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Continuous presence

Known for its tough stance on traffic safety, Western Australia looks set to roll out average speed enforcement systems in an attempt to reverse a worrying trend

Main: Redflex's 'Point' average speed enforcement system in action
Below: Police Minister Rob Johnson is looking to make changes

➔ LEANNE KEEBLE

Perth, Western Australia Police minister Rob Johnson believes that new enforcement technology set to kick into action in Western Australia will have a significant impact on the behavior of motorists. Johnson said the point-to-point cameras – which measure average speeds over long stretches – could be tested on the Perth-to-Bunbury Highway ahead of a potential roll-out of the systems across the state. "I would hope that they will be in place within six to 12 months," he said. "I believe they will achieve a significant reduction in those people who speed and put their lives and other people's lives at risk."

He added that the cameras – which would be placed up to 30km apart – would be a "tremendous deterrent to people speeding on our freeways and highways". The cameras are linked to each other and centralized computers and identify vehicles by scanning their license plates. They are already used in the Australian state of Victoria, and parts of Europe, although in the case of the latter, mainly in work zones. The proposal to use point-to-point cameras with a mixture of handheld radars, fixed cameras and Multanovas was detailed in a government-commissioned report, *Development of strategies for best practices in speed enforcement in Western Australia*,

Inrix on iPhone

Kirkland, USA Inrix's Traffic! application is now available from the Apple 'App' store for iPhone and iPod Touch users, to provide forecasts of road conditions and help drivers make routing decisions. It uses real-time, 'crowd-sourced' information from more than one million vehicles to show current and predicted conditions for over 160,000 miles of freeways and highways in 126 cities in the USA and Canada, and all interstates between metropolitan areas.

28 …million pounds (US$46 million) is now owed by overseas embassies for unpaid London congestion charges and parking fines, so the UK Foreign Office has taken over the collection of outstanding monies. The backlog had become so large that Transport for London – which had attempted to enforce the payments – decided in February to abandon further attempts to force the foreign embassies to pay their legal dues. They are relying instead on the Foreign Office to intervene to try to make them pay up.

Just the man…

Melbourne, Australia Joop Berendsen has joined the senior management team at Redflex Traffic Systems to help spearhead the company's growth within Europe. He is an astute appointment – having once been the MD of Gatsometer in the Netherlands and more recently Robot Visual Systems in Germany – and he is now looking forward to a new challenge. "Redflex has recently received UK Home Office approvals for three portable enforcement systems, as well as further approval in Hungary, and I am delighted to be joining the company at this most exciting point in its European growth," he said.

sections of the Kwinana and Mitchell freeways and Albany, Roe and Tonkin highways. In rural areas, the cameras would target long sections of major roads, including the South-Western, Brand and Great Eastern highways.

The plan has been backed by the state's top traffic policeman, Assistant Commissioner Steve Brown, who in March 2009 described average speed systems as the "ultimate model" for speed enforcement. Johnson added the Perth-to-Bunbury Highway – expected to open by the end of next month – had the necessary infrastructure to install the cameras. Meanwhile, Office of Road Safety executive director Iain Cameron feels the cameras would make motorists aware that their speeds were being constantly monitored, which would result in greater compliance with speed limits.

In 2008, 1,463 people lost their lives on Australia's roads – the lowest toll in more than 50 years – but still the annual economic cost of road crashes

Handheld and mobile enforcement systems will still be used as a deterrent

released last year by Monash University Accident Research Centre researcher Max Cameron, who estimated that the model could save dozens of lives a year on Western Australian roads. He concluded that the scheme would probably cost more than US$17.5 million (AUS$21 million), which would be a small price to pay for the lives and injuries saved.

The cameras would monitor vast stretches of highway, including in the country is estimated at AU$18 billion (US$14.8 billion) a year. In Western Australia alone, more than 200 people were killed in traffic-related crashes, which makes it the worst among all of Australia's states on a per capita basis (11 deaths per 100,000 people). Reacting to last year's figures, the RAC's spokesperson, Matt Brown, commented, "Let's stop making excuses and start doing something about the problem."

FOREWORD

Some people are surprised to learn that I am often bored by technology. I've never particularly obsessed about the latest gadget, although I do hold my digital meat thermometer in very high esteem. I held out for as long as possible before switching from compact disc to MP3 (or MP4a) and still refuse to shell out for an HD receiver, believing for the moment that the digital signal that is beamed into my 36in widescreen TV is perfectly adequate. I don't own sat-nav, although on a recent trip to Florida I was most impressed with how the TomTom in my rental car located the nearest McDonald's Double Quarter Pounder with Cheese. And despite the fact that I recently purchased a Garmin Nuvi 205 for my father, this was prompted mainly by the endless amusement from seeing him arguing with a generated voice of John Cleese about the optimal route to Croydon.

Having recently bought an iPhone, though, I predict my outlook could change. What this wonderful piece of gadgetry is doing to my marriage aside, I now know what it is like to feel truly connected. And I am amazed by the array of ITS-related 'apps' emerging – as well as pondering those that could be developed in the future. Let's forget for the moment that my iPhone has 32GB of memory, so can store all my music and photographs. Let's forget that I can shoot 51 at St Andrews on Tiger Woods PGA Tour, and can then connect to the internet and brag about it to my friends via Facebook. And let us forget that it's also a cell phone… so I can make calls! I now don't require a sat-nav, as I can download an app that provides real-time predictions about traffic conditions, using information gleaned from cell probes on the roads. And if you don't believe what these updates are telling you, you can connect to live traffic video to doublecheck that the coast is as clear as you have been advised. Another app even provides an audible or haptic warning when you are breaking speed limits, and can alert you to upcoming red lights or cameras (not that I would condone such behavior). And if you think these applications could be an unsafe diversion, the very latest software is being designed with driver distraction firmly in focus. Although the most exciting developments in ITS will be in-car and on the road, my eyes have been opened to a whole new world… in the palm of my hand.

Sent from my iPhone

Nick Bradley
Editor
Traffic Technology International

Exemption rules to be scrutinized

London, UK Mayor Boris Johnson is to review the exemption rules for alternative fuel vehicles to the London Congestion Charge, following a challenge by Volvo. The UK arm of the Swedish OEM believes that the charging system unfairly biases hybrid cars over other low-emitting vehicles. In his response to Volvo's campaign, Johnson confirmed that the exemption to the charge was introduced to incentivize the take-up of more environmentally friendly vehicles, but that he recognized that technology has developed considerably since the rules were drawn up. TfL will report its recommendations by the end of the year. Stuart Kerr, regional president for Europe at Volvo, recently wrote to Johnson highlighting the disparity between the treatment of hybrid and conventional internal combustion-engined cars. In essence, drivers of hybrids enter the zone free of charge, while drivers of low-emission cars powered by conventional IC engines with the same – or even lower – levels of emissions are charged £8 (US$13.5) per day.

ALGULLON

A TRIPLE TRAGEDY THAT MUST NOT BE REPEATED!

Fewer road fatalities during economic crises is nothing new, but some people have attributed the drop to other, self-serving factors. Enough of this egotism, our columnist says

As the US-caused global recession got ever deeper, we have seen safety officials in many countries patting themselves on the back while looking in the mirror – instead of looking out of the window to see that all of their neighbors have the same large decreases in their traffic fatality rate (per VKmT). As their 'shadow-banking' system started the economic mess, I will quote a US official, from a press release from a high office on February 4, 2009. "While a number of factors have helped … it is our experience that public education coupled with visible enforcement of safety laws can be one of the most effective ways to change behaviors and save lives."

There must be a blinding light reflected in that mirror because this otherwise intelligent person appears blind to the obvious. There is no way on earth that those programs could have quickly changed their effect on drivers to produce such a sharp decrease in the fatality rate. A more understandable oversight is that as the GDP of each country followed the USA into the economic hole, the reduction in traffic fatalities followed… in lockstep!

This is not the first recession to produce a drop in fatalities. Even by 1974-1976, several countries had good data and I have been able to show the same close tie between fatalities and economics in 17 countries – and in the three succeeding recessions as well! That 'oil crisis' recession was particularly tragic because some countries imposed a 'fuel-saving' general speed limit (GSL) on previously unlimited motorways. They were quick to credit the GSLs for the biggest one-year drop in fatalities that has ever been seen (until now). Had they looked out of the window, they would've seen their neighbors who had not imposed limits had the same huge drops.

This was a truly tragic coincidence. The misinterpretation of the cause of the reduction resulted in the creation (or consolidation) among government safety officials of the 'Speed Kills' policy. This has led – in every developed country – to a triple tragedy. Many thousands more died each year because resources were diverted from effective safety programs (e.g. the 'Rappel' concept in France) to setting and enforcing GSLs. Traffic officers have wasted much of their professional lives trying vainly to enforce the unenforceable. Lastly, a massive wedge has been driven between the public and the police: citizens everywhere resent being randomly selected from a stream of vehicles all well over the GSL.

I urge every reader not to let this tragedy continue in their country. Please bring this column to the attention of your traffic safety officials while telling them to look out the window – rather than into that damned mirror. ∎

Please email feedback to al@alsaces.ca

by Al Gullon, Automobiles+Concepts+Environments, Canada

VCA approval for LaneHawk

Dorset, UK Siemens' ALPR-based automated bus lane enforcement technology has been approved by the Vehicle Certification Agency (VCA), making it the first unattended, digital operating system to obtain approval status.

"This removes the requirement for authorities to provide detailed technical construction file information to the VCA, reducing implementation costs and the time taken to start enforcing bus lanes. Siemens simply has to register each new LaneHawk system with the VCA," explained Mark Bonner-Morris, product manager. "LaneHawk interfaces easily with existing back-office facilities, providing a solution that is simple, quick, efficient and unattended. High-resolution evidential images and increased capture rates greatly improve the cost-effectiveness of bus lane enforcement," he said.

Deadly roads

Calverton, Maryland A recent study shows that more than half of US highway fatalities are related to deficient roadway conditions – a substantially more lethal factor than drink-driving, speeding, or non-use of seatbelts. In revealing that deficiencies in the roadway environment contribute to more than 22,000 fatalities and cost more than US$217 billion annually, the Pacific Institute for Research and Evaluation concluded that making the roadway more protective and forgiving is essential to reducing highway fatalities and costs.

"If we put as much focus on improving road safety conditions as we do in urging people not to drink and drive, we'd save thousands of lives and billions of dollars every year," said PIRE's Dr Ted Miller.

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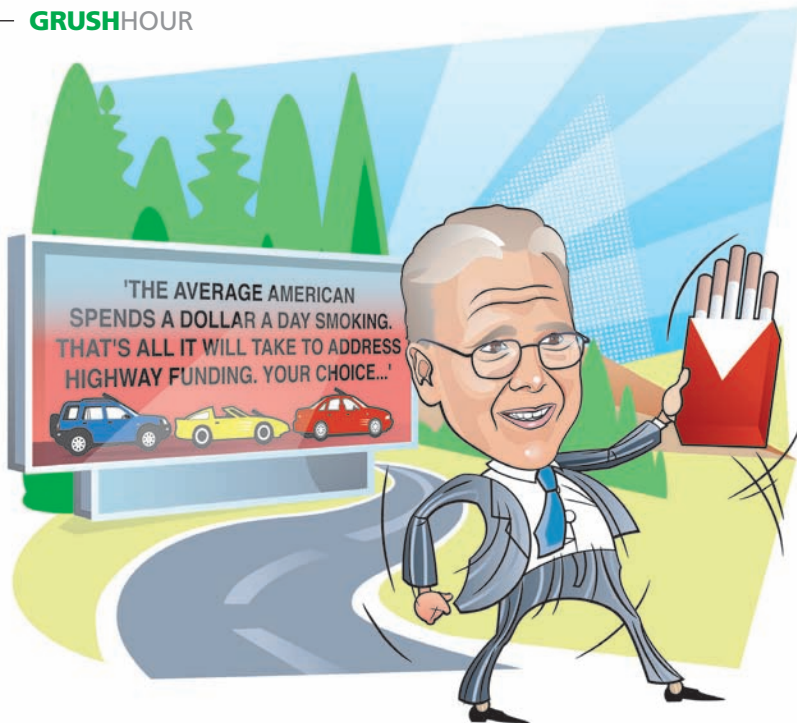
FAIRER FARES FOR ALL

Our GNSS tolling expert thinks the cost of paying to use the roads in the USA in a GNSS-tolled future could be less than the average American spends on cigarettes. Smoke that!

by Bern Grush, www.grushhour.com

One of the many unfounded fears about satellite-based, vehicle-miles traveled (VMT), road use tax is that it will leave all non-Lexus drivers impoverished. Properly priced, privacy-assured, fuel-tax-replacing, time-distance-place tolling is unlike the US$0.10 charged per mile on Toronto's 407, or the US$14 charged to enter central London. As a replacement for the fuel tax, if it is applied in a 'revenue-neutral' manner (by removing the fuel tax and charging the same average amount), it would cost the average driver zero in new taxes.

However, this form of road pricing should not be a simple, same-everywhere charge. Instead, more should be charged at congested times and places, less in rural areas, more for gas-guzzlers, less for greener vehicles, and so on. This has two effects. Firstly, it moves a portion (around 20-30%) of trips to other times and other modalities – thereby reducing congestion. Secondly, it gives those with flexibility an opportunity to save money – travel at a different time, take a bike, move closer to work, carpool, telework – anything but the dreaded bus! Oh wait… even the bus will now be faster due to less congestion *and* cities will have to put on more buses as a result of the increased demand, so suddenly the bus can now be a far better choice than it currently is. And *that* is what makes road pricing an advantage to those people on a lower income.

But this utopian view misses one critical factor for the USA. Our highway funding shortfall has been some US$8 billion each year for this year, as well as in 2008. The gas tax is not keeping up as VMT drops and each remaining mile gets more fuel efficient – all while building and maintenance costs keep increasing. Realistically, road use charges should be about twice the current gas tax. Hence, we can project an average of less than US$300 per year per vehicle as a net new tax (a road tax authority in Washington told me the number is US$225). This dollar a day is about what the average American spends on cigarettes!

If transport economists are right, then we can address roadway funding (as we electrify our fleet), congestion, road safety, emissions, health (obesity), quality of life, and national security (reduced use of oil) for about a dollar a day to the average driver – and less to those who switch.

And if that is not enough value for your dollar, there is a projected saving of a few days of sitting in traffic each year for the average driver, should congestion be dramatically reduced by selecting the right price differentials. That saving would include fuel savings – possibly in excess of the US$1.00 tax paid – anyway.

We would all be better off paying for when, where and how much we drive – rather than paying gas tax. ◼

Any comments to bgrush@skymetercorp.com

Electric boost for New Zealanders

Wellington, New Zealand The government in New Zealand has passed legislation that will exempt electric cars from road user charges for the next four years, to encourage people to use them. The exemption applies to light electric vehicles (weighing up to 3.5 tonnes) that are currently classed as diesels for the purpose of road charging. They currently pay US$0.024 to US$0.026 per kilometer. The exemption will be effective from October 1, 2009 and will continue until 2013 when it will be reassessed. Currently, owners must purchase prepaid RUC distance licenses – available in 1,000km units – which vary based on the vehicle's type and weight.

Resigned to jams

London, UK A recently released report summarizing a new survey on car use and congestion – published by the RAC Foundation and Ipsos MORI – shows that more than half of all UK motorists would rather take the chance of being stuck in a traffic jam than get on public transport. The report, *The Congestion Challenge*, also shows that opposition toward local road charging schemes, aimed at cutting congestion, has hardened over the past eight years. It reveals that the public appear to have resigned themselves to a congested, low-performance future. It also suggests they remain unconvinced about alternatives to the car, and are generally unsupportive of ways to reduce jams, unless these are paid for out of the 'public purse'.

Ironically, while the survey revealed 53% of drivers admitted they would rather risk being stuck in a traffic jam than take public transport, at the same time 77% support increasing the number and frequency of buses as a way of tackling traffic growth.

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Positive reaction

HOT lanes prove popular choice

Olympia, USA Washington State DOT has released the SR 167 HOT Lanes Pilot Project's first *Annual Performance Summary*, which shows people are increasingly using the congestion-relief scheme. More than 30,000 solo drivers paid an average toll of US$1.00 to escape traffic on SR 167 and drive in the HOT lane during the pilot's first year. The four-year project is studying how variably priced electronic tolling can ease congestion on SR 167 between Auburn and Renton. It began in May 3, 2008, when solo drivers with a 'Good To Go!' tag were offered the choice to pay for a faster trip in the carpool lane when extra space was available.

Despite an opening year that saw increased gas prices, a recession, and severe snowstorms, the report showed that solo drivers increasingly chose to pay for a faster trip in the HOT lane, with the number of solo drivers using the HOT lane increasing nearly every month since its opening.

LET'S NOT GET SNOOKERED ON POLICY

This issue, Professor Sampson takes his cue from sport and proclaims the pressing need for a new team strategy when it comes to improving how the UK manages transport

by Professor Eric Sampson

Watching snooker recently, I was amused to hear Steve Davis comment, "He's playing like Eric Morecambe." The other commentator asked, "Was Eric good at snooker?" to get the response, "No, I meant he's playing all the right shots – but not in the right order."

Current transport decisions also fit this description: we are going to have a new road safety campaign; we're going to have to pay more for train fares; there won't be a sensible debate on road pricing until after an election; and many politicians believe the *King Report* that (nearly) says there's no need for unwelcome environmental policies in transport as powertrain advances will solve emissions problems anyway.

Park the new safety initiative. UK roads are among the five safest in Europe and although seven people die each day in road crashes, 12 die from accidents in the home, 44 from bowel cancer, 68 from pneumonia and 77 from bronchitis. Have we got our priorities right? The new initiative is likely to focus on speed enforcement, an inexact approach as most roads don't have the technology to set a VSL. On a motorway in fog or heavy rain, 60mph is legal but likely to be a menace; 90mph in a modern car on the same dry road at 03:00hrs is illegal but unlikely to be unsafe. Driving without full attention to the road causes accidents; speeding doesn't necessarily. We need to change driver behavior, such as targeting those without VED or insurance.

Forget making sense of rail finances. As long as 'profits' are involved, running the railways will cost more pro rata than it did before privatization. We need to loosen the Safety Mullahs' grip on rail health and safety (the likelihood of a rail fatality is six to 10 times lower than on the road yet road safety engineering is based around a value of life of just over £1 million whereas the equivalent figure for rail is up to five times higher) and change the franchising system to drive down the cost of rail journeys and help to shift travel away from roads.

And forget waiting for an environmental silver bullet: it isn't coming. Even if we switched to an all-green vehicle fleet, we would still have to deal with congestion. The only quick way to balance Eddington's recommendations and the Stern environmental agenda is to reduce road traffic, shift it to other modes – or both.

What we need is a technology initiative and it's very simple – impose road charges on most of the trunk network using tag and beacon. Forget complaints about charging twice – we pay prescription charges, and governments have sold us shares in gas, telecoms, etc, all of which we owned as taxpayers. With all vehicles carrying a tag that would double as a VED disc, you could revolutionize detecting and catching VED evaders and also start to lean on local government to act on local congestion.

And that's playing all the right shots in the right order! ◼

MAKING THE SMART CHOICE ABOUT TRAVEL

Although a car can be very smart indeed, it's not always the smartest way to travel – particularly when public transit and travel services are becoming pretty clever also

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

Recently I attended a sporting event with a good friend of mine. We had planned this for a while; he was to drive from the suburbs to my home, whereupon we would decide on the mode. Drive from the suburbs? Not smart. However, we are subject to the land use planning, or lack thereof, in the USA. Population densities are simply too low to support moderate transit levels of service.

Upon arrival at my home, my friend, ever the suburbanite, wanted to drive from my house to the venue, both in San Francisco. I pointed out that I had internet (and even smartphone) access to advanced travel information systems (ATIS) that showed real-time arrival of transit to a station within walking distance of my home, and that the route took us to within 200m of the stadium. Moreover, I had access to arterial traffic conditions, and that based on the special event (a big game), transit would be the better travel alternative. If we left now, the total trip time would take 28 minutes! And at US$2 per person, the price was nominal.

ATIS is smart. It promotes efficient use of public modes and allows travelers to make the correct mode choice. Also, if I had been a frequent transit user, the trip would be even more convenient. I would have had either a monthly transit pass and would have amortized all trips by that bargain amount. Or I would have a 'smart card', which in some jurisdictions (but not

mine) could have been a near-field communications chip on my smartphone.

But my friend was insistent. So we drove. Indeed, we encountered congestion as we neared the venue. Street parking proved difficult, so we circumnavigated the area near the event several times without luck. The total travel time, therefore, was 45 minutes. Parking cost US$30.

Transit is smart. In this instance it would have saved nearly one-third of the trip time. Not even counting operating or environmental costs, a transit trip would have cost the two of us over a factor of seven less. I did not wish to lecture my friend, but in the USA the annual number of traffic fatalities to transit bus passengers is less than 700, whereas the number of passenger vehicle fatalities is in excess of 30,000. According to a study in the *American Journal of Epidemiology*, in the USA bus riders have a fatality rate of 0.4 per 100 million passenger trips versus 9.2 per 100 million passenger trips by car.

My friend learned from the barely tolerable trip time to the event. In fact, before our event ended, he asked that we leave in order to avoid congestion as we exited the parking lot. Reluctantly, I agreed. Leaving a sporting event early, even before the outcome was certain? Not smart.

Alas, we departed. As we drove to my home, I spied a bus. Undoubtedly, relative to our condition and vehicle, it was a smart bus. Next time it will be my smart bus. ∎

11 …million dollars is the approximate value of the contract awarded to Telvent for the installation of a new toll management system on the recently completed Bilbao southern bypass (South Metropolitan Highway), which has been built to avoid the congestion caused by the 100,000 vehicles that pass through Bilbao on the A8 each day. A mixed system will be installed that combines both conventional and electronic tolling, including two free-flow gantries that will detect the entry point of vehicles.

Safety for all

Hanover, Germany Through the integration of yaw rate and acceleration sensors into one single central SMD component, Tier 1 supplier Continental feels it will bring more advanced active safety features to a wider range of vehicles – not just top-end models. Both yaw rate and acceleration sensors are key for stability control.

"With this new development, Continental is remaining true to its philosophy of making safety systems such as ESC available to all motorists," said Dr Ralf Schnupp, head of inertial sensors at the company's chassis and safety division. "The complete integration in silicon technology is offering us the option of making highly developed assistance systems such as adaptive cruise control or active front steering even more effective through the use of high-precision sensors, and further developing our ContiGuard safety system." The new cluster will go into series production with several vehicle manufacturers at the beginning of 2010.
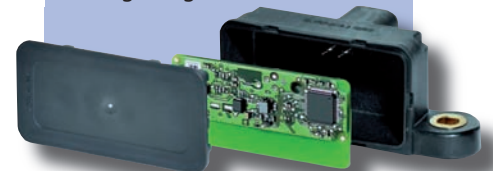
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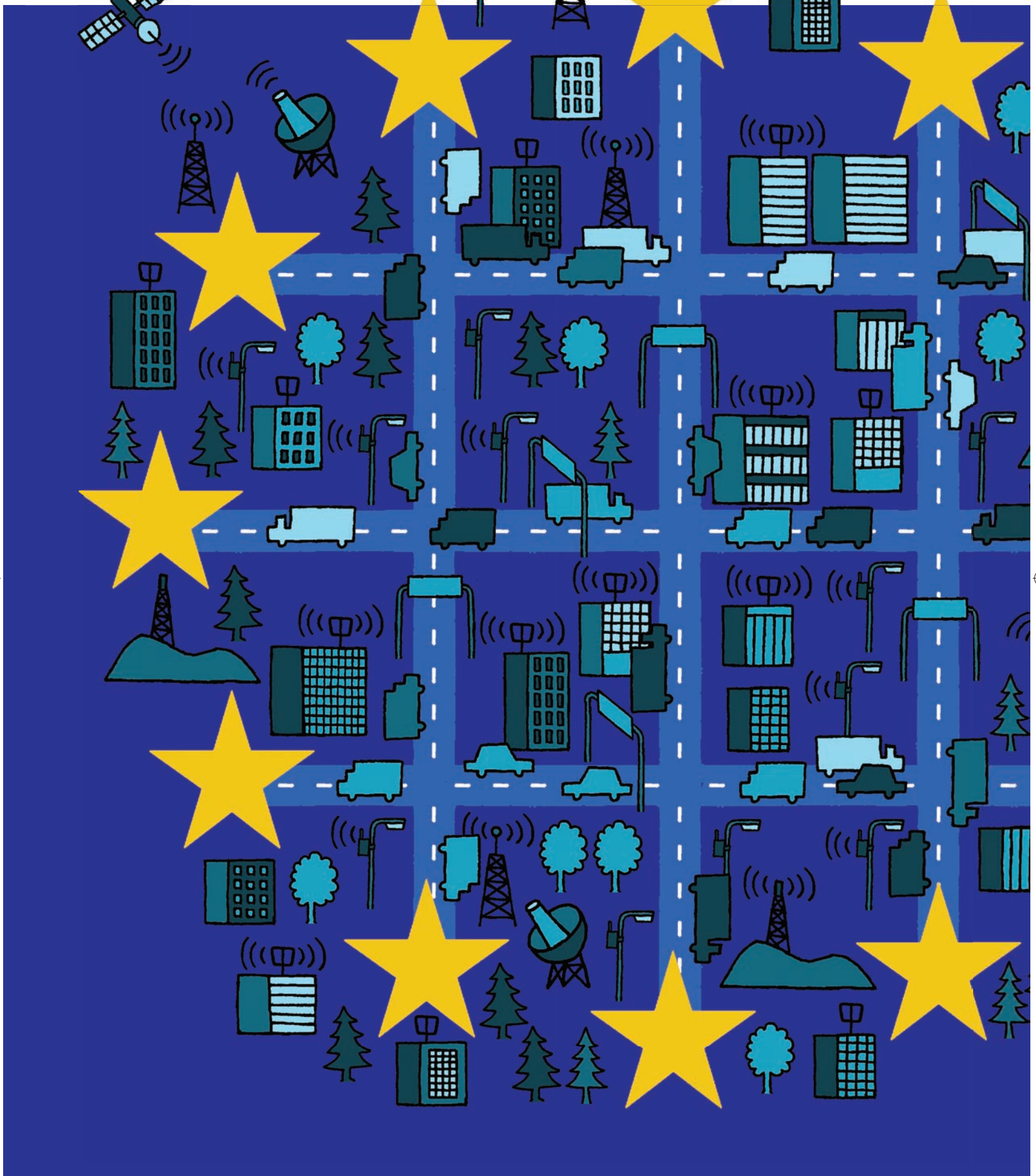
LINKS COURSE

The road to interoperable RUC across Europe is littered with obstacles. Technical and legal issues aside, **Louise Smyth** asks the experts the best route forward to achieve one-contract-one-OBU tolling

Illustration by Tim Ellis

Interoperability. Nobody said that it would be easy. But did they ever think it would be this hard? From an average driver's perspective, it must be somewhat confusing. He can hop into his car in Italy, head to France and use his Visa card to buy a case of wine, then continue to Switzerland and use his cell phone to make a call from the top of a mountain. Why, then, does paying for this journey involve dealing with numerous organizations, unfamiliar and often baffling tolling systems, and that troubling sense of 'If everything else works fine regardless of my location, why is the journey itself such a nightmare?'

