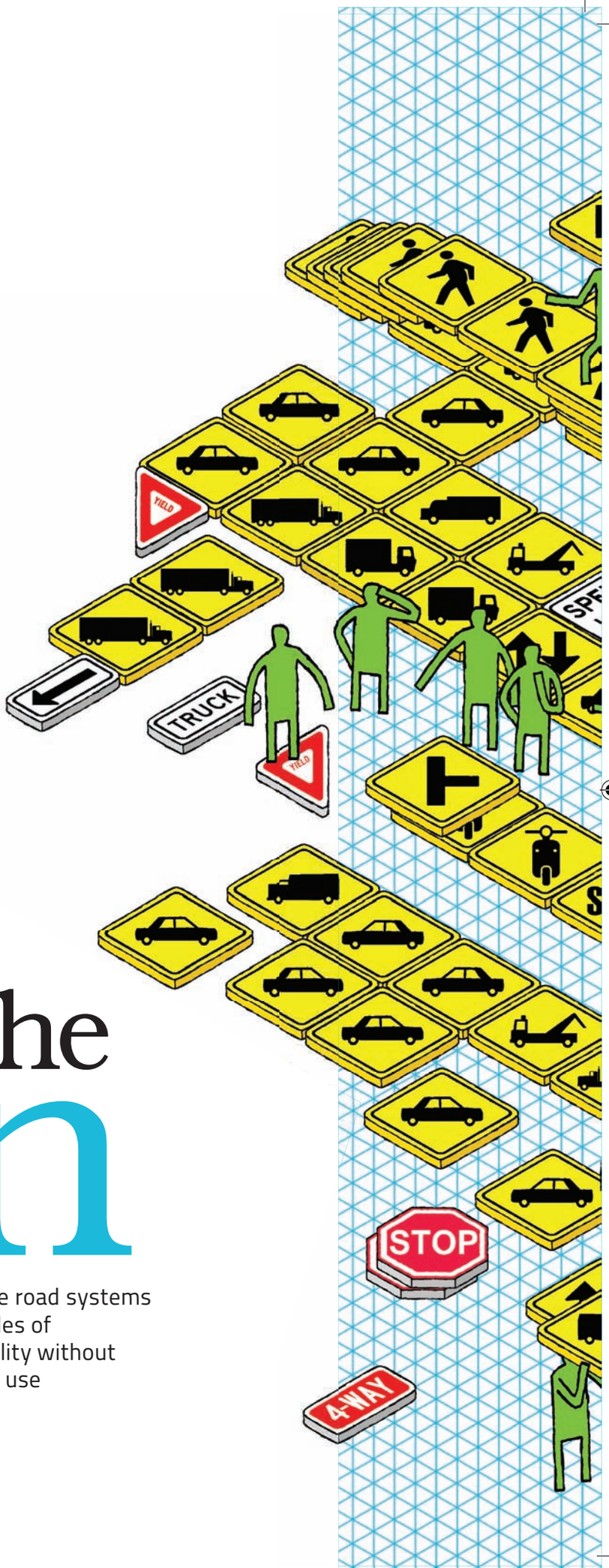
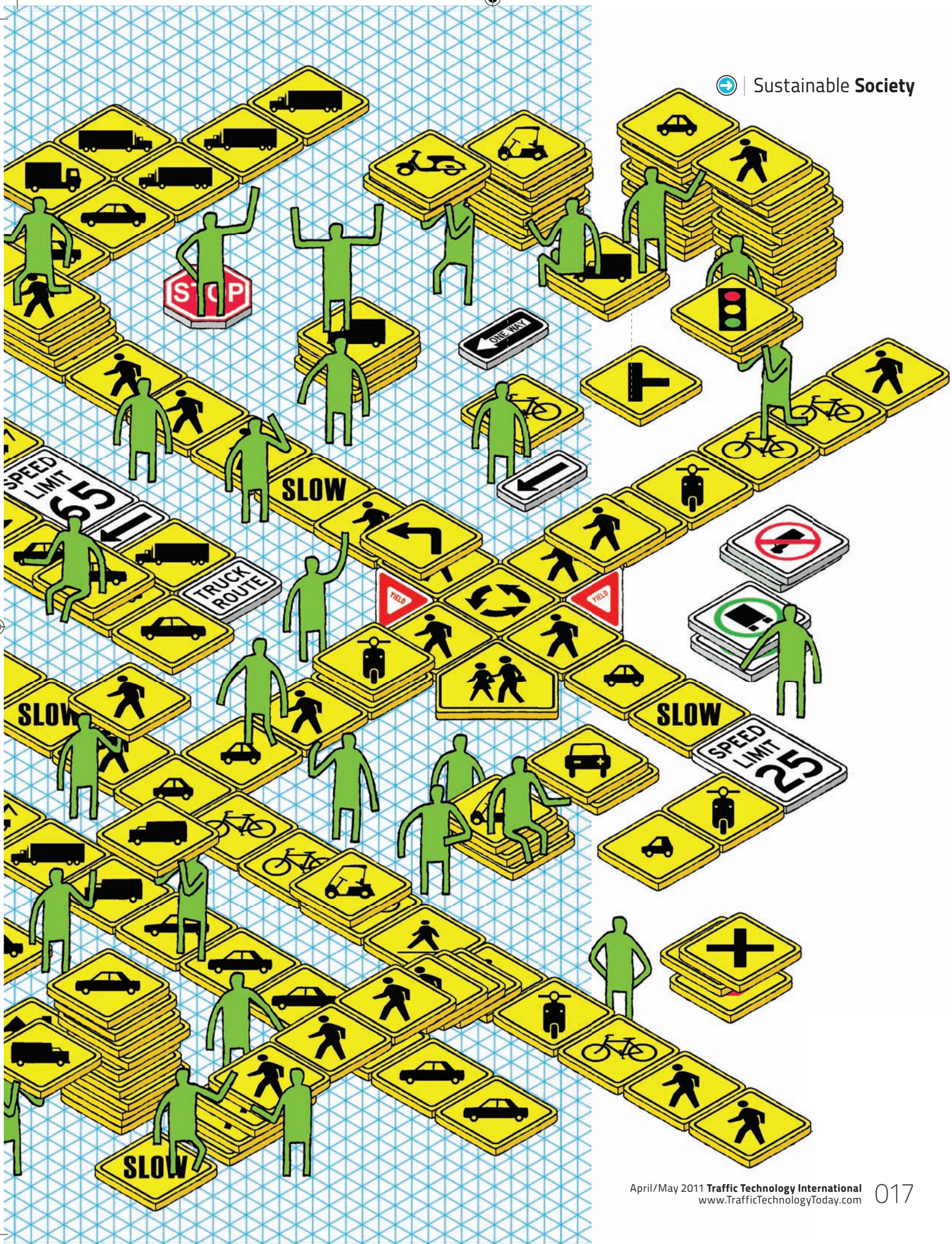


Illustration courtesy of Tim Ellis


STOP
ONE WAY
SLOW
SPEED LIMIT 65
TRUCK ROUTE
YIELD
YIELD
SLOW
SLOW
SPEED LIMIT 25
SLOW

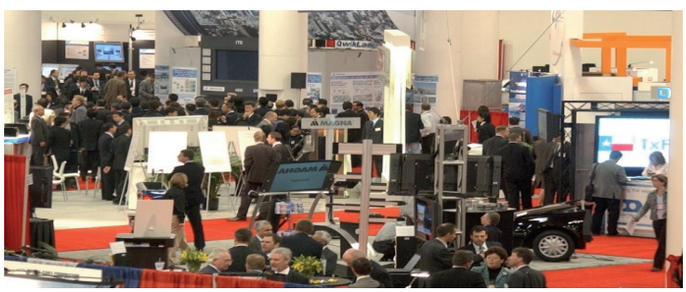
18TH ITS World Congress
2011
ORLANDO

REGISTRATION OPEN!

OCTOBER 16-20, 2011

Orange County Convention Center
Orlando, Florida

EXPERIENCE HOW SMART TECHNOLOGIES ARE TRANSFORMING TRANSPORTATION AT THE LARGEST ITS EVENT IN THE WORLD!



Participate in the most comprehensive exhibition of transportation technologies, services and solutions

Hear from leading policymakers and innovators about ITS solutions that will revolutionize transportation

Network and make business connections with transportation professionals from the U.S. and across the globe

Choose from 250+ policy, technical and educational sessions and earn professional development credits

Catch a glimpse of what's possible at the Technology Showcase, the most interactive and innovative test site for advancing transportation technologies

Co-Hosted By:

ITS AMERICA

ERTICO ITS EUROPE

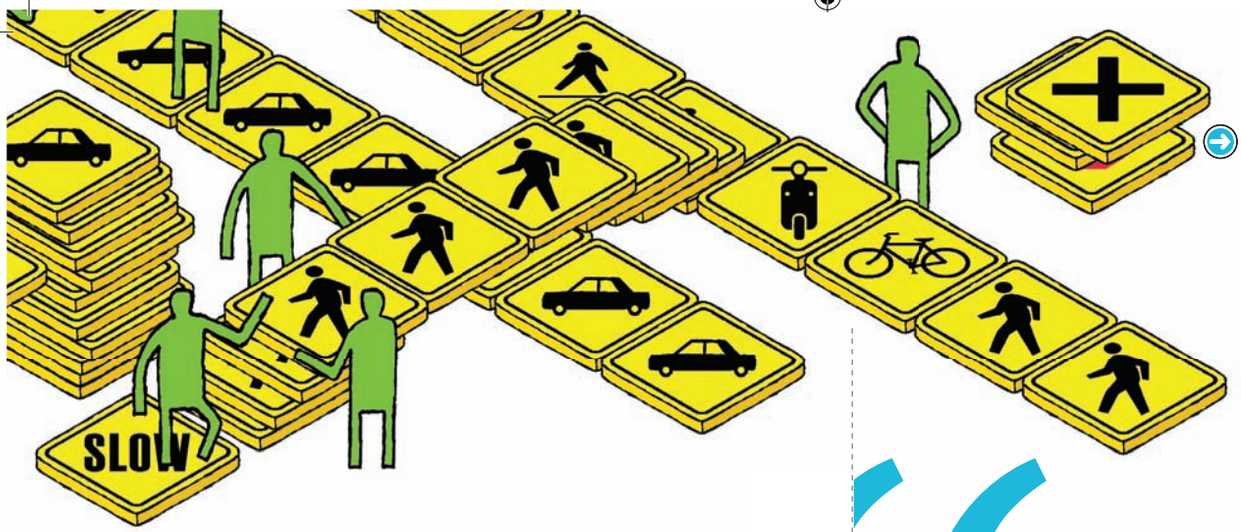
ASIA-PACIFIC ITS

For more information, visit www.itsworldcongress.org

www.facebook.com/its2011
www.twitter.com/itscongress2011

Attending the 2011 World Congress? Scan this code for a chance to win 4 free passes to SeaWorld or 2 free Disney World Park Hopper tickets.

Keeping the Economy Moving



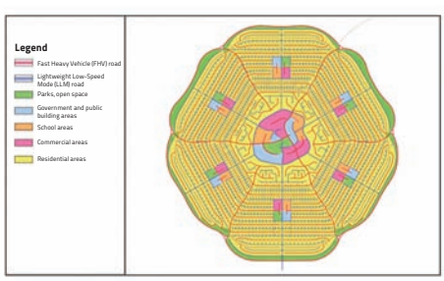
towns with two separate road systems, segregated according to the maximum mass and speed (i.e. kinetic energy) of the modes. Cut points of 25mph top speed and 1,100 lb (500kg) maximum curb weight will distinguish low-speed, lightweight modes (LLMs) from fast, heavy vehicles (FHVs). LLMs include any mode of transport under the mass and speed limit: pedestrians, bicycles, pedicabs, mopeds, motor scooters, motorcycles, golf cars, minicars, and so on. FHVs range from the conventional cars, trucks, and vans we drive every day to the tractor-trailers that deliver most of the goods we buy. The physical infrastructure of the LLM network can range from an undifferentiated narrow lane that handles all LLMs (where traffic volumes are very low) to a multi-lane roadbed for motorized traffic with a paved bicycle path and an unimproved pedestrian path alongside (where traffic volumes are high). FHV roads will be similar to present conventional roads.

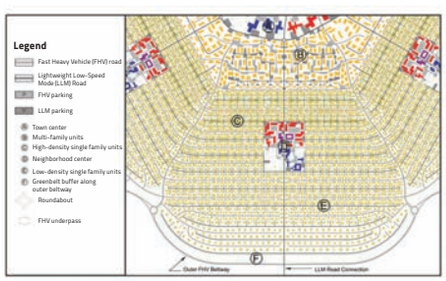
The entire town lies within an outer, high-speed beltway for FHVs (Figure 1). A central LLM road rings the commercial and civic center of the town (Figure 4). Neighborhoods, accessible everywhere by LLMs and FHVs, lie between the outer FHV beltway and the central LLM ring (Figure 2). The LLM streets all radiate outward from the LLM ring road around the town center, and the FHV roads radiate inward from the FHV beltway around the entire town.

The FHV roads have two main functions: to provide households direct access, via the outer beltway, to outside of the town, and to provide people- and goods-movers from outside the town direct access to the inner civic, commercial, and service core of the town center, via two or three FHV roads that penetrate all the way to the town center (see Figure 4). These FHV roads go underneath the central LLM ring road and come up into roads and parking on the 'back' side of all of the businesses, offices, schools, and so on.

> We propose to plan new towns with two separate road systems, segregated according to the maximum mass and speed (i.e. kinetic energy) of the modes

(Below left) **Figure 1 shows plan of dual-road system for new towns, with land uses**
(Below right) **Figure 2 shows plan of neighborhood branch**
(Bottom left) **Figure 3 shows details of driveways and residential streets**
(Bottom right) **Figure 4 shows the town center**





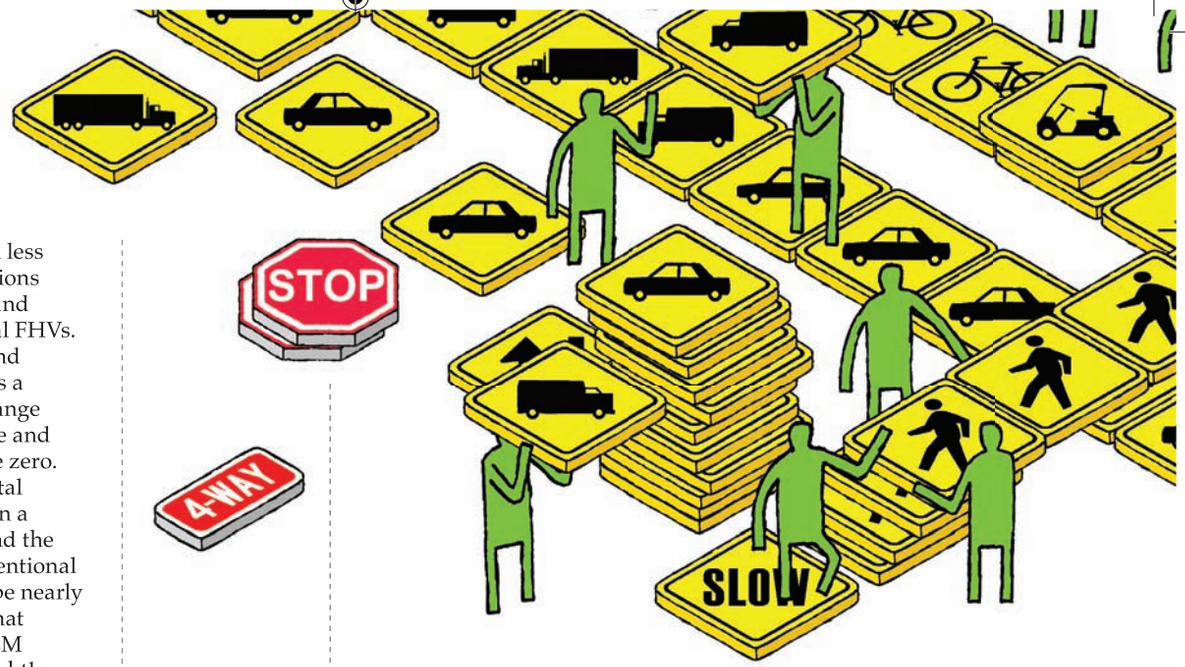
By contrast, the main function of the LLM streets is to provide access inside the town, especially to and from the town center, via the central LLM ring road. The FHV network and the LLM network thus complement each other functionally: the LLM network is designed mainly for trips within the town, and the FHV network is designed for all other trips.

Analysis

This transportation and town plan gives rise to appealing town characteristics and provides substantial safety, social, environmental, and economic benefits, while at the same time enlarging choices for travel and living.

Stores, offices, schools, civic buildings, churches, parks, inter-city transit stations, etc, are in the center of town (Figure 4) and neighborhood centers (Figure 2), not sprawled disjointedly over a suburban landscape. This coherent social and commercial geography identifies the town and neighborhoods. High-density multifamily housing units are around the core (Figures 2 and 4), and provide convenient pedestrian, bicycle, and other LLM access to the town center for those who prefer higher-density, more urban living.

The LLM network dramatically improves transportation safety, without increasing the time or cost of travel. In fact, it should be possible to virtually eliminate fatal crashes on the LLM without sacrificing travel convenience. As they are low speed, safe, inexpensive, and convenient, LLMs are attractive to four groups for whom ownership and use of FHVs is now problematic: the young, the elderly, the poor, and those otherwise without licenses



to drive FHVs. LLMs also use much less energy and have much lower emissions of air pollutants, water pollutants, and greenhouse gases than conventional FHVs. If LLMs are powered by batteries and electric motors – which is feasible as a result of the low power and short-range requirements of LLMs – then oil use and local air-pollutant emissions will be zero. And even though there are more total miles of roadway in our plan than in a conventional plan, both the FHV and the LLM roads are narrower than conventional roads, and the LLM roads will not be nearly as thick as conventional roads, so that overall the total cost of the FHV+LLM street system in our plan will be slightly less than the total cost of a comparable conventional suburban road network.

LLMs, even fully featured, will be relatively inexpensive, and will certainly cost less to operate than a conventional FHV. To the extent that LLMs replace FHVs, they will lower total household travel costs.

Of course, the plan does involve some tradeoffs compared with a traditional plan and there are some drawbacks. In some designs, travel on the FHV network will be less convenient. The convenience of the FHV network depends mainly on how many of the radial FHV roads go all the way to the town center, and whether the FHV roads in the town center go all the way through and connect to each other.

Vehicle holding may cost more: if LLMs are additional vehicles in households, i.e. additional with respect to FHVs, then garaging and registration costs increase.

Our plan requires either that each single-family household share a driveway with one or even two other households or have an LLM road along the 'front' and an FHV road along the 'back' (Figure 3). It is not possible to have only one road along the house and not share a driveway. Some people may not like this.

The dual-road system would separate pedestrians from high-mass, high-speed traffic to eliminate conflicts and enhance safety

Implementation

In the preceding sections we have discussed a wide range of potentially significant personal and social benefits of the LLM network: nearly perfect safety, reduced congestion, a unified street space and coherent community feel, very low environmental impacts, near-zero petroleum use, and so on. Of course, the overall magnitude of these benefits – and hence the desirability of the entire system – depends directly on the extent to which LLMs are used. However, there is nothing yet in the real world quite like what we have proposed, and consequently it is not possible to provide a straightforward empirical answer to the question of how much might LLMs be driven. Our inferences from studies of the use of small electric vehicles – and our own analysis of trip-making behavior and the potential of LLMs to displace certain kinds of trips – suggest that LLMs can displace in the range of 30-50% of vehicle miles traveled by current light-duty vehicles.

The final question is where might towns like this be built? In many of the growing urban areas around the world, from South America to Asia to the American West, the urban newcomers are developing the exurban fringe. This kind of exurban-fringe expansion can be accommodated well by the town and transportation plan we propose. However, in rapidly expanding cities in developing countries, it may be difficult to commit the necessary capital up front to establish the basic dual-network transportation infrastructure. Thus, the plan perhaps is more naturally suited to large new subdivisions on the urban fringe of cities in the American West, such as in California's Central Valley.

Many transportation-related problems, from accidents to climate change, are attributable to the high kinetic energy of fast, heavy motor vehicles. The challenge is to find a way to dramatically lower the kinetic energy of personal travel, without compromising any of the benefits of motor vehicle use and suburban living. This is achieved by creating two autonomous and universally accessible travel networks: one for fast-heavy vehicles, the other for low-speed, light transportation modes.

The town plan and transportation system we propose is safe, convenient, clean, and pleasant. It should be attractive to households without economic or regulatory incentives or injunctions. The requisite technologies, and analyses of their economic and social impacts, are available now. The challenge is to interest city planners and developers in the idea.

• Further reading

M. A. Delucchi, K. Kurani & J. Koo, 'How We Can Have Safe, Clean, Convenient, Affordable, Pleasant Transportation Without Making People Drive Less or Give Up Suburban Living', *UCD-ITS-RR-02-08-rev.1, Institute of Transportation Studies, University of California, Davis, October (2010). www.its.ucdavis.edu/people/faculty/delucchi/*

CAN YOU READ THIS?

NEURAL LABS CAN

RELIABLE, EASY TO INTEGRATE

PLATFORM AND CAMERA INDEPENDENT

ANPR ENGINE

The systems that work use Neural Labs ANPR technology

www.neurallabs.net

After 14 years serving public toll agencies, **Ron Fagan** explains why he is going it alone as a private consultant

Interviewed by Louise Smyth

> I believe a lot of folks turn a new system on, cut the ribbon and don't then ask with any regularity 'Is it still working to the standard we said we needed in the first place?'

There's not exactly a shortage of consultants in tolling. For every Wilbur Smith & Associates and HNTB, there are scores of notable characters at an independent level, such as Hal Worrall, who have carved out successful niches for themselves. Why, then, has Ron Fagan given up a high-flying career at the Central Texas Regional Mobility Authority (CTRMA) to go it alone and join this seemingly saturated market?

The answer lies in the fact that his expertise is focused on operations at the everyday, on-the-road level. He is not pitching to design a futuristic, all-singing all-dancing transportation network. But if you want someone to tell you how to successfully run a toll road, Fagan's your man. "Being out in the industry, I was constantly asked for advice and more often than not it was about going cashless, which we at CTRMA did very well – I've spoken on the topic at every IBTTA meeting for the past five years. At conferences you get a lot of very smart people presenting about high-level, exciting ideas that are maybe a decade or more into the future – IntelliDrive for example. Yet I was being bombarded with questions by folks looking to try something in the next week, month or six months.

"I asked a few people who I trusted if they thought there was a need for advice about the nuts and bolts of operations," Fagan explains. "The bigger 'Where are we going?' type issues, the federal government/vehicle miles traveled kind of things, will be figured out by greater minds than mine, but there are people going through the day-to-day procurements, budgets, operations, violations enforcement, etc, who I believe would value my 14 years worth of experience working in the field.

"Some of the big consultants have really great thinkers doing incredible work," he admits. "But these guys may not have spent a whole lot of time figuring out something basic such as how to put together an invoice statement. It's one thing to have been a consultant for 10 or 15 years but it's quite another to have been the guy sat behind the desk making the decisions and having to look at budgets and all of the things that really matter to a small government agency, as well as having the ability to talk on an equal footing with these folks. I'm like the director of operations who you couldn't necessarily go and hire, but you can use me to look at certain elements of your operation and see if they can be improved."

Go your own way

Although it would be easy to ascribe this bigger-picture approach to the strategic thinking Fagan learned during his time in the US army, the fact he has forged his own path through the industry is his real USP. The toll industry is full of people for whom it's a job for life, and many of them have never acquired experience outside of what's a very close-knit community. So it's refreshing to find someone who's got to where he is today on merit – not on nepotism or via an old boys' network. And Fagan freely admits it's been a steep learning curve: "When I left the army and joined the Orlando-Orange County Expressway Authority in Florida, I could barely spell 'toll'," he laughs. "I certainly had no idea what electronic toll collection was. I started there as HR manager in July

> I was the first one to stand up and give a presentation to say that all-electronic toll collection is not for everyone

1996 and by January 1997 they'd created a deputy director of operations role and there I was, working for Jorge Figueredo and trying to find my way.