Cell phone and credit card technologies have an architecture that is structured to allow interoperability – a point that reflects today's mobile society. Yet the road network that enables this mobility cannot offer the same flexibility. This it is not surprising. Roads – and indeed road tolls – have been around far longer than cell phones and credit cards. Existing systems are managed independently of each other; it takes time to bring them together. It also takes legislation.

TOLLING'S DIRECTION

The EC Directive 2004/52 – a broad framework for interoperable tolling – was adopted by the European Parliament in April 2004, and is leading to the creation of the European Electronic Toll Service

(EETS), beginning with heavy trucks (by the end of 2012) and covering all vehicles by the end of 2015. In terms of technical interoperability, it allows for two technologies: satellite (GNSS) and mobile communications; and DSRC. In regard to contractual interoperability, this will require agreements between infrastructure operators and service providers.

Speaking on behalf of the European Commission's DG TREN department, policy officer Charles Surmont (who helped draft the EC's decision on defining the technical elements of the European service) is only too aware of the complexities surrounding EETS. But he also knows that it is very much in the interest of the EC to encourage interoperability: "The different existing systems hinder the fluid traffic of vehicles around Europe. It's an unnecessary administrative burden on transporters – some of them have to deal with five or six pieces of onboard equipment and are receiving invoices from several different toll domains. Ultimately, with interoperability, we should be able to achieve a free-flow system that is more efficient."

And as more member states introduce or extend tolling schemes, this need becomes ever more pressing. Surmont has been watching the plans for large-scale schemes unfold in France and the Netherlands – not to mention the expansion of the German

TollCollect scheme and the Czech truck tolling project – and has observed a familiar pattern: "The first interest a country has is for tolling national vehicles on extended parts of its own network, but it realizes rapidly that interoperability has advantages for the treatment of foreign cars, making it easier to deal with cars registered elsewhere in the Union than in their member state. France and the Netherlands are very much taking notice of the EC's decision and are designing their systems to be compatible with EETS."

Surmont previously worked on railway interoperability so is very familiar with the challenges involved in such schemes. "With EETS there will be the new role of service providers, which might be compared with what happened in the rail sector where the distinction was made between the ownership and the management of the track and the companies operating the trains. Here you will have the same sort of business model, with the service provider having the contact with the users and needing to have non-discriminatory access to all of the toll domains. The toll chargers will have to make public the conditions under which service providers can work. This is not the way they are used to working. Technically, it's not that complicated: the way DSRC works, little would change apart from the fact that toll chargers would receive the information from onboard equipment – which they do not own and is managed by third parties – and instead of charging the users directly, they would send the invoice to the service provider, who will then contact the user.

Satellite technology – particularly that used in Galileo – could be extremely valuable for European interoperable tolling

the view. "Interoperability is not dependent on, or made easier as a result of, satellite technology. Interoperability is rather neutral with regard to technology, except that it is easier when there are not many competing technologies, infrastructures and equipment – hence the reason that the Directive limits the number of technologies to just two."

He does however praise the flexibility that satellite technology can bring: "It doesn't require much ground infrastructure, and while the main problem with signals is

the technical issues surrounding the Austrian truck-tolling scheme, so subsequently dealt with all issues relating to interoperability and international vehicles. Sieber is also the project leader of CESARE (Common Electronic Fee Collection System for a Road Tolling European Service) IV – one of the major projects of the EC that is focused on devising an implementation strategy for EETS.

Sieber regards GPS-based tolling as most appropriate for many upcoming schemes: "If you see the ongoing tenders, as in Slovakia or the Netherlands, they are looking at tolling not only highways but the secondary road network as well," he notes. "For that, I think the only feasible technology now is GPS, then, later, Galileo will enable satellite tolling. I'm not sure GNSS will be the only solution for the future, though – if a country considers just tolling highways and not secondary roads, it may opt for DSRC as it is cheaper. Tolling the secondary network means a lot of effort and costs, but as a result of the lower mileage, not so much revenue. I do think that satellite technology will become a more important tool in the long term." A mixture of satellite and DSRC is set to stay – particularly as a result of DSRC's current dominance. "We need to bring up a few more satellite systems to have interoperability between them," Sieber continues, "so to achieve interoperability today, we have to have both technologies."

He doesn't, however, regard technology as a big hurdle to interoperability. More worryingly, he doesn't cite legislation or red tape as the main challenges either. "The real issue is the business case. Is there really a business case for interoperability and is there the demand? If there is, then why hasn't it emerged so far? Interoperability for cell phones was established within a few years because there was a good business case, but

"Interoperability is not dependent on, or made easier as a result of, satellite technology. Interoperability is rather neutral with regard to technology"

Charles Surmont, *policy advisor, European Commission, DG TREN, Brussels*

Surmont explains that things should be easier with EETS, as toll chargers would only have to deal with a limited number of service providers, as opposed to all users. "For them there is clearly a gain to be had in 'outsourcing' the management of the user relationships," he says. "Satellite-based tolling is relatively new – currently, it's only used on a broad scale in Germany – so there needs to be a new way of doing business in the sense that the information should come from the service provider. The OBE doesn't communicate directly with the charger but with the service provider, which then informs the charger."

SATELLITES AS THE SAVIOR?
Although many industry experts are heralding the use of satellite technology as the defining method to achieve interoperability, Surmont does not share

urban canyons, these shortcomings are at the point of being resolved. A number of companies are developing algorithms that enable a vehicle to be located with precision, even in difficult areas. Such flexibility allows you to easily cover a great part of your road network without installing lots of gantries. DSRC is good if you don't have a satellite and aim to cover a limited part of your network, such as highways. But if you have a satellite and it performs, then I don't see why you would introduce DSRC as well."

Central to bringing the EETS system to life has been to start with commercial transportation and enable interoperable tolling for heavy goods vehicles – after all, it is these vehicles that will benefit most from free-flowing conditions and reduced paperwork. The Austrian system, operated by ASFINAG, is a prime example. The company's Anton Sieber was responsible for

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Truck tolling checkpoint on the German TollCollect scheme

"The real issue with interoperability is the business case. Is there really a business case for interoperability and is there demand? Why hasn't it emerged so far?"

Anton Sieber, *deputy director, ASFINAG International, Austria*

tolling systems have existed for decades with interoperability developing only on a national level or between neighboring countries. Are customers truly willing to pay for this or is the industry too conservative? I don't know, but I don't think we have found the big business case so far."

But surely it must help to have the likes of the EC on side? "Yes, but it is a 'top-down' approach to expand the existing interoperability to an EU-wide level. So the market players have to pick up the new rules now. The framework for EETS is finally designed and implementation can start."

Sieber is optimistic that these market players (such as ASFINAG and others) will be able to make the most of the opportunity on offer. "The setup of the legal framework and the creation of the new role of an EETS provider opens up the potential to emerge into a new business field for many companies – which could be the spark for EU-wide interoperability."

ONE-FOR-ALL APPROACH
In terms of countries paving the way toward EETS, those that share land borders with others are the ideal starting point to foster collaborative approaches. In France, Olivier Quoy is deputy head of the Modal Charging Task Force at MEEDDM, the French Ministry for Ecology, Energy, Sustainable Development and Sea (formerly known as MEEDDAT). MEEDDM encompasses the former Ministry for Transport, so one of its priorities is to find the smoothest ways for French truckers to travel through Europe.

From 2001 to 2007 Quoy worked in Alsace – the French region on the border with Germany – dealing with infrastructure projects. He was also directly involved in setting up the German LKW-Maut tolling scheme and was responsible for predicting and observing the impact of pricing in Germany on the traffic in France. "I was in charge of designing the network which would be subject to the Alsatian tax – a new toll conceived to reduce the volume of trucks coming from Germany to French motorways as a result of the LKW-Maut."

When it comes to technologies for interoperability, he is gleaning valuable insight from his home country: "I am not sure satellite is better than DSRC. France is today the only country where interoperability came true, with four ETS providers offering contracts covering 15 toll domains – and we use DSRC. The advantage of satellite technology is probably more in the potential to offer other services in addition to tolling." He regards interoperability's main challenge as contractual: "Technology will bring solutions, but the issue is to build a contractual scheme, regulatory rules and economic models to ensure that EETS providers will arise and offer the services.

"We all hope that EETS will come into force as quickly as possible. It may end up taking three times longer than the time imposed by the Commission to set it up, because it is so ambitious and challenging. But with some smart thinking and goodwill, incredible things can be achieved." ∎

EXPERT OPINION

Following a Council resolution in 1997, political Europe was of the opinion that the benefits of interoperability in tolling were obvious and that achieving it would not be too hard. Not too sure about that assessment, I organized a conference with different sections of the EC and concessionaires. Not one concessionaire saw a business case for interoperability, as it required relatively high investments and lower revenue volumes than for their national customer base.

Business case is also the driving factor when choosing between DSRC or satellite. Today's DSRC systems are cheaper for limited networks of motorways, but satellite is almost unavoidable when implementing EFC on extended networks. Where satellite does require less roadside infrastructure, you still need some for enforcement, and OBE and communication costs can be higher. GPS is here today, while Galileo will provide extra advantages in the future.

EETS is now here on the legislative level, with notification expected in October. Three years later it should exist for trucks, five years later for cars. Realizing it will be tough though.

Toll chargers need their income guaranteed as well as mechanisms to control EETS providers and their users. A European standard for secure monitoring is needed, but it does not yet exist for satellite tolling.

EETS providers need a minimum business case. Expecting modest volumes of customers, certainly at the start, the costs should be limited. Having extensive acceptance tests separately in all 200 toll domains might jeopardize that. So initiatives to create national or regional interoperability can play a role in gradually introducing interoperability.

By Jan Willem Tierolf, ITS co-ordinator at the MoT, Rijkswaterstaat
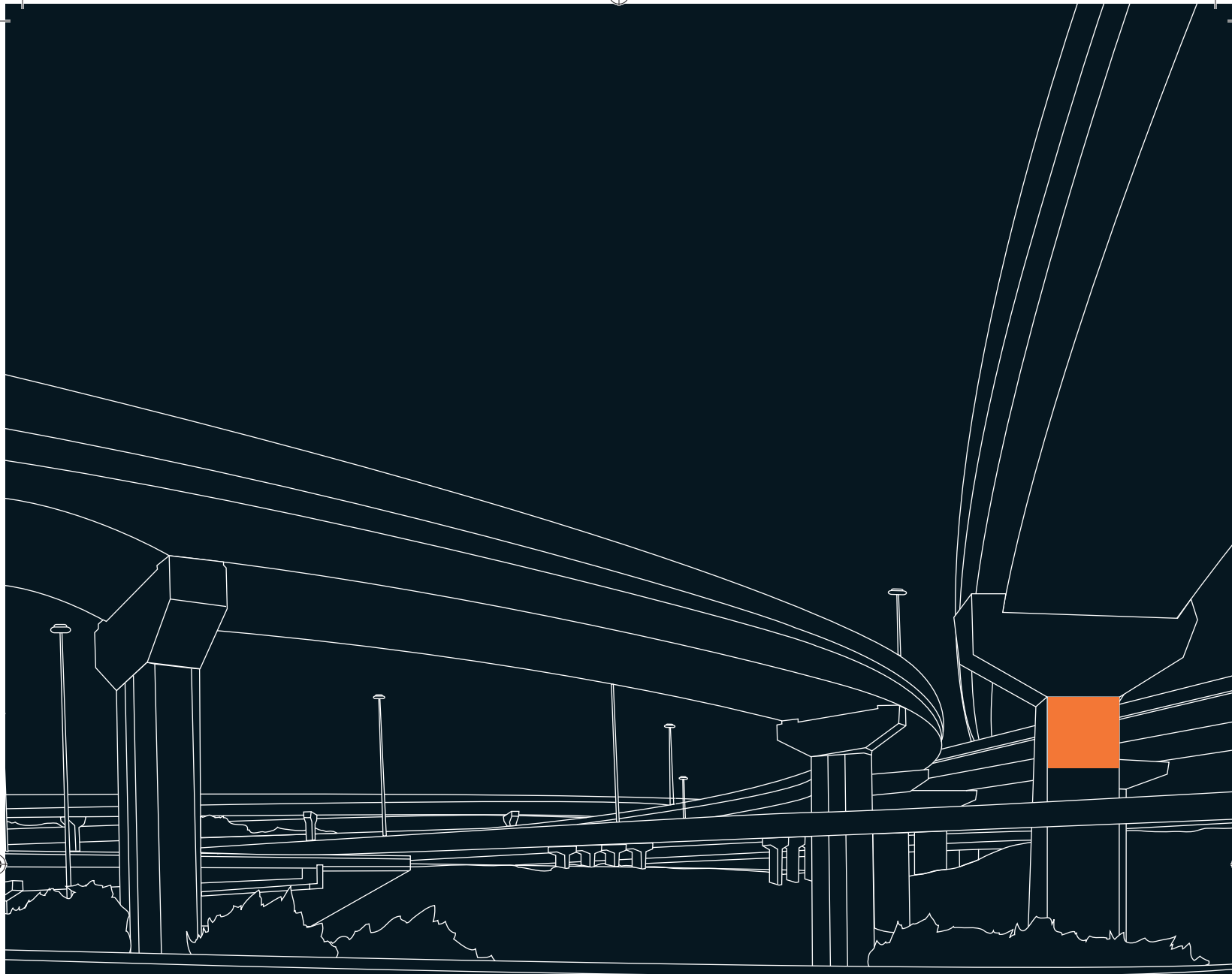
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ROAD RAGE

If you want to protect your highway assets, enhance safety, or even collect vital traffic data, weigh-in-motion is the perfect fit. As **Saul Wordsworth** discovers, the latest advances in the technology are creating a real buzz

Illustration by Flatliner
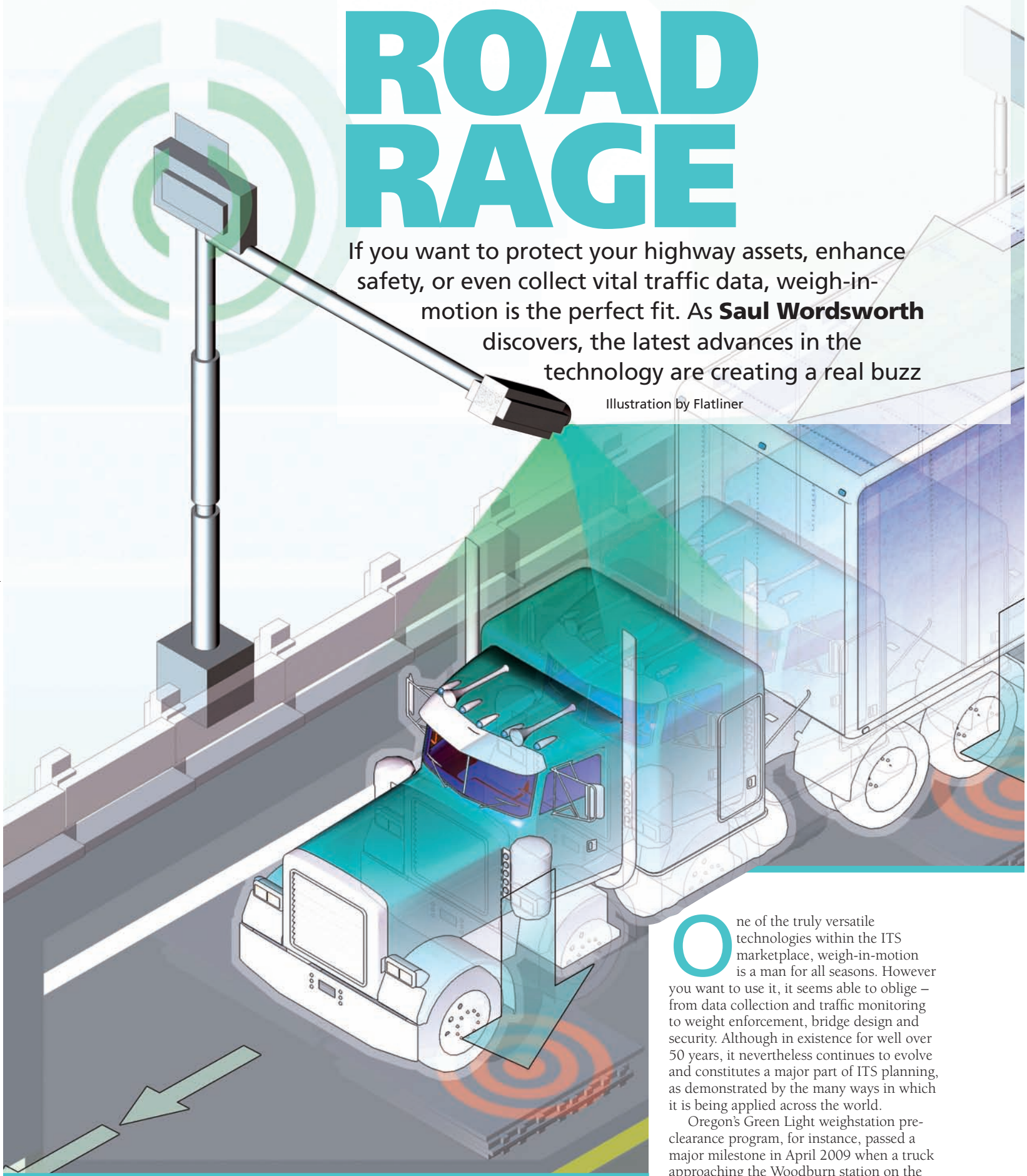
One of the truly versatile technologies within the ITS marketplace, weigh-in-motion is a man for all seasons. However you want to use it, it seems able to oblige – from data collection and traffic monitoring to weight enforcement, bridge design and security. Although in existence for well over 50 years, it nevertheless continues to evolve and constitutes a major part of ITS planning, as demonstrated by the many ways in which it is being applied across the world.

Oregon's Green Light weighstation pre-clearance program, for instance, passed a major milestone in April 2009 when a truck approaching the Woodburn station on the
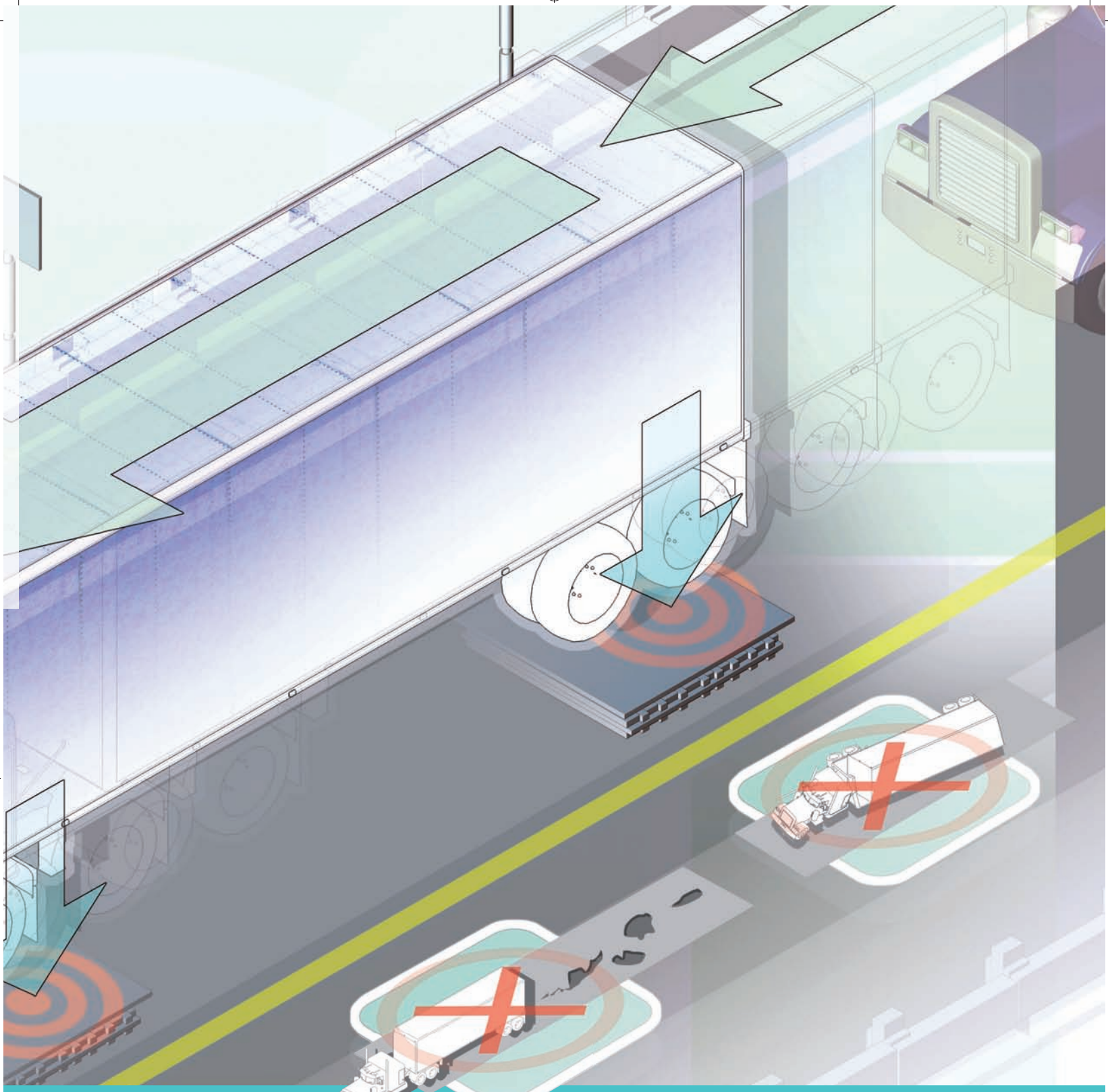
I-5 northbound became the 11 millionth to be weighed in motion. Green Light is one of the most successful and biggest WIM programs in the world and attracts interested parties from across the USA, keen to learn how the project has grown to be such a success since its inception in 1999. Oregon has a long history of WIM technology, as David McKane, Oregon Department of Transportation's manager of safety, details further. "Listen to this," he says, reading aloud from an article in the 1955 publication *Popular Mechanics* concerning Oregon's first weigh-in-motion scales. "We have come a long way since then," he adds. "When Green Light started 10 years ago

we had four weighstations preclearing an average of 51 trucks a day. In the first five months of 2009, the 21 stations with Green Light were averaging 4,100 trucks."

The Green Light program uses hydraulic loadcell WIM scales and free telematics transponders to screen trucks as they approach the weighstation. Once truck size and weight are 'all-cleared', a green light signal is sent back to the transponder. "We were one of the first states to use loadcells," McKane claims. "They are more expensive but very durable and work well in the many different weather conditions of Oregon."

Green Light was created to lessen the burden on existing weighstations, increasing

a station's capacity without expanding the facility. "Without WIM we would have had to close some of the weighstations," McKane continues. "The queues would have been too dangerous." A total of 4,361 trucking companies participate in Green Light, with transponders in almost 40,000 trucks. WIM is set to eliminate 1.5 million unnecessary weighstation stops in Oregon this year, saving truckers 125,000 hours of travel.

Last year, the Oregon Department of Environmental Quality discovered that a truck traveling at normal highway speed – as compared to one stopping at a weighstation – emits between 36% and 67% less particulate matter, carbon dioxide, carbon

Low- and High-Speed WIM with Lineas® Quartz Sensors

monoxide, hydrocarbons and nitrogen oxides, the first and last of which are most detrimental to human health and the environment. This transmutes into thousands of tons of saved emissions and US$600,00 in fuel. Little wonder that McKane has much to shout about. "We are unique," he says. "Not only is our program free, we have taken over the management of the technology ourselves. We still have a relationship with International Road Dynamics (IRD), but now employ one technician to manage it. This way we can control costs."

WIM AND SECURITY
IRD is certainly one of the leaders in weigh-in-motion. Besides the more obvious uses of WIM, such as enforcement, tolling and data collection, the company's president and CEO Terry Bergan believes an area where its use is fast growing is security. "On the southern tip of Arizona on the Mexican border, we have WIM technology in place," Bergan explains. "We use it to classify cars and trucks, which means we know the weight of the vehicle in question. We can then tell if something or someone is trying to be smuggled across the border." As accuracy is the key, single loadcell or bending-plate technology is deployed. "The first time we used WIM technology for this purpose was after 9/11, and it has grown from there, on both the US and the Mexican side. We are also involved in a similar project in Kashmir. In Mexico, we monitor for people and weapons; in Kashmir it's just weapons."