"It was a great place to learn, and I was privileged to work with the likes of Jorge, Hal Worrall and Greg Dailer. It was a medium-sized agency – when I joined they had about nine or 10 toll plazas and had just become the first in Florida to do electronic tolling and when I left they were collecting US$165 million a year in revenue."

Fagan looks back on eight happy years in Florida before he received a phone call alerting him to a brand-new agency in Texas: "I became employee number four of the CTRMA," he recalls. "The first assignment was walking in the door to a stack of proposals from system integrators, so we got the opportunity to build a whole ETC system from scratch." Fagan's team brought in Caseta as system integrator and the system was created on time, on budget and proved sound. What he is even more proud of, however, is maintaining the level of operations. "One of the first things we introduced was the act of fully testing the entire system annually to see how well it is working. I believe a lot of folks turn a new system on, cut the ribbon and don't then ask with any regularity 'Is it still working to the standard we said we needed in the first place?' Testing your system is critical."

The truly remarkable thing about CTRMA was that it managed to run a successful toll road without really having a back-office. "To start with, we were piggybacking off Texas DOT's back-office but we agreed that it was really our responsibility to do our own violation enforcement processing," Fagan explains. "We assumed it would be tough to build a back-office just for violation enforcement, but we got lucky. We were approached by a debt-recovery agency about collecting our bad debt and it occurred to me the only thing a collection agency can't do that we would need is processing images. So we went through a procurement process, selected a firm and got our integrator to build six or seven image-review stations and today, CTRMA is the only agency that uses a collections firm for its entire payment-processing back-office components. This outside agency receives the images, processes them and sends out the invoice. If the invoice is paid, they collect the money, keep their share and send the rest to CTRMA. The drivers who don't pay go into the debt-collection process. So CTRMA's only expense from the process is to pay seven cents per image review. There's no back-office, no infrastructure, no personnel, just a steady flow of checks."

Generally evangelical about all aspects of ETC, Fagan is particularly strident about the fact that all-electronic toll collection (AETC) is not the only solution. "After a couple of years of AETC being the hot topic and people at IBTTA saying to agencies 'What are you waiting for?', I was the first one to stand up and give a presentation to say this is not for everybody. You can lose a lot of money doing this if you don't have the basics right – and there are certain critical operational aspects that you need to understand before you take the risk of just switching to all-electronic because that's the sexy new thing. A lot of people in the audience were nodding along and I think the first big one to come out and say "Not today, maybe someday" was Pennsylvania. But every agency needs to take a look at this. What is your AVI percentage? Do you have front and rear plates? Do you have the legislative backbone to go after the people that won't pay? AETC is a wonderful thing and all of the benefits that are touted are true: the capital-savings cost of not having to build eight lanes across a toll plaza; the safety; the flexibility of being able to adjust toll rates as required, and so on. But some back-office costs will increase depending on how you do it. Are you using OCR and does it work without adding to your workload, or will you have to hire 15 people to review images? There's a lot to consider and I am a proponent of AETC when it makes sense."

Regional before national

The other thing that Fagan is in favor of is seeing more interoperability in tolling and in that respect he has high hopes for the ATI (Alliance for Toll Interoperability), although as ever he is happy to leave the big guys to the nationwide issues while he focuses on the finer details: "There is a strong desire for national interoperability, although from a technology standpoint I don't think anybody can see how we'd get there with the use of transponders and readers. But short of a national scheme in the near future, I think more people will push for regional interoperability. So instead of just Texas, you'll see Texas, Oklahoma and Kansas offering interoperable tolling.

"Another important element going forward is the wider use of express lanes," Fagan states. "In contrast to HOV lanes – where we see too many cases of under-used capacity and congested general-purpose lanes – properly enforced express lanes are an important part of the mobility kit-bag.

"Roads are a utility, but for some reason it is the only utility that our society is convinced we don't have to pay to use," Fagan concludes, while pondering what the future may hold for US mobility. "It was explained to me when I joined this industry that we live in a cowboy society – everybody wants to ride their horse into town and back whenever they want to do so. It's a challenge to shift that mindset. There's a myriad of technologies, solutions and ideas out there – I am an expert in none of those big, high-level things, but we have to address mobility locally, regionally and nationally – and do so before it's too late." ○

The CTRMA managed to go cashless without needing its own back-office – a business model that Fagan believes others should also adopt

LEADING THE WAY: www.q-free.com

Next generation Multilane Free Flow solutions: catering for urban and highway tolling on a single gantry.

Q-FREE

LEADING THE WAY

In Road User Charging and Traffic Management

www.itsineurope.com

8th ITS European Congress

6 - 9 June 2011

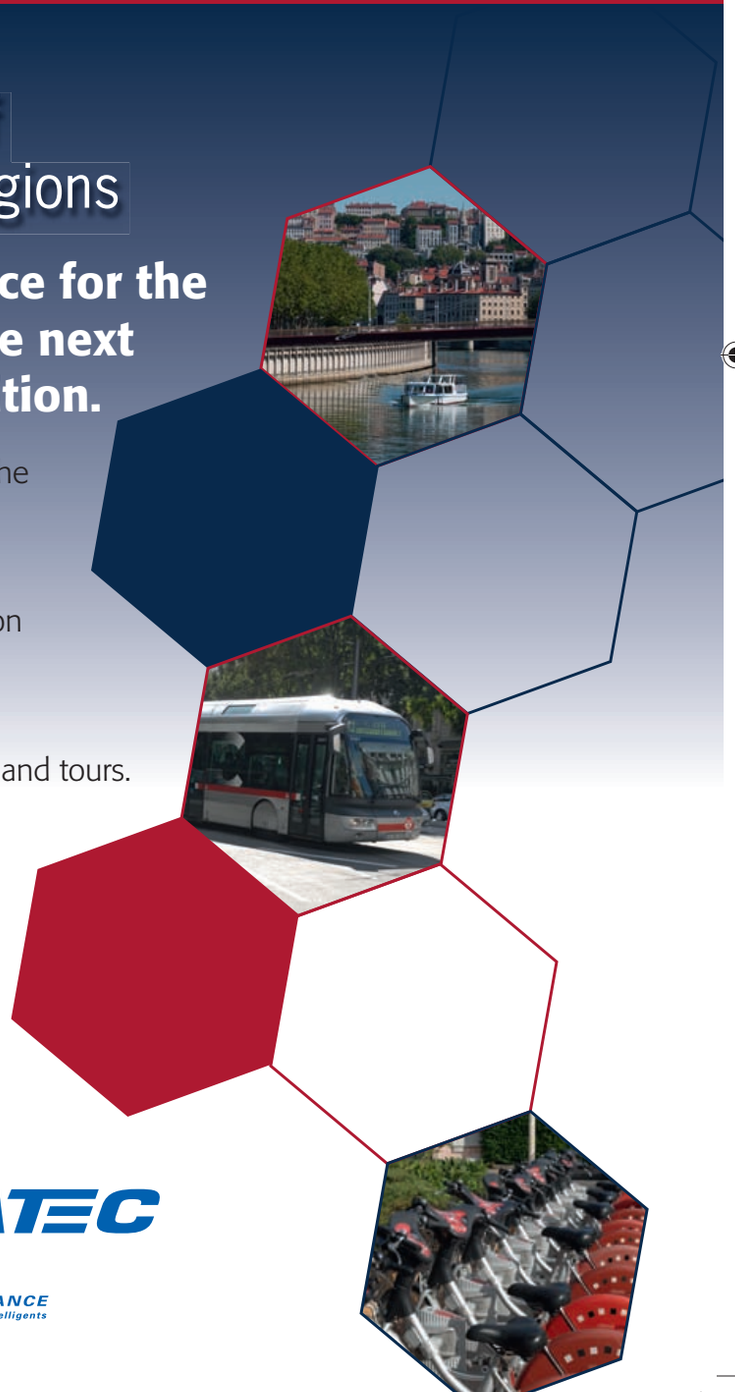
Lyon / Rhône-Alpes France

Intelligent Mobility

ITS for sustainable transport of persons and goods in urban regions

Join us in Lyon, centre of excellence for the automotive and ITS sectors, for the next ITS European Congress and Exhibition.

- Meet with over 100 world-class exhibitors showcasing the latest innovations in ITS
- Network with over 1500 international delegates
- Take part in a dynamic Congress programme, focused on the key fields of mobility and sustainability
- Enjoy a full social and networking programme
- See current ITS projects in action on the technical visits and tours.



To register and for the latest information, visit **www.itsineurope.com**

ERTICO ITS EUROPE

Hosted by:

Région RhôneAlpes

ONLYLYON

LYON URBAN TRUCK & BUS

Under the high patronage of:

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

Ministère de l'Écologie, de l'Énergie, du Développement durable et de la Mer

supported by:

CEREMA

ITS FRANCE
Systèmes de Transport intelligents

State of play

Caltrans District 12 has implemented a new set of tools to more efficiently manage and monitor its field equipment, which as **Dr Morteza Fahrtash** reveals has resulted in cost savings and improved safety for maintenance personnel

Inductive loop sensors providing data on traffic speeds, volumes and lane occupancy are the primary source of traffic data used by Caltrans, California's state DOT, to monitor the real-time state of the freeway system. As such, it is highly desirable to maximize the uptime and minimize any errors in these sensors.

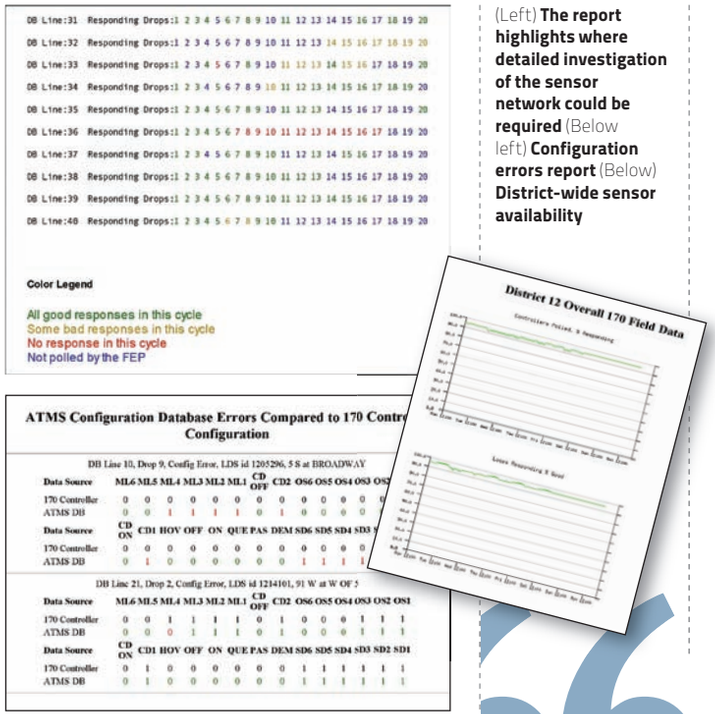
Caltrans District 12 has more than 6,000 inductive loop traffic sensors spread across over 200 centerline miles of freeway, with the vast majority being legacy equipment connected to the Traffic Management Center (TMC) through multi-drop serial connections. Although recent construction uses fiber optics to connect the TMC to the field equipment, many miles of legacy copper lines still exist and these must be maintained for the foreseeable future.

Fault finding

Given the distances involved and the risks of having personnel visit locations on an active freeway (many locations can only be accessed from the freeway), it is vital for maintenance personnel to have as much information as possible regarding the location of a fault before venturing out to a location. In addition, each location must be physically configured – i.e. individual inductive loops connected to a loop controller module – and the configuration entered into a configuration database used by the TMC's ATMS central software to show the current traffic conditions on a map display. This manual process is subject to errors. Furthermore, driving to a location on the freeway to verify the functionality of loops and their configurations can be hazardous and is not desirable.

To address these issues, a set of web-based diagnostics and reports were developed independent of the ATMS central software. Although diagnostics could have been added to the ATMS, running the software requires the use of dedicated computer systems with controlled access and secure subnet to prevent unauthorized access to field equipment. The web-based, read-only solution could then

> Although diagnostics could have been added to the ATMS, running the software requires the use of dedicated computer systems with controlled access and secure subnet to prevent unauthorized access to field equipment



(Left) **The report highlights where detailed investigation of the sensor network could be required** (Below left) **Configuration errors report** (Below) **District-wide sensor availability**

be made generally available to anyone within the transportation department.

Implementing a diagnostics system

The first step in implementing a diagnostic system was to inventory what information is available from the field devices and the communications subsystems delivering the data to the TMC. The next step was to store pertinent information in a cache consisting of a MySQL database.

PHP was selected as the language for generating the diagnostic web pages, which has the capability to easily generate complicated, dynamic web pages, the capability to interface with the MySQL database where field information is stored, and the capability to interface with the Oracle database where the ATMS configuration information is stored.

The first developed diagnostic was a communication status overview, which shows the recent status of all the defined communications lines and all the possible multi-drops, which are from 1 to 20. By implementing this tool, District 12 is able to determine which locations require maintenance without going into the field. As a result, this reduces costs by providing significant time savings and it improves safety by reducing the exposure of engineers to live traffic flow.

Based on this web page, other tools were developed that allow maintenance personnel to summarize failure data by communications line or freeway to localize general system issues and to click on individual items and drill down with increasing scrutiny until the detailed status of individual loop controller hardware is shown.

In the case of the report shown opposite (top left), there are 11 out of 17 locations on Line 36 not responding, so further detailed investigation is required to localize the nature of the problem. Although a given loop controller box may have up to 28 loop sensors attached, normally less than half that number are used at any given location.

To ensure that the physical loop configuration matches the logical configuration in the database, an exception report tool was implemented to show discrepancies between what the controller box has configured and the information in the configuration database. In this report, a 1 in a particular location means the data indicates a loop is configured while a 0 means no loop is configured, with the 1 or 0 displayed in red for the database configuration where there is a mismatch with the physical configuration.

> By implementing this tool, District 12 is able to determine which locations require maintenance without going to the field

Traffic engineers at Caltrans District 12 now use new tools to establish and diagnose faults with sensors out in the field

In the first location shown, the controller has no physical loops connected yet the database shows that 12 loops are connected. A quick check of the related paperwork will inform the engineer whether this is a location under construction and the errors can be ignored for now or that something catastrophic has happened and a trip to that location is required. The second location shows a single error, the most common type found. It is likely that this one loop was overlooked in the database configuration, but again, a quick check of the paperwork will show what was supposed to be physically configured without a trip to that location.

No system is complete without reports for management, so the various diagnostic tools also provide the data to generate a summary of the overall condition of the sensors as percentages operational. In this snapshot (shown above middle), the overall availability of the inductive loop traffic sensors has been approximately 95% for the past seven days, which given the age of the legacy hardware, is quite good. This report is of interest not only to management but also to the engineers maintaining the equipment as it allows them to get an overview of the state of the system and quickly determine if everything is running normally or if further detailed investigation is required.

• *Dr Morteza Fahrtash is a senior transportation engineer at Caltrans District 12. For more details, please email morteza.fahrtash@dot.ca.gov*


Joy of flow . . .
As one of the strongest brands in the ITS world, for the maximum productivity, we present our "Joy of Flow" solutions in forms of environment-friendly products and services that are manufactured with the latest technology
İSTANBUL METROPOLITAN MUNICIPALITY
İstanbul Transportation Telecommunication and Security Technologies Industry&Trade INC.
Tel: +90 (0212) 294 29 00 Fax: +90 (0212) 294 29 06
www.isbak.com.tr isbak@isbak.com.tr
ISBAK is an affiliate company of Istanbul Metropolitan Municipality
İSBAK
Intelligent Transportation Systems

Fuel's gold

Various initiatives are researching how we can save fuel and reduce emissions through the use of C2X technology. **Sonja Koesling** contemplates whether the PRE-DRIVE C2X project could be the jewel in the environment's crown

Images courtesy of Audi, BMW, Daimler, PTV & Volkswagen

The car a few years from now will be incredibly smart – a life-saving, lean, green talking machine. And while such a vision may conjure up scenes from *Knight Rider,* there are no dangerous criminals pursuing the lone crusader in this case, although the driver and his motorized companion are trying to make the world a better place. "Seven hundred meters left until you reach the traffic lights," advises Alter K.I.T.T.. "Please change down into second gear and reduce your speed to 30km/h." By following the instructions, the driver no longer has to stop at the intersection as the traffic light is green upon arrival, as a result conserving fuel and reducing CO_2 emissions – all of which helps the environment.

Focusing on green phase

Such a vision of the future is steeped more in fact than fiction, however, and describes the use case of GLOSA, or Green Light Optimized Speed Advisory, analyzed as part of the European PRE-DRIVE C2X research project by a team of traffic, communications and engine technology experts from PTV, Karlsruhe Institute of Technology (KIT) and the Graz University of Technology. If all drivers in the road network used C2X, the team believes fuel savings of up to 5% could be achieved.

The study is, of course, far more pessimistic than previous research-led investigations, including *Predictive Use of Traffic Signal State for Fuel Saving* by Behrang Asadi and Ardalan Vahidi, which partially predicted a 47% fuel saving. "Our results refer to all vehicles in a large network and not only to one vehicle passing through an intersection," explains Dr Thomas Benz, director of ITS Research at PTV and manager of the simulation work package at

The goal of PRE-DRIVE C2X was the realization of an integrated simulation toolset to assess safety, traffic and environmental impact of C2X communication technology and to upscale the results to the European level

PRE-DRIVE C2X. "We have used a more differentiated approach for PRE-DRIVE C2X and have thus been able to obtain more detailed results." To this end, Benz and his project team developed a comprehensive integrated simulation tool set, including dedicated models for traffic flow, C2X communications and environmental effects.

Modeling reality

Rather than focus on an isolated intersection, PRE-DRIVE C2X analyzed a part of Karlsruhe's road network in Germany, based on real-life measurements using PTV's VISSIM for traffic simulation. The software tool allows users to simulate traffic flows on a microscopic level while considering car-following behavior as well as signal control. Moreover, a communications module was linked to VISSIM that reproduces the communication between the traffic light and the vehicle.

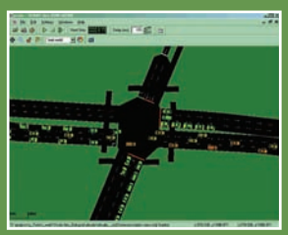
PRE-DRIVE C2X then investigated fuel consumption and emissions: "A majority of previous studies have been based on mathematical approaches calibrated for an average passenger car," Benz continues. "None of these studies addressed aspects such as gear shifting or different vehicle and emission types in detail, however." To model these factors in a highly realistic manner, PRE-DRIVE C2X used the emissions module PHEM (Passenger car and Heavy duty Emission Model). "PHEM is a dynamic model that calculates fuel consumption and emissions from vehicles' instantaneous speed and acceleration," Benz explains. Developed and applied by Graz University of Technology, the underlying database is derived from measurements of more than 1,000 vehicles. "The results clearly show that highly realistic traffic simulation models such as VISSIM and a highly realistic model such as PHEM form a natural combination," he says.

From single vehicles...

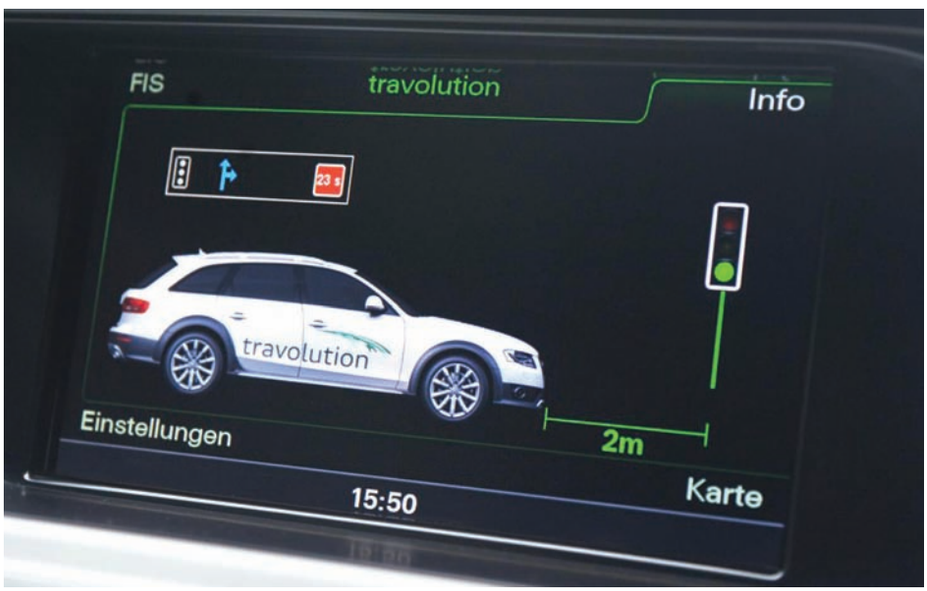
The transportation experts first looked at the vehicle's movements at a traffic light, and in this regard they were primarily focused on gear choice. "We were particularly interested in the driver's gear choice while approaching a traffic light without having any information about the signal state," Benz says. "And we wanted to find out how much fuel is used throughout this time." The experts then simulated a vehicle that received such information and the recommended gear choice over distance, with the results showing that the specific choice of gear has a significant impact on fuel consumption. A vehicle which approached the traffic light in the third gear used up to 24.5% more fuel than a vehicle without C2X communications technology.

VISSIM explained

VISSIM is a microscopic traffic simulation software tool and is part of the PTV Vision software suite. It simulates all modes of transport, including automobiles, buses, trains, cyclists and pedestrians, while taking the behavior of other road users into consideration. The basic concept is that drivers of a faster-moving



vehicle start to decelerate as they reach their individual perception threshold to a slower-moving vehicle. As they cannot exactly determine the speed of that vehicle, they will gradually adapt their speed to the preceding vehicle. Moreover, VISSIM allows simulation of different vehicle types. PTV's transportation experts have integrated C2X communication into each vehicle type, which can be used whenever needed.



Audi is part of the PRE-DRIVE C2X consortium. The car-maker's Travolution road traffic emissions reduction system involves wireless local area network connections between cars and traffic lights, which supply a flow of data from one to the other

This changed as soon as the second gear was recommended, with fuel consumption reduced by up to 43%.

...to the entire road network

In real life, no vehicle moves within a vacuum, especially in inner-city areas where numerous road users have to share the network. "For PRE-DRIVE C2X, we have simulated GLOSA on a busy part of the Karlsruhe system," Benz states, with around 850-950 vehicles on the 3km² area during rush-hour. "We assumed 40% of the vehicles had Otto engines and 60% were diesel from EURO 0 to EURO 4," he says. "Our scenario was also based on the assumption that the driving behavior would not always be perfect. Other road users might influence a driver's individual speed, for example."

Based on these parameters, the project team simulated GLOSA by evaluating five different penetration rates of radio-equipped vehicles – 0, 25, 50, 75 and 100%. "The first thing that grabs your

> A majority of previous studies have been based on mathematical approaches calibrated for an average passenger car

attention when looking at the results is that the fuel savings were significantly lower than in single-vehicle analyses," Benz says (see the chart in *I2V and fuel consumption* sidebar).

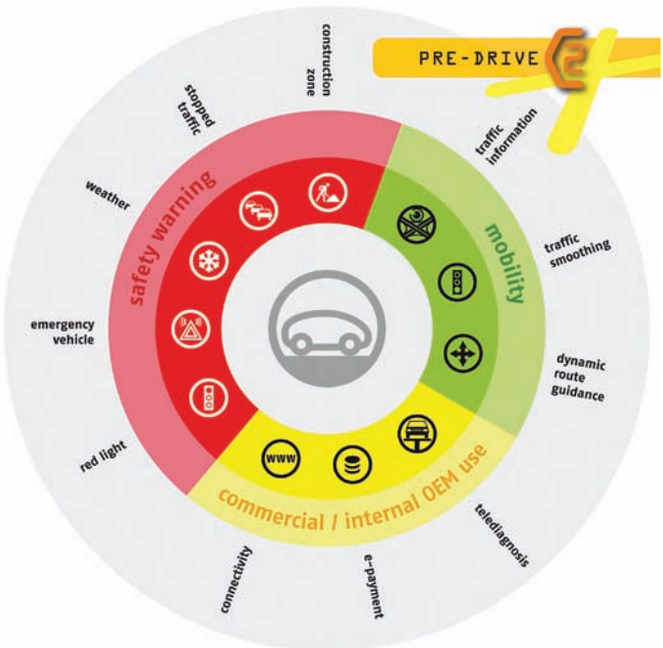
From the simulation to the field test

Nevertheless, 5% fuel economy means a 5% actual fuel saving that helps us conserve the environment and puts cash back into our wallets. It is therefore vital that PRE-DRIVE C2X is assessed via field trials and with this in mind the follow-up project, DRIVE C2X, started in January 2011. In cities including Frankfurt and Gothenburg, a fleet of test vehicles will collect data in real-life traffic, the results of which will be evaluated by the various members of the project team by the end of 2013. Should the PRE-DRIVE C2X results be confirmed in the field trials, the next step would be to provide all road users with access to traffic signal information. But will drivers embrace C2X and to what extent?