Although WIM is fairly prevalent in the developed world, this is less the case elsewhere. In a recent survey in Pakistan, over 70% of two-axle trucks weighed were found to be overloaded. In the UAE, vehicles sometimes weigh in at over 100,000kg, with individual axle loads often exceeding

IRD's WIM at Nogales, on the USA-Mexico border, is integral for Homeland Security purposes

Oregon's Green Light program serves 4,341 trucking companies with 39,686 equipped trucks

35,000kg. A few years ago, almost 90% of IRD's market was based in the USA; now it is as little as 50%. "We completely redesigned all of our electronics," Bergen states. "It's now open architecture, modular and low power. Back in the 1980s, WIM technology was in its infancy in terms of reliability. Now it is approaching maturity. The market itself isn't yet mature, but most products are,

including ours. They are off-the-shelf. The new era of electronics has made them that way. Previously, every time you deployed WIM, it was a customized system."

IRD South Asia has recently won a number of deals in India, including one for the supply, installation and commissioning of 10 toll lanes with two slow-speed WIM for the Trichy-Thanjavur Expressway, as well as 18 lanes for the Surat-Bharuch toll plaza. "Increased infrastructure investment in India presents a significant opportunity for further growth," says the Canadian.

UNDER THE BRIDGE
Those of you familiar with *Traffic Technology International*'s annual focus on the subject will not be a stranger to B-WIM, otherwise known as bridge weigh-in-motion technology. Devised in the USA in the 1970s but deemed too inaccurate, the technology was latterly taken up by Slovenian firm, Cestel. Over time, though, B-WIM has been fine-tuned to the extent where it is now perfectly accurate enough for pre-screening purposes. With its potential for enforcement, data and bridge longevity reporting, B-WIM also has the great advantage of incurring minimal time lost during installation. With its application being made under deck, there is no need to close lanes or disrupt traffic.

Although B-WIM is a feature in Slovenia as well as countries such as France and

A long weigh into the future

Terry Bergan is president and CEO of IRD, one of the world's largest suppliers of WIM. He predicts that in the future, a vehicle could display its own weight on board, either by becoming its own scales and weighing itself – although that technology has some way to go – or, as he explains here, via wireless technology: "WIM sensors in the road may be able to communicate their data to a controller on board, which would enable the vehicle to know its own weight, information that could then, in turn, be transmitted either to enforcement vehicles on the same highway, or to some kind of central state highway database."

Kevin McFadden is product group leader for Mettler Toledo Systems Solutions. He, too, foresees a marked

change in WIM of the future, although in a very different way: "I would look to WIM accuracy to improve to the level that we no longer require static weight measurement," he predicts. "That would revolutionize our notion of what a weighstation is and how traffic planning is conducted. The footprint of the solution will also become smaller."

Holland, it has yet to catch on in the USA. Enter Wilbur Hitchcock, Professor of Engineering at the University of Alabama. He and a group of his students are currently carrying out an extensive research project that could have huge repercussions for the WIM marketplace in the USA. "The purpose of our research is to install B-WIM on three different Alabama interstate highway bridges to determine whether the technology is suitable for detecting overweight vehicles," Hitchcock explains. "If these portable systems provide sufficiently good results for enforcement, the capability to measure truck weights at different locations without the driver knowing there are detection systems in place could mean substantial savings."

Although there are other benefits to be gained from B-WIM – notably an insight into the health of the bridges being monitored – its primary role would be one of enforcement. Much is hinging on the outcome of this research, not least the potential rolling out of the technology across many – if not all – of the 50 US states.

"Our results have improved with every installation," Hitchcock continues. "We have learned much about the bending-plate equipment and understand how it performs on our highway bridges, as opposed to those in Slovenia. We have longer spans, so the signals and measurements are more complex to interpret, but we are still able to capture good information. Although we have only evaluated one of three bridges so far, our report is being reviewed. Yes, B-WIM has its limitations, but it still gives a very good indication of which trucks are overweight,

Although overloaded trucks are a danger to other vehicles, they're also a hazard for the driver, in that overloading affects stopping distance, adds wear and tear, as well as causing damage to roads
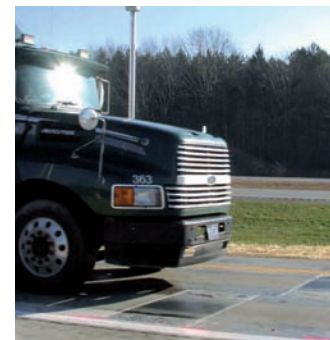
➔ **A truck crossing Mettler Toledo's weight-checking scales**

"The capability to measure truck weights at different locations without the driver knowing there are detection systems in place could mean substantial savings"

I-4 WIM system helps traffic go with the flow

Filtering by at around 50mph, the trucks on the award-winning automated I-4 weighstation in Florida have their weight registered, speed calculated, dimensions recorded, and axles counted by underground sensors. They don't need to stop and the process takes just 10 seconds – much more swift than the previous 10 minutes. "The system ensures the protection of the infrastructure and the traveling public," says Bob Susor from Mettler Toledo Vehicle Systems division – the company responsible for system design and installation. "Throughput has increased greatly, as only those trucks that are most likely violators are stopped and forwarded to the static scales." While addressing the traffic increase in the area – which has been steadily rising for years – the increased inspection and enforcement features of the new system enable it to identify and stop weight overloads, permitted loads, overdue citations, and also criminal infractions. However, Susor goes on to detail an unanticipated benefit, which arose during training. "Certain classifications of vehicles have tax weight limits based on registration, but we were able to legislate for this request as the system we developed can sort classification based on individual weight thresholds for each class."

Florida DOT feels the new system – in operation since January – will deliver far-reaching benefits. The public, for instance, are protected as overloaded and possibly unsafe vehicles are removed from the road, potentially along with some criminal elements also. The DOT is able to protect its infrastructure, while reducing the total costs of maintaining said infrastructure. The real-time traffic counts, meanwhile, assist FHWA and FDOT in terms of planning, and the increased inspection rate means that the Florida Office of Motor Carrier Compliance (OMCC) is able to identify more violators. And sorting based on overdue citations has assisted OMCC in the collection of overdue fines. Last, but by no means least, non-violating truckers pass through with minimal delay, which has a knock-on effect in terms of the environment, based on reduced pollution from idling trucks.

Mettler Toledo's system on the I-4 freeway could be a model for other states

and experience using the equipment has given operators increasing confidence. It is quite possible B-WIM could be rolled out in a number of states."

CALIFORNIA DREAMING

One man keeping a particularly close eye on the outcome of the Alabama trials is Randy Woolley. As Caltrans' chief systems engineer at the Division of Research and Engineering, Woolley visited Slovenia in 2006 as part of a working group to identify possible new ITS to implement. Three years on and B-WIM is still not a part of the USA's WIM repertoire. "Although upper management in California want to get it going," Woolley reveals, "they are not willing to make the spend until it has been demonstrated in the different types of environmental conditions that we have here. With high and low temperatures, mountain ranges and salty coastal regions, our climate is a real mixed bag."

Perhaps the powers that be would be more inclined to give B-WIM a whirl were it not for the current budget crisis engulfing California. The challenging economic climate – of which the Sunshine State is a particularly high-profile victim – is impacting ITS projects across the world. Although the deployment of WIM is an incurred cost, it is also an investment with an excellent return. Woolley remains frustrated about a large-scale WIM project that is close to his heart: "Our research budget – and therefore the magnitude of the projects we can work on – is down. Yet I continue to plan for an open-test facility to evaluate the entire portfolio of WIM technologies, one against the other, and also against a static weight fixed inspection station. It would enable us to carry out a truly definitive evaluation of WIM where, for instance, we could discern when a sensor is starting to fail or when a WIM station needs recalibrating. This is a large-scale project that we can run on the open road, the results of which could be disseminated across the country. When we get some budget again, we can go into operation, but with some of us currently having to take unpaid leave, I have no fantasies about gaining any significant funding anytime soon."

FRENCH WEIGHING

The King Fahad Causeway (KFC) is the second-longest causeway in the world, stretching some 17 miles and connecting Saudi Arabia with Bahrain. Four million vehicles pass over it annually, and hundreds of thousands of trucks. Toll stations are included on both the Saudi and Bahrain sides of the causeway. And on each side are two WIM scales that must be passed over by all trucks at speeds of 8km/h or less. Captels is the French firm behind this WIM deployment, and Pascal Berthet is the company's sales director: "KFC employs our R125 axle weighing system. We take the weight by axle and then the total weight. The truck then drives off. When it arrives at

The Captels system checks axle loads before vehicles are sent out onto the road, thereby reducing Carrefour's liability in case of accident

American uniformity

In the USA, the FHWA recently joined forces with the National Institute of Standards and Technology (NIST) to investigate the development of standards for the evaluation of weigh-in-motion scales in support of FHWA's truck weight enforcement program. As John Barton, weights and measures coordinator for NIST, explains: "This project – while still in its early stages – will include WIM scales manufacturers and vendors, state enforcement personnel, state WIM technology experts and NIST employees. With the emphasis FHWA has placed on introducing enforcement checks at the roadside as part of the Smart Roadside Initiative, this collaborative endeavor to develop a uniform set of standards is vital to advancement of roadside enforcement program priorities." The immediate focus of the working group is to develop uniform standards to apply to WIM devices currently used in targeting possible overweight vehicles.

"Private companies are becoming increasingly aware of the negative consequences of overloaded vehicles. The Carrefour deployment underlines once more the flexibility of WIM"

the next checkpoint the weight is displayed on a computer terminal and the driver must pay his toll according to this weight." With two lanes going in both direction, each lane averages 750 trucks per day, equating to a total of 300 per day and almost one million a year.

A more recent project Captels is engaged in is with French hypermarket giant, Carrefour. LCM is Carrefour's logistics platform. Every day, its drivers visit Carrefour's out-of-town warehouses and collect huge loads to be disseminated to Carrefour outlets across the country. Yet if Carrefour overloads an LCM truck and there is an accident, the former risks being sued by the latter, so the introduction of WIM has removed this risk. Captels has adapted its R125 permanent axle weighing system to perform low-speed WIM for LCM, allowing the company to be sure that its trucks conform to the law. This use of WIM is fully automatic, with no personnel required, just the driver and his vehicle. Once in front of the platform with his truck, the driver swipes his transponder in front of the sensor then proceeds forward. When he reaches the end of the platform an alarm will sound if the truck is overweight, at which point the driver must return to the warehouse and lighten his load. Those that fall within legal parameters are free to continue their journey. "Private companies are becoming increasingly aware of the negative consequences of overloaded vehicles," Berthet notes. "The Carrefour deployment underlines once more the flexibility of WIM." ∎

SWEDE SIXTEEN

As the World Congress rollercoaster touches down in Stockholm, **Louise Smyth** and **Nick Bradley** highlight some of the standout sessions, the key product launches, and discover how business has been for ITS in 2009

Illustration by Ben White

Taking place at the Stockholm International Fair from September 21-25, the 16th World Congress on Intelligent Transport Systems is 2009's much anticipated industry showcase. The focus this year is 'ITS in Daily Life' – and there are few better cities worldwide where ITS can been seen in action than in Sweden's capital. The country's renowned position in traffic safety aside, Stockholm is a great example of how transportation technology – when used intelligently – can make a real difference to its citizens' lives.

For example, congestion charging was rolled out permanently in 2007 following a successful six-month trial in 2006, and had an immediate positive impact, cutting traffic by 20%, reducing harmful emissions, producing a surge in the use of public transport, and raising revenue to go toward other local infrastructure projects. This is ITS in full swing, and no doubt there will be a massive demand to attend the technical tour of Trafik Stockholm, as ITS practitioners from around the world clamor to see and hear for themselves how cordon charging is making a difference.

HIGHLIGHTS

Of course, there are numerous other technical tours and demonstrations, plus over 170 exhibitors and 250 conference sessions to whet your appetite. Over the following 20 or so pages, you will read about some of the must-attend sessions, while we also preview some of the product launches that will be making the news when the show doors open. As usual, *Traffic Technology International* will have a booth in the exhibition hall (Z70), at which we will welcome you to share some of your own experiences of ITS, suggest an article, or even renew your subscription. We look forward to meeting you in Stockholm! ∎

Written by Jo Versavel, Traficon, Belgium

Written by Bas van Bree, Buck Consultants, the Netherlands

Automatic incident detection for Europe's longest bridge

## Video detection is key to the smooth running of traffic on the Öresund Bridge

→ The Öresund Bridge is a combined road-rail bridge-tunnel across the Öresund strait. At a total length of 16.4km (just over 10 miles), it is the longest of such bridges in Europe and connects the two metropolitan areas of the Öresund Region – the Danish capital of Copenhagen and the Swedish city of Malmö. The international European route E20 runs across it and through the tunnel via the two-lane motorway, as does the Öresund Railway Line. This huge project was started in 1991, and the Öresund Bridge was officially opened on July 1, 2000.

Ideal for travelers wanting a quick connection between Sweden and Denmark without flying, the Öresund Bridge now guarantee top-level safety and security for road users. With AID, all incidents inside each section of the tunnel – stopped vehicles, slow-moving vehicles, traffic congestion, smoke, etc – are detected within two seconds. This enables operators to take all necessary actions to make sure any incident has minimum chance to escalate,

> "With AID, all incidents inside each section of tunnel – stopped or slow-moving vehicles, traffic congestion, smoke, etc – are detected within two seconds"
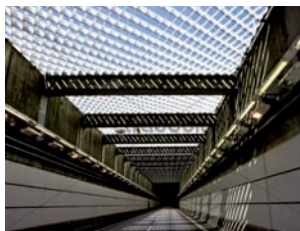
carries more than 60,000 travelers a day – visitors as well as local commuters. The bridge's four-lane road carries six million vehicles a year, and two train tracks carry another eight million people each year.

Safety and protection was of utmost importance when designing and executing this project. As a result, both tunnel and bridge are equipped with state-of-the-art traffic management systems, such as Traficon's Automatic Incident Detection system (AID). Such video detection technology – which is today setting the standard in quick detection – is regarded as essential to monitor and secure the whole stretch, and has proved to be an indispensable tool.

Traffic managers want a system that enables them to stay in control of the situation, no matter what happens. As such, they are able to

and the situation remains under control.

However, for certain traffic specialists this is not enough. More and more traffic managers are convinced that they can bring safety to a higher level by implementing a redundant AID system. But what does redundancy for a Traficon AID system mean? It's the ability of a system to keep functioning normally in the event of a component failure (such as power failure, network communication failure, and so on), by having back-up components that perform duplicate functions.

Redundant components can include hardware and software elements. The power of such a redundant system is that it prevents loss of important data and operators know they can count on the system 24 hours a day, enabling them to remain in control. In the case of the Öresund Bridge, redundancy was implemented at camera level to be sure that any incident is still detected in the event of camera failure.

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Pilot scheme tests truckload of anti-accident systems

Testing ADAS for trucks – a large-scale field operation test in the Netherlands

→ In spring 2008, the Dutch Ministry of Transport, Connekt/ITS Netherlands, TNO, and Buck Consultants International launched a large pilot scheme to test five individual anti-accident systems (AAS) for preventing accidents with trucks. Involving more than 2,400 trucks, it's the largest field operational test (FOT) to have taken place in Europe, and it was initiated to improve safety and to maintain traffic flow.

The objectives of the pilot were to measure the impact of the large-scale implementation of AAS on traffic flow, to reduce the number of accidents involving trucks, and to map out the impact on traffic safety. Systems tested in the FOT

participants. In fact, it is unique that all manufacturers participated in one pilot via their branch association, the RAI Vereniging.

Another challenge was the installation of the AAS, as the systems needed to be fitted onto the 2,400 participating trucks. Most of the trucks were already used in daily activities of the 123 participating companies, so they needed to

> "Involving more than 2,400 trucks, it's the largest field operational test to have taken place in Europe, and was initiated to improve safety and maintain traffic flow"

included lane departure warning assist (LDWA), forward collision warning plus headway monitoring and warning (FCW/HMW), adaptive cruise control (ACC), directional control (DC), and black box feedback (BBFB).

One of the key challenges was to involve as many stakeholders as possible in the process, such as branch associations, transport companies, truck OEMs, and system suppliers. The transport companies and their branches (TLN, EVO, KNV, VERN) were crucial partners for the success of the FOT, and the Dutch branches of DAF, Volvo, MAN, Scania, Iveco, Renault, and Mercedes were also active

stand still for a couple of hours per truck for installation. In the competitive transport sector working with tight timeframes, this turned out to be more difficult than anticipated. Open communication with clear agreements between supplier and company was therefore required, which was established with help from the BOVAG Truck Dealer Association.

A datalogger was also installed in the trucks. Parameters such as speed, GPS location, brake use, etc, were stored and sent to a central database via GPRS technology. Over 178TB of data covering 77 million road kilometers driven was eventually analyzed.

At the time of writing, the results of the effectiveness of the AAS on safety were not ready for publication. However, the results will be announced during the 16th World Congress on ITS in Stockholm. Overall, though, the participating partners and stakeholders believe the FOT was a success, with of course many lessons learned from the test.

TS007
**Tues, Sept 22**
11:00-12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Fredrik Davidsson, Mowea Trafikkonsulta, Sweden

# New traffic theory eases tunnel traffic problems

Predicting extreme congestion and tunnel closure using three-phase traffic theory

Over recent years, the Three-phase Traffic Theory has been introduced by Boris Kerner and others. In principle, the traffic flow could be divided into three main phases – free-flow, synchronized flow, and moving jams. By focusing on the transitions between phases in the physics of traffic, a pattern – typical for each highway or arterial – could be identified and used in real-time applications. Combining the new traffic theory with a well-detected highway network makes it possible to make short-term predictions on a minute-by-minute basis. In Stockholm, for instance, a warning system for extreme congested traffic situations in
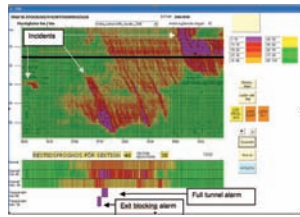
through the network with a 10km/h speed of approach. Other less severe moving jams are also shown (dotted arrows). The colors represent the spot speed at detection points: more intense colors indicate low speeds (red = 10-20km/h and violet = <10km/h). As the incident is cleared at 07:45, the moving jam is replaced by synchronized flow and in some locations even free-flow.

> "The idea behind the prediction technique is to identify moving jams upstream of the main tunnel exit and follow their progression through the highway network"
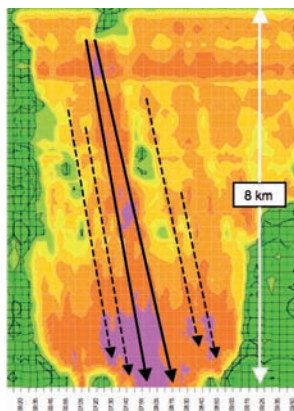
the 3.5km-long highway tunnel Södra länken (Southern link) has been developed. The system gives a warning to the operators in the TMC up to 15-30 minutes in advance, allowing for accurate traffic information and a well-prepared launch of the tunnel-closing procedure.

For instance, a speed analysis from June 8, 2009, representing the traffic situation on a 9km stretch of northbound motorway during the peak time of 06:00-09:40 shows that a small incident creates a growing moving jam starting at 07:15 downstream, which manifests

The fundamental idea behind the prediction technique is to identify moving jams upstream of the main tunnel exit and to follow their progression through the highway network. If the width and progression speed of the moving jam is above certain thresholds, the first level of the warning system is triggered. In the next level, the expansion of the moving jam is under consideration, i.e. the duration of very low speed at a specific detection point in the network. Often, the moving jam is shrinking as it approaches the tunnel exit, so the chance of tunnel blocking is reduced. When the alarm goes off the operators are able to activate VMS with queue warning and use other traffic information channels to warn drivers of a tunnel closure. The second image shows that an incident at 07:20 creates a moving jam. The 'exit blocking' alarm goes off at 07:28 and the 'full tunnel' alarm at 07:32 (section 16 is down, shown as a black line in the diagram).

TS034
Weds, Sept 23
09:00-10:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Bern Grush, Skymeter Corporation, Canada

Performance analysis framework for GNSS RUC

Overcoming GNSS signal problems to ensure charging reliability with newly defined tests

There are many ways of using GNSS data for road charging and there are several companies patenting and designing systems to use these techniques. As GNSS signals can be easily deflected or blocked in very built-up areas and steep terrain, these systems must mitigate positioning errors to be reliable. None are more troublesome than site-specific multipath, known as 'urban-canyon' error. This can be influenced by time of day, proximity of buildings and vehicles, and many other variables, and system viability can be influenced by the topology of the policy schema being deployed.

Given this, which system should be selected? If a system

related only to charging data, not distance or other accuracy metrics. Hence, GPAF analysis is independent of onboard technology, algorithms, processing and interconnection to vehicular systems.

Charging reliability has two counterbalancing components: charging integrity is designed to ensure the road user is not overcharged, and charging availability ensures that the toll

> "Charging integrity is designed to ensure the road user is not overcharged, and charging availability is designed to ensure the toll operator can assess a correct fee"

performed well in London, would it perform similarly in San Francisco? If it works for cordon charging, will it work for lane differentiation? How can ongoing performance levels be characterized? How will performance be affected by a change in urban landscape or solar activity?

The GNSS Metering Association for Road User Charging (GMAR) has set out to create the GMAR Performance Analysis Framework (GPAF) to quantifiably address these and other issues. Experts from a number of countries have drafted a body of criteria, tests, and analyses specific to charging reliability. The measurement criteria are

operator is able to assess a correct fee. This protects both parties in a potentially adversarial relationship.

For continuous charging, charging integrity is an expression of the probability that any given calculated charge may be slightly more than the correct charge, although only fractionally. Charging availability is a measure of the probability that a calculated charge will be either slightly less than the correct charge or very slightly above it. Both of these measures are biased toward the road user to minimize billing errors. There is a related set of metrics for discrete charges.

The first draft of the GPAF standard related to charging reliability has been released and feedback will be incorporated in a second draft soon. GMAR will also address security, including a component to protect road users (privacy) and another to protect the operator (tamper protection). This work will start by the end of 2009.

TS025
Tues, Sept 22
14:00-15:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by David Carels, Ghent University, Belgium

Simulation aids optimization for ad hoc networks

Architecture and scalable testbed for cooperative systems in NextGenITS

→ Within the scope of the NextGenITS project, a simulation and small- and large-scale testing environments will be set up to test scalability of routing protocols and energy optimization for cooperative vehicular ad hoc networks.

The system architecture is based on CALM, with roadside, vehicle, and vulnerable road user nodes. The first two nodes consist of a CALM router, a host, and a gateway. The vulnerable road user node consists only of a host and a CALM router, which are reduced and run only a selection of applications for energy efficiency.

A big challenge lies in the optimal usage of the VANET

the opportunity that nearly the same code of routing protocols can run in the simulator and on the hardware for real-world experiments. For such experiments on a large scale, use will be made of the IBBT Wilab, consisting of 400 IEEE 802.11 wireless mesh network nodes and 200 IEEE 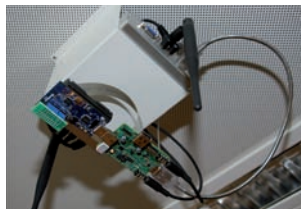802.15.4 sensor nodes, installed at 200 fixed locations at the IBBT office. The nodes are installed in a grid-like topology with an

> "The major research interests regarding cooperative systems are the scalability issues of IEEE 802.11p and VANET routing protocols, and energy optimizations"

interface due to fast movement, dense traffic situations, etc. This also has implications on the routing of information through the network. The major research interests regarding cooperative systems are the scalability issues of IEEE 802.11p and VANET routing protocols, and energy optimizations. These domains receive less attention in current European projects but fit closely to the competencies of the research partners.

For the simulation, the TraNS Environment is used, which links together SUMO and NS. This combination makes it possible to use realistic mobility models for the network simulator and enables the communication to influence the traffic behavior.

Furthermore, the Nsclick network simulation tool – an NS-2 network simulator with a Click Modular router inside – will be used. Using Click gives

inter-node distance of a few meters, which makes the testbed very suitable for VANET scalability testing, using scenarios with dense traffic.

The same equipment will be used for the small-scale tests, as it is very portable and could be installed into different vehicles quickly. It can be supplemented with 3G, a touchscreen, aerials, and a GPS receiver.

The small- and large-scale tests both make use of the IEEE 802.11a physical layer. This is a worst-case approximation of IEEE 802.11p operation.

For repeatable experiments not influenced by wireless spectrum interference, the Qosmotec wireless shielded environment testbed could be employed. Using attenuators, it can also emulate mobility.

For stress testing ITS services on a large scale, the IBBT Virtual Wall could be used, which is 100 nodes connected to a non-blocking VLAN switch. These could be configured with different network topologies, network parameters, and node configurations.

TS029
Tues, Sept 22
16:00-17:30

Written by Alan Montesi, Sara Gutiérrez & Marc Torrent-Moreno

Hitching a lift to work has never been easier

Ride sharing: a visit to the future with vehicular communication technology

→ The next generation of vehicles will have onboard communication modules (OBUs), which will – at the very least – include GPS location hardware and GSM communication technology, enabling people to integrate their cars with the internet. One application of this concept is improved ride-sharing services. If people can quickly locate others who live and work near them, with similar schedules, will they use this information for ride sharing? Or, will people be protective of their personal information?

To answer this question, GMV and Ficosa decided to conduct a trial of a new ride-sharing service. This initiative was the fruit of the

management software, MOVILOC. Position and time information sent wirelessly by the OBUs is received by this software in a control center for processing and storage. The trial's approach was to use this service to collect information from each participant's OBU and automatically compute the timetable of each driver. To protect personal data, this information was published on a website for the group only. In
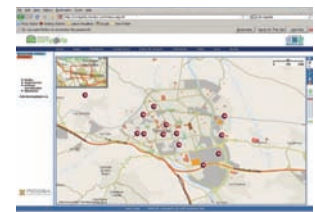
> "If people can quickly locate others who live and work near them, with similar schedules, will they use this information for ride sharing?"

environment created in the Spanish project MARTA, in which both Ficosa and GMV participate. The objective is to foster investigation and development in V2V or V2I communications and develop technological solutions that will improve mobility; ride sharing fits these objectives.

As a first step, a survey with more than 130 participants with common work locations was conducted. For the first phase of the trial, a group of 16 employees living in the same zone was selected. This geographical-based selection modeled the participation of an office with over 100 individuals. This group was given OBUs designed jointly by Ficosa and GMV.

To process the information, GMV adapted its fleet

doing so, each user could immediately see the name and telephone number of a co-worker with a similar route and schedule.

The architecture for this trial is a combination of the communication unit and a web-based ride-sharing application, as shown in the diagram above.

The first phase of the trial ran for six weeks at Ficosa's facility in Barcelona, Spain. The participants found the information very useful and, in fact, an increase in occupancy of about 25% per vehicle was observed. These results will be updated with data from all four phases of the trial, which involved more than 100 participants. The results so far show that this particular combination of technology does indeed foster ride sharing, so it is expected that future services will help to save drivers money by sharing the daily commute. At the same time, this will reduce congestion, so we can all enjoy our daily commute a little more.

TS038
Weds, Sept 23
11:00-12:30

COMPLETE WEATHER SOLUTIONS - ONE SOURCE

RWIS

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Mobile Weather Sensors

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The decider in winning or losing in road management

Integrating traffic management using decision support at Trafik Stockholm

→ The Trafik Stockholm Traffic Management Centre (TMC) is a cooperation between the SRA and the local town authority (Stockholm City). Major roads in the Stockholm region are managed either by the state or the city.

The network has grown a great deal since the first installation in 2001. Just four systems were connected then – now over 20 such different systems are controlled through the Central Technical System (CTS), although all subsystems are completely independent. There is also a well-defined ASN.1 protocol between the local control systems (such as Citect, iFix, or other local control systems) and CTS. All communication is handled via

Second, the scenario variables suggest a suitable action plan. The events are triggered either automatically from subsystems or from other agencies sending information to the TMC. Sometimes the event is a manual input from operators – a result of a telephone call or event seen on the video monitors. The variables are taken from the event information. Usually two or three action plans

> "A basic functionality is the help that the operator gets through the decision support. All events are handled through action plans"

the SRA fiber communication system, GCP, which handles the digital video stream from more than 800 cameras that are used for traffic surveillance.

The business logic is kept as much as possible in the subsystems. CTS sends orders to the subsystem, but it is the subsystem that decides how this occurs. A basic functionality is the help that the operator gets through the decision support. All events are handled through action plans.

The decision support can be roughly divided into three parts. First, the system helps the operator to verify an event. A phone call that claims that there has been an accident or a fire must be verified – even automatic alarms for stalled vehicles or fires must be authenticated, most often by checking CCTV. The system always knows the best camera for verification; if no camera is present, it knows who to call (police or local entrepreneur).

are suggested out of the 1,000 plans available.

Finally, decision support helps operators to execute the action plan – a sequence of actions that the subsystems should perform to handle the event in question. The correct ordering sequence is sent to all the connected systems in the predefined order, enabling the traffic manager to focus on safety and security issues. The operator only has to verify the location and the type of event to start suitable action plans.

An intelligent road network model is vital to any decision support system, as it is a road hierarchy that goes from a certain point to various road segment aggregations via road links. The positioning of an event is always on an element in the road hierarchy or equipment linked to the road. A lot of data specific to the road is maintained, such as the number of lanes, installed equipment, the best camera position, and the availability of road assistance to ensure the correct plan is suggested.

TS005
Tues, Sept 22
11:00-12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

How cruise control helps drivers to mind the gap

Cooperative adaptive cruise control: field testing of driver use and acceptance

→ Cooperative adaptive cruise control (CACC) is an enhancement to adaptive cruise control through the addition of vehicle-to-vehicle data communications. The CACC vehicle receives a continuous stream of status information from the lead vehicle, indicating its speed, brake application status, and other operational parameters.

By combining this information with the normal ACC sensor information about range and range rate to the preceding vehicle, the CACC vehicle can maintain tighter control over the separation between vehicles. This makes it possible for the gap between vehicles to be reduced without sacrificing ride quality, while at

the vehicles. This CACC vehicle can follow the other vehicle at time gaps of 0.6 seconds, 0.7 seconds, 0.9 seconds, and 1.1 seconds (compared to the available time gap settings for the normal ACC of 1.1 seconds, 1.6 seconds and 2.2 seconds). At these shorter gaps, it is less likely that other vehicles will cut in front of the ACC vehicle,
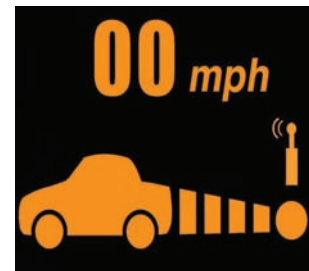
> "If this trend continues through the second group, it will have strong implications for the potential of CACC to increase the effective capacity of a highway lane"

the same time helping to attenuate disturbances, and in doing so enhancing the string stability of a sequence of CACC vehicles.

The test vehicles are two Infiniti FX45 crossover vehicles, provided to the project by Nissan, both of which are equipped with ACC. California's PATH (Partners for Advanced Transit & Highways) added digital data acquisition systems and DSRC communications (using Denso Wave Radio Modules) to these vehicles, and equipped one of them with a new CACC controller that integrates the data communicated from the other vehicle with the normal ACC ranging sensor data to produce an enhanced estimate of the gap and closing rate between

and there is a potential for effectively increasing the capacity of the lane.

The drivers' time gap selections and activations and deactivations of the ACC and CACC were recorded while they were driving their normal commute trips, and their subjective reactions were captured via a questionnaire. The results reported here are for the first eight drivers, out of a planned total of 16. These results show that with the conventional ACC, drivers selected the maximum gap of 2.2 seconds as frequently as they selected the minimum gap of 1.1 seconds. However, when they had the opportunity to use the CACC, they chose much shorter gaps. Indeed, three-quarters of the time that they were using CACC, they chose gap settings of 0.7 seconds or less. If this trend continues through the second group of test subjects, it will have particularly strong implications for the potential of CACC to increase the effective capacity of a highway lane.

Hand view camera
Forward view camera
Driver's face camera
Experimenter's system
Deactivation button
Pedal view camera

TS008
Tues, Sept 22
11:00-12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

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Written by Rod Klashinsky & Rish Malhotra, International Road Dynamics, Canada

How to make sure the heavyweights pay

Weigh-in-motion methods for dealing with overloaded, dangerous trucks on toll roads

→ WIM has a long history of application in data collection for use in planning transportation infrastructure. This has expanded to use in enforcement in sorting compliant from violating vehicles to increase the throughput and ease congestion at inspection stations. In various applications – particularly within the tolling area – it has long proved itself to be a valuable option for road managers. Using this concept, both axle and gross vehicle weights are monitored.

Various vehicle-weighing strategies include the use of static scales as well as high-speed and slow-speed WIM sensors. The WIM technology deployed, installed, and
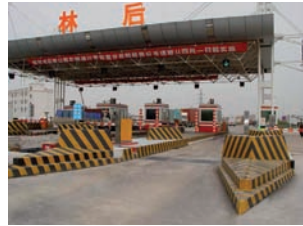
weight. There is a direct relationship between the wear and tear on pavements, bridge structures, and other components of the transportation infrastructure as a relationship to the increase in weight of the vehicle or the vehicle's number of axles.

IRD has installed several WIM@Toll plaza systems in India, China, and Korea, and has several systems at the

> "Concessionaires support this concept as charging tolls to overloaded vehicles is beneficial in recovering the infrastructure development and maintenance costs"

maintained by International Road Dynamics Inc (IRD) in various locations worldwide includes single loadcells, bending plates, slow-speed WIM scales, lineas quartz, and piezoelectric sensors. Systems in operation use a range of video-imaging technologies, including color, low-light, and infrared imaging. Some use ALPR and RFID to assist in identification. Most systems installed by IRD also include various vehicle dimensioning sensors, such as height sensors, light curtains, tire width sensors, and axle sensors.

Data collection, weight and dimension enforcement, truck weighstations, and toll collection have in the past been separate operations, but integration of these fields equates to efficiency. WIM at the toll plaza (or WIM@Toll) is the most easily implemented and efficient method of collecting tolls based on

planning stages in Africa, the Middle East, and North America. The concept of tolling based on weight is seen as a fair and equitable way to recoup the cost of consumption of transportation infrastructure by a commercial carrier. IRD's bending plates are widely used in China where the WIM@Toll concept has been implemented. Concessionaires and other commercial vehicle operators are in support of this concept as charging tolls to the overloaded trucks recovers the infrastructure development and maintenance costs in the long run.

IRD's successful implementation of WIM@Toll is based on its years of expertise in WIM, automatic vehicle identification, video imaging, database management, and application service provision. The future trend is toward the use of universal RFID in commercial vehicles, and in doing so leading to further integration of transportation management functions via ETC of overloaded vehicles.

TS086
Thurs, Sept 24
14:00-15:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Karl E. Schedler, micKS, Germany

Safer driving, whatever the weather

A new atmospheric weather detector can detect rain, wind, temperature and humidity

→ The fieldbus-based WS600 atmospheric weather detector from Lufft can measure a number of conditions. For instance, an innovative Doppler radar sensor can record the type and intensity of precipitation. The direction and speed of wind can also be measured through the use of a non-mechanical ultrasonic transducer, and air pressure can be measured with a built-in pressure transducer. Air temperature and relative humidity are measured within a protection shield, with active ventilation that helps to speed up the response time and ensure accurate measurement of the surrounding atmosphere.

The device has one serial interface within which all

the temperature. Finally, it can measure road surface conditions based on the dielectric characteristics of the cover.

The ARS31-UMB sensor device measures the freeze point temperature by cooling and heating up a small sensitive area on top of the sensor surface, allowing the measurement the actual freeze temperature of the liquid solution on the pavement.
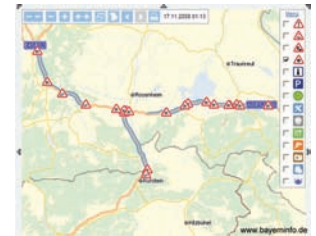
> "For traveler information, a service operation platform processes meteorological and road weather data sources, producing TMC-coded warnings"

measured data is reported. The communication protocol specification is open and can easily be implemented into OEM solutions.

The IRSxx-UMB series of road surface sensors from Lufft has proved successful in accurately reporting all parameters appropriate to the evaluation of the condition of the road surface. It measures road surface temperature (in °C), benefits from up to two subsurface temperature probes (for a depth of 30cm), and provides waterfilm depth measurement by means of a microwave radar transducer. Freeze temperatures can also be measured via gold electrodes that assess the chemical concentration and conductivity within the solution, while also considering the waterfilm thickness and

For traveler and traffic information, a road weather service operation platform was developed by micKS MSR in cooperation with BMW. This processes meteorological and road weather data sources, which can also have various time and geographical references, producing TMC-coded warnings and messages referenced to short road sections based on digital map links or TMC locator.

The platform has been run since 2008 by the Bavarian Traffic Information Agency (VIB), established by the Bavarian Interior Ministry and a consortium of private firms.

To meet the requirements of a premium service, BMW has also run several automatic quality measurement and evaluations, based on defined quality scores for message and service quality. For that purpose, data from surveying and probe-collecting tours by XFCD vehicles from BMW is called upon. The results show a reliability of over 80% for critical weather warnings.

TS116
Friday, Sept 25
11:00-12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Paola Dalmasso, Centro Ricerche Fiat, Italy

Integrated communication increases driver awareness

SAFESPOT aims to understand how vehicles and roads can cooperate to improve safety

→ Experience has shown that standalone ADAS have some limits in terms of the physics of the perception process. The V2V and V2I communication approach (wireless links) adopted in SAFESPOT IP enables driver awareness to be extended.

The vehicle-based applications are developed inside a subproject known as SCOVA (System for Cooperative Vehicle-Based Applications). These are based on a safety margin, determined according to the degree of risk that the vehicles encounter. In order to implement a model based on the minimal transmission channel occupancy, some strategies are implemented for enabling the secondary actors

safety distance, head-on collision warning, rear-end collision, curve warning, and an additional support application (external message application). Volvo is preparing to demonstrate the frontal collision warning, road condition status, and vulnerable road user accident avoidance applications using a Premium Distribution Renault truck and an FH12 Volvo truck.

> "Standalone ADAS applications have limits. The V2V and V2I communication approach adopted in SAFESPOT IP enables driver awareness to be extended"

(cooperative vehicles) to transmit specific data only when some primary actor of an application needs them. The analysis of the scenario should be executed in the ego-vehicles, with the purpose of managing the vehicle HMI, and in the cooperatives nodes, with the purpose of deciding when and how to deliver the applicative parameters.

The responsibility for the implementation of 10 separate applications lies with various companies, with an 'application leader' assigned to each. They have been grouped into four clusters according to the type of the related accident – lateral collision, longitudinal collision, road departure, and vulnerable road users.

In the Centro Ricerche Fiat vehicles (two Fiat Bravos), the implemented applications include speed limitation and

Piaggio, meanwhile, is to provide two MP3 tilting three-wheeled scooters. Within the initial proposal the motorcycles had the main role to act as probes, delivering information to the other vehicles. However, the final version of the Piaggio MP3 hardware architecture can be used for developing applications where the PTW is an ego-vehicle. Motorcycles are particularly unsafe in lane change maneuvers and safe overtaking. Renaults will be used mainly for applications related to intersection safety. For this purpose, two SAFESPOT vehicles are being equipped: an Espace IV and a Laguna III.

The advantages of using a cooperative approach are that vehicles can exchange their reciprocal position, and share dynamic information among the cooperating vehicles or sensor data from vehicles with advanced exteroceptive sensors on board. This level of information would be useful for vehicles with the SAFESPOT communication capabilities and no additional ADAS sensors.

TS009
Tues, Sept 22
11:00–12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by André Weimerskirch, Kai Schramm, Lars Wolleschensky & Thomas Wollinger, escrypt

Have confidence in future communication systems

Protecting privacy is key to the successful implementation of V2V/V2I communications

→ V2V and V2I systems are expected to be deployed within the next decade. The main motivation for such systems is improved traffic safety, as well as plans for commercial exploitation such as infotainment on demand, location-based advertisements, and tolling. Data security is an enabler for V2X, because the authenticity, integrity, and confidentiality of network traffic as well as the privacy of the participants must be guaranteed, especially as these messages will be used for safety applications. Although available mechanisms provide protection against mechanical or electronic failures, data security provides protection against malicious attacks. Data

a secret key (hybrid data encryption).

Although it is agreed in the IEEE 1609.2 draft to use a very efficient cryptographic scheme (i.e. elliptic curve cryptography, or ECC), the demand for computational resources and over-the-air overhead is rather high. The computational costs of ECC for V2X applications can be achieved only with expensive, dedicated cryptographic hardware.
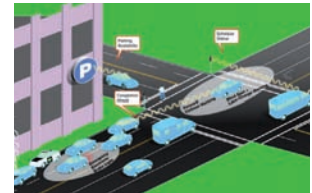
> "Privacy in V2X communications systems can be guaranteed by regularly changing all broadcast identifiers under certain conditions"

security therefore enables trusted V2X applications and results in fruitful business model revenue.

There are several standards and projects dealing with data security and privacy in vehicular communication networks, including the IEEE 1609.2 standard draft, the US VSC-A and IntelliDrive initiatives and the European C2CC project.

Although in symmetric data encryption the sender and receiver usually share the same cryptographic key, in digital signature applications the sender uses his/her private key to digitally sign data whereas receivers use the sender's public key to verify it. Digital certificates – which are issued by a trusted certificate authority (such as the national DOT) – enable parties to securely communicate over a non-secure channel such as a V2X communications link without having exchanged

The VSC-A project proposed an alternative approach based on efficient cryptographic schemes such as the TESLA protocol, which is far more efficient than ECDSA in terms of CPU load at the cost of a slightly increased latency. Another approach is to filter incoming messages and to verify only messages that have a notable threat level.

There is also concern that vehicle tracking reveals private information – i.e. a car parked in a red-light district, or transmitting messages indicating high speeds. Privacy in V2X communications can be guaranteed technically by regularly changing all broadcast identifiers under certain conditions, but it needs to be discussed on an organizational and legislative level. Vehicular communications networks provide exciting new possibilities. Data security in such networks is currently being researched and implemented, and reliable solutions will be available within the next few years.

TS029
Tues, Sept 22
16:00–17:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Brian Burkhard, HNTB Corporation, USA

Groundbreaking technology set to transform highways

IntelliDrive is set to enable vehicles to communicate with each other – and the road

→ At the heart of the IntelliDrive movement is the state of Michigan, where several roadway miles have been outfitted with IntelliDrive infrastructure. Partnering with consulting firms such as HNTB Corporation, the state's DOT has spent more than four years and US$2 million exploring the technology.

During recent ITS meetings, the state and HNTB showed that IntelliDrive applications can be implemented right now with off-the-shelf technologies and minimal customized coding (they are currently being proved in test beds throughout the USA).

IntelliDrive equips vehicles with sophisticated computing and communications devices resulted in a new 'sandbox' for future development that goes beyond the numerous applications of IntelliDrive that have already been created, such as: emergency vehicle signal preemption, traffic signal countdown, mileage-based user fees, congestion pricing, merge warning, bridge height warning, parking availability information and e-payment, emergency vehicle warning, workzone warning, and commercial services information.

IntelliDrive's safety features are designed to cut into the 40,000 deaths that occur annually on US roadways. Through the initiative, an in-vehicle warning system could sound an alert if a driver is

> "IntelliDrive is designed to cut into the 40,000 deaths that occur annually on US roads, and could one day be used with a system of mileage-based user fees"

that store, dissect and disseminate data. Those devices calculate a vehicle's position, speed, rate of acceleration, internal diagnostics and more, transmitting some of the data to other vehicles and some to roadside communication and computing infrastructure. The roadside units, often not much bigger than a shoe box, then feed centralized computers that compile, analyze, and redistribute the data to vehicles on the road, back to roadside devices, and to other interested parties – and most of it happens within milliseconds.

The use of readily available technologies, such as laptops and GPS devices, has been successfully demonstrated in Michigan. That success has approaching an accident he or she can't see. It could warn a driver that he or she is close to running a red light, or it might sound a series of loud chirps or vibrate the seat if sensors detect the driver is veering onto the hard shoulder and perhaps falling asleep.

IntelliDrive could also alert drivers to congested roadways and suggest alternative routes. In fact, it could one day be used with a nationwide system of mileage-based user fees, keeping a detailed log of the vehicle's travel history and calculating fees accordingly.

TS007
Tues, Sept 22
11:00-12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Masao Fukushima, Nissan Motor Co, Japan

Cooperative driver assistance functions

Driving safety support systems are being used to prevent intersection collisions in Japan

→ The UTMS (Universal Traffic Management Systems) is a National Police Agency system that aims for a 'safe, comfortable, and environmentally friendly traffic society' by using an advanced information communication technology such as interactive communication between traffic control systems and individual vehicles using an infrared (IR) light beacon. These systems are being used by UTMS Japan, which was established in 1996.

The driving safety support systems (DSSS) – which use infrared beacons for vehicle-to-infrastructure communication – is one of the UTMS activities and is now developing a vehicle-to-infrastructure cooperative safety support Nissan's customers has recently been completed. Functions tested at nine intersections in Japan's Yokohama City included stop sign recognition enhancement, signal recognition enhancement, and crossing collision prevention. The cooperative driving assistance functions can be easily added to a vehicle by reprogramming the car navigation system.

> "The OBU alerts the driver if necessary, but will not generate an alert if the vehicle speed is low, for example, to avoid annoying the driver"

system. There are several regional DSSS activities composed of six car OEMs and 23 Tier 1 companies. The IR beacon of a roadside unit (RSU) sends downlink data to the vehicle that passes under it. Downlink data is as follows: road shape; traffic signal information such as current color, rotation schedule and location; traffic sign information such as presence of a stop sign; information about obstacles such as other vehicles, motorcycles, bicycles and pedestrians that are detected by roadside sensors; and other data. The vehicle's OBU has a data-sorting logic and alerts the driver if necessary, and will not generate an alert if the vehicle speed is low so as not to annoy the driver.

A large-scale field operational test by 2,000 of Test intersections had a data monitoring system and logger. The participants used their cars as normal in their everyday life, and data was monitored and logged only for participants who passed through the test sites. The number of participants, 2,000, was decided on the premise that some would never visit the test sites. To compare, traffic flow and speed change data from vehicles without DSSS functionality were also measured.

Data from more than 20,000 vehicles was logged during the 2.5-year test period. The amount of vehicles logged for dangerous speeding before the intersection – which could have caused accidents – was reduced by 40%. Throughout the test, no influence of drivers' experience with the system was found, and no influence of drivers' over-trust was found, even if no information was provided at the test site. In fact, drivers who experienced this system slowed down before an intersection.

TS056
Weds, Sept 23
14:00-15:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

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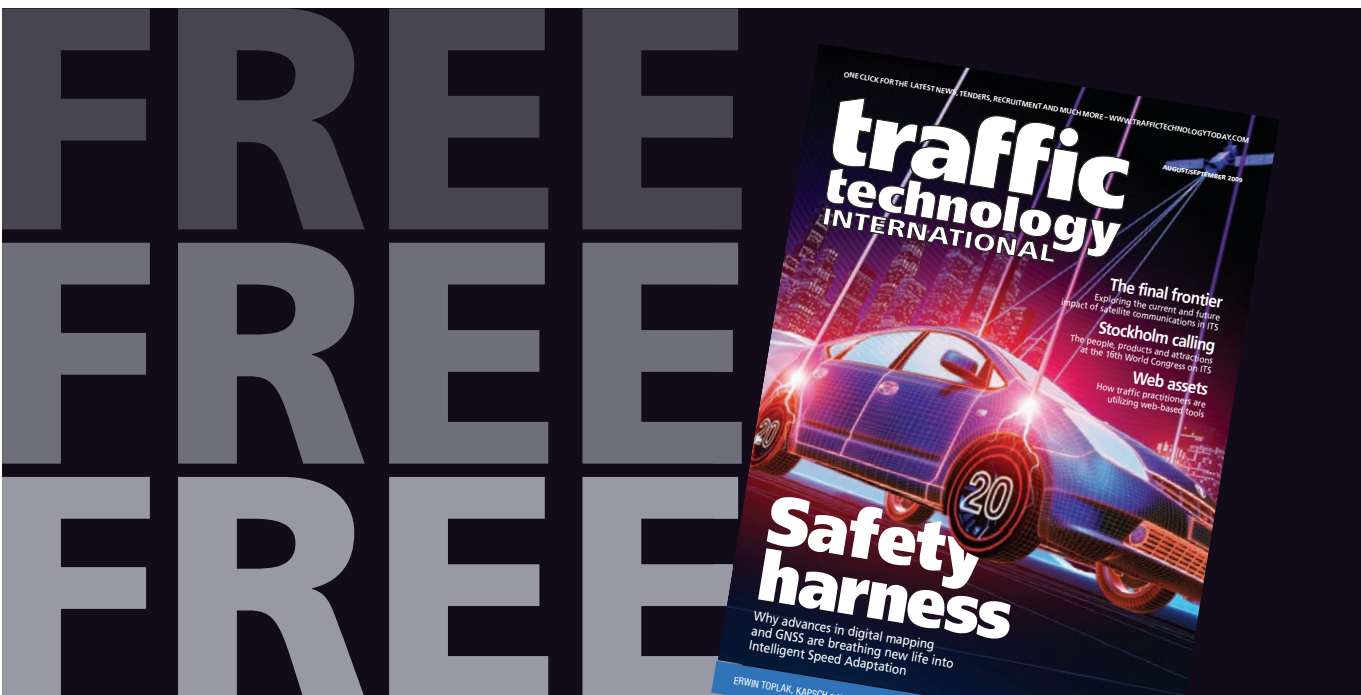Written by Kristin Virshbo, Castle Rock Associates, USA

Sometimes it pays to take a step back in technology

We've got GPS, GNSS, and RDS-TMC – but let's not forget good old SMS

→ Continual internet and communications developments have enabled ITS experts to find new and interesting ways of solving transportation problems. The 2005 Google Maps API release was pivotal, bringing detailed and usable interactive maps to an industry that had struggled to present clear geo-coded information to the public. Cellular, satellite, and wireless protocols have improved the coverage and performance of public communications networks, and many obstacles that prevented the realization of ITS plans have been removed through these innovations.

And yet, as 2010 approaches, a humble, low-fidelity, back-to-basics medium

with texts is finding a way to send clear, relevant information to people when they need it, within 160 characters.

This is not the first time the industry has faced this challenge. In the 1980s, RDS-TMC was one of ITS's key achievements. It specifies how roadway event details – something that can be surprisingly difficult to describe – can be squeezed into a very

> **"The simple, 160-character plain text message is where many in the ITS industry are creating the most innovative applications"**
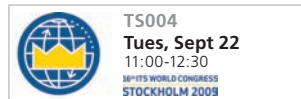
is emerging as one of the most important tools: the text message, or SMS. Even as web applications grow more pervasive, the text is becoming one of the primary means by which people worldwide perform tasks previously done on their PCs. They use it to stay in touch, receive alarms from their calendars, to get air travel information, look up addresses and phone numbers, and even to conduct personal banking.

Naturally, people are also interested in texts about traffic. Texting current traffic conditions, road closures, and travel times may be one of the best ways for agencies to reach the general public. If a cell phone is switched on and within a cellular coverage area, texts can be sent and received. This has obvious advantages over web-, email-, and phone-based systems. The challenge

small container. In fact, some agencies are looking to RDS-TMC for text message design inspiration. Of course, unlike texts, RDS-TMC requires a specialized decoding device at the receiving end. Yet, one of the most common mistakes is to treat the text message as though it were an RDS-TMC-like broadcast. Some agencies are designing traffic text alert systems (through Twitter, etc) that blast every known traffic fact to all recipients. Users quickly get alert fatigue. A successful service will find out what each user wants to know and will send them tailored texts to meet those needs.