Psychological factors

Communication technologies are a part of information systems, but unlike systems such as emergency braking assistance (EBA) and electronic stability programs (ESP) – which intervene automatically in borderline situations – drivers themselves decide whether or not they want to follow the recommendations. "And little research has so far been conducted regarding the acceptance and degrees of success of these recommendations," confirms Professor Bernhard Schlag, Department of Traffic and Transportation Psychology at the Dresden University of Technology. It is clear, however, that trust in a system plays a major role in this field, meaning drivers need a positive learning experience as the new technology will have an impact on their everyday driving routines. "It is important that success is noticeable," Schlag adds.

But how can everyone become aware of the benefits to be gained from GLOSA? To this end, it is important to show not only the reduced amount of CO_2 emissions but also the improved fuel consumption and shorter waiting times at traffic signals. According to Schlag, the technology won't assert itself until drivers simply follow the instructions provided by the system instead of thinking about whether the recommendations are useful or not. It therefore remains to be seen whether every driver of a 'smart' car will turn into a brave *Knight Rider* whose primary purpose is to protect the environment.

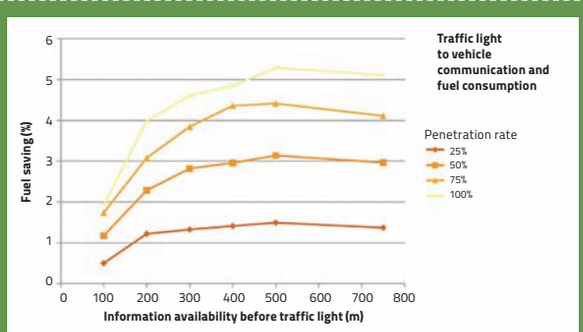


PRE-DRIVE C2X develops an integrated simulation model for cooperative systems that enables an holistic approach for estimating the expected benefits in terms of safety, efficiency and environment

I2V and fuel consumption

How much fuel can be saved through C2X communications? How many vehicles would need to use wireless technology? What is the perfect information distance between the vehicle and the traffic signals? The chart opposite shows the results of the EU PRE-DRIVE C2X project. To translate these research findings into practice, cars have to be equipped with appropriate radio technology. Additionally, HMIs play an important role and will be brand-specific.

Car-makers such as Daimler, Audi, BMW, Volvo Technology, etc, were therefore also involved. Their first task was to formulate the criteria and coordinate everything with the electronics industry and software developers. In total, 24 organizations were involved in the EU project, which had a budget of €8.4 million – of which €5 million was funded by the EC as part of the Seventh Framework Programme. PRE-DRIVE C2X started on July 1, 2008 and was completed on June 30, 2010.




GAS
$ 10.00
THIS SALE
001
GALLONS

Less means more

Peak oil, argues **Bern Grush**, is likely to usher in an increase in automobiles, an increase in vehicle miles traveled – and yet more congestion

Illustration courtesy of Magictorch

In early April this year, a group of colleagues in the USA agreed to collaborate on a white paper concerning the US$5 gallon of gas – assumed to be a milestone the nation has in its sights and one that will soon after become a watermark that it will never retreat from. That we will see the US$5 milestone is doubtless. That it will stick is also assured. And that it will have a short-term dampening effect on vehicle miles traveled (VMT) – and therefore fuel tax revenue – is equally guaranteed. But consider for a moment that the US$5 gallon is merely a rest stop on our upward journey toward the US$10 gallon, and you'll have a far more interesting matter to contemplate.

As I write this, Colonel Gaddafi currently has us wincing. On April 10, 2011, a gallon of gas in

Toronto was US$5.10, while I filled up with premium at US$5.60 – and I was hardly the only 'addict' at the station. The average price in the USA on that day was US$3.85 a gallon (the difference is the low US fuel tax, at bargain-Hummer rates for 20 years now). Surely a revisit to the US$4 gallon will just be another blip and prices will soon recede – once we lock down Gaddafi. But as we become increasingly accustomed to this oil-price rollercoaster, we note that each drop is muted and every subsequent rise sharper. The relentless, long-term economic stranglehold of higher oil prices continues its saw-toothed, tidal rise.

The State of Washington recently released a Request for Qualifications for a series of transportation studies (Google for WSDOT RFQ 11-001). One of the requirements is for a study titled *Effects on VMT, GHGs and Revenue from Changing Fuel Prices and Availability*. Reading the study request reveals an assumption on the part of its authors that rising prices for fossil fuels would reduce VMT, unless mitigated by an alternate supply: "New drilling and recovery techniques have resulted in a dramatic increase in the amount of recoverable natural gas and a consequent decrease in natural gas prices," the study reads. "Because natural gas can substitute for some uses of oil and gasoline it raises the possibility that rising petroleum prices may not diminish VMT to the degree assumed by some observers." (see *p*12 of the study.)

I am ignoring, for the moment, the current debate about how dirty the 'fracking' process might be that releases natural gas from deep-shale formations, which is providing the "dramatic increase in the amount of recoverable natural gas". Fracking is considered by some to be even dirtier than coal, but let's assume that we will work out a way to clean up natural gas.

Although the study requested by WSDOT is concerned with the near-term sustainability of fuel taxes, one of its underlying, long-range assumptions here is that a decline in the availability of fossil fuels would force us – both gradually and permanently – to significantly rethink our use of the automobile, as well as the suitability of fuel taxes. Some who focus on the horrors of the automobile gloat that less oil means fewer cars and fewer miles traveled. Don't bet on it. The expected suppression of VMT will be transient.

Dark age ahead...

In his 2009 book, *Your World Is About To Get A Whole Lot Smaller*, Jeff Rubin predicted oil prices would pass the US$100/barrel mark by the end of 2010 – and would continue to rise from there. Even before the recent Libyan shocks, we were tracking Rubin's

Oil prices continue to rise on the back of the unrest in Libya, with the benchmark price for crude rising by US$2.25 to US$106.67 per barrel at the time of press

prediction very closely, and this is justifying ever-more marginal extraction. Geo-nasties such as tar sands and oil shale look increasingly attractive. This cycle forces up the costs of everything and the result, according to Rubin, would be an increasing number of Americans eating locally more often, manufacturing returning to the USA, fewer vehicle miles traveled, fewer ton-miles of consumer goods, and a devastated Chinese economy, heavily dependent on cheap oil to make and move its exports. Reading Rubin, I imagined myself back on my great-grandfather's farm in 19th century Wales.

...or green utopia instead?

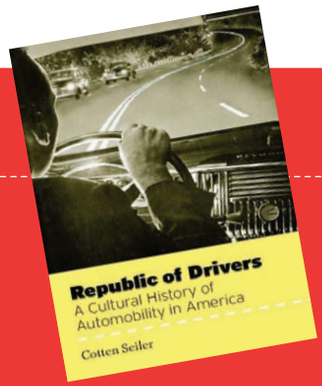
Such a throwback can be avoided according to green energy optimists such as Tom Rand. An antidote to Rubin's work, Rand's 2010 book, *Kick the Fossil Fuel Habit*, points to numerous alternatives, and suggests that oil is almost fully replaceable over the next few decades and that if we focus as hard on this as we did moon landings and Manhattan projects, we can crack the problem bequeathed us by peak oil. Rand's energy-solution basket includes solar, wind, geothermal, biofuels, hydropower, tidal and wave, net zero buildings, electric vehicles, smart grids and of course efficiency and conservation. Taken together – and with several trillion dollars in investment – we can replace oil and coal a few times over.

> Some who focus on the horrors of the automobile gloat that less oil means fewer cars and fewer miles traveled. Don't bet on it. The expected suppression of VMT will be transient

Rebound on steroids

Although I doubt a 100% switchover to green alternatives by 2050 – there's too many vested interests in the remaining oil and coal

Automobility



According to Cotten Seiler's brilliant 2008 book *Republic of Drivers: A Cultural History of Automobility in America*, automobility encompasses "the act of driving and all those components that make driving possible, practical, empowering, fun, salutary, and imperative." Automobility "has provided Americans the means to tremendous economic growth, ease of life and, in some cases, formal political equality for marginalized groups".

Most Americans prize automobility very highly – by some measures more highly than health, longevity, or peace. It is made possible by cheap fuel, innovation, attitudes, desire, and notions of freedom. It shapes landscapes, creates suburbs, delineates class, and defines Americanness. As a dimension of freedom, automobility dominates, and in many social frames it is the epitome of freedom.

Surprisingly, Seiler makes the same oversight most of us do when equating automobility with oil. On the final page of his treatise, he proposes that digital technology will become the "structural paradigm and ideological prop" for automobility "well after the exhaustion of the petroleum supply makes its twentieth-century manifestation impossible." *Beam me up, Scotty.*

We falsely see ourselves as addicted to oil. We are, instead, addicted to automobility – powerful, speedy, flexible, comfortable, sexy, autonomous mobility. There are many reasons that it is currently synonymous with oil, but fossil fuels are merely the current enabler.

What automobility apparently grants to most of us far outweighs the perceived personal harm wrought by the automobile itself. Automobility is so deeply rooted in our psyche it will not be eradicated by appeals to conservation or threats of planetary horror.

In every success (and the internal combustion engine is an incredible success story) is buried the seeds of its destruction. The fossil automobile is now in greater danger than the civilization it threatens. Emissions, congestion and safety issues make the automobile itself even less "livable" than the cities it crowds out. As alternative automobiles replace fossil automobiles and VMT continues its climb, congestion and infrastructure funding shortages will grow, making concerns for emissions pale in comparison. This means the car will be increasingly treated as a pariah by segments of our population. Only demand management, including fair payment by motorists for most externalities, can mitigate the effects of the next wave of automobility.

– as much as I doubt the bike-everywhere scenario (too fat, too lazy, and too far to pedal), what will happen is that the Rubin and Rand effects will complement each other. And the synergy will provide new problems.

For exactly the same reason that Rubin's oil scarcity drives investment in lower and lower yields, oil prices also drive investment in Rand's fossil-fuel-habit-kicking technologies. The entire goal of investment in innovation is wealth, and wealth likes to overachieve. So, when green solutions reach critical mass – and that is coming – stand back. But we will see neither Rubin's dark age nor Rand's utopia.

There is a well-known economic phenomenon known as the 'rebound effect'. This refers to a behavioral response to the introduction of a technology or a measure intended to reduce resource use that instead reduces the savings intended for conservation. Often applied to incremental technologies such as a new generation of lightbulbs or a slightly more efficient engine, the effect causes incremental consumption as a result of the cheaper resource. Fast food, a huge pile of incremental technologies, is cheap, so we eat more.

A common example familiar to the automotive analyst is the well-known fact that most engine efficiencies designed for our automotive fleet during the past few decades have been lost to supplying heavier and faster vehicles, yielding very little in terms of net fuel savings for the average vehicle mile. But even this remarkable and long-standing rebound effect is a simple aggregation of many incremental steps for one technology, the internal combustion engine. What about a bigger shift such as the shift from whale oil to the electric lightbulb? What would a major rebound like that look like?

In her 1961 book, *The Death and Life of Great American Cities*, Jane Jacobs, who thought the car a far better idea than the horse, wrote (*p447*): "We went awry by replacing, in effect, each horse on the crowded city streets with half a dozen or so mechanized vehicles, instead of using each mechanized vehicle to replace half a dozen or so horses." By 2010 – and with Jane now at rest – we have replaced each horse with 100 cars. It's taken innovators such as Robin Chase (Zipcar) and Conrad Wagner (Team Red) to develop car-sharing to even begin to reconsider ways to deal with that ratio.

Thinking about cars dominates more and more books since the 1960s. Jane Jacobs wanted to plan for them more carefully; Jeff Rubin thinks we'll be using them less; but Tom Rand's contrarian view says that we could have a lot more – just different

One can imagine how Jacob Robins, in his 2061 book, *Memories of Oil* might write about the 2020s and 2030s: "We went awry by replacing, in effect, each internal combustion vehicle on the already crowded city streets with half a dozen or so zero-emission vehicles that ran on free, personal, self-generated solar energy instead of using each of those new shareable marvels to replace half a dozen or so of those antique, oil-thirsty, combustion machines."

The US$10 gallon

The US$5 gallon will have a modest impact, adding a bit to the slow economic creep of the CAFE Standards. It will bring us more

tar sands than PHEVs, and more natural gas than electric vehicles. Whatever superstitious import round-numbered milestones carry, we will soon get inured to the US$5 gallon as we did to the US$3 gallon. If you are my age, you will remember that people promised to quit smoking when cigarettes reached 50¢ a pack – or US$1, or even US$3. What the US$5 gallon is going to give us is incremental – the average vehicle size will shrink a bit, and still-pricey PHEVs and electric vehicles that look like golf carts will get great press and modest sales. But what the US$10 gallon is going to give us is the no-gallon car – in large quantities, at astonishing prices and in great, sexy variety. And this is not because the Federal government puts another quarter-turn on the CAFE standards ratchet.

Because fossil fuels extracted from the earth are in limited supply and becoming increasingly inaccessible, their price can only go up. Because we are just beginning to innovate alternate sources of power, their prices can only go down – in relative terms, if not in absolute terms. This guarantees that powertrains using renewable power sources will become less expensive, more accessible and more competitive. Not only will the electric vehicle become less expensive than the fossil vehicle, alternative vehicles will compete among themselves to become far better than the current fossil vehicle.

The rapid and massive dedication of capital by some of the world's most successful investors in the design and power of alternative vehicles cannot be ignored. Shai Agassi's company, Better Place, has succeeded in raising US$700 million in capital from investors such as HSBC, Morgan Stanley Investment Management, Lazard Asset Management, Israel Corp, VantagePoint Venture Partners, Ofer Hi-Tech Holdings, Morgan Stanley Principal Investments, and Maniv Energy Capital. For HSBC, responsible for the lead investment of US$125 million, the deal represents one of the largest financial investments of its kind by the bank – no amount of capital this large has been raised so rapidly in investment history.

Warren Buffett took a large stake in the Chinese electric car and battery maker, BYD, two years ago. Why would he do that? Investors such as HSBC, Morgan Stanley and Buffett hardly make a habit of backing the wrong horses.

> Greening our fleet will exacerbate our current funding and congestion problems – problems that will insist on a new model much more loudly than the bankrupt US Federal Highway Trust Fund

The tables below show a range of traditional and new automotive manufacturers placing heavy bets – and these are far from complete. One hundred years ago there were some 75 manufacturers of automobiles in the USA and it took about 75 years for the market to mature that to a mere handful. A similar wave of innovation has started. The players will be forward-thinking traditionals interspersed with a modest number of new entrants, but it will only take 20 years to mature this time.

Just as we had hints about global warming from the think-tank Club of Rome over 40 years ago, so, too, we had hints from Sheikh Yamani, former OPEC oil minister in 1973, that innovation would transform us out of the age of oil. You might see his oft-quoted advice – "The stone age didn't end because we ran out of stones" – as a warning to his oil-producing colleagues that they should extract their oil and sell it while there was still demand for it. But reconsider his advice now in the face of the innovations and investments being made in the past several years, and in the face

Photo courtesy of Reed Saxon/AP/Press Association Images

Now averaging US$3.88 a gallon nationwide, gas prices have jumped 37% so far this year and have more than doubled since President Barack Obama took office

New market extrants

Vehicle	Manufacturer	Vehicle type	Electric range (miles)	Battery size (kWh)	Model year
Roadster	Tesla	BEV	245	53	2009
Karma	Fisker	PHEV	50	20	2011
Coda Sedan	Coda	BEV	100	37	2011
F3DM	BYD	PHEV	62	13.2	2011
e6	BYD	BEV	250	72	2011
Think City	Think!	BEV	120	24	2012
Model S	Tesla	BEV	160-300	42-95	2012

Major manufacturers

Vehicle	Manufacturer	Vehicle type	Electric range (miles)	Battery size (kWh)	Model year
LEAF	Nissan	BEV	100	24	2010
VOLT	GM	PHEV	40	16	2010
ActiveE	BMW	BEV	120	32	2011
Transit Connect Electric	Ford	BEV	100	28	2011
Focus	Ford	BEV	100	24	2011
iMiEV	Mitsubishi	BEV	75	16	2011
Prius Plug-in Hybrid	Toyota	PHEV	14.5	5.2	2011
Smart ED	Daimler	BEV	70	16	2012
RAV4-EV	Toyota	BEV	n/a	n/a	2012

In the meantime…

There is reason to expect advances in technology will eventually lead to superior alternatives to the internal combustion engine. Rising oil prices may hasten that shift to cleaner transportation power sources. Desirable though that vision is, we should keep in mind that the shift away from fossil fuel will not address the problems of congestion and inadequate funding for infrastructure. Those are problems public agencies responsible for roads and highways must face in the near term.

The root problem is the disconnect between travel demand and the way roads are funded. At present, fuel taxes are the primary source of funding for highways and roads. But the fuel tax motorists pay at the pump does not fully reflect the cost of using the system. Nor do fuel tax revenues

reflect the cost of providing the increased highway capacity needed to meet growing demand. The result is inefficient patterns of use (congestion) and inadequate revenues for building and maintaining roads.

Increasing vehicle fuel economy, the eventual shift away from fossil fuels, and the consequent erosion of fuel tax revenue exacerbate this situation. The good news is that technology now provides a way to address this problem. Electronic technology enables highway operators to charge motorists tolls that vary by time of day, location, and type of vehicle. This has the potential to reduce congestion by balancing peak travel demand with available highway capacity while simultaneously providing a stream of revenue that reflects demand on the system. We can't know with certainty when gasoline and diesel fuel will be replaced by cleaner power sources, but we don't need to wait until that day to operate our highways more efficiently and to fund them at levels that accommodate the public's desire for mobility.

▪ *Charles Prestrud, system planning manager, Urban Planning Office, WSDOT*

of Thomas Friedman's 2006 advice in the *New York Times* where he pointed out that the addiction to oil will end when people are no longer willing to pay such high prices for gas in the face of the invention of alternative energy tools. Consider that the age of the fossil car will peak in the next couple of years – if it has not already.

In a TED (Technology, Entertainment, Design) talk in April 2010, Richard Sears, visiting professor at the Massachusetts Institute of Technology and senior science and engineering adviser for the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, made the point that, "It's ideas, it's innovation, it's technology that will end the age of oil long before we run out of oil." And as Phil Hayward, an independent researcher and lobbyist in New Zealand, puts it directly for the alternative car: "Green automobility is the subject of so much research and investment today, that there is every chance that the result will be automobility at a far lower cost than was ever necessary to replace oil."

The kind of thinking that constrains peak oil projections to reductions in vehicle miles traveled, a loss of infrastructure funding and a threat to automobility is called hyper-linear thinking. Systems (and automobility is an example of a complex system) may be predicted for only short periods of time or over constrained geographies using linear thinking. A recent award-winning student paper *Identifying the Elasticity of Driving: Evidence from a Gasoline Price Shock in California* is a case in point. The author, Kenneth Gillingham, concludes that the price of gasoline, when it endures a shock such as the one in 2006-2008, substantially influences consumer behavior by way of "corresponding reductions in the demand for oil and greenhouse gas emissions".

In the case of the 2004-2008 California data Gillingham studied, elasticity ranged from -0.15 to -0.20, meaning that a 1% increase in the price of gas produces a 0.15%-0.20% reduction in VMT.

Gillingham makes it clear that elasticity is non-linear, heterogeneous, and may change over time. He points to numerous other influential variables including income level, vehicle class and geography. Two other important factors are the degree of the price increase (small increases may show no change in consumption) and the degree of discretionary driving remaining available for sacrifice (this happened for the London Congestion Charge when a new £5 fee caused a 12% drop in traffic but a further 60% increase to £8 caused almost no incremental difference).

What this means is that while the peak-to-valley gas price increase in California of over 100% in the 2004-2008 span resulted in a substantial drop in VMT (since largely recovered), this does not predict the effect of a sustained 200% price increase. At some price increase, VMT could drop disastrously. If a sustained increase occurs, as it is happening now, in a saw-tooth that swings 20-30% per annum, fossil-fuel automobility will reach a 'tipping point', and a shift away from the internal combustion engine will start in earnest and accelerate as the remaining elasticity is exhausted.

The impact of this tipping point will be the flood of new technology that people such as Hayward and Sears hint at – and this cheaper, cleaner, sexier

Although some of us will use and pay for access to publicly supplied power, others will be able to generate enough power on rooftops and in backyards to drive for free

automobility will mean more congestion, more infrastructure demand, and less funding from controlled (auditable) liquid fuel taxes. Greening our fleet will considerably exacerbate our current funding and congestion problems – problems that will insist on a new funding model much more loudly than does the current bankrupt US Federal Highway Trust Fund.

The best hint of that new future is buried in the presentation from the PHEV Research Center at UIC Davis. At least one of their EV trial participants exclaimed, "We are driving further with the MINI E than we would with our gas car." And that is exactly what I'll do when I get mine!

The Royal Wedding, devastating tornadoes in the USA, forest fires in the UK, and the killing of Osama Bin Laden. They're all very disparate events that took place over the course of one week yet brought the issue of security overwhelmingly into public consciousness, prompting much debate about the risks to the transport infrastructure and how best to tackle them. Do we cope better with a planned special event, such as a high-profile marriage, than we do a natural disaster? Do any countries invest enough resources in protecting against man-made attacks? And aviation aside, is security the high priority it ought to be across all modes of transport?

These and many other questions are familiar to Ryan Fries. Although there are many security experts and equally as many ITS practitioners around the world, it's rare to find someone whose experience spans both sectors. "I began to gain a growing interest in security in 2006, so I haven't been involved in this area for that long, but I've done a lot of work in a short amount of time," Fries explains. Currently assistant professor of civil engineering at Southern Illinois University Edwardsville (SIUE), one of Fries' notable achievements has been the 2008 publication of *Transportation Infrastructure Security Utilizing Intelligent Transportation Systems*, which he co-authored with Mashrur Chowdhury and Jeffrey Brummond. "The motivation for

Photo courtesy of Petros Gianakouris/Press Association Images

Natural disasters such as wildfires can have a major impact on mobility

Secure network

Our roads are critical components that are essential to everyday life yet inherently vulnerable to being compromised. **Louise Smyth** speaks with the experts who are bridging the gap between ITS and homeland security

Illustration courtesy of Magictorch

Damien Meyer/Press Association Images

Dave Martin/Press Association Images

From planned special events such as Royal Weddings to tornadoes to the killing of Islamic extremists, our transport network is continually at risk

Photo courtesy of Ng Han Guan/AP/Press Association Images

writing the book corresponded with the university offering a graduate-level course in ITS security. We noticed there were very few sources to guide anyone teaching such a class, so we wrote the book for that class specifically," Fries recalls.

Essential reading

The work has found a wider audience among the ITS community however: "An additional focus of the text is aimed at transportation practitioners," he says. "Most transportation folks don't have an in-depth knowledge of computer network security, for instance, so we decided to provide a chapter on that topic from the transportation engineer's perspective. If you're in charge of hiring contractors for cyber security, you need to at least understand the key terms and concepts so you can effectively communicate exactly what you need."

A number of other key points within the book are also of value to transport engineers: "There's a very comprehensive review of risk-assessment methods, and that applies not just to ITS but to all areas of transportation, multimodally. The tools we covered, such as multi-attribute utility analysis, are very useful for analyzing the risks that are facing our transportation infrastructure and categorizing the best approaches for mitigating them."