Some agencies are also considering SMS for expanding mobile traffic operations. The US-based Enterprise research group is exploring how TMC operators might change DMS, control cameras, and conduct other critical operations tasks through SMS commands. This may be especially useful in rural areas where no other communications networks are available to off-duty operators.

TS004
Tues, Sept 22
11:00-12:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Lars O Landerfors, Swedish Road Administration, Sweden

Do variable speed limits improve road safety?

The success of VSL makes it a priority in short- and long-term budget planning

→ The Swedish five-year trial (2003-2008) on variable speed limits (VSL) involved 20 sites with VSL facilities (which are now in operation) and the application of either road crossing control, pedestrian control, weather control, or traffic control – or a combination.

Particularly interesting are the effects at rural intersections controlled by stop and give-way signs. Speed reductions were substantial for high secondary road traffic (2,000 vehicles a day) as much as 15km/h. Slightly surprisingly, the VSL signs had an impact on speeds while active and inactive. It is assumed that a certain frequency of activity is needed to get a positive effect.

actuate speed limit signs. The Swedish Road Administration (SRA) is currently carrying out a trial on a suburban motorway.

Less costly solutions are desired and to some extent tested. Plant architecture is being standardized to make maintenance more cost-effective, and improvement of weather models and IT for automated weather-controlled VSL depends on more efficient detectors.

> **"Motorist acceptance is high for VSL applications, which is encouraging for their further expansion. However, most installations are costly"**

Comparisons with other methodologies, such as three-lane barrier roads or reconstruction of roundabouts, show VSL is very competitive at rural stop or give-way controlled intersections with secondary road AADTs above some 1,500 vehicles a day.

Weather-controlled VSL gives extra encouragement to reduce speed when driving on difficult road surfaces or in windy conditions.

Motorist acceptance is high for all VSL applications, which is encouraging for their further expansion. However, most installations are costly, limiting the number of sites with sufficient cost-benefit ratio.

A new take on VSL is that variation in air pollution levels caused by road traffic could

Based on its VSL project, the SRA has decided to implement VSL as a standard measure within its short-term minor improvement program, as well as in the preparation of the next national plan. The short-term objective is to open at least 20 new, cost-effective VSL sites by 2011.

The program for implementation will be further expanded as applications stabilize. Pre-studies are currently underway, dealing with expected benefit, road signing and plant setup, installation cost, control parameters, and validation scenarios.

A follow-up program is being outlined in order to maintain and develop knowledge about traffic effects and road user acceptance. A profile of operation is written for each VSL site, including follow-up of observance of speed limit, displayed speed limit versus criteria, and calculated road surface friction versus measurement.

TS057
Weds, Sept 23
14:00-15:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009
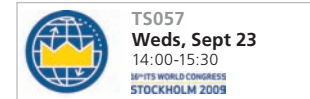
Written by Li Xuelun & Sean Haw Kuan, LTA, Singapore

Electronic VMS hailed a success for city's parking

Traffic planners in Singapore improved the city's parking to reduce its congestion

→ The frequent movement of vehicles to and from Singapore's city center generates much demand for its limited parking. The adverse impact of this spills over to the roads when some vehicles search for alternative parking in the vicinity, so contributing to the existing traffic.

In 2007, the Land Transport Authority (LTA) of Singapore embarked on a project to introduce the Parking Guidance System (PGS) in the Marina Centre area. The system provides real-time information on the availability of parking spaces of the participating developments via roadside electronic VMS, which are strategically installed along the major approach roads to the

Based on a post-implementation feedback survey, most respondents indicated their positive reception of the PGS. More than 80% said that the information shown on the VMS made it easier for them to locate available parking spaces, and 90% of the respondents felt that the implementation of the PGS improved their overall driving and parking experience in the Marina Centre area. In terms of influencing their parking decisions, 76% said they would switch to another car park if the VMS showed that their original intended car park was full or almost full.

An evaluation study carried out by the LTA showed that the average time required to find a

> "An evaluation study showed that the average time required to find a parking space during the weekend evening peak hours decreased by 3%"

Marina Centre area. The information from each development's parking lot management system is collected via an individual lot's data collector, which in turn sends this information to the central computer system via digital subscriber line access. This information is then sent out to the various VMS via a wireless data network.

The main objectives of the PGS project are to reduce the time spent by motorists searching for available parking spaces, to minimize unnecessary traffic recirculation into the road network, and to enhance motorists' driving experience. The PGS project was successfully completed in April 2008 and has since been in operation.

parking space during the weekend evening peak hours decreased by 3% after implementation of the PGS. Furthermore, the study also indicated that the vehicle queue length outside popular parking developments generally reduced by approximately 50% during the evening peak hours.

The results of the study and feedback survey demonstrate that the PGS has achieved its objectives to minimize unnecessary traffic recirculation into the road network and to enhance the overall driving experience of motorists.

TS036
Weds, Sept 23
09:00-10:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Oscar Lazaro, Innovalia, Spain

How close cooperation could be ITS's savior

The importance of improved sustainable mobility of cooperative ITS is clear

→ The most important question raised today by road authorities is: how can the actual worth of investment and effectiveness of traffic engineering applications on city road traffic be estimated?

The European Commission estimates that road traffic congestion costs Europe around €50 billion per year, or 0.5% of community GDP, and this is expected to increase to 1% by 2010. The majority of European citizens live in urban areas where there is increasing demand for mobility of people and goods. Given that urban environments do not generally allow for building additional roads to deal with this situation, wireless vehicular cooperative systems are an

issues of cooperative ITS. How does cooperative ITS contribute to traffic policy objectives satisfaction? Under which conditions is cooperative ITS more effective and better performing? Which traffic management strategies for public transportation and freight management should be considered? Which are the most suitable communications

> "Before cooperative ITS is widely deployed, road authorities need evidence of the benefits and impact of these solutions for their own particular scenarios"

attractive solution to improve road traffic management.

V2V/V2I communication technologies can improve traffic management through real-time exchange of traffic information (RTTI). However, before cooperative ITS systems are widely deployed and evaluated in field operational tests (FOTs), road authorities need clear evidence at city level of the benefits and impact of these solutions for their own particular scenarios. The iTETRIS project (www.ict-itetris.eu) has set out to satisfy this need through the development of an open, ETSI standard, compliant, and flexible simulation platform that will create close collaboration between engineering companies, road authorities, and communications experts, and enable them to develop adequate solutions for the key

technologies to support the cooperative ITS traffic management applications? How would low penetration rates be effectively handled? How is it possible to assess traffic management policy portability across cities?

To meet this aim, iTETRIS integrates data communications and road traffic simulations in an environment that is easily tailored to specific situations. Engineered for collaboration, it enables each stakeholder of a cooperative ITS project to benefit from functionalities exposed through open interfaces and to provide others with its own expertise. The accuracy and scale of the simulations leveraged by iTETRIS reveal the impact of traffic engineering on city road traffic efficiency, operational strategy, and communications interoperability. Therefore, quantifiable results of large-scale deployment and investment on cooperative ITS applications can be presented to road authorities.

TS100
Thurs, Sept 25
16:00-17:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Paul Blakeman, TRL, UK

Using variable speed limits to reduce flow breakdown

VSL is used in England to tackle the effects of motorway congestion, but can it do more?

→ A Controlled Motorways (CM) mandatory variable speed limit (VSL) system has been operational on the UK's M25 since 1995, and as part of the M42 Active Traffic Management Pilot scheme implemented in 2005. Several other schemes are in the design phase and a basic version has also been developed. With the launch of the Highways Agency's Managed Motorways initiative last year, it has become a key tool in a national strategy to tackle motorway congestion, through improved use of the existing roadspace.

The ability to set mandatory VSLs on motorway gantries helps operators to effectively respond to an incident, or manage traffic during

the road space at the particular location and point in time.

The principle is that it is not simply the reduction of speed that increases capacity, but the changes to driver behavior that result from this. The accompanying message sign for these congestion settings reads 'Congestion: Stay In Lane'. It is this advice, explicit in the message sign, that is implied and encouraged in the reduced

> "By lowering the speed limit, the proportion of vehicles that can drive near the limit is increased, so the need for lane changing is reduced"

roadworks. The automatic queue protection is a safety feature that sets signals to slow traffic approaching the back of a queue, but CM goes one step further and attempts to tackle congestion before flow breakdown occurs. The 50mph and 60mph signals set by the CM algorithm attempt to deal with congestion before capacity is reached, as well as helping to regain smooth traffic flow as demand drops.

TRL in the UK was instrumental in developing the original algorithm for congestion settings, the main aim of which is to reduce vehicles' speed just before traffic reaches the critical level where flow breakdown is likely to occur. The algorithm relies on the principle that the capacity of a section of motorway is not merely dependent on physical factors such as the incline of the road or the number of lanes, but on how the drivers themselves use

speed limit. By lowering the speed limit, the proportion of vehicles that can drive near the limit is increased, and hence, vehicles drive at a more uniform speed and the need for lane changing is reduced. Of course, lane changing will always be required for those leaving or joining the main road, but this approach aims to reduce it for overtaking.

TRL has carried out several studies to measure the effectiveness of CM and has attempted to quantify the benefits to help generate business cases for future schemes. The major benefit of the M25 CM scheme is an estimated 28% accident savings. Improvements in journey time reliability and a reduction in emissions have also been seen. Difficulty lies, however, in showing which part of that success has been down to the effects of congestion settings on reducing the risk of flow breakdown rather than, say, the queue protection provided by the speed limits.

TS057
Weds, Sept 23
14:00-15:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Peter Ummenhofer, Kapsch, Austria

Is dynamic tolling the key to reduced congestion?

Next-generation traffic management can reduce congestion and air emissions

→ Due to increasing road traffic transport policy, traffic engineers have to find new approaches and concepts for managing traffic effectively. The goal must be to ensure traffic flow, decrease pollution, and reduce emissions.

Most of today's traffic management concepts rely on 'soft' measures and depend to some extent on the understanding and the cooperation of road users. Traffic management on the basis of variable or even dynamic toll tariffs is a stricter approach that influences the behavior of road users by temporarily increasing toll tariffs to make them rethink their route choice, departure time, or preferred mode of

Stockholm. In both cities tariffs vary depending on time of day according to a predefined but fixed tariff pattern. In the USA, HOT lanes are tolled dynamically, giving those willing to pay for using these lanes free-flow traffic and a calculable time of arrival.

With the technologies available today, further fields of applications for dynamic

> "Traffic management on the basis of variable or even dynamic toll tariffs is a stricter approach that influences the behavior of road users"

transport in case certain roads reach their capacity limits, or air emissions reach critical values.

Objectives of dynamic tolling include traffic control and demand management for reducing traffic congestion, maximizing throughput and use of HOT lanes, or guaranteeing a certain level of service on road sections and in zones. A second objective is to improve environmental protection and quality of life by reducing air pollution and noise.

The first tolling schemes using variable toll tariffs have already been successfully implemented in Singapore and

tolling are possible. Variable or dynamic tolling for traffic/demand management purposes and for protecting the environment could be applied on highways and rural roads, in cities, on single lanes, in environmental zones, and in tunnels and on bridges.

At a European level, politicians are currently discussing the Eurovignette Directive, which enables the integration of external costs such as air pollution and noise caused by traffic into tariffs levied on heavy goods vehicles. This Directive – even if not yet finalized – would be an important step toward a legal framework that better reflects external costs by road user charges in general. The Directive could also be a starting point for a legislation allowing the use of electronic toll collection systems as a core piece of future traffic management schemes to ensure traffic flow and reduced emissions to sustain our mobility and to protect the environment.

IS36
Friday, Sept 25
09:00-10:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

The ITS technology showcase

Watch this space…

**STAND K20**

J. D. Hassan, vice president, business development, at **Skymeter** says that in respect of trends in GNSS tolling, some governments are starting to look at multiple concurrent applications for private automobiles (e.g. parking and PAYD insurance), "to both increase user acceptance and potentially lower RUC collection costs."

In line with this, 2010 will see the roll-out of Skymeter's first city-wide parking pilot in Canada. "We also expect to be involved in three other pilots, at least one of which will support multiple payment and 'driver reward' applications," Hassan adds.

California's DOT, Caltrans, recently conducted independent tests to verify the claimed reliability and accuracy of the Skymeter system, and much to Hassan's delight
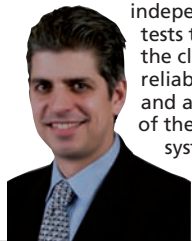
reported that it performed "substantially better than the commercial off-the-shelf receiver to which it was compared", which bodes well for the future.

"Metering of vehicles occurs today on a limited basis, for limited stretches of roadway, often for commercial vehicles," Hassan says. "In five years, it will be seen as a strategy to use in every vehicle on every road, and will be under discussion for implementation in virtually every jurisdiction that experiences congestion."

Visitors to Skymeter's stand can view the results from the Caltrans and Seoul trials, and also concurrent ARENA Trials. Its GNSS OBU will also be on display.

www.skymetercorp.com

A big push on ALPR

STAND N12

Looking ahead to 2010, Erno Szucs from ALPR specialist, **ARH Inc,** says the company will be working hard to ensure the growth experienced this year continues: "We will be promoting our Carmen ALPR software engine. Our experience shows that the quality of the camera has a major effect on the overall system performance. Most ALPR cameras available are modified versions of general-purpose security cameras, so we decided to extend our camera selection. We predict significant growth for ALPR in ITS – doubling or even tripling within five years."

The Carmen ALPR engine is used in a number of high-profile projects around the world. In 2009, there have been two big success stories for

the product – Vietnam's Can Tho Bridge ETC system, and the modernization of the South and North Hai Van Tunnel Toll Plaza on National Highway 1. Carmen is also used in the access control system for the local police HQ in Valladolid, Spain and for the Border Information System in Slovakia.

Szucs will be at the World Congress on ITS to show a new ALPR smart camera with infrared illuminator for night/day usage on highways and roads. A CPU and PC board is included and ALPR processing is performed within the unit itself.
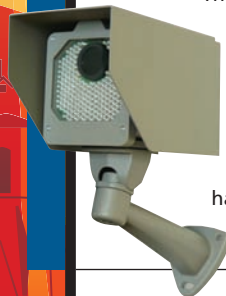
www.arhungary.hu

Embedded intelligence

STAND Z120

Using embedded technology for intelligent traffic control is the goal of Dutch organization **Advantech**, and Sjoerd van Unen, key account manager, sees a pressing need for further deployments of ITS technology. "Efficient transport infrastructure plays a crucial role in the social and economic life of cities and metropolitan areas. By sharing vital information, ITS allows people to get more from transport networks, more safely and with less impact on the environment. Only once travelers, vehicles, and infrastructure can freely exchange information will the capacity of the transport network be fully utilized," he explains.

For Advantech to expand its ITS market share in the coming years, van Unen believes that "state-of-the-art technique, fit-for-use computer platforms" are the way forward. "Modern embedded PC-based technologies are cost-efficient open platforms, designed to fulfil the need for safe, comfortable, efficient and environmentally protected applications," he says. "The fanless and rugged hardware design, the diskless embedded real-time operating system, and powerful computing technology enables us to deliver reliability and flexibility. Touch-screen panels with sunlight-readable transflective

displays provide a user-friendly interface to the driver." Mobile communication technology is one area where such technology thrives, partly due to the popularity of new machine-to-machine applications for the transport sector.

Advantech has also recently been involved with a project called 'eCar Center', about which van Unen details more: "Our customer was looking to implement advanced operating software that was intuitive and easy to use, while being powerful and functional. They required the ability to interact with maps on-screen down to a single street, and be able to view multiple vehicles on-screen at once. The system provides detailed reports for monthly distance tracking, average/top speeds, suburbs visited, driving

times, waiting times and more. All of these functions needed to be established in their new eCar Center." The company's embedded vehicle controller UNO-2053E and flat-panel touch-screen FPM-3060G monitor products are put to good use here to monitor and control the advanced system functions.

Advantech and its system integrator partner, Aqeri, are sharing a stand in Stockholm to showcase the fruits of their cooperation in creating ready-to-use industrial solutions for the ITS market.

www.advantech.com

Active participation

In Stockholm, managing director Dirk Hübner is looking forward to showcasing **Heusch/Boesefeldt**'s ITS capabilities. "One thing we will present is a software solution for ATM, which will be demonstrated using an offline system with real data," he explains. "The system performs automatic control measures based on sensor data and allows manual interaction via an ergonomic graphical user interface. In addition to this, our roadwork management solution will be on show."

In his sector of the market, Hübner notes further integration of vehicles into traffic management and control applications. "The magic words here are 'cooperative driving'," he says. "They will be floating probes that detect traffic problems, dangerous situations, and environmental conditions. Our applications currently only work with fixed sensors at the road;

direct information to the driver requires VMS. This will change and we must follow these developments closely."

Heusch/Boesefeldt has supplied many installations in and around Germany, but in the next year Hübner will focus on expansion in other regions. "We offer complete systems, but we also supply specific software modules for almost any traffic management purpose, which can be integrated into existing solutions. Any supplier looking for sophisticated software in traffic management is welcome to contact us."

One project that Hübner will be highlighting in Stockholm is a contract awarded earlier this year by the Dutch Ministry of Transport for the roadwork management system, known as the SPIN project. While another current work-in-progress is to upgrade the Berlin-Brandenburg TMC to the newest version of the company's GeoDyn2 product.

www.heuboe.de

Get smart about ITS

"2009 has been a year of phenomenal global expansion for **Wavetronix**, and we expect that expansion to continue into 2010," enthuses Mike Rose, vice president of sales. "By the end of this year, we will have established offices in the UK and Australia. We are currently represented in more than 40 countries around the world by a network of 35 companies that serve as authorized Wavetronix dealers and distributors. Our dealer network will continue to expand next year."

Projects such as the four-year framework agreement Wavetronix has entered into with the Danish Roads Directorate (Vejdirektoratet) for the supply of high-definition radar are helping the company achieve its aims. "Danish officials conducted an extensive study of traffic detection devices and found that the performance of SmartSensor HD met their meticulous requirements," Rose details. "SmartSensor HD was also recently preapproved for similar traffic detection duties in Sweden."

Getting out and about at industry events such as the World Congress allows Rose to keep a close eye on current trends, and over the past months he has noticed a definite shift in the way that organizations think about procurement costs. "They are moving from a focus on costs to a focus on performance. It has been interesting – especially in this economy – to watch transportation organizations worldwide seek out traffic detection devices that provide feature-rich data, as opposed to lower-cost alternatives that only identify general traffic flow."

And as the global traffic industry moves away from the use of inductive loops and embraces non-intrusive data collection devices, Wavetronix should continue to go from strength to strength.

At the 16th World Congress on ITS, Utah-based Wavetronix is exhibiting as part of the ITS America pavilion. "Visitors will be able to see SmartSensor HD and learn more about the global acceptance of high-definition radar, which is helping to drive our international expansion plans."

www.wavetronix.com

Educating America into a smart technology future

Scott F. Belcher, president and CEO of **ITS America**, is looking forward to catching up with many of his international colleagues, as well as some of ITS America's members that will be located in the ITSA Pavillion in Stockholm.
2009 has been a challenging year for suppliers, policy-makers and the industry as a whole, yet Belcher is still seeing positive trends in the ITS sector.

"State and local governments are expanding their public systems, making more data available than ever before on dynamic message signs, the internet, and handheld devices," he explains. "The USA is also now engaged in real dialogue about transportation mode choice and the reality of electric vehicles. The deployment of smart transportation systems will enable successful

decision-making and progress on these fronts."

Looking ahead, how does Belcher feel his organization can support further progress? "ITS America will continue to help communities solve their transportation problems by educating public officials, legislators, and consumers on how smart technology can address metro-mobility issues," he explains.

"Through our forums and meetings, we will provide the opportunities for cities, states and counties to share best practices and learn more about

cutting-edge technology that can help them squeeze more out of their transportation systems. Finally, we will focus on how smart technology can help communities address performance management and sustainability needs," he concludes.

www.itsa.org

STAND I20

The voice of experience

One of the highlights on the UK pavilion will be the presence of the **Transport Research Laboratory (TRL)**. "We are witnessing a new wave of technology adoption in the ITS arena," suggests Gavin Jackman, TRL's head of traffic and software. "Several years ago, there was an explosion of ITS from TRL's UK and overseas client base. But this new wave is driven by the economic climate and is more cautious and evaluated. Does ramp metering work? What are the benefits of adaptive signal control over fixed-time? What's the whole life cost of LED versus halogen signals? How do I share the data I have on my network versus collecting the data for analysis? How do I inform travelers rather than manage travelers?

"As an independent company that doesn't sell signals, or lay concrete or tarmac, we are more often contacted to give advice on the reuse of existing technologies. New technology is great, but many LAs or municipalities can reuse what they have with the right optimization."

One recent success story was the West Midlands UTMC project, with the scheme's Monitoring and Evaluation (M&E) contract awarded to TRL. As well as developing online decision-support tools for use by operators, conducting evaluation of the benefits of the scheme when operational, and working on macro and microsimulation models of the West Midlands area, TRL is also tasked with validating the scheme's 2004 business case to ascertain if the approach and data used was valid and defensible.

Jackman details another project: "As the developer of SCOOT, TRL was requested to provide due diligence on a recent Transport for London (TfL) study to quantify its benefits when compared with fixed-time control to support the business case for enhanced SCOOT roll-out. TfL is seeking to invest significant resources in deploying SCOOT across London over the next six years, and has conducted a detailed and thorough analysis of its benefits over fixed-time. Elements provided were emissions modeling, review and advice of methodology into the review, microsimulation results analysis and, of course, (under a separate contract), TRL developed the link between TfL UTC and VISSIM that enabled the data to be simulated within the review."

TRL is now focusing its efforts on the integration of tools and services, as well as supporting the reuse of data for different purposes – rather than more tools to create more data – and is investing in developer staff to build and expand its offerings. "Not everyone has the time to use nor money to buy new technical solutions. Everyone is trying to do more and TRL is working on ways to address this, such as building or extending tools that connect applications for reuse of data or that can automate processes to save time," he explains.

TRL will be able to show visitors some of these tools, including DRUM (reuse of data to optimize motorway management during construction projects), a TRANSYT to Aimsun link (reuse and linking of data between two world leading products), a TRANSYT to VISSIM link (reuse and linking of data between two leading products), and TfL UTC (SCOOT) to VISSIM link, which simulates traffic control in an offline environment.

www.trl.co.uk

STAND C30

Dynamic player

Austrian tolling expert **Kapsch** has had an action-packed 11 months since the 15th World Congress on ITS in New York – possibly the most pivotal in its history. Erwin Toplak, the company's COO (featured in this issue on page 72) explains why: "Our 5.9GHz technology has really taken off in a big way, and there is serious interest in the USA. I can't say when the first deployment will be, but there are a number of DOTs and toll operators comparing system performance with 915MHz and coming to the same conclusion as we have. Without doubt, 5.9GHz is the future of ETC. But it's not just about tolling: it's safety, it's mobility, it's value-added services. It will do everything you want it to do and more."

At the 16th World Congress on ITS in Stockholm, there are various topics that Toplak is keen to discuss with visitors to the company's stand, including dynamic tolling – next-generation traffic management based on dynamic toll tariffs. Another subject he hopes to focus on is increasing HOT lane usage and revenue by combining video tolling and transponders. And with funding for large infrastructure hard to come by at the moment, Toplak would like to praise the virtues of road user charging as a financing tool for PPPs and concessions.

The company has a great deal of experience in this regard, and the ultimate showcase in the Czech Republic, with its much publicized truck-tolling project. "From a technical point of view it was not a challenging project," he says of the scheme.

"But it was challenging in other ways. There was a drawn-out political debate before we implemented the scheme about whether it was the right thing to do. The government also took time to prepare the tender, more time than expected. There was also a change of governments during the whole process, so we had to convince a new leadership about the benefits. It all ate into the time that we had to get the system fully installed, but we did it. In nine months, from start to finish, the system was up and running."

The expectation of the Czech government was an income of Kc2.5 billion in the first year; Kapsch delivered Kc6.7 billion. "We had a very aggressive enforcement system in place," Toplak reveals, "which means we collected as much revenue as possible." By January 2009, around 380,000 OBUs were registered to the system – three times the level of expectation. On an average working day, this generates incomes of around Euro 740,000 (US$1.05 million).

"We have a great deal of experience in such large-scale schemes, and we are hoping to be successful in our bids in South Africa (the Gauteng MLFF) and also in the Slovenian scheme."

No doubt, we can expect Toplak and his colleagues to have some more big announcements in Sweden.

www.kapsch.net

Seeing me, seeing you

Amparo Solutions doesn't have far to travel for this year's World Congress – the company is based in Västra Frölunda. "2009 has so far been highly successful for us," says COO Leon Nilsson. "Our latest undertaking was to provide active warning systems to secure school bus stops alongside two regional bus lines, covering five counties in our home country of Sweden. In fact, the SeeMe Bus Stop has recently been awarded the highest traffic safety award by The National Society for Road Safety.

"On our stand and in the Experience Park at the ITS World Congress, we will launch the latest version of our SeeMe System, with real-time warning at pedestrian crossings, pedestrian counting, and wireless remote monitoring and maintenance."

Protecting pedestrians is a recurring theme in Amparo's efforts, as Nilsson explains: "We notice a trend toward real-time warning and information systems, especially geared to pedestrian safety. The global financial situation calls for cost-efficient solutions – i.e. solar-powered and wireless technology – hence easy-to-install systems instead of traditional wire-based signaling systems."

As well as rolling out the award-winning pedestrian safety system, SeeMe, 2010 will see the company taking a leading role in the EU project 'Safeway2school' – the aim of which is to increase traffic safety for vulnerable road users, such as school children. The project features pilot sites in countries including Poland, Sweden, and Italy.

Although Nilsson hopes to expand his company's reach in the coming years, he also anticipates a paradigm shift from his current and future customers: "We will see a transition in revenue from large-scale ITS solutions toward local ITS solutions, thereby addressing the needs of people in daily life, such as VSLs around schools."

www.amparosolutions.se

Making sense

One company looking forward to a World Congress on its doorstep is Sweden's **Sensys Traffic**, and CEO Johan Frilund is delighted to showcase his company's products to an international audience: "We are already the leader in the Nordic region and also in the Middle East. But in 2010, we intend to strengthen our position in Europe, and expand into the Asia-Pacific region as well as the Americas.

"We see a growing awareness of traffic safety in many countries – a tendency to look for national strategies for road safety projects. We see more safety projects in the pipeline globally, but also short-term delays in decision-making processes in several markets. The overall trend is growth – both in awareness and interest, as well as in the number of projects and in business generally."

In 2008, Sensys secured major contracts in Dubai and Saudi Arabia, and this year it has developed its aftersales business with its current customer base in Sweden, Malta and Dubai. The contract in Saudi Arabia is for more than 500 red light and speed enforcement systems, and the latest contract in Dubai has seen almost 500 red light and speed enforcement systems installed. "The requirements are very different in these two countries," Frilund states. "In Dubai, vehicles travel at high speeds in up to seven lanes, whereas Saudi Arabia requires front and rear photos, driver identification, and has a huge volume of violators, thereby driving the requirements for image capturing, processing and storage. Both projects illustrate our ability to tailor road safety solutions with very short lead times."

Sensys is set to launch new products in the traffic safety sectors in the coming months, and Frilund reveals that addressing traffic informatics for better traffic flow, as well as reducing CO_2 emissions, is next on his list.

www.sensys.se

Adopting a new surveillance strategy

It has been a busy time of late for France's **Neavia**, as president and CEO Jean-Hubert Wilbrod outlines. "We have just signed two contracts that show the potential of our 'green' technology. We are equipping a 13km section of the A86 motorway, linking the suburban ring of Paris to the west A12 motorway. With three or four lanes in each direction, it carries around 100,000 vehicles every day. Comprehensive traffic data and images will feed the traffic information system, which delivers travel times to Parisian users. We will also equip a 7km portion of a mountain road near the Swiss border, proving that this technology can be installed anywhere."

Although projects such as this are great news for technology, Wilbrod says that the policy side of things is not so great. "In France, even if new projects are launched by the government, the effect of these measures on this sector is not obvious – it's very much asphalt first! The local authorities that manage the largest number of road miles seem to have difficulties getting funding. But the major trend is definitely a move from traffic concern to mobility concern. Roads will no longer capture massive public investments."

So how can Neavia respond to this trend? "Broadening the range of traffic surveillance applications is our challenge for 2010. We will do this by responding to the traditional demand with traditional tools, which we have redesigned for sustainable development, and also by proposing new applications suited to the emerging needs of eco-mobility," he says.

"Traffic surveillance has been traditionally managed by road authorities, who capture, check, and dispatch information. Automation and the internet will move the borders. Simple probes will be in-vehicle or integrated into cell phones. Thus, authorities will require diversified and sophisticated applications. We will develop and market technologies that leverage the internet to provide valuable information at low economical and ecological costs."

Indeed, visitors to Neavia's stand will be able to see the new release of its traffic management tool, WebVia. Fully internet-based, it enables traffic managers to be 'virtually' anywhere: in a control room, at home on a PC, or on the road receiving alarms and pictures via a smartphone. Accessed through any browser, WebVia provides traffic monitoring, streetview, and VMS control in an all-in-one tool.

www.neavia.com

Enhancing safety and efficiency with cooperative systems

As part of its involvement with ITS Austria, **AustriaTech** is exhibiting on a combined stand, with partners such as Asfinag, ITS Vienna Region and Smart Spectors. As well as the exhibited information and technology on the ITS Austria stand, there are several site activities too, including a technical tour showing cooperative systems on the road, and a workshop on E-Frame that can be visited.
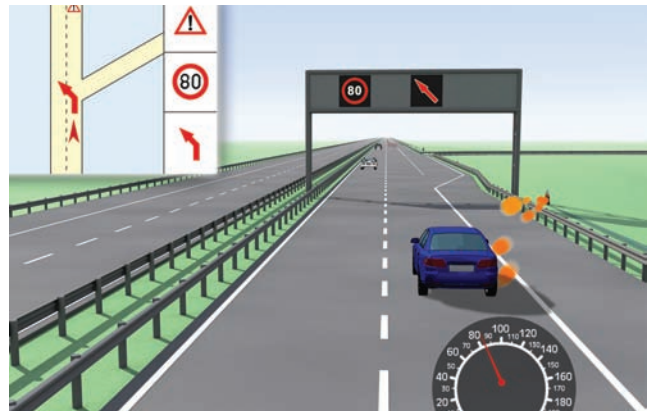
Reinhard Pfliegl, AustriaTech's managing director has noticed a distinct pattern emerging in the traffic sector.

"There is a growing trend to link vehicles with infrastructure under the umbrella of 'cooperative' systems, which should enhance safety and efficiency as well as improve use of existing infrastructure capacity," he explains.

"This is extremely important as a result of the limited network capacity and policy restrictions on one side, and the low acceptance of additional infrastructure investments on the other. It leads to an approach of shared responsibility between all of the parties involved," he says.

AustriaTech has been busy on the COOPERS project (see page 92) and the goal in the coming year is to bring it to a successful conclusion by demonstrating and confirming the technical feasibility of cooperative systems on public roads within the concept. "Another important step for us is to realize an intermodal traffic information service based on a unified data interface in five European cities in the In-Time project," Pfliegl adds. In-Time began in April 2009, while another project, 2Decide (which is a toolkit for sustainable decision-making in ITS deployment), kicks off as this issue goes to press.

Pfliegl therefore predicts that AustriaTech will remain busy for some time to come: "Major effort will be necessary to develop new applications for efficient traffic management, in respect of managing the capacity of the transport infrastructure, and providing real-time traffic information specified to the requirement within the framework of cooperative systems."

www.austriatech.org
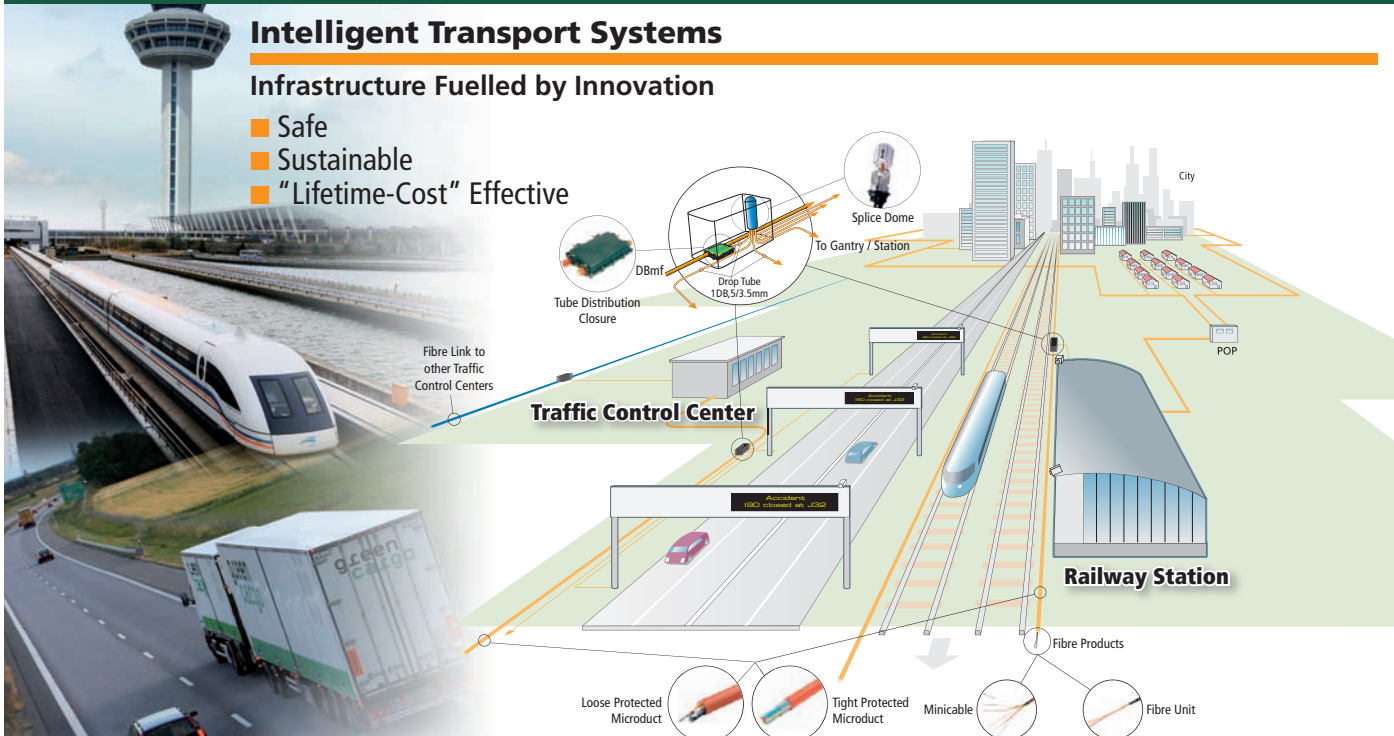
STAND **Z201**

Joined-up thinking for improved modeling

In Stockholm, **TSS – Transport Simulation Systems** will be officially launching Aimsun 6.1, the highlight of which is the Legion for Aimsun plug-in. Over the past 18 months, Legion and TSS engineers have worked together to integrate Legion's pedestrian movement engine into Aimsun. Managing director of TSS, Jaime Ferrer, describes the result of this partnership. "For traffic engineers who wish to design solutions that promote road safety and improve connectivity between

different transport modes, this is a marriage made in heaven," he says. "Legion for Aimsun combines the unparalleled quality of Legion's patented movement algorithms with Aimsun's characteristically user-friendly interface. This makes it uniquely able to study the true interaction of pedestrians and vehicles at crossings with or without signal control. Boarding and alighting pedestrians onto/from public or private vehicles is another key feature of the new offering."

TSS will also be unveiling the Aimsun-SCOOT link – a product born from work with Siemens Traffic Solutions. This enables Aimsun simulations to exchange data in real-time with either a live SCOOT system or its emulated counterpart, called PC-SCOOT. Studies of areas controlled by Siemens SCOOT systems can thus be performed in Aimsun, incorporating precisely the reaction of the traffic control system to the varying network loads. The result is improved realism, leading to better planning and operational decisions.

Ferrer has observed two key trends emerging in the field – large-scale modeling and modeling being used for real-time decision support. "Aimsun has been used to model a large part of Manhattan to evaluate congestion-mitigation measures. Rather than focusing on a small area, the idea is to understand the impact of infrastructure or operational changes over the

entire metropolitan area at different times of the day. Also in New York, Aimsun was deployed by KLD Associates in a system that evaluates and optimizes – in real-time – signal control for a busy arterial."

As these trends progress, Ferrer is keen to ensure TSS continues to respond: "Our goal is for Aimsun to have the largest user base in simulation modeling. We take pride in Aimsun's three-level (macro, meso, micro) framework and are working on some innovative ideas of making each model richer in functionality, as well as getting levels to work even better with each other, pushing the integration envelope further than ever before."

www.aimsun.com

Upholding the law

German company **Vitronic** is involved in several areas of the traffic industry, from speed and red light enforcement to ALPR and toll collection/enforcement. "The switch to LIDAR (laser) is a major trend in the industry," suggests the company's Daniel Scholz. He puts this down to two factors associated with LIDAR: increased performance and a reduction in lifetime costs. "With speed enforcement, for example, PoliScan^{speed} is capable of detecting and tracking vehicles over four lanes," he explains. "LIDAR generally prevents the need for invasive equipment such as loops or sensors, therefore saving significant costs and time in relation to installation and maintenance. As a result of the same LIDAR principle, PoliScan^{redlight} is also capable of monitoring intersections without any loops at all. Meanwhile, TollChecker^{freeflow} uses non-invasive laser technology to accurately detect and classify vehicles."

The company hopes to continue its international expansion over the coming months by applying for product type approval for its traffic enforcement products. Several new launches are also planned, including the official launch of PoliScan^{redlight} – one of the world's first red light systems that functions completely without in-road equipment. Additionally, it can be combined with PoliScan^{speed} to provide speed and red light enforcement from a single installation.

This July, the company announced that a major tolling project in Brisbane, Australia, went live. Working with partner company Thales and back-office provider IBM, Vitronic delivered the first multi-lane free-flow (MLFF) tolling system in Queensland. "Vehicles on over six lanes of traffic in each direction must be correctly classified and payments collected," Scholz details. "The flawless transition from single-lane toll collection to MLFF tolling is a perfect example of ITS making traffic smoother and safer. The Brisbane project was delivered on time and on budget."

www.vitronic.com

Combined force in AID

Dave Patterson is counting down the days to his first visit to the World Congress on ITS, having taken over the reins at surveillance specialist **Optelecom-NKF** in March 2009. "We'll be showing our joint development with Traficon, the Siqura TrafficServer – which combines intelligent incident detection, traffic data collection, and camera monitoring in a single system," he says.

Despite some pretty tough conditions, Optelecom-NKF is doing what any successful company should do when the chips are down – develop, innovate and come out the other side stronger. "When DOT budgets have been reduced, products such as TrafficServer will help deliver more for less. We're combining video and traffic management in an off-the-shelf package. You can't stand still, and innovation is part of our DNA. We reinvest 20% of our revenue into R&D to ensure that we're always delivering the technology that the market demands. TrafficServer is going to be a big success, and I look forward to showing visitors the system in action in Sweden."

The economic climate aside, the company has still secured some very high-profile contracts in 2009. "The FALCON project in Dubai is big for us. We are delivering a massive ITS system to address the Emirate's burgeoning traffic congestion. This ITS system not only addresses the jams but will have an impact on road safety as well," Patterson explains.

Scientific, the local system integrator in Dubai, will be incorporating Siqura IP switches into the FALCON ITS architecture to connect all IP-based data streams within the network. With temperatures reaching 50°C during the hottest months, it was vital that the field equipment could withstand operating temperatures of 75°C. Products used in the Dubai contract, as well as many other Optelecom-NKF systems, including TrafficServer, will be shown in Stockholm.

www.optelecom-nkf.com

Bringing safety to developing nations through enforcement

Dr Heinz Marburger from **Robot Visual Systems** has some important news to share with visitors to the 16th World Congress on ITS. "We are now offering developing nations managed services for traffic law enforcement programs at a regional and a national level. Such countries may not have the necessary skill sets or monetary resources to realize programs alone, so we have set up a dedicated Traffic Service Providing Business Unit, which is able to bring cameras, processes, and know-how, thereby allowing host countries to benefit from lower road casualties."

The new business unit is just part of Robot's overall strategy to be flexible enough to address the individual needs of different customers. "We don't have a standardized offering as such," he says. "For one customer, the local requirement might be front images, rear images or even both. It might be for piezo, loop, radar, or laser-detection techniques. We offer the whole range of traffic enforcement equipment and also provide all the services around it. In Germany, we already work on behalf of several municipalities. For our German customers, one priority, for instance, is that all images are being processed. We do this via online connectivity to our data center."

This strategy of flexibility is paying off and Marburger hints that a large-scale project will be announced by the end of 2009. Indeed, he is optimistic that Robot's growth will continue in the coming years: "Traffic law enforcement markets are growing steadily with a significant yearly increase. More and more countries realize that road fatalities have a high negative impact on their overall economy. Therefore, fully fledged managed traffic law enforcement programs will be a common means to be used to increase overall road safety."

www.robot.de

JUST THE TICKET?

Intelligent Speed Adaptation systems have been developed and tested for a number of years, but are set to become even more advanced, ensuring that drivers maintain sensible speeds, and leading to safer, less congested and cleaner journeys for all. By **James Gordon**

Illustration by Magictorch

When *Traffic Technology International*'s editor lined up a test drive for me, he didn't reveal much, although I conjured up some pretty glamorous images. But the dark blue car sitting in the underground car park in London's Victoria wasn't a Ferrari, a Lamborghini, or even a Porsche. Indeed it didn't look very fancy at all – just a conventional four-door family saloon. Although the Toyota Prius, which belongs to Transport for London (TfL), looks like any other car, it's what lies beneath that is truly remarkable – for this car will help you stay on the right side of the law. Fitted with Intelligent Speed Adaptation (ISA)

technology, it automatically decelerates when the driver exceeds the speed limit.

THE TRIAL BEGINS...
The six-month trial – which began in May and is only available to drivers in London within the M25 motorway area – aims to reduce road casualties and is expected to cut speeding penalties. Overseeing the ISA trial is Chris Lines, the head of TfL's Road Safety Unit, who meets me with the keys. He starts by demonstrating the two different modes. The 'Advisory' setting merely warns the driver that he is breaking the speed limit, while the 'Voluntary' mode, aided by a digital map, ensures that the car never

exceeds the set speed limits. "If this technology is employed throughout the UK it will save lives," Lines says, taking care never to let his hands cross the steering wheel. "If two-thirds of drivers start to use this technology in London alone, the number of road casualties could be cut by 10%. Last year, our figures show that 203 people died on London's roads, while a further 3,277 were seriously injured."

The ISA system then senses that we're entering a 20mph zone and the car slows: "We started the ball rolling five years ago," Lines explains. "If the technology was to work, we knew that we would have to produce a digital speed map that would contain the details of every speed camera and every speed sign in London." But TfL didn't have the time nor resources to carry out the work itself, so commissioned a specialist transport planning consultancy, Colin Buchanan, to gather the information on its behalf at a cost of around £200,000 (US$337,000). "They took eight months to complete the survey and we are paying them around £40,000 (US$67,000) a year to ensure the map is updated," he adds.

THE DIGITAL AGE
With the digital map in place, TfL then hired Dutch technology solution firm, Technolution, to adapt the technology and retrofit the ISA system in 20 of its vehicles. The company's chief scientist, Dr David Marples, explains how the technology works. "It is split into three modules. The vehicles are equipped with a display that indicates the limit for that road along with a warning signal to show the driver their speed and, of course, the correct speed. The display is connected to a black control box, which sits in the glove box. The speed control peripheral is connected to the throttle pedal. If the driver exceeds the legal limit, a counter pressure is applied to the accelerator, causing the car to decelerate."

Early trials of ISA in Sweden (left) and (right) the MOTION cell phone project

Sweden's experience with speed

According to Johnny Svedlund from the Swedish Road Administration, we are *all* responsible for our actions in traffic, including respecting speed limits. "But it can be difficult to maintain limits," he says. "ISA could offer the voluntary support we need to ensure that we do not find ourselves in situations that could lead to serious accidents."

Speed is one of the most important factors in deciding the seriousness of an accident, a fact that Svedlund expands upon. "Seventy of the 100 pedestrians that are hit by a car traveling at 50km/h are killed, but if the car is traveling at 30km/h, then 90 of the 100 survive."

The socio-economic benefits of fewer road injuries and fatalities and a reduction in environmental impact can quickly be shown if large numbers of vehicles are equipped with some form of ISA. "States clearly have an important role to play in promoting the growth of the market," Svedlund says. The Swede goes on to detail an example, the MOTION project, which is partly financed by the Swedish IVSS program. "MOTION is an offboard Speed Alert service for cell phones, which has been combined with an offboard navigation system," he explains. A major field test with 600-1,000 drivers started in February 2009, and we will be presenting an evaluation of the field test at the 16th World Congress on ITS. Part of the focus has been on how drivers want to configure their Speed Alert functionality to really use it and feel comfortable with the system. A data supply chain was also established where changes in speed limit data (and some other data) are pushed incrementally from the National Road Database in Sweden to the offboard application server.

"If two-thirds of drivers start to use this technology in London alone, the number of road casualties could be cut by 10%"

Chris Lines, *head of the Road Safety Unit, Transport for London, UK*

Marples – whose team has spent just over a year perfecting the technology – thinks the system could be retrofitted to cars for around £300 (US$505). If, however, a major car company began installing the technology on the assembly line, he believes the price would decrease significantly as the only costs incurred are research ones. Curiously, though, the car manufacturers have yet to incorporate the technology into vehicles. Is it the economic climate that's preventing

← Intended as a road safety device, if Londoners embrace ISA, it could lead to reduced congestion as a result of fewer collisions, as well as lower emissions due to a smoother driving behavior

↑ **Developments in GPS mean that ISA has become a commercial reality rather than an experimental novelty**

→ **A supportive ISA system was tested in Lund and Lidköping, where the driver received information about the prevailing speed limit via a display, and a resistance was felt in the accelerator**

them from investing in the technology? Or is it that the GPS cannot yet guarantee the driver 100% accuracy? For an answer, we spoke with an inside source from the Nissan Technical Centre, who told us that "a lack of customer demand" and a "lack of a business case" is the main obstacle preventing car companies from installing the technology en masse. "The main problem is the accuracy of coverage," the source told me. "It's technically possible if all of the data is in

Carsten, who heads the University of Leeds Institute of Transport Safety, says, "If 100% of the population had access to ISA, there would be a 3% reduction in casualties if the public used the advisory system, a 12% reduction if drivers used the voluntary system, and a 29% decrease in casualties if the public used a non-overrideable system."

The figures alone make a powerful enough argument for the government to signal a telematics revolution here. So why is

greatest threat to the system is the negative press that the technology could generate."

PUBLIC SUPPORT

And Dirk Jan Huisman, a senior advisor with DH Group, agrees with Carsten that public support is vital if it is to be implemented throughout the Netherlands. "The technology was first field-tested a decade ago in Tilburg," he explains. "The trials involved 20 cars and one bus and took place in urban areas with limits ranging from 30km/h to 80km/h. The vehicles were not fitted with an advisory setting, but were programmed to intervene directly with the fuel supply, to prevent the driver from breaking the speed limit."

Although researchers concluded that ISA had a positive effect on road safety – 65% of test drivers supported the idea – the testing sparked a public debate in the Netherlands, with many in the Dutch transport community requesting further trials, this time using vehicles fitted with just an advisory setting. "Last year we trialed such a system in Waalwijk," Huisman continues. "It warned drivers every time they were about to break the speed limit. But, significantly, we let the driver make the decisions and not the car. The results were striking, with the majority of drivers obeying the speed limits and driving markedly more slowly in built-up areas and near schools."

"I cannot see any privacy issues as there is no database that records and stores driver movement. The greatest threat to the technology is the negative press"

Professor Oliver Carsten, *director of the Institute of Transport Safety, University of Leeds, UK*

place, but due to the amount of data required and the frequency of update that would be required to maintain accuracy, it's unclear if it is really possible to implement the technology beyond the trial stages."

But Professor Oliver Carsten – one of the world's most distinguished voices on in-car technology – thinks it will only be matter of time before the car industry and the UK government fully embrace the technology.

the DfT still dragging its heels? Could it be that it has yet to consider the legislative issues and privacy concerns surrounding the technology? Carsten thinks not. "There are no legislative issues to consider because the technology is only an aid – the final responsibility lies with the driver. I cannot see that there are any privacy issues either as there will be no database that records and stores driver movements. Perhaps the

← **Australian trials have concluded that ISA can facilitate real reductions in travel speeds by drivers prone to unintentional and deliberate speeding**

→ **In Umeå, where 10% of vehicles were fitted with ISA, the risk of being involved in an accident on 30mph or 50mph streets was reduced by about 3-4%**

ISA trials deliver positive results

Perhaps the most comprehensive ISA project outside of Europe is taking place in Melbourne, Australia. Seven years ago, the Transport Accident Commission (TAC) joined forces with the world-renowned Monash University Accident Research Centre (MUARC) and Ford to trial a number of intelligent transport systems, with ITS technology at the forefront of the field testing. The trials revealed that overall the ISA systems promoted safer driving, reduced mean and maximum speed, while also reducing speed variability in most speed zones. But particularly revealing is that researchers discovered that ISA not only reduced the amount of time drivers spent traveling above the speed limit, but significantly did not increase travel times.

A sister study, also carried out by experts at Monash University, revealed that drivers believe that ISA technology would only benefit those who accidentally broke the speed limit. The survey also found that the drivers who took part in the survey were reluctant to accept the technology unless it could be proven to save lives and was cost-effective.

Speedshield has been developed by Melbourne's Automated Control Systems, and uses a combination of dead reckoning and GPS to establish vehicle location and local speed limits

"The results of the field-testing were striking, with the majority of drivers obeying the speed limits and driving markedly more slowly in built-up areas and near schools"

Dirk Jan Huisman, *senior advisor (consultant), DHV Group, the Netherlands*

Huisman, who helped coordinate a traffic strategy for Amsterdam before joining DHV, believes a scheme that combines both advisory and voluntary ISA is far more likely to receive the backing of the Dutch public. "TfL has a very exciting project in place and I would like to see the Dutch Transport Ministry trial a similar scheme. But I think it will take us until at least 2015 to get an accurate digital map in place."

But if the technology is to be a global success, surely the Americans have to be on board? Sadly, despite transportation projects receiving over US$100 billion of President Obama's US$819 billion stimulus, the USDOT has decided not to plow any money into field-testing the technology. So why isn't US Transport Secretary Ray LaHood's office interested in championing a telematics revolution? Peter Kissinger, the president and chief executive of the AAA Foundation of Traffic Safety, an organization with 51 million members, believes the recession has put paid to many ITS projects, but it is the lack of public support for ISA that concerns him most. "The American public love their cars and the freedom that goes with them. Unfortunately, there is an ingrained culture of speeding in the USA. Many drivers feel they have the right to speed." And Kissinger thinks some of the blame for the public's distrust of ISA must fall on the shoulders of the legislators. "A huge percentage of limits are set by politicians rather than engineers," he says. "So, the public believes the speed limits here make no sense and use it as an excuse to exceed the thresholds.

"For ISA to work," Kissinger determines, "we need to foster an incremental approach. Society will have to accept there is a relationship between speeding and crashing. Only then will the USA begin to achieve its own Vision Zero." ∎

THE FINAL FRONTIER

ITS could boldly go where it hasn't been before if the industry can fully exploit the potential of satellite communications technology. **Louise Smyth** reports

Illustration by Anna Davie

Researching this article shortly after the 40th anniversary of the first moon landing prompts an interesting contemplation of the space race that's occurring in the ITS field these days. Today, it is not a challenge between the Russians and the Americans; instead it is a sector where any country or company that wants a piece of the action can participate. It centers around using satellite communications and finding the most valuable transport-related applications for them. As with the huge success of satellite television, it is applications with an obvious customer base that flourish initially. Entertainment and infotainment services come first, hence the rise of in-vehicle satnav systems. But these applications can pave the way for true intelligent transportation and safety applications.