When considering an infrastructure as large as the US road network, even getting to the stage when you can understand what the risks are is a huge challenge. "Bridges are one area of concern, but it doesn't stand to reason that a bigger bridge is more of a risk – if a terrorist attack destroys even a small bridge, it's still severing the transportation link. It's impossible to physically protect all areas on our roads, but by using the risk-assessment tools, you can identify the higher-risk targets. After all, terrorists focus not just on immediate damage but also having an impact factor."

> Bridges are one area of concern, but it doesn't stand to reason that a bigger bridge is more of a risk – if a terrorist attack destroys even a small bridge, it's still severing the transportation link
>
> **Ryan Fries, assistant professor of civil engineering, SIUE, USA**

What defines the work of Fries and his peers is that they recognize the benefits of using ITS to assist with risk-mitigation strategies. Traffic management tools can be greatly beneficial in the event of an emergency – and even before, with regard to using traffic data to help prepare emergency response plans. Fries also makes the point that if an emergency occurs, traffic surveillance equipment can be hugely valuable to first responders and traffic managers themselves: "Traffic surveillance via video is a preferred tool simply because a picture really does paint a thousand words," he says. "During critical situations you can identify a lot from a quick glimpse at a video image, which allows you to react that bit quicker. That's true whether we're talking about looking at a transit system to identify where your key assets are or whether we're talking about a roadway system and identifying which links still have traffic flowing."

Bridging the gap

At ICX Transportation (ICXT) Group, the company's president, Peter Dwyer, says they're trying to leverage what he refers to as 'peace dividends' – "Taking technologies that were developed for the security or defense markets and applying them to traffic management applications," he reveals. One example of this approach has been the successful use of thermal imaging for traffic monitoring in fog – not a security application per se, but proof of the viability of such a technology for applications in challenging conditions.

ICXT is also focusing on how to cross-use systems: "Video access is one of the things we in the USA do well," Dwyer says. "It's easy to share video through a thin client, so different agencies can now get access to thousands of cameras. In the past, security systems were siloed from traffic management, but with the enabling technologies for video distribution and sharing, there's far more collaboration. Take crowd management at large venues, for instance. There's far more opportunity to 'co-mingle' technologies for dual purposes, such as bringing together access management and security. At the heart of this is video imagery and analysis."

On that note, ICXT is currently pursuing a large contract in Gujarat, India, that will bring together ITS and security tools including ALPR, smoke detection, left object detection and more.

Help is at hand

The role of fire operations is critical to maintaining tunnel safety. **Zrinko Hrzic** from Egis explains how it runs like clockwork on the Zagreb-to-Macelj motorway

The Zagreb-to-Macelj motorway in Croatia and its tunnels already operate according to many European requirements and standards, including permanent monitoring through a centralized control room, dedicated intervention and first aid teams, as well as periodic drills and feedback in order to continuously enhance the skills of the operator staff.

Although Croatia is not a member of the EU, it is one of the candidates to join soon. And while the Zagreb-to-Macelj motorway is not part of the Trans-European Road Network (so not subject to Directive 2004/54/EC), the high level of services already provided by the operator, Egis Road Operation, will result in compliance with EU rules when needed.

According to Croatian law, it is mandatory for tunnels with a length of more than 1,000m and less than 3,000m (the Sveta Tri Kralja tunnel is 1.7km) to be classified into a special category with respect to endangerment from fire, referred to as categrory Class II b.

In this case, Class II b obliges Egis to engage a fireman on duty, with two professional firemen per shift, or one professional fireman and three specifically trained volunteer firemen. To fulfil the Class II b requirements, Egis's fire brigade is organized in a specific manner. The brigade consists of four professional firemen (at least one fireman is always present in the operations and maintenance (O&M) center and ready for intervention) and 15 volunteers (all of whom have fire training and certification). Of these 15 volunteers, five are patrolmen (from the northern portion of the highway), five are security guards, and five are from the toll collection department.

During each shift, there are two units ready to step in. The first consists of one professional fireman and one volunteer (security guard). This unit is programmed to be first on the scene of an event, with a reaction time after a call of generally under one minute. The second unit consists of two volunteers (a patrolman and a toll collector).

The fire brigade has two fire trucks at its disposal – a fully equipped truck for fire-fighting and a fully equipped van for technical interventions. According to written procedures, for each fire-fighting intervention, operators call Egis's fire brigade first, and after that the public fire brigade, JVP Krapina.

The opening of the section with six tunnels between Krapina and Macelj required Egis to maintain a fire brigade. Consequently, the concession company, Autocesta Zagreb-Macelj Ltd, had to invest in fire trucks and Egis was required to hire the necessary employees. A contract was signed with JVP Krapina and professional firemen were hired, one per shift, as well as special training for three firemen volunteers from Egis 's staff.

The organization of the fire brigade with one professional and three volunteers is optimal from a safety and cost point of view. The main advantage of having this dedicated team is that it provides autonomy, an important consideration for responding to emergencies in terms of the time needed to arrive at the scene of an accident. The brigade also contributes to staff satisfaction as well as the employer's confidence in its staff, in addition to providing additional monthly payments.

> "Egis will allow the motorway – one of the most vital roads in Eastern Europe – to be compliant with European requirements

Croatian law specifies special requirements for dangerous goods transport through tunnels longer than 1,000m. These include explosives, goods marked with an

Tools of the trade

When it comes to being proactive rather than reactive, the first ITS tool that springs to mind is intelligent video-based incident detection systems. Worryingly, though, given how far the technology has come, Fries says he's still not hearing great feedback on these systems from traffic operators: "It's a paradox that as you improve toward not missing any incidents, you have the potential to increase your false alarm rate," he notes. "I know of several agencies that have incident detection systems but simply don't use them as they have to take so much time out of their busy schedule to address all of the false alarms."

Fries is however quick to praise the merits of another widely deployed ITS: "License plate recognition is an excellent tool," he says. "For technologies such as this – which can be expensive to deploy initially – it's great to use them at their full benefit, so not only assisting law enforcement and security but using that data for travel-time information and other tasks that are beneficial during non-incident times."

Photo courtesy of Charles Rex Arbogast/Press Association Images

Courtesy of Ron Edmonds/Press Association Images

Given that there is very little money in the pot for new technologies, it's common sense to do more with the technologies we already have in the field, but as Fries observes the same theory can also be applied to our human resources: "One current project we're working on is developing a highway incident management training course for the state of Illinois that brings together all incident managing responders, so not just a course for DOT responders but one that includes the state police, and the fire and emergency medical services, too. The challenge is bridging the gap so they know each other's role well enough to ask the appropriate questions and give appropriate information to each other, so that we start to build a more cooperative and collaborative environment, especially at high-stress incident scenes. As well as helping manage incidents better, getting all of these responders working together more efficiently helps reduce the risk of secondary incidents."

> "State transportation agencies tend to see security as a relatively low priority compared with their other daily priorities"
>
> **Joe Crossett, partner, High Street Consulting, USA**

(Left and bottom left) **ITS tools are being used more frequently for security applications**
(Below) **DOTs have to work with Homeland Security and law enforcement agencies to keep our roads safe**

Security: a low priority?

Ensuring that DOTs prioritize security in the first place is another big challenge, according to Joe Crossett of High Street Consulting. "Most of my work focuses on state transportation agencies, but they tend to see security as a relatively low priority compared with their other daily priorities," he says. Having worked at Wisconsin DOT before becoming a consultant, Crossett is well placed to understand why this is the case. "For traffic managers, their whole background, schooling and interest is focused on engineering," he explains. "Although there is a sub-set of folks scattered across different states who have done a better job on security, every so often something happens of such a national magnitude – whether it's the New Orleans hurricane, where parts of the interstate were underwater, or the events of 9/11 – that causes a huge wake-up call for all agencies."

The use of the words hurricane and terrorist attack in the same breath provides a clue as to one of Crossett's key focuses, and is an area of work he's keen to continue on behalf of the legacy left by his friend and colleague, ex-Virginia DOT Secretary David Eckern. "Dave had great success selling security as 'We can handle winter

Courtesy of Matt Houston/Press Association Images

Evacuation? There's an app for that

Homeland security and defense expert, Applied Research Associates (ARA), has recently launched its second HAZMAT Evacuation app for the iPhone and iPod touch.

The app displays the isolation and protection zones (in accordance with the *2008 Emergency Response Guidebook*) for hazardous materials incidents on a street/satellite hybrid map. It automatically retrieves current wind direction from the National Weather Service and the user's location from the device. Location can be input via GPS, coordinate input, address look-up or through a map interface. The results can be shown geographically as well as text based. The user can send an email of zone information, including map image. The app includes material guide information and chemical contacts for quick access.

By producing such apps, ARA is reflecting the point that cell phones are ubiquitous, so it makes sense to exploit their value during an incident. As much as ITS and defense technologies have a role to play, it is vital not to forget the role of citizens. Taking advantage of the rise of the smartphone is a cheap, clever and highly useful way of communicating critical information to all road users.

snowstorms more effectively if we have emergency planning processes in place', rather than by trying to encourage DOTs to focus on less likely events such as terrorist attacks. One of the key points of the paper we published for AASHTO in 2005, *Protecting America's Roads, Bridges and Tunnels*, was to focus on the idea of all-hazards emergency management as opposed to focusing on security."

At the end of 2010, Crossett helped produce a research implementation plan for the Transportation Research Board on all-hazards security and emergency management, which is designed to keep pushing this point. "It's a question of shifting your mentality toward realizing that whether it's natural disasters or man-made events, the responses are similar and DOTs are in a position to provide significant support to the other partners in the homeland security and emergency response sector. They have a lot of resources and man power, are usually spread around the state to a significant degree and can mobilize quickly to provide rapid response when it comes to aspects such as debris removal. Whether it's responding in the aftermath of floods or tornadoes or something like a terrorist attack, they have a lot of capabilities to offer.

(Above) **Surveillance is critical to both ITS and security**
(Right) **Emergency planning is essential to lessen disruption on our busy highways**

Video-based incident detection and monitoring is a key part of the security jigsaw

"But all DOTs have different needs. Florida is more prepared for evacuation during hurricane season and their engineers are well aware of tools such as contraflow systems. States such as California and Washington are more focused on the risk of major earthquakes. Meanwhile, Texas is focused on wildfires. Everybody has a different set of reasons why they ought to be concerned about all-hazards emergency management, but a lot of the tools are very similar. In an emergency situation, ITS is invaluable in alerting the public and getting messages out to them via VMS or portable board signs, for instance.

Bringing more to the table

"And there is a noticeable trend in the USA for integrating traffic incident management

centers with emergency management centers so that the great value of traffic monitoring equipment, camera feeds and so on can be better harnessed during an incident of any kind. But the true value of ITS is not designed for one-off events. If we can deploy more equipment that's good for traffic management purposes on a day-to-day basis, the knock-on effect is that the ITS sector can bring more to the table when it's called upon to respond to more serious but infrequent types of events."

This ability to bridge the gap between traffic management duties and homeland security is one that not many vendors have managed to accomplish, for varying reasons – price usually being the most prohibitive element. DOTs are not cash-rich: much as they'd love to invest in the latest technologies from the defense or aerospace industries, more often than not, the purse strings only stretch to off-the-shelf, industry-grade kit. Which is where the likes of Pelco are carving a niche.

Kevin Carpenter has been in the security industry for around 30 years. Today he is senior manager of government vertical markets for Pelco – and he also happens to be the company's go-to guy for all things ITS. "The transportation world has some unique challenges," he begins. "The local jurisdictions responsible for traffic management are under severe budgetary constraints. Roads can no longer be widened to be made safer, so the only approach is to do more with what we've got; to make the existing infrastructure more intelligent."

(Far left) **Pelco's video analytics software** (Left) **The Esprit Rain system from Pelco offers thermal imaging**

With his Pelco hat firmly on, 'more intelligent' simply boils down to deploying more video surveillance for first responders. "I hear feedback from DOTs every day that praises the virtues of video surveillance," Carpenter says. "They appreciate the flexibility of being able to verify any incident – be it an animal in the road or a report of a shed load – by simply spinning a camera around to see what's happening."

Pelco sells a lot of equipment that's used at border crossings – where security has long been a priority – but even in this sector Carpenter's noticed the trend toward being less concerned with ambitious deployments of expensive kit and sticking with proven, field-hardened equipment: "There's obviously a lot of initiative currently on the southern border. Homeland security is changing it up. Instead of installing something unique to the southern border, they are more interested in off-the-shelf products – things that are not designed or manufactured for a specific application, so they've changed their attitude dramatically and they're looking more toward standard products that will effectively support border security."

Thermal imaging is another trend Pelco is pioneering within its security solutions. Although some vendors offer this as a badge-engineered part of their offerings, this wasn't the route Pelco wanted to take: "We chose not to repackage somebody else's thermal imaging core, so now we're building our own," Carpenter reveals. "As well as border checkpoints and crossings, we think this could be invaluable for protecting bridges and tunnels."

As technology from Pelco and others evolves, it's equally important for our security strategies to evolve too, and Ryan Fries has one last message for the transport engineers reading this article: "Our security plans should not remain static," he concludes. "They should not be binders gathering dust on our bookshelf; they should be living documents that are re-evaluated at least once a year to investigate the possibility of new threats, or using the new technologies and tools that become available. The security environment changes very quickly and we must ensure our efforts remain current."

> Roads can no longer be widened to be made safer, so the only approach is to do more with what we've got; to make the existing infrastructure more intelligent
>
> **Kevin Carpenter, senior manager, Government Vertical, Pelco, USA**

Disruptive influence

Although there are various national schemes in many European countries, SeRoN (Security of Road Transport Networks) is the only EU-funded transport security project assessing things from a pan-European perspective. It began in late 2009 and will end in 2012.

PTV's Georg Mayer is the project coordinator, responsible for bringing together seven partners encompassing research organizations (the Federal Highway Research Institute), commercial organizations (such as PTV and Traficon) and consultants (such as Ernst Basler).

"One aim of the project is to gather the national experiences together but also to develop tools and methodologies to make assessments of road infrastructures," says Mayer. "PTV is involved in several work packages and will primarily develop a database that collects infrastructure data, and will be able to carry out assessments of the collected data."

PTV software being used in the project includes its transport model Validate, which has been expanded throughout Europe.

Mayer explains that the project is focusing on bridges and tunnels: "We are taking into account regional and supra-regional economic factors as well as data relating to individual infrastructures. We're concentrating on bridges and tunnels because of their bottleneck function: if they are disrupted, it has a huge impact on mobility."

The overall aim is to provide a methodology for risk assessment that will allow public and private infrastructure owners to develop strategies to improve security – which will hopefully be adopted across Europe. But Mayer also hopes SeRoN will inspire other projects in this arena.

A new breed

The new real-time genus of data collection and processing techniques is bringing just as many questions as benefits for managers of ITS operations. Implementing a successful data and information network, feels **Jon Sorensen**, might best be achieved through a hybrid of data sources

Illustration courtesy of Designerart

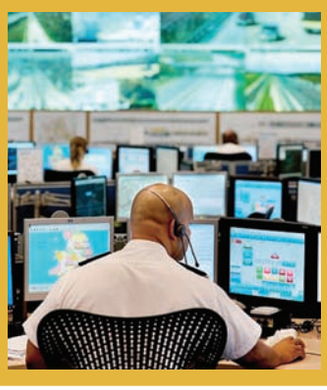
It's no secret that one of the more important factors in effectively managing any transportation system is the operator's ability to attain a quality level of real-time situational awareness for systems within their jurisdiction. The primary ingredient for achieving this knowledge is rooted in the collection and processing of real-time traffic data. Until recently, the acquisition of necessary data was attained through the use of dedicated data-collection systems, constructed, operated and maintained by the operator. Today, the options for sourcing data are expanding at great pace, as the past several years have seen a rapid proliferation of real-time traffic data sources. However, it is this increase in the number (and quality) of alternatives that ultimately places additional burden on the operating agency, clouding the waters when determining the most appropriate data sources to support their specific systems.

Traditional means

Until recently, public agencies usually designed, built and operated all data and information system components (hardware and software) required to meet their traffic management and transportation systems' data requirements. Public agency data networks are beneficial in that they can be developed with hyper-local understanding of user needs and constraints, and procured with specific detection and data-collection strategies in mind. Public data systems place complete control of data management in the public agency domain, thereby maximizing the value of the harvested data, as well as allowing for the use of alternative means such as sharing of data with other internal and external agencies. Another primary benefit of public data networks is the fact that technology vendors typically develop the data management systems from end to end, including head-end and system management software for the operations of data collection and delivery devices. This alleviates the need for the operator to develop costly operations

Establishing a Data and Information Framework

An operating agency will need to conduct several planning and evaluation efforts prior to considering alternatives for real-time traffic data. The first major planning task includes the development of a 'Data and Information Framework' (DIF). A transportation DIF provides an essential foundation for the planning and design of any data and information system. It identifies all functional limits, including network and system boundaries for all existing data and information management systems that support and interface with the framework (and the technologies and applications that operate within the framework).



A detailed framework also maps all data and information flows within and between transportation systems and supporting technologies, defines functional requirements associated with the framework, as well as specifies technical requirements associated with the data and information environment, such as data formats, communications protocols, bandwidth requirements, polling rates, as well as processing and storage requirements. In addition, the DIF identifies future user needs and future system needs associated with the framework, in doing so establishing a comprehensive mapping of all existing and future data and information requirements for the operating agency.

and management software. However, the disadvantages to owning and operating public data and information systems are well documented. Public systems require significant upfront capital investment to implement as well as continuing funds for the operations and maintenance of the infrastructure, including field devices, communications infrastructure, head-end hardware, and licensing fees for utilization of vendor products. In addition, as is the case with many public projects, considerable time is generally required to procure public data collection and information networks.

Private sector data

The past five years have seen the emergence of 'Data as a Service' (DaaS) models, where real-time data is collected, processed and delivered through a private business model. DaaS originated with GPS data, cultivated from fleet management applications. However, the recent emergence of GPS-based consumer-grade technologies has enabled private data providers to shift to a hybrid solution of fleet-based data and crowd-sourced data collection generated from GPS and Bluetooth-enabled mobile devices such as smart phones and PNDs. The proliferation of GPS-based probe data and peer-to-peer crowd-sourced data sources is rapidly implementing a rich network of real-time data resources.

Private data sources are most attractive in comparison to public data sources when considering the ease of deployment and general coverage capabilities. Private systems can provide much quicker 'coverage' than traditional public agency systems, so drastically reducing the need for time and upfront investment funds (similar to the industry shift to cloud computing). Private services also minimize typical annual operations and maintenance costs when directly compared with traditional public agency data collection systems. Also, because the data is generally delivered via typical internet connections or dedicated leased circuits, public agencies do not need to design, build, operate and maintain the communications and networking infrastructure typically required for public data collection systems. In addition, GPS-based data allows for a multimodal source, as a probe (GPS device) can provide real-time data across multiple modes because the person has become the probe.

Operating agencies rely on data sources for numerous daily traffic management applications

However, private data limitations need to be considered as well. Dedicated applications and middleware are typically required to ingest, process and disseminate data and information culled from private data services. Also, the 'black box' nature of the data can limit the end users' understanding of the delivered product (values/meaning of the data), and is incapable of providing specific volume/count-based information. Another current shortcoming of GPS-based real-time traffic data is its level of granularity and inability to differentiate between parallel or adjoining lanes. This marginalizes data accuracies in locations with managed lanes such as HOT lanes, or where physically configured roadways are parallel, such as frontage roads. In addition, restrictive

> …With careful planning and evaluation, an operating agency can implement a successful data and information network with a hybrid of data sources

Considering data resources

A comprehensive data and information framework enables the end-user/operator to better understand existing data and information system requirements, as well as plan for forecasted future data, and ultimately assess and understand functional and technical requirements required for their data and information systems. This level of understanding is essential to the end-user considering implementation of new data management strategies, or simply just trying to identify data sources best suited for their specific ITS needs. One of the initial decisions to consider is whether or not an operator needs to design, build and manage the data and information network in its entirety, or if requirements allow for the use of private data to supplement portions of the data and information systems within the DIF.

data-usage contracts can limit the potential for agencies to engage in innovative data and information solutions, such as 'Open Data' initiatives and crowdsourcing for software solutions development. The use of private data also includes typical vendor-dependency issues, often tied to public data as well. Finally, private data sources can be vulnerable to single points of failure and are less resilient than publicly built networks.

Crossroads

To date, private data has been primarily used to provide congestion information to consumers and operating agencies, and in some cases provide a resource for performance metrics and evaluation. Operators will always be dependent on dedicated, publicly owned and operated data collection and information systems to feed agency-operated traffic management systems, unless private data sources can supply suitable data. For example, an agency will always need real-time data to feed operational algorithms for systems such as ramp metering and incident detection. For private data to reach its full potential, it will need to be suitable (and allowed) to replace existing networks used to feed those systems. This most likely would require legal considerations as well as reconfiguration of existing systems. However, one early move in this direction has seen private data procured to provide real-time data for automated travel-time information systems.

It is unlikely that a single type of data, public or private, will be able to address all transportation data needs anytime in the near future. The recent increase in suitable real-time data resources has placed additional evaluation responsibilities on those agencies considering potential resources. However, with careful planning and evaluation, an agency can implement a successful data and information network with a hybrid of sources. Any assessment of potential resources should include a detailed lifecycle cost analysis, comparing all costs associated with public and private data alternatives. Also, private data service contracts must not tie the hands of public agencies, hinder expansion or tie the hands of innovation. The data should be usable for other transport systems and evaluation metrics too. Finally, agencies should always keep an eye on the horizon for the emergence of new data-sourcing solutions such as IntelliDrive, which will generate a huge amount of new information, and potentially provide yet another resource. One could easily envision a platform for a new public data utility, or 'Data as a Utility' (DaaU) model, sometime in the near future. ○

• *Jon Sorensen is ITS project manager, Atkins North America. To contact him, please email jon.sorensen@atkinsglobal.com*

Global reach

Fiammetta Diani from the European GNSS Agency analyzes the use, potential, and applications of GNSS in projects co-funded by the EC

Images courtesy of CoVeL, European Space Agency & Siemens

Europeans are refining the accuracy of GNSS through EGNOS, the precursor of the Galileo constellation

The road transport sector is currently facing major challenges, particularly the ongoing demands to increase safety and reduce congestion and pollution. The use of Global Navigation Satellite Systems (GNSS) is a powerful tool for improving road transport. Not only do such systems help drivers to get where they want to go more quickly and efficiently, they also enable fairer (and more automated) road-pricing schemes to be deployed.

Within this sector, three major drivers are emerging. The first is a positive market trend in terms of GNSS penetration in vehicles is being challenged by the associated price decrease of the devices. This price erosion can be compensated for by creating innovative solutions and new services. The second trend is that the current EU regulatory framework is having a positive impact on GNSS adoption. Reliable and accurate positioning, as offered by EGNOS and Galileo, is considered a key enabler for many ITS services and GNSS will be a key technology of the European Electronic Tolling Service (EETS). It is also expected to be embedded in the new generation of digital tachograph devices. Thirdly, as these new European GNSS join the market (EGNOS has been operational since October 2009 and Galileo looks set to arrive in the next few years) and early R&D results become available, the whole issue of GNSS is kept in the limelight, with the industry discussing these results at various events throughout Europe and beyond.

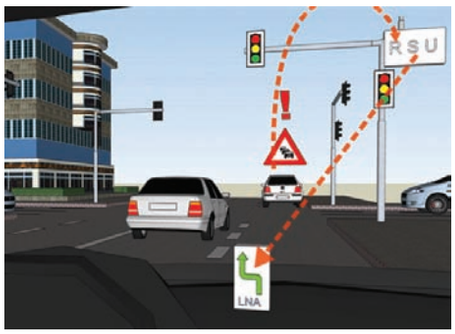
According to the *GNSS Market Monitoring* report, recently published by the European GNSS Agency, the road transport sector is the leading GNSS segment, accounting for more than 50% of market share. The penetration of receivers in road vehicles – today at 30% – will exceed 80% over the next decade. However, after a period of fast growth, market saturation and competition in the form of smartphones equipped with free navigation capabilities have resulted in a slowdown in the car-based navigation market. Smartphones are now taking the lead in front of personal navigation devices (PNDs).

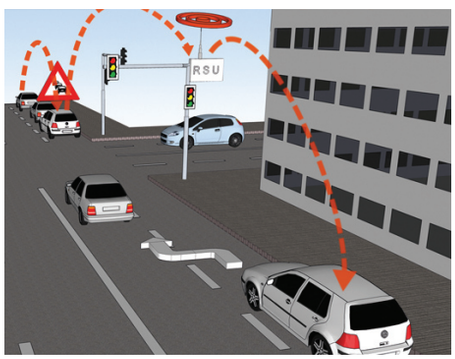
Price erosion has been high, driven by declining costs and strong competition. Vendors are using innovation as a differentiator, resulting in 'converged' products with both communication and multimedia functionalities. Some PND vendors are also tapping into new distribution channels, including car dealerships and smartphone application stores.

Services based on cooperative systems, such as advanced services for safety, driver assistance and active traffic management – as well as new information and entertainment services – will provide an important additional source of growth.

Regulations enabling opportunities

The ITS Directive, in force in Europe since July 2010, is opening up new possibilities for a safe, smart and green transport system, which is boosting attention and investment in the sector. Accurate and reliable





positioning is a key technology for ITS deployment. As an example, in the ITS Directive, EGNOS and Galileo are addressed as key enablers for ITS applications and services for which accurate and guaranteed timing and positioning services are required. Particular focus is given to the tracking and tracing of freight along its journey and across modes of transport. Another major application of Galileo for roads will be its inclusion in future digital tachograph devices.

With the new EETS decision adopted in 2009 after intensive discussions with toll chargers and service providers, GNSS can become a core technology to realize a unique, Europe-wide tolling service.

Early results from EU research

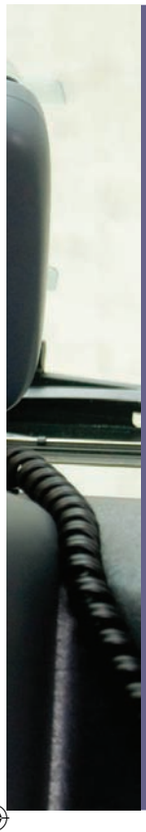
The European Commission is co-funding a portfolio of 15 R&D projects related to EGNOS and Galileo for ITS applications, under the Seventh Framework Programme. Some of them are already providing interesting technical results. An almost complete overview will be provided at the forthcoming ITS in Europe event in Lyon, but it's possible to anticipate some of the more interesting results now.

The SCUTUM (from the Latin for 'shield') project is applying EGNOS for the provision of reliable and guaranteed positional information for the transport of dangerous goods. As a result of a location server that is exploiting the EGNOS integrity signal and applying advanced techniques to mitigate the multipath local effects, SCUTUM provides the position and a circle of confidence that is around 8-9m in diameter. The user can be sure that the vehicle is within that circle. The main user is currently Eni, an Italian company ranked among the top oil and gas companies worldwide, which started to use the service in operational conditions, and is expected to implement it across all of its fleet. Italian and French transport ministries are actively involved in SCUTUM, as they are highly interested in having a confidence level in the tracing path of dangerous goods transport. The R&D phase is almost complete and the service will be ready for commercialization at the end of 2011.

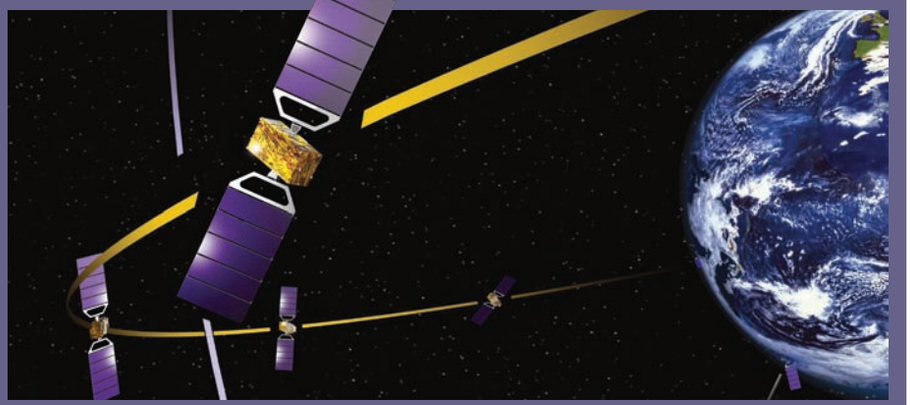
The GINA project developed an advanced GNSS-only road pricing solution, applying geo-fencing based on position integrity. Two trials have been performed – an exhaustive one, assessing the performance of the system, and an end-to-end one, involving 100 final users. An incredibly large amount of data has been collected and independently analyzed. The analysis confirmed that GNSS is a reliable tool for different road user charging (RUC) schemes and that the technology proposed by GINA allows distance-based charging with good performance in a simple, affordable solution. Therefore, EGNOS and other GNSS-centered techniques (e.g. Receiver Autonomous Integrity Monitoring) can be used to improve performance and reliability. GINA technology is now available to be integrated in innovative RUC systems. The GINA

> The European Union GNSS projects demonstrate a significant improvement of accuracy and a surprising availability level of EGNOS signal in different European areas

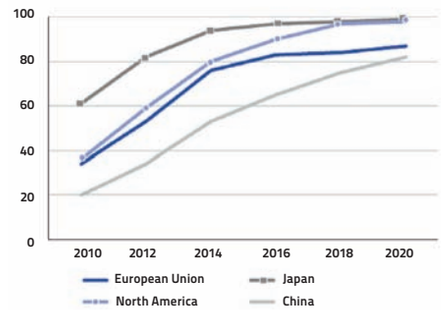
(Top left) **The aim of the CoVeL project is to develop and commercialize the Lane Navigation Assistant (LNA) – an in-vehicle device which will enable lane-level navigation and lane-level traffic management especially in urban areas**
(Above) **Satellite-based tolling offers high flexibility in terms of choice and extension of toll route**

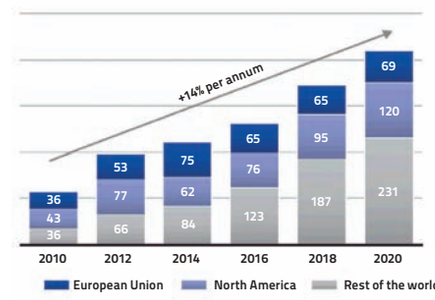


The Euro vision



EGNOS and Galileo are the two systems implementing the European GNSS strategy. Galileo is scheduled to start operations in 2014 and will be Europe's own GNSS, under civilian control. With respect to GPS, currently available for civilian uses but conceived and managed for the military, Galileo will contribute to more accurate and trustable positioning services. EGNOS is a satellite-based augmentation system (SBAS) that improves the accuracy of the GPS satellite navigation signals over Europe. Conceived for civil aviation needs, EGNOS has interesting commercial utilization potential in other markets ahead of Galileo going live. EGNOS improves GPS position accuracy down to 1m and provides integrity information, making it suitable for applications requiring very accurate and trustable positioning.





(Above right) **The top graph shows GNSS penetration in the road sector shown in percentages; the one below shows shipments of GNSS devices in the road sector, including smartphones used as PND (source *GNSS Market Report*)**
(Left) **GNSS solutions are a powerful tool for improving road transport**

project also developed a business plan for a potential EETS provider entering the market. The positive and encouraging business model will be presented at the ITS in Europe event.

In another example, the CoVeL project is developing a lane positioning assistant (LPA). The LPA provides a vehicle position with a higher level of accuracy than the GNSS mass-market receiver currently in use for navigation systems. Lane-level vehicle position enables a series of possible applications, including lane pre-choice or wrong-way driver warning. The output from the LPA is the vehicle position with lane accuracy using satellite positioning as its primary source, data that is augmented by EGNOS correction information. Advanced algorithms for relative positioning and group map-matching are currently under development, and it is expected that a demonstration will occur in Bordeaux in November 2011.

The GSC project, currently in its final phase, went beyond the demonstration of the 'multiple services platform' technical feasibility. In fact, it is providing analysis and recommendations with respect to market deployment. GSC identified the key differentiators of Galileo and EGNOS for a number of critical potential mass-market applications, including the interoperable road charging applications, and it demonstrated how these differentiators could become enablers for the market industrialization. Two leading road pricing service/technology providers took part and had the opportunity to directly trial EGNOS, with support of GNSS specialists. Among other achievements, GSC has demonstrated a relevant improvement of accuracy in extra-urban scenarios and a surprising availability level of EGNOS signal in different European areas.

Focus on EGNOS

The EC, Directorate General for Enterprise and Industry, is currently driving the EGNOS to Road project, involving key users such as a leading toll charger, a Tier 1 automotive manufacturer and a capital city traffic manager. The aim is to assess the EGNOS added value for road applications, with a focus on road pricing, tracking and tracing, and urban mobility. The project is running a field trial on a new motorway and in a challenging urban scenario. On top of the technical evaluation, EGNOS to Road will deliver a business and legal analysis of what EGNOS – and in future, some Galileo differentiators – could bring. The results will be available next summer and a preview will be presented at the upcoming ASECAP Study Days event in Brussels.

For more information about the European GNSS Agency, please email fiammetta.diani@gsa.europa.eu

Map quest

Transport for London's Model Auditing Process (MAP) is driving change in the capital. **Dr James Smith** and **Robert Blewitt** explore the role of this innovative approach to modeling

Images courtesy of TfL

Traffic modeling is a complex process that typically involves parties that have differing priorities and varying levels of understanding, experience and expertise. At the end of the modeling process, however, the highway authority is required to make an informed decision on scheme approval based on the modeling provided.

The mixture of different parties involved – together with conflicting priorities and interests – has the potential to create lengthy delays and costly resubmissions when traffic models and associated proposed designs are rejected as not fit for purpose. To combat this, Transport for London (TfL) created the Model Auditing Process (MAP) to ensure that all parties work together during early stages of proposal and model development. Experience has shown that the efficiency of the whole process can be improved, leading to cost-savings, a cultural shift in the approach to traffic modeling and a more constructive working relationship with software suppliers, consultants and scheme promoters.

Artist's impression of Piccadilly Circus, which has since been modeled in PTV's VISSIM software

Traffic management responsibility

TfL is the traffic manager with responsibility for over 1,000km of London's busiest roads. When there is a proposal to make either a temporary or permanent change to the Transport for London Road Network (TLRN) or Strategic Road Network (SRN), the Traffic Directorate's (TD) Forward Planning Team (FPT) needs to grant approval for the change to proceed. To perform this role, the FPT relies on the TD's Network Performance (NP) department to provide expert analysis on the likely impact of the proposed scheme. This analysis will often require the use of calibrated and validated base case traffic models modified to investigate the impact of the proposal.

To ensure that modeling is of sufficient quality for the FPT to conduct its work, the NP employs two interrelated instruments that together guide model development and verify model performance. The first is its *Traffic Modeling Guidelines* (TMG) document, which the NP has produced since 2004, with the third revision released in September 2010. This extensive reference document provides an understanding of the key issues involved in traffic modeling for TfL while also detailing tried-and-tested modeling techniques. The TMG operates alongside the overarching guidance provided by the Department for Transport to give all parties an overview of the approach to scheme design needed to meet TfL standards.

The second instrument is MAP, produced since 2007 and now onto its third revision, with an updated process launched at Traffex in March 2011. MAP establishes a common decision-making structure for all model submissions from initial scheme scoping through to assessment of proposed model results. It defines key roles and responsibilities for all parties involved, together with six sequential stages of model development (see sidebar overleaf).

By stipulating that documented meetings must occur between all parties prior to the development of base or proposed models, MAP ensures that all parties are in agreement on the modeling required from the outset. This reduces the possibility of any uncertainty or misunderstandings over the approach to be taken, and helps avoid any surprises appearing later during model auditing. These scoping meetings dovetail the software-specific stages of MAP where technical benchmarks must be achieved prior to continuing along the process. MAP currently supports modeling undertaken using LinSig (LMAP), TRANSYT (TMAP) and VISSIM (VMAP). Version control is achieved through check-sheets at the end of stages one, two, three and five, which must be signed off by all parties before development can proceed to the next stage.

Encouraging effective scheme design

MAP has been applied to all TRANSYT and VISSIM modeling undertaken within London Streets since 2008, with over 1,100 traffic models following the process. In conjunction with the TMG, this level of uptake has led to an increase in the quality of modeling submitted to the TD. MAP has allowed model auditors a mechanism by which to control the quality of submissions, while the TMG has provided the promoters and developers a means of understanding why quality assurance is required prior to any on-street implementation.

A recent scheme showing MAP in action was during proposals to rejuvenate an area around Piccadilly. The scheme proposed to remove the one-way gyratory system with two-way traffic operation around Pall Mall, St James's Street and Piccadilly. It was felt this would increase routes available for traffic traversing Central London from Hyde Park Corner toward Trafalgar Square and beyond, while also bringing pedestrian benefits in the form of an increased number of crossings and reduced street furniture.

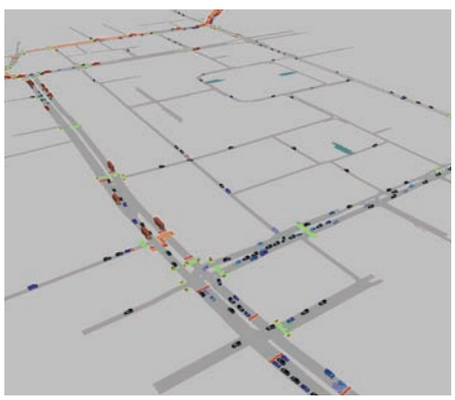
The TD became heavily involved with the scheme's design from its conception through to final approval. A design team consisting of representatives of the TD, Colin Buchanan and developers West One met regularly to discuss design issues. These meetings allowed model development to be guided at an early stage following the collaborative working approach inherently promoted by MAP Stage One. The design team was able to influence factors such as junction layout and signal design through to carriageway alignment, vehicle turning radii and the location of parking and loading facilities. MAP was used to ensure the impacts of these changes were accurately captured through 'fit for purpose' base and proposed modeling. The modeling submitted went through a number of iterations to meet the required standards, with the final TRANSYT and VISSIM models being of sufficient quality to allow an accurate assessment.

> The design team was able to influence factors such as junction layout and signal design through to carriageway alignment, vehicle turning radii and the location of parking and loading facilities

Model results were used to demonstrate an expected reduction in delay for both general traffic and public transport as a result of the scheme's implementation. The scheme was successful in completing MAP and is expected to be on-street by the end of 2011.

Promoting software development

Although originally designed to increase the quality of traffic models, MAP is also being applied to increase the quality of the traffic modeling software in which models are developed.

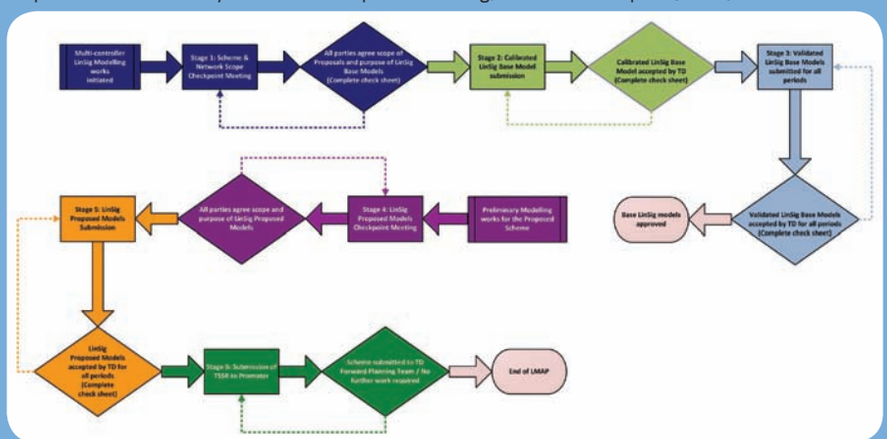


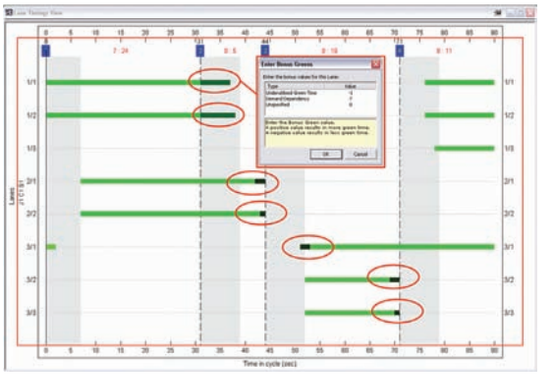
Piccadilly as modeled in VISSIM software

The six stages of MAP

The latest version of MAP offers a step-by-step guide about how model development should be conducted. The idea is to ensure that all participants are on the same page, figuratively speaking. Breaking the process down in this way ensures that all parties know exactly what they should be doing, and when they should be doing it – and helps to avoid misunderstandings that create problems further down the line.

There are six separate stages to MAP's model development guidelines:
MAP Stage One: base model checkpoint meeting;
MAP Stage Two: calibrated base model;
MAP Stage Three: validated base model;
MAP Stage Four: proposed model checkpoint meeting;
MAP Stage Five: proposed model submission;
MAP Stage Six: submission of traffic signal supplementary report (TSSR) to FPT.





Assessing green times

The release of LinSig 3.0 by JCT Consultancy (JCT) in mid-2009 represented a significant change from previous versions in terms of functionality and potential application. Following a review of the new software, TfL identified key modeling requirements that prevented LinSig 3.0 models from being accepted under MAP. Using MAP as a template, TfL and JCT agreed to implement effective solutions. JCT developed extra features to assist the transparency of the auditing process while also providing TfL specific functionality. At the same time, TfL started work on a dedicated MAP for LinSig. The results of the collaboration between TfL and JCT can now be seen in the newly released LinSig 3.1.

MAP requires repeatable traffic flows to be present at different stages of model development, so LinSig 3.1 now includes fixed Flow Groups and user-defined Flow Group layers that allow the direct entry of traffic flows for different vehicle types (e.g. public transport). To increase the speed by which MAP auditors can examine signal design, LinSig 3.1 now includes a Lane Timings View, which allows the modeled green times to capture the effects of demand dependency and under-utilized green time (UGT) without modifying the original signal timings.

Scheme designs within congested networks such as London need optimized signal timings to smooth traffic flow and adequately cater for demand. For this reason, the TMG outlined a strategy for optimization: in response, JCT created optimization options for fixing offsets between junctions, applying degree of saturation limits and performing offset-only optimization.

Traffic model development can be completed in a myriad of ways. As a result, the process of analyzing a model is also highly complex. MAP is used to rationalize this process into small steps, but to remain efficient it is useful to have a single source of auditable information. JCT was therefore encouraged to develop a Model Audit View that groups all major calibration and validation parameters into a single window for quick reference. A model will undergo identical checks at each stage, so to help reduce auditing time an integrated file comparison tool was developed to identify differences between LinSig models.

Finally, the latest version of LinSig also contains a custom feature that exports output data in a specific format for automatic uploading to an external database. This allows a model auditor within MAP Stage Five to consider output values in a single pass during the final stages of proposal assessment.

Available to all

MAP and TMG provide a best-value approach for TfL that enables it to influence all parties – providing an effective and efficient process that delivers high-quality, cost-effective scheme designs that aid the smoothing traffic flow agenda in London. ○

• TfL's Traffic Modeling Guidelines and new MAP, including LMAP for LinSig 3.1 modeling, is available free of charge at www.tfl.gov.uk/trafficmodelling

Simon **Pickup**

The Middle East has an appalling track record in traffic safety, but as **Simon Pickup** reveals, moves are afoot to reverse the trend

Interviewed by Nick Bradley

> The fact roads in the Middle East are so chaotic presents a major hurdle. On a three-lane road you might have five cars lined aside each other

The good ship 'enforcement' has seemingly run aground on certain shores, chief among them the UK. In a tough economic climate with cutbacks aplenty, scrapping camera schemes might appear to be a short-term fix to make ends meet, but some experts suggest Local Authorities in the UK do so at their peril and risk the country's position at the top of the road safety tree. That's why recent figures emanating from the Middle East should serve as a timely reminder that enforcement is an integral part of the mission to curb accidents, save lives, and reduce debilitating injuries – regardless of where you sit in the road safety league.

A long road to Vision Zero

The need for action in the Middle East is acute; countries in the region have some of the world's highest road death tolls. A recent World Health Organization study states that in Saudi Arabia 49 people in 100,000 die in traffic crashes every month; in the UAE the figure is 37. Traffic crashes are also the main cause of death among children under 14 years old, accounting for 63% of all accidental child deaths.

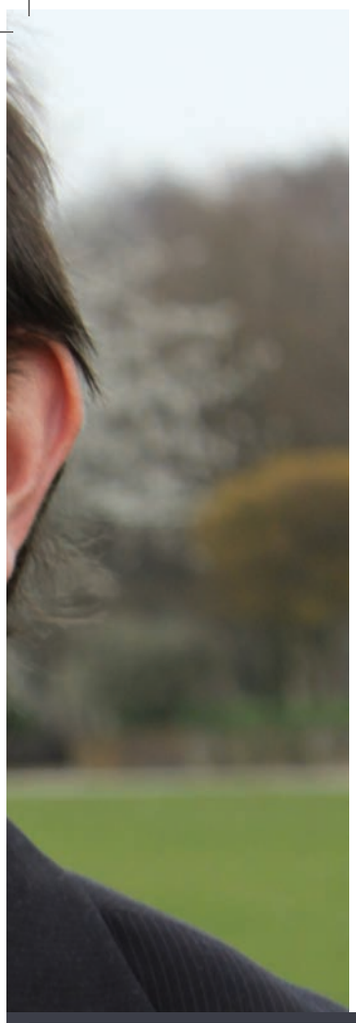
Vastly improved enforcement of traffic laws was thus branded essential by Dr Michal Grivna at the 2010 Arab Children Health Congress in Dubai. However, such worrying statistics in the Arab states have been a cause of concern for Australia's Redflex Traffic Systems for a decade or more. "We've had trial systems there since the early 2000s," reveals Simon Pickup, manager, Middle East at Redflex Traffic Systems, which has set up a satellite office to better serve the needs of the region.

Working closely with local partners, including government and police authorities, Redflex's tenacious belief in these lifesaving devices paid off in October 2009 with the signing of a major contract for the Saudi Arabian Automated Traffic Violations and Monitoring Project (ATVAM), known locally as Saher. The five-year deal was worth around A$34 million and involved the installation of around 400 mobile and fixed-speed measurement devices through a BOOM (build, own, operate, maintain) contract, which has served Redflex so well in the USA.

"We've employed a number of mobile camera operators and back-office processing staff from the local community and currently have around 40 employees, and are growing quickly," Pickup reveals.

And this relatively small team is delivering big results. In February 2011, Lieutenant Colonel Ali Al-Zahrani, supervisor of the Saher program in the Eastern Province, announced an 18.9% decline in the number of road deaths, further stating that accidents were 7.7% lower than in the same month in 2010. "Injuries also dropped by 30.4% following Saher's implementation," Pickup adds.

This is, of course, not particularly revelatory to Redflex's man on the ground – he's seen well-coordinated enforcement strategies such as Saher deliver results all around the world. "Although there's a culture of dangerous and uncontrolled driving in the Middle East, there's also an acceptance that something needs to be done," he says. "Nobody likes to be fined, but on the whole the public has embraced the program. One of the interesting aspects in Saudi Arabia is that they have a highly integrated system for recording the fines, so if you go to renew your passport or driving license, or go to leave the country, you're



Simon **Pickup**

A new breed of enforcement

"Middle Eastern countries are no different to other places around the world in that you see drivers slow down for cameras and then speed up again – it doesn't take them long to familiarize themselves with fixed-point speed enforcement locations," admits Redflex's Simon Pickup. "I'm a big fan of point-to-point – it's very much the way of the future," he adds. "I'm also pretty excited about mobile point-to-point, where you deploy a number of vehicles temporarily along a particular road. As we've seen on the Hume Highway between Melbourne and Sydney, you really do see a behavioral change when using these technologies. You can't fool a point-to-point system."

The familiar NK6 design (below) **is giving way to the Redflex NK7** (left) **– the world's first of which will be installed in Abu Dhabi as a part of the large contract with the Abu Dhabi Police**

presented with a list of the penalties owed, so there's no getting away from it."