Anything involving space still requires huge investment, while the proprietary nature of the sector and the lack of standards is also a challenge when bringing products to market. For ITS, another requirement is to come up with applications that can provide a better result than terrestrial solutions – a tough nut to crack as terrestrial coverage and usage is so well established.

Somebody more than familiar with these demands is Dr Yanying Li, a project manager at Ertico, who has been involved with the organization's participation in the eCall scheme – something she believes is the perfect ITS showcase for satellite technology. "The main point of eCall is that all accidents can be reported immediately to a control center, so it requires fast communications," she begins. "GSM communications are used at the moment but GSM coverage in Europe has not yet reached 100%. The gaps,

100%

100%

particularly in France and Scandinavia, tend to be in rural areas, so if an accident does occur, there's no signal and there may be no other vehicles passing by for days. What's critical for eCall is the potential for satellite communication to offer 100% coverage."

SISTER ACT

Li has been working on the Satcoms In Support of Transport on European Roads (SISTER) project – a scheme aimed at studying the roles of satellite communication in ITS. A prototype has been developed based on capabilities of existing satellite constellations to see how such solutions can aid the market. The SISTER training pack (available from Ertico) explains how a particular setup is appropriate for systems such as eCall (see sidebar). "Iridium satellites create a network whereby they not only communicate with the ground segment but also with each other. This improves the coverage and reduces the time required for a message to reach its destination, as the first receiving satellite doesn't have to wait to see a ground segment but can pass a message to the next satellite currently in the view of a ground base." This echoes Li's point about speed, and explains how greater coverage than GSM alone can be achieved. "We want to push forward pan-European eCall. We need backup communications to achieve the performance required for a pan-European system," she adds.

Fleet management is another suitable application, as Li explains further. "Satellite communications have two advantages for fleet management. One is coverage and the other relates to fees. Satellite communications offer flat fees for all countries. If a truck is traveling from the UK to Russia it will go through many different countries, but using cell phones to monitor where the lorry is can be very expensive. For logistics companies that use satellite communications, they are guaranteed 100% coverage and they also know how much the communications costs will be."

Satellites also open up the opportunity for two-way communications. It is all well

and good having an in-vehicle system that tells a truck driver where he is at any given moment, but his superiors back at base may also need to know this information. Unsurprisingly, fleet managers are already integrating satellite communications into their onboard equipment to meet this need for on-demand communication.

On the much discussed problem of urban canyons, Li is realistic: "Urban canyons are still a problem. Satellite communications wouldn't perform well in urban areas. There are very few ITS applications where satellite communications are ideal as the single solution. They are more likely to be used as complementary to terrestrial systems."

In terms of challenges to wider deployment of satcoms, Li acknowledges that technical issues remain, but says that satellite operators are still not aware of their potential in ITS. "Many operators suffer from financial difficulties," she explains. "They run out of money because they don't understand the right applications. Without enough uses, the system is very expensive. Due to their unstable financial situation,

some ITS providers and automotive manufacturers are afraid of cooperation with these companies.

"Cost is also a challenge. For something such as eCall, it's mainly capital costs – you need satellite antennae in the cars, and for something such as road user charging, it's mainly operations communications costs, which currently would be more than using GSM. The ITS industry and the satellite industry must work together to develop low-cost and small-sized antenna receivers. We will see revolutionary changes in the next few years. The EC is encouraging roll-out of mobile satellite phone services, and we are pushing for applications in transport."

RADIO STAR?

A popular application of satellite communications is satellite broadcasting, which has taken off rapidly in the USA, with the whole of North America covered by the SIRIUS ONStar service. So, when European satellite radio comes to market, it will allow a driver from the UK who is traveling through Europe to listen to his favorite

"The ITS industry and the satellite industry must work together to develop low-cost and small-sized antenna receivers. We will see revolutionary changes in the next few years"

Dr Yanying Li, *project manager, Ertico, Belgium*

BBC radio channels wherever he is. The commercial value of such systems is clear.

Li regards significant potential for satellite broadcasting within map updating: "If you go to another country, your GPS may well have the relevant maps, but they could be out of date. The broadcast can be used to update that information." It's no wonder, then, that so many commercial players are eager to push forward development in this arena – again, the consumer value is immediately obvious. "That was the reason that NAVTEQ and Navcom both joined the SISTER project," she states.

Kevin Link, vice president of marketing at Hughes Telematics has been involved with automotive telematics since 1999, so has witnessed many trends: "What we see in the US today are battles between some of the players, all of whom are experimenting in a combination of voice, data and video communications and experimenting with two-way communications. They are all wrestling with what they want to be, and often what they want to be is constrained by the form factor of the antennae they are on and the speed of the communications."

As an example, Link offers the TerreStar solution. "Domestically we're seeing three players that have emerged over the past few years – TerreStar, ICO and MCV. Traditional satellite video technology is at Ku-band, such as the AT&T CruiseCast Mobile Video solution. TerreStar and ICO operate in S-band and ICO operates in the nearby L-band region. The reason that the recently launched TerreStar-1 satellite has caught a little bit more attention is that it has the largest transmit satellite antenna, which would allow for smaller receiving antenna in the consumer's device. In layman's terms, the

Satcom in times of emergency

The SISTER eCall demonstration with Volvo in Sweden will validate satellite communications as a complementary communication method for eCall services. The data communication results will be compared to those of terrestrial communications for critical functions. Based on the eCall architecture, the testing will utilize the GSM network to 'talk' between the vehicle in the incident and the Public Service Answering Point (PSAP). A single pan-European number, 112, ensures that eCall has full roaming capabilities in Europe. The in-vehicle system will be integrated with the satcom to provide additional coverage for areas where there is a weak GSM signal.

Two test vehicles will travel on various types of road during the three-month trial,

and will also compare Iridium and Thuraya services to provide comparisons with competing satellite networks. They will be equipped with a commercial GSM-based telematics system, Volvo's OnCall for the car and Dynafleet for the truck, and reports will soon be compiled with overall success rates, possible latencies and other identified exceptions.

bigger it is in the sky – the smaller the receiver needs to be. TerreStar is working toward a solution that could potentially support data in a PDA or smartphone. That's a pretty important breakthrough."

Hughes is eagerly observing progress and even evaluating hardware for some of the players in the field of voice, data and video. Link regards two key issues that will define evolution: "One is the form factor. We don't see people adopting the mushroom-type antennae that are the size of a basketball on top of cars. We also don't see a one-way application; two-way is required and the band speed must be able to support video."
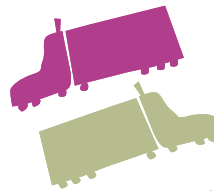
Link predicts that once the technology is more mature, Hughes and others will be able to make the move to broadcast data downloads. "One of the applications is reflashing vehicles," he explains, "so that a satnav system in your vehicle can be reflashed with current maps, or even just the software itself. The number of ECUs going into cars is growing and in 2007 in the USA, 16% of all recalls were as a result of software. Whenever there's a recall for software you inconvenience customers, whereas with satellite technology you can do these 'one-to-many' transmissions."

Hughes' sister company, Hughes Communications, has a lot of history in satellite development, having been involved since the earliest days of GPS. Today, the company is focusing on HughesNet, the ability to connect to the internet via satellite, and now Link wants to evolve the navigation side of things to improve road safety: "The capability to download large amounts of data to update navigation systems can help with a vehicle's ability to drive defensively. If you're getting ready to go down a steep hill or around a curve, we can manage that data and couple it with more real-time data to assist the driver. Another area is alerts or messaging – emergency notifications, AMBER alerts, weather alerts, etc. Today's cellular is one-to-one, terrestrial networks can be one-to-many, but satellite is perfect for one-to-many for quick messaging."

Link views a technology known as 'spot messaging' as particularly useful for these applications: "A complement of satellites (two satellites coming from different hemispheres) canvass the USA, and spot-beam technology breaks it up into smaller, cellular components. It's not necessarily built around geography; it's whatever you want to dial in the spot beam. If you want it to narrow in on messaging around the southern USA – or specifically Florida – spot-beam

"The more connected the cars are, the more they can tell us, such as when to drive depending on traffic conditions, or they can talk to each other about traffic conditions and navigation"

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

← **Advanced driver assistance systems, such as speed limit advisory and ISA, will benefit greatly from advances in satellite communications**

technology gives us a lot more flexibility in alerting, messaging, and trafficking."

On a personal level, Link dreams of driving in a fully connected vehicle – an automobile that's connected via satellite where users can download movies, games and applications. You could synchronize your contact database and stay connected while on the road. "One of the things we've developed is an aftermarket solution in telematics," he details. "The more devices that are connected, the smarter we are. And the more connected the cars are, the more they can tell us, such as when to drive depending on traffic conditions, or they can talk to each other about traffic conditions and navigation. One of the things we've built is called Next Generation Telematics Architecture (NGTA). This is fairly flexible and we'd like to see rapid adoption. Some of the automotive OEMs are starting to adopt it and when everyone starts to get on a common platform (versus the private networks), then we have more applications."

Agreeing with Li at Ertico, Hughes is not attempting to promote satellite technology as the only solution. "We are somewhat agnostic to technology," he says. "In our next-generation box we have a technology that we've termed 'ABC – Always Best Connected'. In that box we have a Bluetooth chip, a WiFi chip, next will be cellular then finally it's satellite. Why pay for satellite when you can do WiFi? Why pay for cellular when you can do Bluetooth, and so on? We want to pick the communications channel that optimizes the economics."

FROM SPACE TO THE ROAD

Logica is one of the key players in the space sector and its efforts within ITS are also impressive. Stuart Martin has been with the company for 20 years and is the business director responsible for space and satellite communications activity. "We've been working on a project funded by us and the European Space Agency called ARMAS (Active Road Management Assisted by Satellite)," he says. "This looks at how you can use satellite navigation, in particular things such as EGNOS and Galileo, to make your road management systems more active and detailed.

"As well as looking at where congestion is on specific roads, you can see what lanes are congested, or even do a road charging scheme relative to the lane you're in on a motorway. It's based on the premise that the next-generation satnav systems – the so called GNSS 1 and 2 systems – will for one thing have better accuracy (to distinguish between lanes), and also they will have integrity, which provides a certain legal confidence and reliability in the data you're getting. This means you can use it for value-added services and can defend against potential legal challenges – for instance if someone claims they were not in that lane."

"The challenge is how to reach more and more people with higher and higher bandwidth, to deliver more services to more people"

Stuart Martin, *business director, Space & Satellite Communications, Logica, UK*

Lane departure warning system on the new Opel Insignia, which uses vision-based technology. Future variants could call upon satcoms for a more accurate read of the road

Martin is also looking ahead to evolutions in safety, such as lane departure warning technology: "Systems at the moment are based on identifying where the lanes are in the road, yet not everywhere has lane markings, so satellites can potentially give more coverage and more capability to offer that same service – and yes, it does provide opportunities for taking that to the next step. Perhaps it can warn other vehicles, too.

"The areas we are looking at solving with satellite technology are where you have a specific benefit in covering a large area, or communicating data over a large area in a short period – or even for areas where you don't have terrestrial coverage. Traffic management, lane utilization and route management are very relevant in that context." Martin cites another benefit for applications such as RUC – security. "Using a satellite link might potentially be more reliable than using terrestrial as it's a one-stop channel, so there are fewer chances to tamper with it."
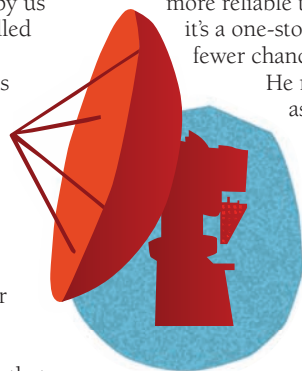
He regards the major hurdle as a regulatory one. In Europe, the market is fragmented and there are so many organizations to deal with in order to deliver a service. He believes the USA has a more friendly regulatory environment that makes it easier for companies to establish services. But it's not all doom and gloom, as he explains further: "The big advantage Europe has over the next five to 10 years is Galileo – *if* we can get it up and running. The Galileo satellites will be the European equivalent of GPS, or the European satnav system. They will give Europe a huge advantage in developing the next ITS technologies around GPS because we will have the inside track on how Galileo works. It will mean that you

can use it for safety-critical applications – maybe not initially, but leading up to some really advanced ADAS. If you want to get to the point where every car has it, then all the cars will know where the others are. They won't need to have local proximity systems on board; they will know via the car's central communications system."

Logica is also heavily involved with the recently launched Innovation Growth Team (IGT) for space, which is looking at how the UK government, industry and academia can harness the potential of space over the next 30 years. "It's going to be looking at things such as intelligent transport systems – what the applications are for space and how the UK can get maximum benefit from them," he says. "We are a space infrastructure company, but we are also one of Europe's largest IT services companies, so we have customers in the transport sector, in finance, and other commercial sectors. We've got that end-to-end service picture of how space is used now and how it can be used in the future. That's how we got involved with Ertico and the other ITS organizations."

Looking ahead, he says, "I think the challenge that space technology companies have is the same as the one faced by the commercial terrestrial companies – how to reach more and more people with higher and higher bandwidth, to deliver more services to more people. If you look at the commercial service providers such as Inmarsat and Terrestar, they are all forecasting pretty aggressive growth – in the region of around 15%, even during the current financial difficulties. They're financing themselves now, they've got revenues, contracts and growing demand. They're all looking at rolling out new services in new frequency bands, trying to get more out of the available space that's up there, looking at new receiver technologies to deliver that bandwidth. It's a pretty exciting time really." ■

ITS IN DAILY LIFE

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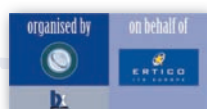
INTELLIGENCE INSIDE

Dr Li-Qun Xu from BT Research details how video analytics technology deployed as part of an information network can provide automated monitoring and decisions to dramatically improve efficiency and reduce response time to major events

Illustration courtesy of Samuel Chesterman

T oday's CCTV-based video monitoring and surveillance systems (VMS) are manually monitored, with typical control rooms occupied by operators working around the clock on multiple screens. This requires operator knowledge, experience and skill if there is to be a good chance of an unusual event or behavior being detected – let alone an integrated situational awareness of a large complex space. Although cameras and networks can bring remote scenes to a close distance to view, it is humans who actually perform various processing tasks, from low-level pixel perception and motion detection to high-level behavior identification. However, despite human intelligence, significant or composite events can often be missed due to operator fatigue, the challenge of viewing multiple video streams simultaneously, and the sheer volume of visual information.

PARADIGM SHIFT
The advent of IP CCTV has brought about big changes in remote video monitoring. Not only has it provided the flexibility to monitor video anywhere and anytime on the IP network, it's also enabled network-based video storage for distributed video hosting, high quality of streaming videos of potentially mega pixels resolution, and more efficient video compression techniques. Nevertheless, the way in which humans are involved in the video monitoring loop remains more or less the same, still requiring either intensive eyeballing of screens in real-time, or laborious searching for suspicious events in huge volumes of storage video.
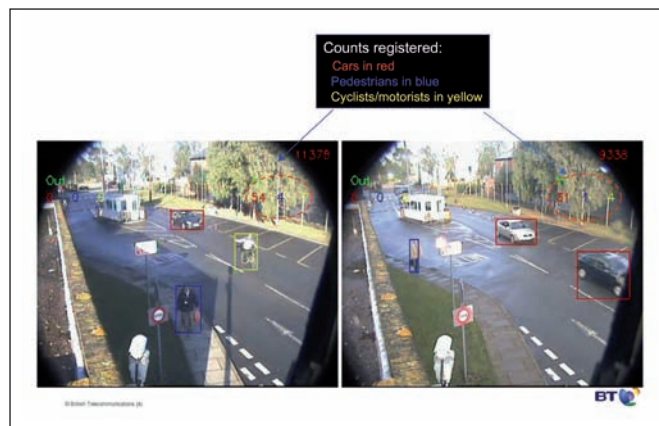The next major development of video monitoring and surveillance technology is the transformation from IP CCTV infrastructure to network-centric intelligent and cooperative IP CCTV. In simple terms, this approach would provide three key

advantages. Firstly, cameras monitoring a given physical space connected to the edge of a distributed IP network would become 'smarter'. Secondly, in the case of more than one camera monitoring a common space from different vantage points, the cameras would automatically 'collaborate' with each other – rather than act independently – to maximize the collective knowledge of the scene. And thirdly, the separate events descriptor (or metadata, as acquired from an individual or group of cameras at the edge) are simultaneously fed to the central server, thus enabling a higher level reasoning of the 'event web' for integrated situational awareness of a large geographic area. This hierarchical and layered extraction and representation of the knowledge of a dynamic scene – as well as the imitation of human visual perception and processing capabilities and intelligence – is 'video analytics' in a more precise sense.

VIDEO ANALYTICS

Through research, BT is delivering an enhanced portfolio of intellectual property rights and know-how in video analytics. The company is studying how advanced video analytics technology can be deployed as part of an information network to provide automated monitoring and decision-making to dramatically improve the efficiency and reduce response time to major events.

One of the key research developments is a suite of new software solutions that enable real-time incident/events detection and intelligence extraction from a distributed network of cameras that are monitoring cluttered indoor or outdoor environments. The solution is clever in its ability to remain robust regardless of changes in conditions, such as lighting or weather. To reach this point, the company's research into the development of end-to-end video analytics solutions has focused on three parallel and complementary tasks. The first is to build a testbed for testing the potential uses for the solution. This has been achieved using a mixture of IP and analog cameras connected to existing local area networks (LANs). This enables robust assessment of any system design issues of image quality, end-to-end latency, and network traffic properties that may be experienced when distributing live surveillance video streams across LANs. The LANs will already carry over a mixed voice, data and other multimedia video traffic. The second task is to engage advanced vision algorithms and scene behaviors modeling studies to have a foresight view of future and emerging trends in the dynamic visual surveillance domain by producing novel concept and capability demonstrators. The third task is to conduct realistic trials on selected domains of interest to showcase VMS application service demonstrators

BT Adastral Park site's North gate security camera view and the classification and counting results

(Below left) Pedestrian crowd counting in loose clusters and (below) counting cars and bicycles at the main entrance
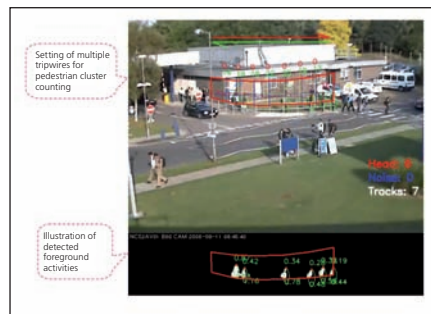
"The next major development of video monitoring and surveillance is the transformation from IP CCTV infrastructure to network-centric intelligent and cooperative IP CCTV"

that have video processing and scene understanding functionality as well as system-wide intelligence. The demonstrator would provide online real-time service.

To put this into context for ITS, the solution can provide accurate counting of moving objects in complex mixed traffic. This is an area of particular interest to BT and something the company has trialed at its own research park, BT Adastral Park, which has nearly three thousand cars, cycles and pedestrians passing through its gates every day.
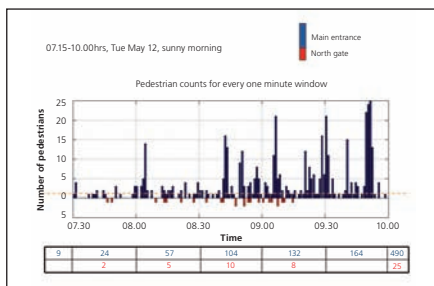
A CASE STUDY

Similar to many large corporations, BT is committed to reducing its carbon footprint and Adastral Park is not exempt from such ambitious plans. The travel plan manager responsible for reducing carbon emissions at the site wanted to have an accurate count of the number of people, bicycles and vehicles entering the site each day to enable strategy planning and effective analysis of the success of implemented solutions. A labor-intensive method was the only available option, with classified traffic census being performed in the form of a manual clicker count, with

three volunteers manning each of the site's two entrances from 07:30 until 10:00hrs. Due to the labor intensity, this was only able to be completed once a month. Unsurprisingly, a non-intrusive automated video-based solution would be highly desirable.

Fresh from the labs, the video analytics solution was conceived and a system developed with a three-camera setup. One camera monitoring the site's North gate is an existing analog pan-tilt-zoom (PTZ) security camera, which can be targeted to have a vantage viewpoint of the single-lane incoming and single-lane outgoing traffic. The other two are newly installed IP cameras targeting the two-lane incoming and two-lane outgoing traffic at the site's main entrance. Due to the main entrance's physical constraint and structural obstructions, it wasn't possible to mount the two cameras in preferable overlooking positions closer to the monitored regions.

By taking the highly compressed live video streams as input, the solution is able to classify moving vehicles, pedestrians and bicycles entering the site, and provide a real-time count of multiple flows of cars and streams of pedestrians within predefined regions of interest. Several approaches have been developed (such as multitripwire-based

07.15-10.00hrs, Tue May 12, sunny morning

Pedestrian counts for every one minute window

9	24	57	104	132	164	490
2	5	10	8			25

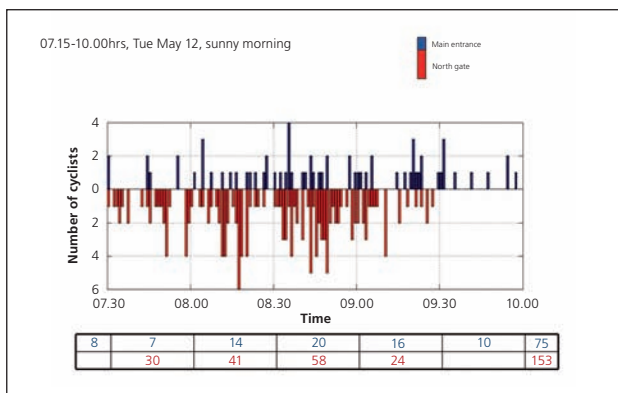07.15-10.00hrs, Tue May 12, sunny morning

Vehicle counts for every one minute window

54	196	241	242	212	170	1,115
73	138	188	145			544

07.15-10.00hrs, Tue May 12, sunny morning

8	7	14	20	16	10	75
	30	41	58	24		153
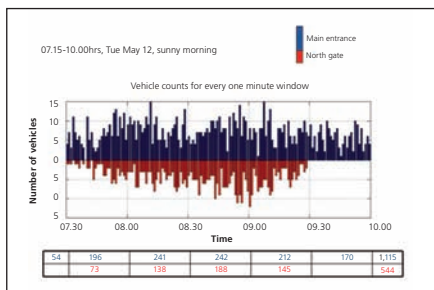
lost tracks handling and semi-appearance-based object modeling) to enable accurate segmentation of streams of loose pedestrian clusters; parallel traveling and overlapping vehicles; slow-moving and waiting-vehicle queues, as well as performing traffic counting from the distant suboptimal camera-mounting positions.

The new system is efficient and only requires a standard PC for real-time counting of three incoming and three outgoing traffic flows, with a very low error rate. The results proved to be consistent as compared with manual click counts on many selected days in different months throughout the four seasons. Additionally, the new system proved its robustness in an external environment, working perfectly despite changes in lighting levels, cast shadows, reflections from wet ground, static structure occlusion such as lamp-posts and traffic sign boards, and cluttered and moving background objects such as waving trees under strong winds. ■

Dr Li-Qun Xu leads BT's research in image and visual computing. His research focuses on multimedia content analysis and indexing, robust object segmentation and tracking for intelligent visual surveillance, people behavior and event analysis, motion analysis and segmentation, 3-D vision techniques and image-based rendering for collaborative working environments

WEB ASSETS?

The internet has experienced multiple paradigm shifts since its genesis in the early 1960s. Here, **Jon Sorensen** looks at what impact today's web-based tools and applications might have on the intelligent transportation systems sector

Illustration courtesy of Ben White

Since its inception, the internet has proved to be a big asset to the ITS community, establishing a foundation for innovation and the development of leading-edge applications that benefit the traveling world. The infant web, however, was limited in overall functionality.

The first generation, Web 1.0, provided one-way communications between websites and site users. The ITS industry used it primarily to 'push' information to visitors, or to aggregate information for 'offline' or back-office processing. It offered little in the way of real-time, two-way communications and very limited collaborative functionality. Recently, the internet has experienced a paradigm shift in the functionality and services that it provides, with web-based tools and services supporting a culture of collaboration, enhanced communications and greater interoperability among users. The emergence of this new collaborative commons was ultimately provisioned as 'Web 2.0'.

The term Web 2.0 was coined several years ago to classify and categorize the shift in design, presentation, use and interoperability of web applications. In general, it's an umbrella of tools and services available as part of a new collaborative internet culture. It encompasses functional enhancements that include a departure from mainstream, static websites to a more dynamic, interactive and collaborative platform. Its applications provide a bridge between geographic and institutional divides by establishing a shared space for users to contribute data and intellectual value to communal information stores.

The ITS community was quick to embrace Web 2.0 technologies. The marrying of ITS and Web 2.0, or 'ITS 2.0', has led to the development and deployment of numerous tools and applications for both the ITS community, as well as the end-users of transportation systems. Some of the more prevalent examples of today's Web 2.0 applications, including blogs (Blogger), wikis (Wikipedia), mash-ups (Google Transit), social networks (Facebook and MySpace), multimedia applications (YouTube and Flickr) and enhanced communications platforms (podcasting, instant messaging or Twitter), have proven to be highly effective tools for the ITS industry.