In Dubai, where Redflex has red light and speed enforcement systems in place, local police believe the message may also be sinking in, with the number of deaths on the roads halved in the first quarter of 2011 from the previous quarter. "It's not solely about the cameras," Pickup acknowledges. "There are very good awareness campaigns and programs in place to educate bad drivers, as well as schemes to educate schoolkids about their future responsibilities as road users."

Dubai now benefits from around 95 police patrols, with a particular presence in school zones, as well as 570 speed cameras.

Redflex also has systems deployed in Bahrain, Qatar, and Abu Dhabi. Regarding the latter, in February Pickup and his team scooped an interim contract for the supply, installation, and maintenance of a number of enforcement units as well as a massive back-office system to the Abu Dhabi Police. Worth over A$5 million, 40 fixed radar systems and 20 point-to-point enforcement stations will be supplied initially, and a contract is also due to be signed for the supply of a further 435 fixed radar systems and another 40 point-to-point systems, worth around A$30 million. "There's quite a lot of competition between the Arab states," Pickup reveals. "Once one country has a particular system, you often find that another wants the same or better. And because the legal infrastructure is not quite as sophisticated as in some western countries in terms of approvals processes and certification, they don't have to be as conservative in the systems that they're deploying. They're pushing out the latest and greatest in digital enforcement, featuring high-resolution cameras, infrared imaging, and lane-discrimination radar, etc, which can identify which vehicle or vehicles within a group are speeding."

Pickup has also noted a demand for more aesthetic systems, particularly in Qatar on the roads frequented by the Emir. Other than that, though, the technology is no different to the systems deployed elsewhere. No modifications are required to account for the climatic conditions; with Redflex's US headquarters in Phoenix, Arizona, and its parent company in Australia, the desert-like extremes are quite comparable.

Culture of change

Although not for one second suggesting enforcement is the panacea for the Middle East's road safety problems, Pickup does sense a culture of change that he believes is a vital first step to making inroads into reducing fatalities. He is not, however, underestimating the challenge ahead.

"The fact that the roads are so chaotic presents a major hurdle," he explains. Red light runners in the UK, for instance, tend to jump the light as it turns from amber to red, but in the Middle East it's not at all unusual to approach a red signal, see that there's no one around and just go. "Also, on a three-lane road you might have five cars lined up aside each other," he continues. "One thing that's similar is that young males are disproportionately represented in crashes," a fact backed up by a WHO report published in 2010 stating that road accidents are the leading cause of death among males aged 16-36. Pickup also says the culture of antisocial driving appears to be a global phenomenon. When combined with increasing motorization – the automotive market in Saudi Arabia was worth US$11.7 billion in 2010 – the big fear is that the road safety problem will explode if not tackled head-on now. Indeed, a study by the King Abdulaziz City for Science and Technology (KACST) confirms this and warns that if the current rise in road accident rates is not addressed, Saudi Arabia will have over four million traffic accidents a year by 2030.

Although the early signs are encouraging, countries in the Middle East are merely at the start of a very long road, but have set themselves some ambitious targets. "One police chief recently told me that they used to have typically 20 deaths on the road in their region every week and in the first week of enforcement they hadn't had any," Pickup enthuses. "Personally, it's pretty exciting for me to hear that we're actually making a difference." ○

Charging ahead

Chargemaster's CEO, **David Martell**, explains how his company is doing its bit to ensure that there will be sufficient charging points to service the expected influx of electric vehicles

Over the next 12 months, electric cars will appear in showrooms across Europe from manufacturers such as Nissan, Mitsubishi, Peugeot, Citroën, Renault, and Smart. The launch of these new electric cars will be quickly followed by new plug-in hybrids from Toyota and GM. Over the next five years, nearly every car maker will launch an electric or plug-in vehicle and the motor industry predicts that 10% of the world's car production will be battery powered by 2020.

With this influx of electric vehicles, there will be a need for charging locations on street, in office and public parking lots, in supermarkets, at airports, and at users' homes. The number of charging post sites in Europe will accelerate over the next 12 months as the initial deployment will be subsidized by governments wanting to spur the take-up of low-carbon transport.

In the UK, the government is operating a scheme called 'Plugged in Places'. Around £22 million (US$36 million) is being provided initially to three cities – London, Milton Keynes, and Newcastle – which have been selected to become showcases of electric vehicle technologies. Over the next three years, more than 5,000 charging stations will be installed in public and private locations supported by a 'matched funding' initiative, whereby the government pays 50% of the cost of installation. The second round of Plugged in Places is already underway, with Birmingham, Greater Manchester, the West Midlands, Northern Ireland, and Scotland pushing to have EV hubs.

Chargemaster is actively leading the way to promote interoperability right across the charging posts in the UK with an RFID-based payment system

The electric and plug-in hybrid vehicle market will be further stimulated by a £5,000 (US$8,200) government subsidy that is currently available and this will bring the cost of the Mitsubishi I-Miev or Nissan Leaf down to an affordable level. Although the upfront cost is still higher than that of an equivalent petrol or diesel vehicle, the running costs of these cars are comparatively low, with no fuel bills (on-street electricity is free for the foreseeable future), no road tax, often no parking charges, and in London no congestion charge. Also, when you buy an electric car, many OEMs are offering a special charging unit – such as Chargemaster's HomeCharge unit – installed in your garage or on your driveway at a special rate. This is often coupled with a preferential tariff for electricity supply; the HomeCharge unit charges the electric car automatically using off-peak electricity, reducing the cost by more than 60%.

UK supermarkets are also preparing for the growth in the electric car market, with the major players planning to install multiple charging locations to meet the needs of their customers. Charging points will also be installed at railway and underground stations, enabling commuters to leave their cars charging at the station parking lot while they are at work.

Many companies are looking at installing charging stations in their office parking lots and planning authorities in London and elsewhere are making it a requirement that 20% of all new developments have bays with a provision for charging. Indeed, developers are already integrating charging points into new plans.

Global initiative

This development of the electric vehicle charging infrastructure is happening in many other countries as well as the UK.

> By encouraging people to charge at night and during other off-peak periods, the impact of electric vehicle charging can be minimized

(Above) **The new Opel Ampera, the European rebadge of the Chevy Volt**
(Left) **As car manufacturers bring cars out with faster charge capability over the next year or two, the CombiCharge unit provides a future-proof and flexible solution**

Chargemaster is working with its partners in France and other European countries to support electric vehicle programs in cities such as Paris, Amsterdam, Nice, and Brussels. In the USA, the Obama Administration is supporting electric car buyers by paying for 50% or more of the cost of installing charging points and a recent US research report forecast that the charging point market would be worth US$6.5 billion over the next five years.

With the increase in electric vehicles, governments are now looking at the potential effect on the electricity supply grid and Chargemaster sits on government advisory panels looking at ways in which the power supply can be managed efficiently. By encouraging people to charge at night and during other off-peak periods, the impact of charging can be minimized and in the future there may be requirements to restrict charging rates at peak times. With the advanced technology in charging posts, online services can be provided to site owners and electric vehicle users to help them identify the best times to charge and alert them when a car has finished charging, or when it is about to go over its allotted time.

Motorists will start to see more and more charging posts on street corners and this will act as a credential for low-carbon motoring. So-called 'range anxiety' will be diminished, with motorists having the confidence that there will be a charging point available when they need it. In reality, this concern is needless; the average UK commuter journey is less than 25 miles and currently a typical electric car will travel for approximately 100 miles between charges. Battery technology research is also being carried out to improve range, and VW engineers forecast that within 10 years a normal night-time charge will easily provide a range of 300 miles.

Governments are investing in the production of low-carbon electricity with new nuclear power stations, as well as renewable energy resources such as wind and tide generators. Even with old-fashioned coal-powered generation, official figures show that electric vehicles release 25% less CO_2, even taking into account the carbon produced by the energy source. It is within the power of governments to make this figure closer to 75% over the next 50 years and this will make a significant impact on overall carbon reduction targets and help reduce the effects on climate change. ○

Artificial neural networks-based OCR

In the traffic sector, almost any company that develops software may at some stage require ALPR technology. This encompasses companies offering software for tolling, truck weighing, network video recorder (NVR) applications, police authorities, city councils, and more. Perhaps as a consequence of the wide scope of ITS tasks that ALPR is used for, the marketplace is awash with vendors offering various solutions. The variety of options to consider when first investing in ALPR solutions can be bewildering, so it helps to get some expert advice.

At the heart of any ALPR system is the OCR software engine. You can have state-of-the-art image capture – the latest cameras, illuminators, etc – but unless the software engine that's processing those images is effective and reliable, your system is as good as useless.

A number of companies are marketing ALPR software engines, either as part of a full ALPR system or as an individual component of a pick-and-mix approach – but very few of these companies offer as much experience and expertise as the Barcelona-based Neural Labs.

Need to know?

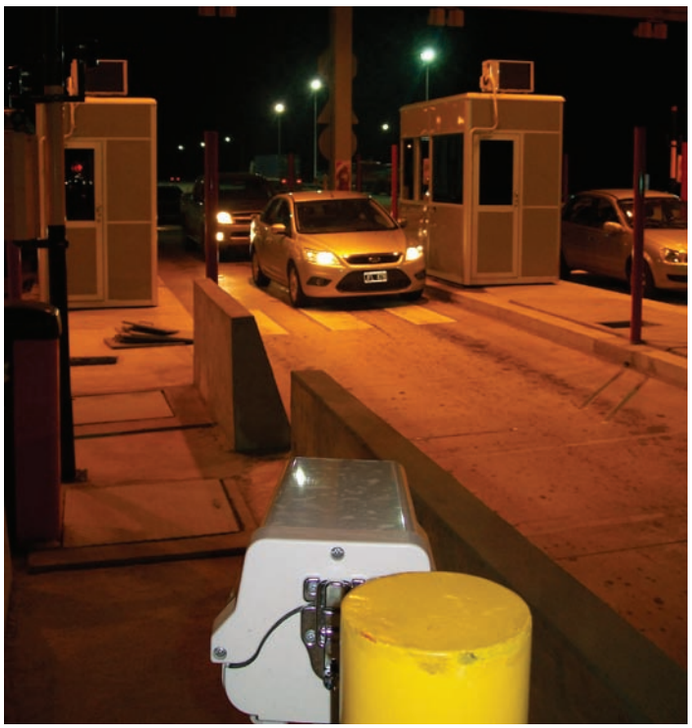
The use of proprietary neuronal technology to create advanced ALPR engines

- Expert assistance on ALPR systems from computer vision specialists
- How neuronal technology contributes to effectively read license plates
- Helping software companies with vertical solutions get into the ALPR sector without any stress
- How these ALPR engines are being deployed in the real world

READER ENQUIRY NO. 501

The company was founded in 2005 by computer vision experts Elías Valcárcel Torres and Jesús de la Calle Orodea. The founders share 15 years of experience in recognition software (not only for license plate recognition but also for applications such as container ID recognition) including being involved with Spain's first ever ALPR systems. They had worked in full ALPR systems before seeing a gap in the market for a sustained focus on the computer vision and neuronal network segment of an ALPR system – the engine. They identified a need to offer tools to enable companies that are new to the ALPR sphere to enter this world quickly and hassle-free. Testing specialist TÜV Rheinland Iberica, for example, needed to include ALPR in its vehicle-inspection software to meet Spanish law requirements, so Neural Labs provided its ALPR engine and TÜV used Axis cameras to incorporate the engine into its vehicle-inspection software.

Using proprietary neuronal technology, Neural Labs' ALPR engines perform extraction of the license plate information



from an image using a number of techniques – including image processing, image analysis, and artificial intelligence – to create what is known as 'artificial neuronal networks'.

The company's main USP is that its engines are not hardware-dependent and work with all of the main types of cameras found within the ITS market, such as those from IDS, JAI, Sony, Axis, and Mobotix to name but a few. This is a real selling point for those customers looking to gain license plate recognition functionality, as all they have to do is combine the Neural Labs engine with their existing, off-the-shelf camera hardware. Naturally, the company also offers unbiased advice about what camera hardware works best for any given task. As clients typically have a vertical solution requiring ALPR capability in their software, Neural Labs works alongside them to guide them as to which cameras are a good fit for ALPR, where to buy them, how to set them up, and even how to design specific solutions.

Neural Labs prides itself on responding to customer demands with an appropriate technical solution. One client, for instance, needed to read more than two license plates in one image, so a software engine was developed that can now read up to eight plates in one image. Similarly, another client needed to conduct ALPR in-vehicle, day and night, without any illumination at all. The software copes admirably with this challenging condition, which well reflects Neural Labs' unofficial tagline 'If you can see the license plate, our engine will read it'. And as Neural Labs owns all of its technology, it's also easier for it to tailor software to meet specific situations, the knock-on effect of which is that continual development and modification results in even better engines.

Satisfied customers

For 99% of the software licenses sold by Neural Labs, the company has no idea where the technology is ultimately deployed, either due to badge engineering, confidentiality agreements or the fact the software is discreetly integrated into an end system without users even being aware of the engine supplier. Despite this, Neural Labs has a number of interesting case studies that showcase exactly how these engines are being deployed.

A toll road in Ecuador, for example, needed to implement an ALPR system to prevent fraudulent activity occurring within a clearing system between three toll bridges. The clearing system grants free access at the second bridge for a certain amount of time to those vehicles that paid at the first toll bridge. With the ALPR system implemented by Telectrónica and the NeuralLabs ALPR engine, the operator can verify at the second toll bridge that the fee was paid at the first by correlating the license plate reads in both cases. Sixteen toll lanes are now outfitted with this ALPR solution.

Telectrónica and Neural Labs also put their technologies to work on an a toll road in Argentina. Under the country's law, motorway concessionaires are obliged to register the license plates of all the vehicles traveling across their toll bridges. Telectrónica's automated system complies with this with a performance rate of 99% by using the NeuralLabs ALPR engine. This specific concessionaire company now has 20 lanes with the ALPR system installed and working.

Aside from toll roads, Neural Labs has also sold software licenses to 30 countries across the world, where the engines are used for access control, security applications, law enforcement, traffic signal control, and more.

Despite such success, Neural Labs' founders are eager to bring ever more advanced offerings to the market and will keep improving the existing range as well as launch new solutions, including an embedded engine that represents a cost-effective solution to process one camera and send results to an application running on a server. Another development will also bring together its object-tracking and ALPR technologies into one single traffic engine.

(Main, opposite and above) **Toll plazas rely on ALPR** (Left) **Neural Labs technology is behind a variety of ALPR systems for different applications**

Contact

Neural Labs
+34 933 968 572
info@neurallabs.net
www.neurallabs.net

Radar sensors to solve diverse vehicle-detection challenges

From tracking road usage to vehicle detection at traffic intersections, sensors are increasingly used to optimize traffic control and management. But such diverse applications bring with them numerous challenges for the reliable detection of moving or stationary vehicles, so a sensor that uses Frequency Modulated Continuous Wave (FMCW) radar could be an ideal solution.

FMCW radar-based sensors were originally designed for the detection of trains – an application where magnetic, ultrasonic and photoelectric sensors are impeded by various environmental elements. Magnetic sensors, for example, may be affected by a train's electric current, while ultrasonic sensors are susceptible to the interference caused by the wind of passing trains. Optical sensors, such as photoelectrics, may provide reliable detection but are ultimately inhibited by the dust and dirt that accrues, which renders them ineffective.

Emitting a well-defined beam of high-frequency radio waves from an internal antenna and processing the signal reflected back to the receiving antenna, FMCW radar sensors provide reliable detection without being negatively impacted by the above problem areas.

Adjustable-field radar

Designed to detect objects located within a user-defined distance while ignoring objects and any background beyond the setpoint, adjustable-field radar sensors can be used for detection of vehicles on roads and near intersections, as well as vehicle counting for parking ramps, gates and drive-thrus.

On-road, the sufficient metallic mass on cars, trucks and motorcycles – especially when in motion – accurately reflects the radar back to the receiving antennae. But they can also be used to detect cars driving on rural roads, freeways and more for statistical purposes. For instance, it can easily record how frequently a road is used, helping traffic engineers to determine whether a road should be widened, a stop light should replace a stop sign at an intersection and more.

They can also be set up to detect a car further down the road from an intersection. A stoplight, for example, could be alerted when a car approaches so the light sequence switches to green by the time that the car arrives meaning the car doesn't have to stop. It could also sense when a vehicle enters a turn lane, signaling the light to switch to a green turn arrow.

Uncontrolled intersections on rural roads pose serious risks to drivers, even to those familiar with the area as they may become accustomed to infrequent traffic. Hills, curves and vegetation may also make it hard to see oncoming traffic in both directions. Such sensors could therefore be employed to send a warning signal to cross traffic when vehicles approach an intersection.

Three mounting options are available for such applications. The first and easiest is mounting the sensor at the side of the road, facing perpendicular across lanes toward the sides of passing cars. It can also be mounted from above, aimed down the road toward oncoming traffic, allowing it to avoid many roadside obstacles. A third mounting option – which consists of a sensor positioned above the road, aimed straight down and perpendicular to the pavement – requires a retroreflective FMCW radar sensor.

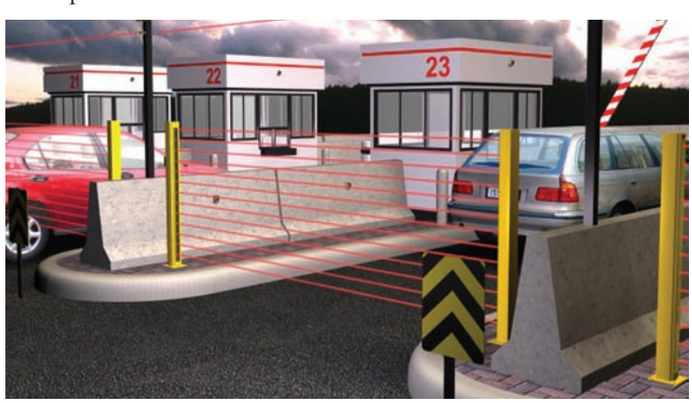
Retroreflective radar

The retroreflective model complements the adjustable-field model by effectively

Need to know?

Improving commuter safety by providing more reliable vehicle detection at intersections

- Utilizes FMCW radar to provide reliable detection of moving or stationary objects in areas where photoelectric, ultrasonic and magnetic sensors fall short
- Designed to detect objects located within a user-defined distance, ignoring objects and any background beyond the setpoint
- The QT50R adjustable-field radar sensor emits a well-defined beam of high-frequency radio waves from an internal antenna



(Top) **Detects objects up to a set distance, ignoring objects and backgrounds beyond the setpoint** (Left) **Reliable vehicle detection at toll booths**

sensing stationary targets with poor or no radar reflection through the use of a reference signal, or retro-target. Emitting the same high-frequency waves as the adjustable-field model, retroreflective models have a narrow effective sensing beam, ignoring objects in the background beyond the retroreflective target. This results in a more focused sensor and allows the ability to sense targets up to the sensor face, eliminating any dead zone.

This breed of sensor can be used to detect the presence of a vehicle in order to activate a scanning system, or toll or gate mechanism. They can also be used to detect when a vehicle is no longer present so that it is safe to lower the gate arm or otherwise close access. For detecting the presence (or absence) of a car stopped at the gate, the sensor is mounted above the ground, aimed straight down perpendicular to the pavement. It senses the pavement as a retro-target, and will then detect the presence of cars above the pavement. For precise detection of whether a car has cleared a gate or not, it should be mounted beside the gate, aimed horizontally across the road toward a retro-target accessory that is positioned on the opposite side of the gate.

All in all adjustable-field and retroreflective radar sensors promise to solve the many shortcomings of traditional technologies, with many current applications and numerous additional possibilities.

Contact

Banner Engineering
sensors@bannerengineering.com
+1 763 544 3164
www.bannerengineering.com

Eric **Sampson**

eric.sampson1@btinternet.com

Nearly five years ago we had a marvellous event in London – the 2006 World Congress on Intelligent Transport Systems. All Department for Transport (DfT) ministers either attended to visit the exhibition and meet delegates or took part in technical and policy sessions. Two Department for Trade and Industry (DTI) ministers also came.

One event that stays in my mind – because, Dear Reader, I too was there – was a ministerial visit to the DfT stand and a discussion about costs and benefits prompted by the minister's test driving of a neat software package for conducting these calculations for ITS investments. The minister asked how many Local Authorities were up to speed with ITS and the reply given was semi-tactful and along the lines of "Well, there's a top 15 or so who are really switched on, innovative and pretty self-sufficient. Then there's a group of 30 or so who are aware, enthusiastic and fairly capable but need some help and guidance. That leaves a large number who are not well aware, are missing the benefits and potentially need a lot of help to get started. Finally there's a disastrous dozen or so who don't really want to know about anything in our experience as it's always far too difficult."

The minister then asked what could be done to bring the worst up to the standard of at least the 30 and we had to say: "It's not easy – you need to run a competition and give the prizes to the losers and ministers have never been able to see a clear way to do that". And so it proved.

What's all this got to do with the price of petrol ? Transport ministers recently published a *White Paper* setting out how to encourage the uptake of more sustainable modes at local level, and publicizing the £560 million allocated in the new 'Local Sustainable Transport Fund' to support this. The Parliamentary Statement on the White Paper explains that, "… the LTSF forms part of a wider picture of more streamlined and simplified funding to Local Authorities. This will give Local Authorities more power and flexibility to meet local transport needs." Sorry minister but it will not work like that.

The Statement continues: "… Across government we have demonstrated our commitment to ending top-down decision-making, and the tendency in Whitehall to develop one-size-fits-all solutions which ignore the specific needs and behaviour patterns of local communities. The Government has already taken significant steps to hand back power to local communities. Today's White Paper is about extending the decentralisation of power to local transport…".

All very good business school dogma but it misses the point. A Local Authority that has thinned out its middle management technical experts and which is too small to be able to devise or deliver a robust set of transport plans will not magically acquire these skills as a result of localism. Instead it will continue to drift along in the bottom tier of knowledge and application because there will be no central guidance to help it improve, no centrally funded work on standard packages and no central coordination of initiatives.

Letting LAs do more to decide whether to do something in transport – a traffic management system, say – is long overdue. But the new localism thinking also removes any coordination of how things are done, which will mean uninformed procurements, incompatible services, barriers to seamless travel and through ticketing, and numerous LAs duplicating each other and triplicating, or worse, the overall cost to the taxpayer.

> Letting Local Authorities do more to decide whether to do something in transport – a traffic management system, say – is long overdue
>
> **Professor Eric Sampson, Newcastle University/ITS-UK, UK**

Environmental solution to keep roads ice-free and safe

READER ENQUIRY NO. 503

(Left) **Eco-Thaw is already commonly used in North America, and is now coming to roads in Europe** (Below) **Eco-Thaw is a derivative of an agricultural product**

Severe freezing weather in the UK and the USA this past winter once again highlighted our dependence on the roads network, as economies on both sides of the Atlantic struggled to keep moving amid scenes of snow and ice. With an increasing amount of traffic on our roads, businesses more dependent on just-in-time deliveries, combined with the need to maintain access to critical services, the prospect of increasingly unpredictable weather resulting in the issue of how to keep traffic moving in severe icy weather is brought sharply into focus.

The key challenge for road and traffic managers is to be prepared, keep roads safe, and prevent gridlock, especially when temperatures plunge below 18°F (-8°C). In the UK, such severe weather was not a common occurrence. But the past three winters have seen snowfall and plunging temperatures down to -4°F (-20°C) in some areas, bringing roads to a standstill and creating new hazards for all road users.

In the UK, the Highways Agency (HA) and local councils are responsible for maintaining the road networks in such a manner that allows the uninterrupted use and safe movement for all highway users from buses and cyclists to motorists and pedestrians.

The HA and the majority of councils use rock salt and coated rock salt as anti-icing materials and stockpile huge mountains of them in preparation for the winter. Councils organize the application of salt to prevent frost and ice from forming on roads when such conditions are forecast. The salt works by turning the moisture surrounding each granule into a saline solution that has a suppressed freezing point. The action of traffic helps the salting to be effective by breaking down the salt granules to allow it to form a brine solution quickly, which will either prevent ice from forming or break through it (melt) to debond the compacted layers of snow and ice to allow them to be plowed off the surface. However, conventional mixtures of salt are ineffective when temperatures plunge really low.

The key problem is that granular rock salt and the associated brine is not effective in temperatures below 18°F, which leaves road managers powerless in the fight against icy roads during periods of extremely low temperatures.

Need to know?

An environmental solution for melting ice and snow on roads derived from agricultural processes

- Eco-Thaw improves response, performance and resilience to severe weather conditions
- Designed to be mixed with existing salt stockpiles or applied directly to surfaces for anti-icing and de-icing
- Saves money, time and labor by reducing the need for salt by 15-60%
- Can reduce overall annual snow/ice control budget by as much as 40%
- Prudent use of resources, enhancing the value of service to both the community and economy through timely and improved road safety

The fight against nature

Countries across the world have had varying degrees of success in the battle against the elements. The spreading of brine has been successful in keeping precautionary application spread rates to a minimum, and accelerating its initial effectiveness, although its use is still limited when it comes to very low temperatures.

This is where Eco-Thaw comes into its own, when we have periods of sustained cold temperatures, particularly when traditional methods and applications struggle to perform. Eco-Thaw depresses the freezing point of its liquid mixtures beyond that of conventional rock salt brine and has proven ice melting capabilities at lows of -4°F.

Environmentally friendly and non-toxic to vegetation,

Eco-Thaw's versatility allows it to be spread using many different forms of applicator, to match existing methods and locations – highways, local roads, cycleways, sidewalks or parking lots. Similarly, it can be used to complement more traditional and existing freezing point depressants (or de-icers) in falling temperatures without any additional cost.

In North America, where Eco-Thaw is commonly deployed, it is not only used as an additive to salt, but also as a direct liquid application and as an enhancer to brine applicators, where it enhances and extends the functionality of the brine throughout the season without the need for extra investment.

The latest application of Eco-Thaw in the UK was with Transport Scotland, where successful trials were undertaken earlier this year in Aberdeenshire. The solution is undergoing further trials after traditional salt and grit failed to keep key routes clear during the recent extreme weather. Scottish transport minister Keith Brown said tests of the liquid had shown "favorable results", and that the measure was part of the methods the government was exploring to tackle future bouts of freezing weather. "This is one of the first times it's been used on the Scottish road network and it is encouraging to see this initial trial deliver positive early results," he says. "Last December we faced the coldest weather for 100 years and it's right we continue to explore ways of improving our capacity to respond to severe weather."

Further advantages of the additive come from the ability to reduce spread rates due to the increased viscosity and ability to reduce bounce and scatter throughout its distribution.

Contact

Innovative Global Products Ltd
info@igp.org.uk
+44 1491 628700
www.innovativeglobal.net

Misener_James@bah.com

So goodbye yellow brick road
Where the dogs of society howl (Elton John)

There are many roads to take toward a Smart Car. The entry to some of these roads might be consumer demand. Conversely, the entry to other roads may be based upon government demand. (Yes, this is economist-speak for the regulatory road.) Continuing in this euphemistic vein, perhaps there is ahead an Emerald City or a hybrid where roads converge and unpopular regulation is banished. I submit that there is such an Emerald City. And unlike Elton John's lyrics, there is no turning back. The road is paved in yellow, and we can ride forth.

Recently and in the USA, the NHTSA, a regulatory agency, released the Vehicle Safety and Fuel Economy Rulemaking and Research Priority Plan. And the yellow brick road is clearly delineated. In the research that led to prior rulemaking, ESC was regulated. Consequently, single-vehicle road departure and rollover crashes have been significantly reduced. The Priority Plan tells us that NHTSA will validate that. Oh yes, the Emerald City is just starting to come into view.

Leafing through the Priority Plan points to more. There is potential rulemaking for forward collision warning, a concept which may be coupled with automated crash-imminent braking. Yes, I can see the skyscrapers in the distance. The Emerald City is clearly discernable.

Furthermore and as touched upon in previous Smart Car columns, the prospect of rulemaking for V2V communications as informed by a large-scale safety pilot test and companion human factors research is upon us. Just read the Priority Plan. Lo! We are finally in the outskirts of the Emerald City.

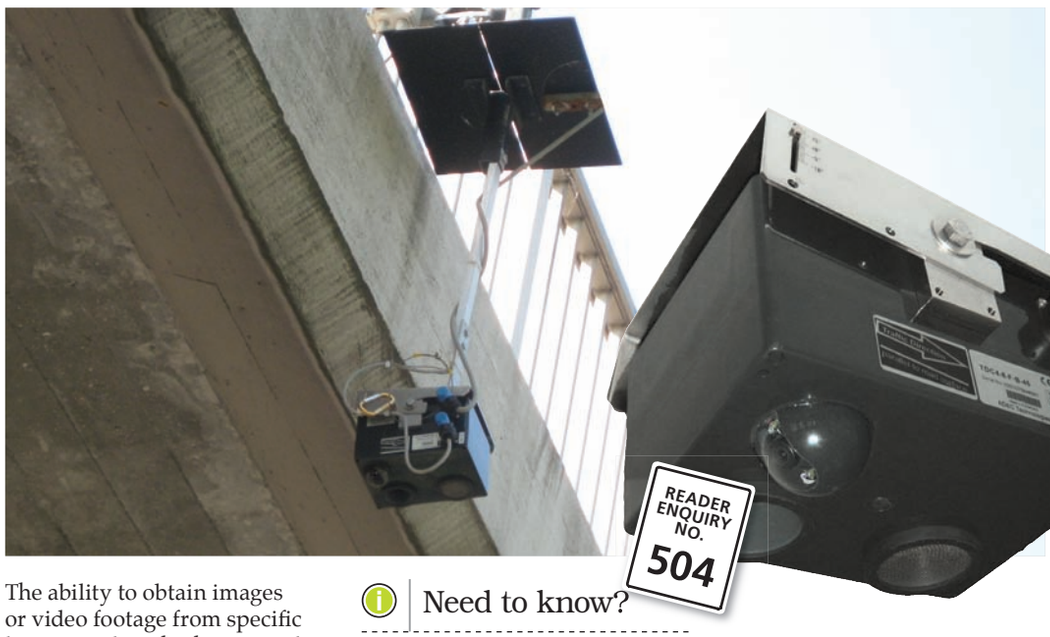
But there's more road to travel. The concept of Advanced Automatic Collision Notification, where first responders are provided vehicle data prior to arrival at crash scenes is described in the Priority Plan. Basic research in vehicle-based alcohol detection is also described. Although some may blanche at the prospect of using this technology for ignition interlocks, I point out that perhaps a third of road fatalities involve alcohol; therefore, I for one think Emerald and not Fools' Gold when I read about alcohol detection.

In the near term and at the center of the Emerald City – and as mapped in the Priority Plan – are ideas for Smart Cars such as rear-visibility cameras to prevent backover crashes. This is especially important for the elderly and future adult population (that's children) of Emerald City. And adding to the list of Smart Car features is the idea of a standard and common sense means to address keyless ignition, as it does no good to breathe carbon monoxide from a running car in a confined area if we don't know if it's running. And of course, there's the infamous floormat-jamming-into-pedal issue which besmirched one car company's good name last year. Foot pedal clearance regulation, while seemingly small and innocuous, are part and parcel of a Smart Car.

The NHTSA roadmap to and through the Emerald City is indeed clear and compelling. So despite Elton John's plaintive lyrics, there's no saying goodbye to the yellow brick road. We will have arrived there in our Smart Car.

> Although some may blanche at the prospect of using alcohol detection for ignition interlocks, I point out that perhaps a third of road fatalities involve alcohol; therefore, I for one think Emerald and not Fools' Gold when I read about alcohol detection
>
> **Jim Misener, executive advisor, Booz Allen Hamilton, USA**

Non-intrusive, single-lane data acquisition with video verification



The TDC4 is part of a new breed of traffic detection equipment

The ability to obtain images or video footage from specific locations along highways and roads is increasingly valuable to road operators. Although detectors of any type generally provide purposeful data relating to the condition of the traffic, the assessment of certain conditions can greatly benefit from the availability of images or video footage in order for appropriate steps to be taken.

To date, the need for visual verification typically required deployment of video systems alongside any non-video traffic detection system already deployed. Alternatively, some video-based traffic detection equipment provides access to the video stream for manual verification of traffic conditions, but such systems (should they remain affordable) do not necessarily provide sustained data accuracy throughout changing environmental conditions.

The first approach leads to the obvious expenses such as acquiring and installing the camera. Less obvious, though, are the costs associated with expanding the bandwidth for transmitting the video images back to the central station, as well as the costs involved with properly integrating the new system into the pre-existing data-acquisition system. The acquisition and installation of the camera is therefore only part of the solution.

The second approach inherently doesn't suffer from these shortcomings, as the primary purpose of such a camera-based system is by its very nature traffic detection. The availability of video outside of the system is a nice add-on, but to benefit from this at the traffic monitoring station, the bandwidth to the monitoring station must suffice and using the visual verification function must not affect regular operation. Although video-based detection systems have found widespread use in intersection control, they are used less for pure traffic data-acquisition applications. Evaluating solutions to obtain video images therefore lacks the option of an integrated approach that takes advantage of the benefits of traditional, proven detection technologies, leverages the pre-existing infrastructure and increases the situational awareness sought through video.

Need to know?

The TDC4 model combines video-verification capabilities with the detection and measurement performance of the TDC3 series

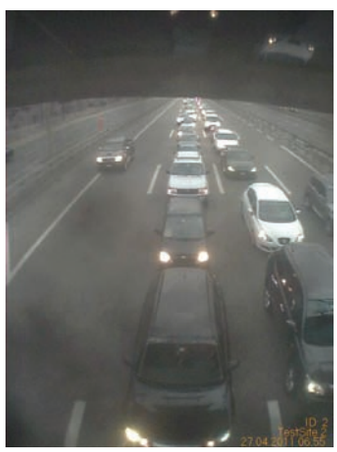
- Comprehensive traffic data including individual vehicle class, speed, length, occupancy time and time gap are provided via RS 485
- Designed for a variety of traffic data collection and traffic control applications where inductive loops have been used in the past
- Can be configured to automatically capture images upon certain traffic conditions (wrong-way driver, queue) or upon external command via RS 485

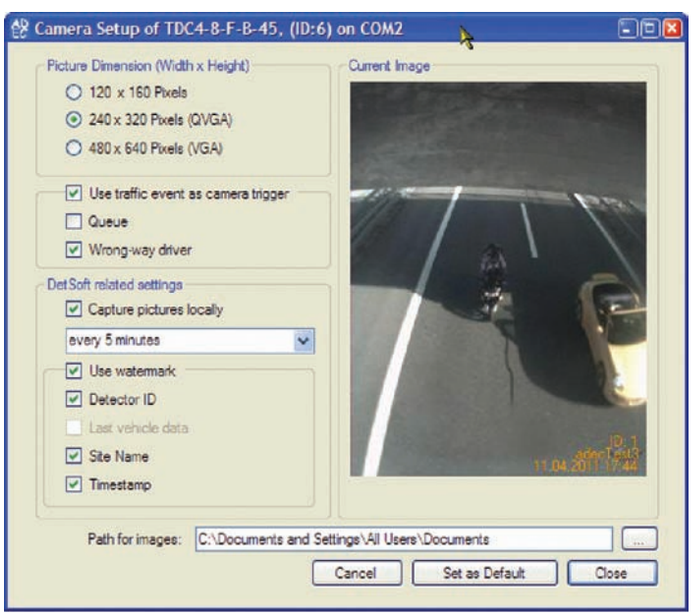
The new breed

The TDC4 (Traffic Data Collector using four technologies) is a non-intrusive, above-ground road traffic detector designed for monitoring a single lane of traffic from above. It uses Doppler radar, ultrasound and passive infrared for detecting each vehicle's properties including its speed, its class according to TLS, its occupancy time, length, and time gap (to previous vehicle). These sensing technologies have been used in the industry for many years, either standalone or in combination, such as by ADEC's TDC3, TDC1 and TDD1 models.

Besides the three technologies integrated in ADEC's TDC3 family, the TDC4 includes a camera that continuously monitors the traffic flow and takes snapshot images either upon request via databus or autonomously following a predetermined traffic condition. The TDC4 implements the commonly found TLS

(Below left and right) **Some traffic conditions benefit from having images available** (Bottom) **The TDC4 camera set-up**





(Technische Lieferbedingungen für Streckenstationen) protocol both for traffic data as well as the transmission of image data.

The TDC4 is designed for overhead mount above the lane to be monitored. The recommended mounting height is 5-7.5m for two-class devices and 5-6m for three-, five- and eight-class devices. Traffic and image data is retrieved through the RS 485 serial bus, which runs at 9,600 baud. The camera faces the oncoming traffic. To take advantage of the video capability, the data collector must implement a few additional commands, namely to retrieve the picture data itself (pictures are jpeg-encoded), its length (in bytes), whether a picture waits to be retrieved and the camera status. The commands are transmitted using the TLS user data frame. The conditions upon which pictures are captured automatically as well as the desired resolution are set during the commissioning process of the detector. At this stage, the detector can be configured to automatically capture an exactly timed image in the event of a wrong-way driver and when a queue is detected. The auto-caption feature doesn't affect the ability to take pictures at any time upon request from the central station or employ an image-capturing schedule on the outstation itself.

Resolution (pixels)	Size (kB)	Transmission time (secs)
320 x 200	7-15	20-40
640 x 480	30-40	100-140

(Table 1) **Typical picture size and transmission time by resolution**

System performance

The dimension of the images can currently be set to VGA or QVGA (320 x 200 pixels). During the transmission of the jpeg image data, the outstation can continue to check for and retrieve new traffic data. If the detector is set to automatically trigger the camera when an event occurs, such as a wrong-way driver, that picture of the event is available at the outstation within seconds (at QVGA resolution).

As with any jpeg-formatted picture, the image size varies according to content, so the values in Table 1 can vary for specific installations.

The TDC4 series of non-intrusive traffic detectors manufactured in Switzerland by ADEC Technologies addresses the increasing demand for video verification through snapshot images from regular traffic data acquisition sites along highways and other vital roads. Combining and integrating proven detection technologies with a camera, the TDC4 detectors can be used both to retrofit installations that use other similar devices to augment functionality as well as to equip new sites where visual verification was not previously considered affordable. The protocol enhancements to retrieve images are easy to implement and no additional hardware or bandwidth is necessary to transmit the image data – existing, limited low-bandwidth connections can easily handle the additional data while giving traffic management station operators a valuable tool to correctly address irregular traffic conditions through visual verification.

Contact

ADEC Technologies
andreas.hartmann@adec-technologies.ch
www.adec-technologies.com

Online toolkit to help authorities navigate the ITS minefield

READER ENQUIRY NO. 505

We live in a world that is jam-packed with ITS solutions for traffic and transportation management. Developed and fine-tuned by experts over many years, such applications, measures, and services are highly complex. While EU-funded projects are often the catalysts for the implementation and realization of future solutions designed to improve efficiency, safety, and the environment, outside of the ITS community a lot of the technologies and services generated through such initiatives remain unknown and never make it to deployment. Moreover, many transport authorities simply don't have the necessary expertise nor the access to the appropriate information, so find themselves scouring various sources to look for the right and comparable knowledge. This ultimately makes it really difficult to search for ITS solutions, so can anything be done to improve the situation? Potentially…

Need to know?

A valuable online resource for ITS deployment will be hitting the net soon

- The ambition is to support EU ITS policy goals and national ITS deployments strategies to gain the utmost benefit of ITS and the related investments for a sustainable road and public transportation system
- Provided via a user-friendly web-based toolkit for decision making for ITS applications and services
- Designed to support ITS-related decision-making processes to be more efficient and faster

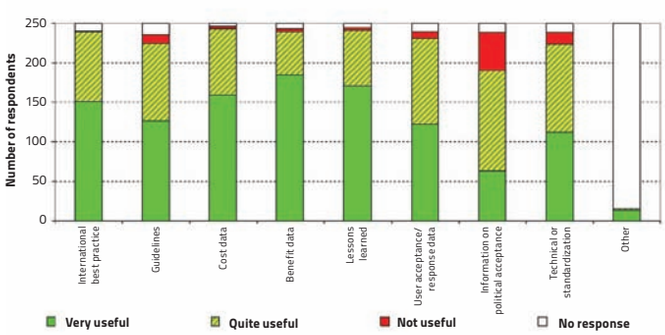
2DECIDE is committed to provide an essential contribution to rapid and consistent decision making for ITS deployment

The 2Decide ITS Toolkit

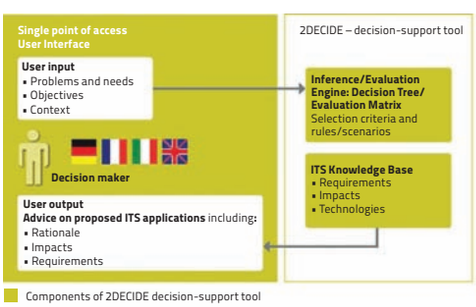
Research today takes place almost exclusively online. So wouldn't a web-based database containing all current project information and evaluation reports be hugely beneficial – a single platform upon which you could find all you needed to know about deploying ITS to solve a mobility problem? That is the goal of 2DECIDE, a European project that is set out to develop an ITS Toolkit to assist authorities in the deployment of ITS, to help them solve their traffic and transportation problems as well as address their policy goals. The database is intended to assist those with little or no experience of ITS in their decision making as it relates to specific traffic and transport problems or challenges. It will help them to best exploit ITS to address issues such as congestion, traffic safety, and even pollution, as well as improve user services, promote intermodality, and access to information, while enhancing safety and security aspects, etc.

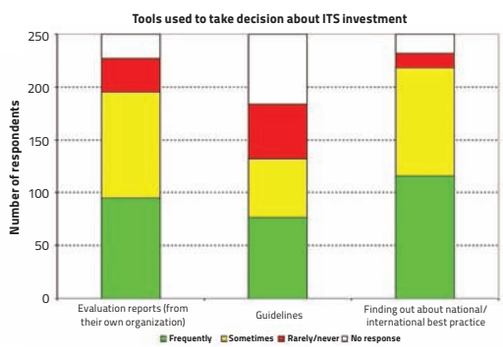
Customization is a key factor. 2DECIDE will thus suggest solutions based on a specific problem or situation. These might include the deployment of systems integrating telematics with transport engineering in order to plan, design, operate, maintain, and manage transport systems in the road and public transport sectors.

Prior to the launch of 2DECIDE, a survey was conducted to establish who the main target groups would be. The results showed that almost



(Left) **Survey results: Relevant and useful categories for potential ITS toolkit users** (Below left) **The ITS toolkit offers information for decision makers** (Below right) **Survey results: Tools used so far to make a decision about ITS investments**





50% of potential users were from public authorities, and 18% worked for state or regional road agencies. Other groups included toll road operators, public transport agencies and operators, associations, researchers, and consultants. Importantly, 2DECIDE caters to all the needs of these distinct sectors, from road transport and public transport through to freight and transport terminals.

Experience counts

Free to use, 2DECIDE will cover best practice examples of ITS deployments, information about costs, benefits and impacts of certain solutions, evaluation reports on ITS projects, and information relating to technical and legal aspects for ITS solutions from all over Europe. The user interface and basic evaluation information will also be available in a number of different languages, allowing laymen from all over to easily familiarize themselves with ITS topics. Indeed, at the time of press, it contains a basic set of information from approximately 300 European evaluation reports, which is expected to grow over time.

Beta version of ITS Toolkit

In mid-April 2011, the very first beta version of the ITS Toolkit went live online and the internal testing and validation phase began. This gives a first impression of the ITS Toolkit. Test users had the opportunity to provide feedback and be a part of the official validation phase. This was essential as it covered all valuable feedback from multinational, multicultural and multiprofessional representation for the next project phase. After this first round of testing, the ITS Toolkit will become available for the public later in 2011.

Contact

Austria Tech
+43 1 26 33 444
office@austriatech.org
www.2decide.eu

Adrian **Walsh**

awalsh@roadsafe.com

Over the past five years, the automobile industry has brought to market cars that have safety systems built in that have reduced the number of people killed at a rate far exceeding that achieved through road engineering or driver training. But in its recently published report, *Make Roads Safe – Time for Action*, the European Commission for Global Road Safety is calling on the industry to play a leading role in promoting the Global Decade of Action for Road Safety with an 'opt-out' consumers' contribution added to the sale price of each new car in order to fund road injury prevention programs.

The Commission for Global Road Safety – which is managed by the FIA Foundation – is calling for a voluntary levy of US$2.00 or equivalent on every new car sold. Customers could choose not to contribute to the Driving Safety Initiative, although it is expected that the vast majority would be willing to pay a relatively small additional cost toward improving road safety.

Make Roads Safe – Time for Action is an agenda-setting report that makes recommendations to meet the UN goal to 'stabilize and reduce' global road fatalities by 2020. These include: a new emphasis on children's rights to protection from road injury; ensuring road safety features are integrated into road projects; and a strengthening of international leadership of road safety.

The Decade of Action – which launched on May 11 – has been established to combat a growing global public health crisis of road fatalities and injuries. An estimated 1.3 million people each year are killed and 50 million more are injured on the roads. Children are among the most vulnerable, with 1,000 young people killed every day. The plan for the decade – which is being coordinated by The World Health Organization – is based on five pillars: improved country-level road safety management; safer infrastructure and mobility; safer vehicles; safer road users; and post-crash response.

Given the forecast rapid rise in the numbers of new vehicles likely to populate the roads of the developing world, it is vital that these are of modern safe design and not cheap, weak vehicles, which – although perhaps attractive in that they may be affordable – would simply make matters worse as they would increase not reduce danger. But much more is needed to make the world's roads safe so customers in the developing world are being asked to help.

The opt-out levy proposed, modeled on similar voluntary arrangements to raise money for other public health epidemics, could raise up to US$140 million a year for a sizeable fund to catalyze country level implementation of road safety programs. The sum raised would be managed by the Road Safety Fund for the UN Decade of Action, which will invest in preventative measures to save lives.

> Customers could choose not to contribute to the Driving Safety Initiative, although it is expected that the vast majority would be willing to pay a relatively small additional cost toward improving road safety
>
> **Adrian Walsh, director, Roadsafe, UK**

Intertraffic
CONNECTING INNOVATION TO INFRASTRUCTURE
CHINA

International trade fair for infrastructure,
ITS traffic management, safety and parking

National Agricultural Exhibition Centre
Beijing

7.8.9 SEP
2011

- Show doubled in size!
- Established hub for visitors from Eurasia and the Middle East
- Dedicated conferences on sustainable mobility and traffic safety
- 200 exhibitors, strong international participation

Register now via intertraffic.com!

AMSTERDAM RAI TTEC Intertraffic.com

Intertraffic
CONNECTING INNOVATION TO INFRASTRUCTURE
INDIA

International trade fair for infrastructure,
ITS traffic management, safety and parking

Pragati Maidan, New Delhi
India

3.4.5 OCT
2011

- Indian government investing $100 billion in road infrastructure
- Development of airports to meet international standards
- Simultaneously with IRF 6th Regional Conference on Road Safety
- Focus on solutions for safety and sustainable urbanisation

Register now via intertraffic.com!

AMSTERDAM RAI IRF Intertraffic.com

Subscribe to our e-newsletter via intertraffic.com

Simulating emergency management

Applying 3D visual interactive simulation to highway and tunnel emergency training and management is a growing trend in ITS. Although simulation has long been regarded as a valuable tool, the effects of bringing it to life in three dimensions should never be underestimated.

Two companies have recently joined forces to create a special training and management tool that can be put to work across a broad spectrum of ITS tasks. The Japanese 3D visual interactive simulation company, Forum8, and French engineering consultancy, BMIA, have pooled their expertise to produce a new solution to the difficulty of highway and tunnel operator training and management.

One of the many problems with training operators – and indeed managing complex traffic events – is the inability to accurately visualize these events realistically, both in real-time and in the classroom. G'VAL, the new solution from BMIA, solves these problems and delivers huge added value to highway and tunnel operators.

The tool provides real-time 3D visual interactive simulation of traffic for road (G'Road) and tunnel (G'Tun) management – for existing and proposed networks – using Forum8's UC-win/Road. The realistic and accurate visual simulation of the projects produced by G'VAL allows communication both internally – with the team prior to and during the project evolution – and externally, with stakeholders and the media.

Realistic and real-time

Driven by the SCADA system, G'VAL allows for training in a realistic environment as a result of the use of a real operational human-machine interface. The visual simulation of a wide range of different scenarios provides users with the capability to evaluate and assess the impact of every conceivable potential traffic emergency incident. Simultaneous virtual incidents can be generated, meanwhile, allowing users to study the efficiency of the different ways of resolving complex issues (management of busy traffic, accidents etc).

Customized to accurately reflect each project precisely, G'VAL provides invaluable benefits at every stage of the project, from initial study to final operation. It allows operators to be taught the various operating rules used to manage different scenarios, which encompasses everything from an accident in the tunnel, to lane closures and slow traffic, fire, flooding, congestion and more. As a result of the realistic nature of the 3D simulation, and its inherent interactivity, the trainer can analyze the operator's ability to react to a range of different situations – within the safety of a classroom. At the end of the training session G'VAL enables the trainer to produce a detailed evaluation report.

G'VAL is composed of three modules – the visual simulator, trainer module, and the SCADA interface. The visual simulator simulates the traffic in a realistic and interactive 3D environment. It generates traffic incidents, simulates the behavior of multiple types of field equipment, modifies their implementation and/or characteristics and can provide images from fixed or mobile cameras into the virtual 3D space. The trainer module permits the user to 'pilot' the simulator in parallel to operating the various tools, and can activate a whole series of scenarios and incidents as well as generate a variety of reports. This module enables the user to control the different parameters of the simulator. The SCADA interface allows the simulator to exchange data with the SCADA database through an OPC protocol. This data comes from the different sensors simulated within the project (LCS, ADI , door, etc) as well as the control orders from the SCADA or trainer HMI (started accelerator, closed barriers, VMS, etc).

A library of street furniture, vehicles and easily integrated characters in a realistic 3D environment allows the user to produce a visual simulation that delivers images comparable to that of the real cameras from roads or tunnels. Potential simulation scenarios include generation of a slow-moving vehicle, generation of an accident between vehicles, generation of a disabled vehicle, lost-loads on the roadway, and wrong-way driving.

Need to know?

Case study of two experts joining forces to devise a tool for training operators in how to manage emergency situations

- Partnership between an engineering consultancy and a visualization expert
- Tackling the inherent problems of training road and tunnel operators how to react in an emergency
- The key role that visualizing events in real-time can play in training sessions
- Tool for interactive, 3D visual simulation of a variety of scenarios

READER ENQUIRY NO. 506

(Above) **G'VAL combines tunnel management software with realistic simulation for training purposes** (Right) **3D visualization of tunnel incidents**

Contact

Forum8
office@forum8.com
+44 207 164 2028
www.forum8.com

Essential traffic services

READER ENQUIRY NO. 507

Traffic monitoring has existed in Germany for over 60 years. In the 1980s, such duties increasingly shifted from the police to individual municipalities, with fines collected by the state or municipalities. This 'income' has now become a regular component of public budgets. In automobile-friendly Germany, the sole purpose of traffic monitoring is to enhance traffic safety, yet similarly to countries elsewhere, some people unfortunately view it as a disciplinary measure with an income-generating function.

On the flipside, the general public is increasingly demanding greater traffic safety from the authorities, yet with the tight resources and budgets available to them they can only implement restricted disciplinary measures. Many municipalities are thus unable to implement increased traffic monitoring on their own, hence why Public Private Partnerships (PPPs) – the direct outsourcing of individual traffic-monitoring responsibilities – has become a sought-after and recognized approach.

Such new cooperative models to increase traffic safety are not used wholesale in Germany though. Each county has its own strict data protection laws and the interpretation in the implementation of legislation regarding traffic monitoring is very restrictive. Furthermore, compared to other countries, as traffic monitoring has been in place in Germany for so many decades, a strong infrastructure already exists.

The operation of speed-measuring devices and the recording of speed violations are the responsibility of public authorities in Germany and extensive data protection laws ensure data can only be accessed by the authorities. Internationally, though, the situation is different. This is why Jenoptik Robot offers a complete service based on national and international requirements, skillfully adapted to suit client- and country-specific market requirements.

From back-office solutions to on-road deployment of traffic equipment, Jenoptik Robot offers expert advice every step of the way

Expert advice

As far as PPPs are concerned, Jenoptik Robot not only offers the financing and specialist implementation of its measurement devices, but is also an expert in the planning, development, implementation and operation of integrated back-office solutions.

In its homeland, Germany, Jenoptik Robot takes responsibility for the financing, development and operation of the measurement devices as well as the technical maintenance of the measurement location infrastructure. This ensures maximum system availability and stability. The company records speed violations and prepares them for the clients. "This preparation process is in adherence to strict client instructions and only takes place on the premises of Jenoptik Robot in a location with controlled access and in accordance with data protection laws for which they were certified," says Krupa Krishna Reddy, manager traffic service providing operations, Germany. The data is subsequently transferred to municipal authorities via a secure data connection for verification purposes. The so-called 'official evaluation' requirement compels the employee of the responsible authority to make a final decision regarding the recorded and prepared speed violation. If the authority accepts the dataset, then an official evaluation takes place. This

Need to know?

A range of services for increased road traffic safety and reduced investment

- How Germany's history of traffic monitoring has enabled a wealth of expertise that can be shared with many other countries
- Optimizing the demand for better road safety (on a limited budget) without the public feeling like traffic enforcement is just for revenue generation
- The important role of the right back-office services

Jenoptik Robot offers a range of traffic monitoring and enforcement products

completes Jenoptik Robot's back-office services. The dataset with the speed violations is then further processed by the appropriate authority. The authority enters the dataset into the Summary Offense Program (OWi), which is connected to the motor vehicle database. Only the recorded license plate is matched to the vehicle owner at this stage. The entire collection procedure is the responsibility of the municipal authorities.

Individualized approach

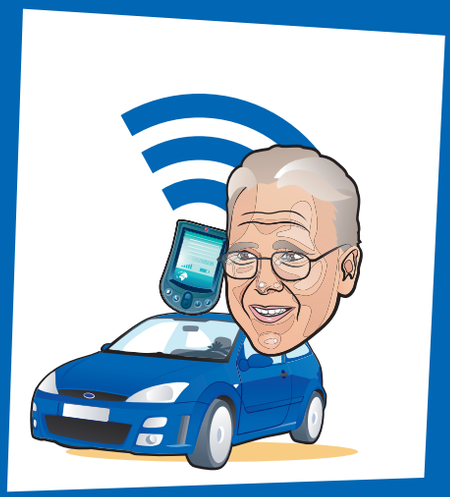
Alternatively, the international market – with fewer restrictive data protection laws – offers the company significantly more leeway in creating and implementing tailormade, full-service solutions. In addition to the installation and operation of measurement devices, countries that have never had extensive traffic monitoring tend to seek complete solutions for the processing and penalty enforcement of traffic violations; private local companies are retained by local authorities to carry out traffic monitoring. They turn to Jenoptik Robot as a result of its extensive range of complementary services and experience. The company also offers software solutions for the complete processing of traffic violations, including evaluation, database access, printing and dispatch of penalty notices and collection procedures. Complete back-office centers are created and operated in cooperation with the client.

Specialists from Jenoptik Robot work closely with local authorities and are on site to support back-office employees. Such staff members are well trained in the entire back-office process chain about how to work with the technology and will quickly be able to complete their tasks successfully.

Contact

Jenoptik Robot
+49 2173 3940 0
info.vs@jenoptik.com
www.jenoptik.com

Grush Hour



bg@berngrush.com

The smartphone app is becoming the standard way we think about our computational experience: many hundreds of them on a small device, updated over the air, cheap or free. Increasingly, we propose multiple ITS applications controlled by in-car telematics – navigation, traveler and emergency services, safety advice, PAYD insurance, parking services, road tolling, etc. The more ITS people think about smartphones and telematics, the more they ask why a smartphone can't do it all. After all, many smartphones have GPS and we already use them to navigate.

There is a lesser and a greater reason that the smartphone alone is inadequate for road use metering. The lesser is that weak GPS signals are susceptible to disturbances that cause positioning errors, especially within cities. In-car navigation devices work because the driver is there to mitigate occasional errors, but this is insufficient for financial application errors for which driver mitigation is impractical or untrusted. Additional sensors and supporting inputs are needed to address this.

But integrating these inputs is tricky. Every input has errors, some quite significant. Although it is possible to be often sub-10m in the most trying signal environments, 'often' is not enough. Systems that are usually accurate are great as navigation aids or for locating a car in a garage, but when using GPS for financial applications (e.g., metering for on-street parking), 'often' needs to be 99.9%, sometimes 10m needs to be 1.5m.

"To solve this problem," suggests Preet Khalsa, CTO at Skymeter, "instantaneous positioning is inadequate. An extensive set of additional context is needed. We solved this for parking payments and RUC in 'urban canyons', which is similar to the indoor problem. We call it Financial-grade GPS (FGPS). We are more concerned with calculating the correct charge and less with pure positioning. Of course, there is a correlation. CEN is developing standard metrics for Charging Performance to describe and certify this."

Even if innovators such as Khalsa find ways to put their technology into a smartphone, there is a much larger problem with using that phone for tolling. "Although I think autonomous devices have an important role to play, without a vehicle-attached metering device whose correct operation can be monitored by the toll operator, who will take full liability for payment?" says Martin Rickmann of Toll Collect. "The use of an autonomous smartphone would put that responsibility on the phone's owner. What government or toll road operator will accept that?"

But this is not the end of the story. Smartphones and the networks behind them will play an invaluable role for ITS telematics, including payment services.

GPS tolling telematics have many components: road use metering, privacy protection via calculating charges within the vehicle, moving updated 'price maps' to the vehicle, handling payment transactions, etc. Although the metering component needs to be vehicle-attached, the others could be handled by smartphones. And that is just for tolling. Given a vehicle-attached metering device communicating to a smartphone in the driver's purse, innumerable payment, safety, navigation, shopping, parking and traveler service apps can be enabled.

> Even if innovators such as Khalsa find ways to put their technology into a smartphone, there is a much larger problem with using that phone for tolling
>
> **Bern Grush, principal, Bern Grush Associates, Canada**

intelligent Cities EXPO

8-10 November 2011
CCH Congress Center Hamburg, Germany

The only global exhibition dedicated to the development of truly 21st century connected and sustainable cities.

Intelligent Cities Expo represents a unique opportunity to engage a wide range of senior city stakeholders from all over the world.

Intelligent Cities are made up of systems, technologies and solutions that talk to each other. Smart transportation and traffic systems are an essential part of this crucially holistic city vision.

Contact us immediately to reserve your space in the exhibition hall.
Email **emma.stokes@intelligentcitiesexpo.com** or call **+44.1306.743 811**

www.intelligentcitiesexpo.com

EXHIBITION SPACE IS IN HIGH DEMAND BOOK NOW

Supported by traffic TECHNOLOGY INTERNATIONAL HWF Hamburg Business Development Corporation

Safety boost for New Jersey pedestrians

READER ENQUIRY NO. 508

The Stevens Institute of Technology (SIT) at Hoboken, New Jersey, has been working with the New Jersey Department of Transportation (NJDOT) to develop a new traffic signal system that protects pedestrians without interrupting traffic flow. According to NHTSA, there have been no advances in technology to reduce traffic accidents involving pedestrians during the past 10 years, so the SIT team was asked to help address this issue for New Jersey's urban areas.

After meeting with NJDOT engineers to gather statistics and other data, such as the typical length of a red light and crossing times for the average pedestrian, the team identified weaknesses in the current traffic signal system. Specifically, it saw that pedestrians do not feel that the current system works for them. The 'walk' button lacks feedback, prompting impatient pedestrians to cross against the light, and the static nature of traffic signal timing does not respond to changes in pedestrian and automobile traffic. The team's solution, Ped-Aware, is a traffic signal and detection system that provides two advances over previous traffic systems. First, by using traffic signals, the new system passively detects pedestrians and provides information for them as to when the light will change. Second, it uses both pedestrian and vehicle data to switch traffic signals dynamically. The two components allow the Ped-Aware system to change the right-of-way based on the actual status of an intersection, rather than rely on pre-programmed signal cycles. By making intersections more efficient, the system promotes pedestrian safety without compromising the traffic flow.

In order to detect pedestrians, Ped-Aware uses cameras that compare images over time to deduce when and how many pedestrians are waiting to cross a street. Using MATLab, the team developed image-processing software based on existing algorithms. Image data is processed in real-time, without a recording unit, so there are no privacy concerns. To test their idea, the team created a program that simulates a traffic intersection running Ped-Aware. Simulation results demonstrate that the system effectively gives both pedestrians and cars enough right-of-way to avoid congestion. NJDOT has already shown interest in Ped-Aware's scalable and adaptable dynamic traffic signal system. The SIT team will demonstrate their solution to urban traffic problems to NJDOT engineers in the next few months.

Contact

Stevens Institute of Technology
+1 201 216 5561
cdelrosa@stevens.edu
www.stevens.edu/sit

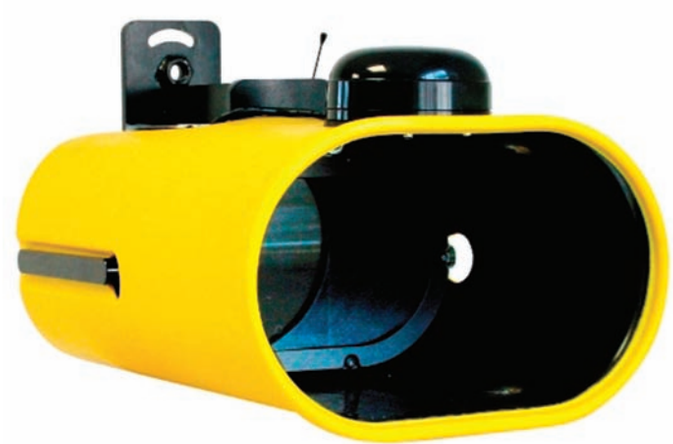
Home Office Type Approval for PIPS' SpeedSpike system

READER ENQUIRY NO. 509

PIPS Technology's SpeedSpike average speed enforcement system has gained UK Home Office Type Approval.

The system has been developed as a cost-effective distance-over-time speed enforcement product that can be deployed on main roads or motorways, urban routes in town and city centers or for local short-distance zones outside schools and colleges. It is able to link up to 1,000 cameras in any one system and can enforce speeds ranging from 32-225km/h (20-140mph) across an entire road network.

SpeedSpike is the company's first product in the average speed enforcement market. The system consists of SpikeHD ALPR cameras and a central server, which is able to compute the average speed of every vehicle at every site and compare it with the enforcement speed of that area. When a vehicle passes a camera, its license plate is read and time-stamped and together with the camera's site identification code, is sent as a Summary Record to the central server. This occurs at every camera that the vehicle passes. The server then computes the average speed of each vehicle detected at every site and compares it with the enforcement speed for that area to detect violations.



The camera network can be connected to the central server via either GPRS or ADSL. "We are confident that SpeedSpike will revolutionize the way Local Authorities enforce speed limits," said Paul Negus, managing director of PIPS Technology. "These cameras are capable of being used in any location and deliver the high standards that are expected from our products."

Contact

PIPS Technology
+44 2380 240250
info@pipstechnology.co.uk
www.pipstechnology.co.uk

How long will it be until cooperative vehicle systems are commercially viable, legally approved and actually deployed?

"My answer begins as most prognostications do – 'it depends'. It depends on the cooperative vehicle application you have in mind. As for the yardsticks, 'legally approved' and 'commercially viable' are interdependent factors. The first implies you have minimized to an acceptable degree – or removed altogether – the uncertainty of the system that causes most angst in the cooperative vehicles community when thinking about actual deployment. Further, the uncertainty creates risk and the more of that you have, the lower your commercial viability. So, complex and technically precise (i.e. risky) 'hard-safety' cooperative vehicle applications – ones with potentially 'bad' outcomes should the system fail – will not be deployed without some acceptable level of indemnity granted to the 'deployers'. Mobility-type applications – those that perhaps only 'inconvenience' the driver if they fail – will be available in the USA this decade (now, even). But as for 'commercially viable', the term is imprecise to me. No cooperative vehicle safety application is commercially viable in the way the term is typically defined. And neither are mobility apps, by themselves. The latter simply make other things (such as selling a car, managing recall costs, operating a toll facility or service station) commercially more viable."

Tim McGuckin
executive director, OmniAir Consortium, USA

"I note with interest that there is an implied sequence in the ordering of the question – from 'commercially viable' to 'legally approved' through 'actually deployed'. If a cooperative vehicle system means modest quality of service connectivity to the cloud, the 'legally approved' may be controversial, given that this type of cooperative vehicle may be a distracting cooperative vehicle. If one applies a safety-centric cooperative vehicle system and makes safety-of-life communications reliability and latency part of the strict definition, then 'commercially viable' might follow 'legally approved'. The key may be to bring incentives or regulation from the public sector. The threshold is in the eye of the beholder. Me? I gesticulate wildly when I drive, and those signals are sometimes discerned by other drivers. Because I've been driving since 1976, I dare say cooperative vehicle systems have been deployed for about 25 years."

Jim Misener
executive advisor, Booz Allen Hamilton, USA

"The term cooperative system is very broad so the question as to when systems become deployable is hard to predict. Early deployments are likely to be relatively simple, 'loosely coupled' cooperative systems that provide useful but not critical information and do not raise legal or regulatory issues. These must offer a step up in quality, functionality or convenience over non-cooperative products. Success will engender confidence in the technology and service provision and lead to applications that have a higher value, for example safety warnings, but require greater investment and technological resilience. The former are virtually here – the latter have yet to establish their value proposition."

Professor Neil Hoose
director, Bittern Consulting, UK

"Research, then demonstrations, then pilots and then implementation is often the way we make progress in ITS – especially when the concepts are technically or organizationally challenging. Cooperative systems are definitely challenging on both counts. Technically, we need systems of extremely high reliability, particularly where safety is concerned. Organizationally, we have many stakeholders and some uncertainties over legal issues and benefits. Nevertheless, leading organizations including the European Commission and the UN/ECE are determined to deliver increased safety as well as environmental and efficiency improvements. So I think that with this support, cooperative systems will be deployable and automation of the driving task will progress. To an extent we already have cooperative systems, including information on travel times from 'probe' vehicles and provision of dynamic traffic information to drivers. Looking ahead, the eCall system is an early example of a cooperative system providing post-crash notification from vehicles to roadside – this exists now and is likely to become common within five years as a result of anticipated European legislation. Vehicle-to-vehicle systems and dynamic vehicle/roadside systems, such as 'intelligent intersections' (with automatic vehicle passage), are definitely more challenging. Vehicle-to-vehicle interaction to assist and warn drivers is on the medium-term horizon – maybe five to 10 years before becoming common – but I would not expect widespread implementation of fully intelligent intersections for at least 10 years."

Alan Stevens
chief scientist and research director, Transportation, TRL, UK

Readers are invited to answer the Burning Question for the June/July 2011 issue:

How can technology – be it surveillance-based, analytical or even communications technology – help us to better manage incidents on our road networks?

email answers to:
l.smyth@ukipme.com

Index to Advertisers

DOUBLE* CONTROL

*control over your ITS and over your investment

At Telegra, we know who is the Number 1 - it is you.

Being our Number 1 means that you will be provided with double control: control over your ITS and your investment. Control over ITS ensures you to obtain the best products on the market: Telegra's own software and key hardware components complemented with meticulously selected and proven third party equipment.

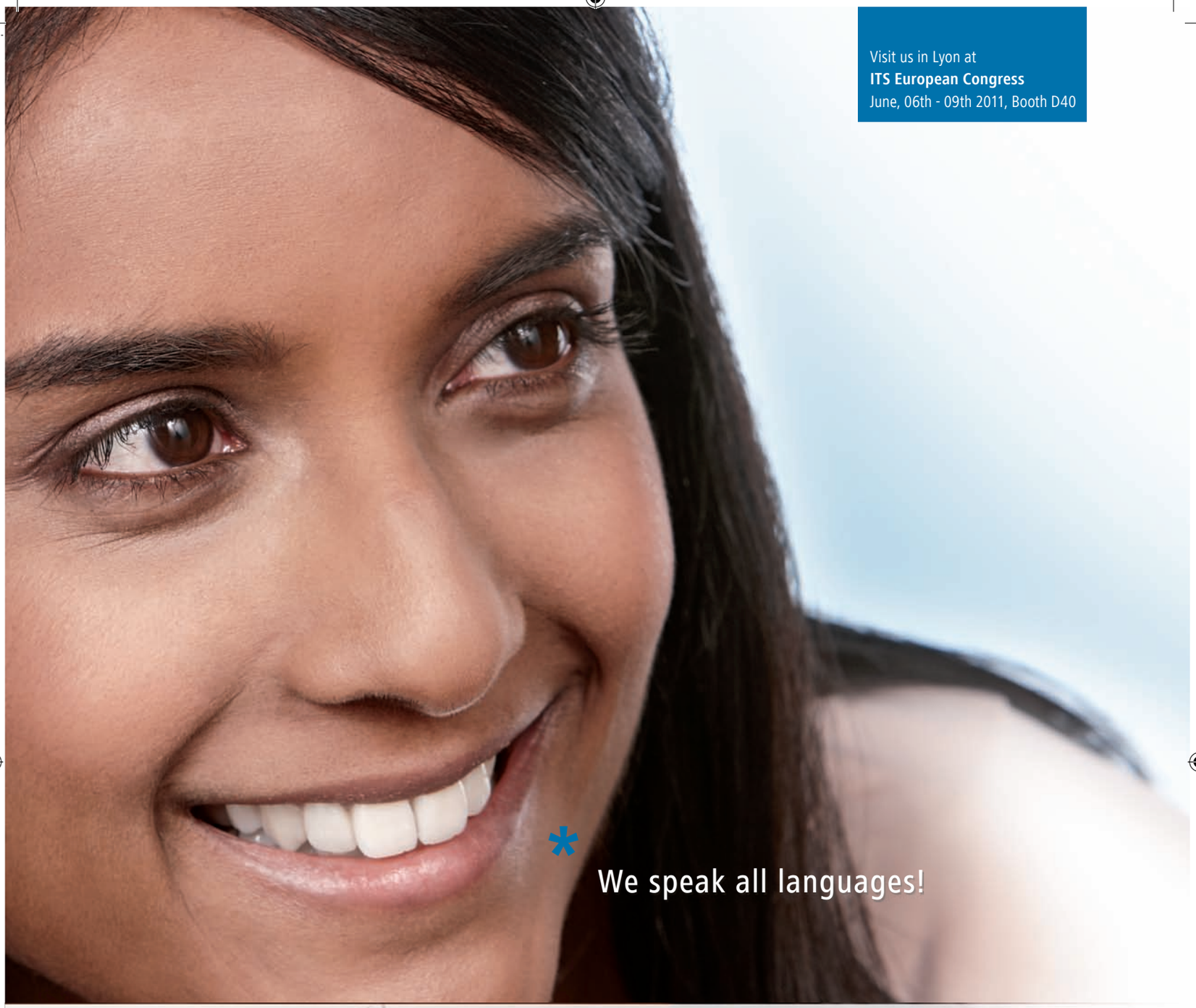
Our everyday mission is to completely understand your needs and provide you with best fit, custom made solutions. This ensures you have long term control of your investments. Requirement to maintain the investment within a budget has challenged us to merge innovative plug'n'play traffic management and tolling solutions and create the smartest, completely to your organization customized systems.

Through provided double control our clients receive unbeatable value for their investment.

www.telegra-europe.com

TELEGRA

SMART TRAFFIC MANAGEMENT



Krupa, Manager Operations Traffic Service Providing, Germany

INTERNATIONAL COMPETENCE

When in Rome, do as the Romans do - other countries, other manners, other requirements. Only tailor-made solutions guarantee successful outcomes. Our products are reliably implemented in over 80 countries worldwide; from Australia to Canada, from deserts to the arctic circle and everywhere in-between. As a specialist for traffic law enforcement, we offer our customers around the globe individual technical solutions for their local requirements.

Jenoptik speaks all languages!

Traffic safety with robot technology

JENOPTIK I Traffic Solutions
JENOPTIK Robot GmbH
info.ts@jenoptik.com
www.jenoptik.com/ts

JENOPTIK