EMBRACED BY ITS

Early Web 2.0 applications embraced by the ITS community included the use of web-based Content Management Systems (CMS) – most notably blogs and wikis. Blogs provide a web-based CMS that allows users to post messages, media, links and comments through a centralized, multi-user web interface. Wikis allow users to collaborate and manage content development through an online platform. A Wiki is essentially a dynamic web page that allows anyone who accesses the page to add or modify content. They allow for the unification of real-time worldwide accessibility and internal, secured real-time editing, review and vetting of content. Many ITS agencies are currently utilizing Wikis for internal, real-time development and distribution of content, including department-related publications, planning and design guidelines, as well as public

information materials. The Missouri DOT recently instituted a Wiki to manage its *Engineering Policy Guide*. The Wiki – which was created with the same public (free) software (Media Wiki) used to create the well known Wikipedia – includes general transportation design information, design criteria, and general guidance for the development and management of ITS in the state of Missouri.

Web 2.0 technologies have also generated mainstream web services for establishing the hyperconnectivity of ITS. Social networking platforms enable users to network and collaborate in ways unattainable in the past. Popular mainstream services, such as LinkedIn and Facebook, have proved to be effective for connecting ITS practitioners globally by establishing user-created 'communities of interest'. The end-user or traveling public has also greatly benefited from the use of social networks. For instance, GoLoco was an early adopter of social networking technologies, dedicated to the transportation needs within a community, and which provides a communal portal for ride-matching and ridesharing services. Applications such as Ning and Google Wave are new web-based applications that allow users to create their own dedicated social networks. Ning sites such as Intelligent Transportation Systems have been created to provide a social network strictly dedicated and configured for the ITS community. The Kansas DOT recently implemented its own dedicated social network, which provides users with a collaborative

platform, allowing them to register an account, which in turn provides personal email, contact management, discussion forums, blogs, Wikis, content and media management, and other Web 2.0 tools, all within a searchable, dedicated information store. It should also be noted that the Federal government's GSA office is currently in negotiations to sign government-wide user agreements with more than a dozen social networking platforms.

Advances in Web 2.0 technologies and programming tools have greatly enhanced the ability to generate new applications. Composite web applications, also known as 'mashups', represent applications that blend multiple data sources and existing web applications to create new, hybrid applications with new functional capabilities. For example, sites such as Google Maps make their Application Programming Interface (API) available to the public, which, in turn, enables users to develop new applications 'on top' of Google Maps. Mashups have been successfully implemented by the ITS community in a variety of ways. Traveler information sites 'mash' congestion and incident data, with web-based mapping products such as Google Maps and MapQuest. The ITS community is also utilizing mashup technologies to mash ITS field device inventories and to create web-based asset management systems with web-based mapping applications. ITS and transportation mashups are also being created by the general public (User Generated Content, or UGC). One of the primary benefits associated with mashups is the ability to enable 'crowdsourcing'

to create very specific, personalized and extremely focused tools, in doing so reducing the development times typically associated with any significant application. Mashup applications, including sites such as Njection's application to track speed trap locations and the National Traffic Management Center Inventory Project, have proved to be very useful resources built by the web community and, in turn, quickly deployable as they are developed through crowdsourcing. MashTrans is a site dedicated to transportation mashups and provides a good introductory resource for agencies looking to assess the value of mashup technologies and investigate possible uses within their own organization.

Recent advances in web technologies have seen the emergence of application development tools to allow users to create their own web applications. With the use of applications such as Yahoo Pipes and Microsoft PopFly, users can create their own

unique applications through simple drag-and-drop of prewritten code modules and simplified configuration user interfaces. These new applications are making their way into the ITS community, allowing agencies and travelers to create their own transportation tools, based on individual needs and preferences. This real-time utilization of web-based tools for traveler application development is enabling the emergence of a wide array of ITS solutions, generated with more of a specific focus and greater granularity with regards to local or individual needs and conditions.

User-to-User (U2U) applications such as Twitter and Microsoft Vine have enabled individual travelers to act as mobile, real-time data collection and dissemination nodes. Twitter essentially allows a user to deploy a real-time, configurable, text-based broadcast domain. During the recent presidential inauguration, several Twitter channels were configured by attendees and local transportation agencies to provide real-time pedestrian and traffic information to those subscribed. Both pedestrians and travelers collaborated regarding traffic conditions, directions, local services and other event-specific information. Numerous DOTs, such as Rhode Island DOT, have implemented Twitter to distribute real-time traffic alerts and construction updates via their dedicated channel.

Recent trends have shown that more and more public agencies, including the Federal government, are striving to make internal data that was once unattainable open and accessible to the general public. This paradigm shift in data management philosophy is opening a tremendous resource for public innovation and development of useful tools and applications. The Federal government recently established a new data warehouse that will provide a single source for government data, open for public use. To encourage crowdsourcing of innovative

ITS available on YouTube

The ITS community has also embraced web-based multimedia collaboration services. Popular applications such as YouTube and Flickr represent powerful platforms for transportation agencies to develop their own content 'channels' for the aggregation and dissemination of multimedia information. These channels also provide for enhanced branding opportunities and digital avenues for community relations, providing the means for users to provide comment, upload their own media, or to simply initiate a discussion regarding a specific topic. The Virginia DOT recently launched its own YouTube channel to provide a general informational and educational service for department-related content. YouTube has also shown to be an effective platform for publishing or reviewing 'how-to' guides, or other multimedia educational tools. Video demonstrations on fiber splicing, traffic signal controller programming and ITS communications network design can easily be accessed and managed through these sites.

Web-based tools have brought ITS practitioners together

applications, agencies are encouraging the general public by holding development contests. Washington DC's Office of Technology recently held a contest to develop open-source web applications based on the District's data. The 'Apps For Democracy' contest was a huge success, with 47 applications developed. This change in data 'openness' and the power of crowdsourcing will continue to provide an innovative means for rapid, affordable application development in the ITS arena.

CHALLENGES

As is the case with the emergence of any new technologies, the implementation of ITS 2.0 tools and services will require structure and regulating within each enterprise and public transportation agency looking to implement Web 2.0 applications. A recent study conducted by the CIMI Group, Inc polled 277 companies regarding their use of Web 2.0 tools. Although 90% of the companies noted they currently used at least one Web 2.0 tool, 0% of the polled companies reported that they included Web 2.0 tools and services in their business and strategic planning. Part of the planning difficulty is the lack of hard metrics for measuring the return on investment. Policy-makers find it difficult to plan utilities with soft metrics or technologies with immeasurable benefits. Policy requirements will need to be addressed from

"Industry buy-in will be critical to the advance of internet technologies within the ITS and transportation communities"

all management levels in order to develop guidelines and protocols that best fit each individual agency or enterprise, as well as the traveling constituent. Security and the lack of appropriate policies and governance will also provide a challenge to IT managers required to implement Web 2.0 tools at the enterprise or agency level.

As with all new advances in transportation, industry buy-in will be critical to the advancement of internet technologies within the ITS and transportation communities. Only time will tell if the evolutionary currents of ITS 2.0 services are a natural step in the progression of ITS solutions, or a novelty in the transportation community destined for the drift nets, or perhaps the birth of actual game-changing applications for which future ITS applications will be built upon. ∎

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"We clearly do not have
an interest in building
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What this market needs
is honest companies
focused on building
systems that satisfy
their customers' needs"

WHEN HE FEELS HIS COMPANY HAS BEEN UNFAIRLY TREATED, **ERWIN TOPLAK** DOESN'T MINCE HIS WORDS. AND WHY SHOULD HE? KAPSCH HAS AN ENVIABLE TOLLING TRACK RECORD, AND SOLID PLANS FOR THE FUTURE

Interviewed by Nick Bradley/Photography by Alexis Kembery

When Kapsch's Erwin Toplak takes the call, he predicts that we may lose each other at some point, as he is in his car while traveling on business. He is correct: it eventually takes three attempts to complete the interview process. "Nobody will understand why they tried to build a toll system on this technology!" he quips.

Toplak's business travels have taken him to Slovenia, as the 48-year-old COO of Kapsch is busy trying to secure the contract for the Slovenian truck-tolling scheme. You would assume the Austrian company's chances are good. Kapsch has a proven track record in the field, and has the ultimate reference up and running in the Czech Republic. But as a recent decision by the Slovakian government demonstrates, when dealing with the complexities of officialdom, you should never count your toll tags until they're stuck firmly to windshields.

LEGAL WRANGLES
Kapsch was thrown out of the tendering process for the Slovakian scheme in mid-2008 on 'technical grounds', a decision that perplexed Toplak and his colleagues. "It was very surprising," he freely admits. "If you get beaten on price, fair enough – that's what competition is all about. But when you get beaten by a proposal that is the most expensive of those on the table, I don't think we were in the wrong to launch an appeal."

Narodna Dialnicna Spolocnost, or NDS, (Slovakia's national motorway company), claimed that there were "deficiencies" and "shortcomings" in the technical descriptions relating to Kapsch's proposed mobile enforcement technology; that the descriptions of said systems were not "detailed enough" or "logical". But Toplak points out that these are the same descriptions given and technologies proved on many other Kapsch projects worldwide – 140 or so installed systems in 30 different countries – so the 'official' stance is that Kapsch deems NDS's objections as unjustifiable from a legal and a technical

standpoint. All of the mobility specialist's subsequent appeals were rejected by NDS, and this January a deal was signed with a brand-new consortium at a cost of SKK25.7 billion (US$1.2 billion) – three billion crowns more than the Kapsch bid of SKK22.57 billion (US$1.065 billion).

Toplak isn't over-excited by the EC's recent decision to investigate the tendering process and the awarding of the contract to SkyToll – the winning consortium established by Ibertax-SanToll and backed by French company SANEF. Siemens will be supplying OBUs for the system, and Kapsch's Norwegian competitor Q-Free will be supplying the central system for enforcement. But an official statement from the EC to the Slovakian government read, "…the Slovak contracting authority excluded three tenders from the tender procedure. Based on the information available to the Commission, the Slovak authorities could have violated the principles of equal treatment and non-discrimination, as stipulated in the Public Procurement Directive 2004/19/EC and the EC Treaty."

"The EC's investigations will not impact upon the civil contract," Toplak suspects. "The losing parties [which include the Slovak-Swiss consortium ToSy and the Autostrade-backed Slovakpass] might be able to claim for damages, but based on my experience of such cases, it could take two or three years for a resolution, by which time the Slovakian system will either be built or it won't."

Kapsch's COO is not drawn on how he thinks the Slovakia scheme will pan out, but he does indicate that we should have a clearer idea toward the end of 2009. "If it's going to be ready to go live on January 1, 2010, we should already see something out on the road. If they are going to be on time, they should already have distribution channels, etc. We will wait and see."

SHARE OPTION
In January, just days after the Slovakia deal was announced to be SkyToll-bound,

"I think it's obvious that our strategy is not to play the same game as existing suppliers in the USA – to build our own protocols and proprietary solutions and bar the market from competition"

Kapsch purchased a 21% stake in Q-Free – a move that was greeted by Q-Free's Øyvind Isaksen as "unfriendly". However, according to Toplak, the strategy was in no way related to the NDS deal and had been under consideration for some time. "It was a little bit driven by share price," he explains. "Share prices have been falling in general, so for us it was a reasonable investment. Having such an interest also means we are kept informed of any potential takeovers of the company from 'sharks' not experienced in the marketplace, which wasn't an impossibility given the drop in share value."

Toplak insists that he always has respect for competitors with competence. "In my opinion there aren't that many competent companies with a proven track record of building components and subsystems satisfactorily. Q-Free has my respect and, of course, it is good to have competent competitors." So would Kapsch consider

stepping in if it felt any 'shark' was getting too close for comfort? "It would depend on the situation at the time and what was on the table," he says. "We clearly do not have an interest in building a monopoly – that does not make any sense. What this market needs is honest companies focused on building systems that satisfy their customers' needs." And of course, in a roundabout sort of way, Kapsch's strategy with Q-Free could mean it will benefit from the Slovakia scheme after all, if only via increasing share prices and any paid shareholder dividends. You get the impression that this particular chapter has a few pages left to be penned.

COMING TO AMERICA
The US part of the Kapsch story could run on for many more chapters. At the 15ᵗʰ World Congress on ITS in New York, the company dominated proceedings, in terms of its booth in the exhibition hall, demonstrations, and indeed news announcements. In a relatively short time, the company seems to have cemented its

position in the US sector, so tolling contracts must surely be on the horizon.

Quizzed about the success that the company has enjoyed in the USA over the past 12 months, Toplak finds it difficult to pinpoint any one ingredient. "There are so many," he says. "You need a good team – that much is true. Whatever your solution is, whatever your strategy, it always falls back to the confidence and spirit of the team that you have in place. I think we made a very wise decision in acquiring the 5.9GHz assets from Technocom. And we were able to prove very quickly that what we were claiming in relation to the performance of 5.9GHz was not hot air. We see technology very unemotionally. Our role is simply to build high-performing money machines. Whatever we do to improve the performance of our systems, I know our customers appreciate it. As far as 5.9GHz is concerned, there is a direct correlation with additional toll income or reduced loss on tolling costs."

Certainly, the E-470 testbed in Denver, Colorado, gave Kapsch a priceless platform from which to prove 5.9 in tolling. Deploying its readers alongside E-470's existing 915MHz technology enabled the company not only to test that its own equipment worked, but to demonstrate that its systems didn't interfere with the 915MHz technology, which will be vital for migration. Although acknowledging that 915MHz has been robust and reliable, Toplak is adamant that 5.9GHz is the next big thing. "There are considerable differences in terms of communication links, security, speed, data rates, and 5.9GHz is a multipurpose technology – much more capable in terms of traffic safety and traffic mobility," he says (see *The Safety Side of 5.9GHz*).

Ultimately, Toplak views 5.9GHz as a necessary step into the future. "Nobody questions that anymore," he adds. "The only questions relate to migration and tag penetration. All the time that your tag penetration is not exceeding 40%, 50%, or 60%, you have to operate a relatively expensive parallel system that kills you on the operating costs. I think 5.9GHz will succeed because the operators and concessionaires understand and appreciate the commercial benefits.

"We are absolutely supporting the intention to build 5.9 as a nationwide standard, so that everybody else can build their components based on that standard," he adds. "I think it's very obvious that our strategy is not to play the same game as the existing suppliers in the USA – to simply

The safety side of 5.9GHz

Erwin Toplak believes Kapsch's expertise in 5.9GHz – and the MCNU platform developed by the now Kapsch-owned Technocom – were key to it being selected by Volvo North America to be involved in the Commercial Vehicle Infrastructure Integration (CVII) program being conducted in New York State.

"The Multiband Configurable Networking Unit (MCNU) R1551 is a wireless communication solution for transportation infrastructure. It supports IEEE-compliant transportation management, safety, and security applications, and can achieve dramatic improvements in vehicle safety, as well as validate potential safety, mobility, and commercial applications for all vehicles," he says. "It can be installed on intersection poles, street signs, and highways. It is deployment-ready and supports the IntelliDrive vehicle-to-infrastructure common protocols for vehicle communications in the 5.9GHz band."

The secure, low-latency capabilities of 5.9GHz DSRC meet the IEEE standards to establish an industry standard, system compatibility, and improve road safety in

order to meet USDOT standardization requirements. "Standardization plays a very important role in the success of any large-scale deployment of DSRC," Toplak says. "A national deployment requires interoperability of equipment and systems coming from many different manufacturers, hardware/software certifications, compliance testing, and security. A complete suite of standards is currently under development within IEEE and other standard organizations, and these are expected to eventually migrate into ISO on a global scale."

IEEE 802.11p addresses the physical layer and medium-access control layer (MAC) called 802.11p module. The upper layers of the communication stack are being developed within IEEE 1609 (Wave Management, Channel Management and Resource Manager) and IEEE 1556 (DSRC Security) through the normal IEEE committee process. The vehicle aspects are being developed and evaluated through VSCC/CAMP (which represents seven major automotive manufacturers) and SAE is creating the message set, data dictionary, and application framework standards.

build our own protocols and proprietary solutions and to bar the market from competition. In any case, the market is so huge in the USA that it's unimaginable that a single company can cover the lot – or if any one company has that intention."

One of the challenges that Kapsch faces regarding 5.9 is the positions that existing suppliers have in their strongholds. Could this therefore prompt a different approach? "If tomorrow one of the US producers comes to us and asks for a license for 5.9GHz, we would provide them with it – we are absolutely prepared to license what we have been developing."

THE SPACE RACE

"It is essential that operators remove the non-electronic payment," Toplak advises, "as these are the costly elements in today's manual toll systems." The ultimate system, he emphasizes, is one without any manual enforcement, thus avoiding the associated operating costs. "You can easily see this in Germany. The reason why TollCollect does not operate all of its enforcement gantries – nor, for that matter, even 10% of them at the same time – is because it is actually more affordable to switch them off and not take so many pictures, especially as they are not accountable for any enforcement rates."

Toplak explains that if the TollCollect system detects a vehicle without an OBU, it is first registered as a violator. Its details are forwarded to an enforcement center, at which it is determined whether or not a violation has actually occurred. "The whole process costs so much money," he says. "This is what most people do not really understand, which is why we keep having this senseless satellite tolling debate. You can use satellite-based tolling for a case such as Germany where you toll only 12 tonnes or more, and where you are not insisting on a comparison between maximum theoretical toll income and real toll income. But if you start digging into that, you can forget about GNSS, even for 12 tonnes. And moving down to 7.5 tonnes or 3.5 tonnes, you would start losing money instead of earning.

"If tomorrow one of the US producers comes to us and asks for a license for 5.9GHz, we would provide them with it – we are absolutely prepared to license what we have been developing"

"I keep reading that GNSS systems are the future of tolling, but I totally disagree," Toplak states. "What is in a navigation device?" he asks. "You have a display, a touchscreen, a CPU, GPS, and that's pretty much it. You don't even have any GSM moduling. And how much does a decent sat-nav set you back these days? Euro 150? Euro 200? Tell me, why are the prices not falling that much? Could it be because they cannot produce them any cheaper? And they're made in their millions! So why do people think that an OBU for GNSS tolling in passenger cars – which is pretty much the same system architecture *plus* GPRS – will fall in price that much that it will not also eat into your operating costs?"

Toplak recalls a recent chat he had with an expert who knows the situation relating to the operating costs in Germany. "He told me that the real operating costs are above 30%, not including depreciations for investment, and not including the 1,000 employees for enforcement of the traffic. If you consider that the 12 tonnes in Germany covers 650,000 vehicles, once you factor in 7.5-tonne and 3.5-tonne trucks, you would at least triple the number of OBUs and also the communication costs. You would quickly lose your business case for 3.5- and 7.5-tonne trucks. Why should it get any better if you equip 60 million cars for passenger car tolling? As long as that situation remains the same, there is no case for tolling with GNSS below 12 tonnes."

Given the strength of his feelings on the subject, can we assume that the Austrian is not gazing into the sky in anticipation of Galileo? "Again, the debate is totally nonsensical," he says. "I would love to hear the migration debate when Galileo is in place, because you cannot use the existing

GPS with Galileo OBUs. Nobody talks about this because nobody thinks about it. If you tell me you can switch from GPS to Galileo on the German system quite simply, it's just a lie. You would have to exchange all 650,000 OBUs. Multiply that by Euro 280 (US$398) and there's your business case. I think the Galileo lobby uses tolling to get support, which is fine, but the argument that tolling would fund or support the applications of Galileo does not stand up. Why should a toll operator that is currently using GPS signals for free on his tolling network pay for the privilege of using Galileo signals?"

Of more immediate concern to Toplak is advancing Kapsch's chances in the Slovenia bid, as well as his company's participation in the Gauteng Multi-Lane Free-Flow system in South Africa. "I don't think they know what they want yet in Slovenia," he says. "In South Africa, we are the only company to have been selected for all five packages in the pre-qualification stage, including package five as the main contractor. In terms of price – we submitted around ZAR 9.1 billion (US$1.16 billion) – I think we're in a very good position. In terms of the technical evaluations of our technology, our projects around the world show that we have nothing to fear. And when you look at the track records of the other companies in the running, I am also not anxious."

That said, Toplak will be taking nothing for granted in pursuit of these high-profile projects. So when the phoneline begins to crackle once more, he suggests that we have probably covered all that needs to be covered for now. "If I have some good news, you'll be the first to know." ∎

The E-470 Public Highway Authority does not endorse any product, service or supplier, and is not responsible for or verified the results of the Kapsch tests

TOUGH TIMES DEMAND INNOVATIVE THINKING, AND AS THE VOICE OF THE IBTTA, **PAT JONES** IS CONFIDENT THAT HIS INDUSTRY WILL ADAPT TO (AND MAY EVEN BENEFIT FROM) THE CURRENT CLIMATE

Interviewed by Louise Smyth/Photography by Alexis Kembery

You would struggle to find a more appropriate person for the role of executive director of the IBTTA. Pat Jones has been in the association business for around 28 years, earning his stripes first at the American Public Transportation Association and then the American Trucking Association before joining the IBTTA in 2002. As a result, he has a thorough grasp of not just the tolling industry but transportation – and all of its various modes – as a whole.

This wider view has served him well. But what also helps is a genuine passion for the industry. Jones is a media-savvy, articulate and assured individual, but patently speaks from the heart: "Transportation is

a foundational industry that supports the rest of the economy," he says. "We are a very mobile society – without mobility, the world is not the same. It's also one of those things that gets into your blood. You grow to appreciate transportation and the more you appreciate it, the more you love it."

Encouraging others in this appreciation is at the heart of the IBTTA's manifesto. A key focus for the organization is holding conferences and meetings that encourage the industry to communicate and exchange ideas. Jones is proud of the efforts of the 10-person team he heads in this pursuit: "Being a leader in education and professional development is a big thing for us. We're also about advocacy – about being a voice

for tolling and user-financed transportation, as well as developing and disseminating knowledge and information."

A great deal of Jones' daily work is taken up with governance – dealing with the IBTTA's board of directors to accomplish the association's aims, and being responsive to the needs of its members. "It's also about positioning the association to be responsive to the economic and political conditions as we find them and trying to create an environment that's friendly to tolling and user-financed transportation."

FACING UP TO A CHANGING WORLD
These are timely words. The 50 year old is presently gearing up for the IBTTA's 77th Annual Meeting & Exhibition in September, an event that enables him to kill two birds with one stone: to meet with his colleagues on the board of directors and to catch up on the latest news from the association's 280 members. This event is taking place during a worldwide economic slump that has hit the USA hard, but Jones is enthusiastic that people are adapting their outlook to this changing world.

"There will be many topics debated. VMT charging is just one of the things that everybody is talking about. Look at the two congressional commissions that have come out with their reports in the past two years and the work conducted by the Bipartisan Policy Center. Everybody is saying we need to move away from the fuel tax (which is unsustainable and legislators are unwilling to increase) and toward a mileage-based fee that is sustainable, that charges people directly for the use of the system."

So is VMT the way forward? "Yes, and I believe that tolling is the original VMT: it's charging for the use of the facility. And we have the technology and the business practices to make VMT happen," he says emphatically. "Now, more than ever, we are looking for better ways to fund and finance transportation. Congress is on the threshold of a new Transportation Authorization and I think it's time to move in the direction that its two commissions have highlighted."

Another topic that is ever-present at IBTTA meetings is that of public-private partnerships in relation to tolling. "I don't know whether I can add much new light to a subject that's been debated endlessly," he notes. "What I can say is that in the USA, it's seen as a kind of historical anomaly to have public-private partnerships. We have the history of the Interstate Highway System being funded through the fuel tax and our highway systems being a responsibility of government, so it is hard for Americans to let go of the notion that transportation is a state function. Yet we see so many other utilities in other parts of our economy (such as telecoms, electricity, and water) that do make good use of public-private partnerships or private investment.

"There's an unfortunate tendency in our country to argue or perhaps govern

"We are moving to a point where the gap between government revenue and expenditure is widening. This places tolling and road user charging in a very positive light"

by innuendo and to use value-laden terms that can electrify a constituency, without thoughtful debate based on what really works. If we really believe that transportation is a foundation for economic growth and access to wealth and opportunity for Americans, then we ought to consider the possibility that private investment and PPPs – although not the only solution – are part of the solution."

The IBTTA makes a point of highlighting successful PPP projects (something that is often reflected in the winners of its annual Toll Excellence Awards) to remove the hyperbole and caution that surrounds them, and to show they are coming into the mainstream. The organization is also hugely encouraging of innovations in terms of technology, which Jones regards as critical to tolling today and in the future. "We wouldn't be the industry we are now without ETC technology. If we were still collecting the majority of tolls with human collectors or coin baskets, this industry would have vanished. Now that we have these technologies we need to move more dramatically toward interoperability, so that every person who uses a toll facility can have one transponder and one account – one mechanism for registering their use.

"That's a big challenge for us. I don't think it's appropriate for the association or even the government to specify which technology should be used, whether it's the current 915MHz, the newer 5.9GHz, some form of satellite or even cell phone

technology. But what we ought to do is work together to create the conditions in which there can be a winner – a situation where people are naturally migrating to a system that will be effective. Maybe it won't be just one system; maybe multiple systems will be the answer. But if we go that way, we need to find a way to make them compatible with one another. Other markets (such as bank card and cell phone providers) have figured out a way for the different providers and networks to be interoperable. And we should be relentless in our efforts to make it as easy as possible for somebody to use a technology that's compatible with other systems, networks, and technologies."

A CASE IN POINT
The success of HOT lane schemes is a good illustration of technology, policy, and positive benefits to the end user all coming together nicely, and Jones is eagerly awaiting the opening of Virginia's Capital Beltway HOT lanes. When prompted, he is able to reel off a list of his 'favorite' HOT lane projects (such as the I-394 in Minneapolis), but it's not geekery that motivates this – it is what these projects represent: "Part of the beauty is that they give people an understanding of the value of pricing the system based on the use of it, and they enable people to experience the true value derived from the additional expense." Jones is adamant that effective HOT lane schemes (and well-executed congestion pricing projects) can help educate the public about the value of mileage-based charging, further strengthening the case for VMT pricing.

As with so many innovations, whether or not the necessary paradigm shift actually occurs comes down to money. "I think we stand at a precipice of great opportunity here," Jones observes. "We are moving to a point where the gap between government revenue and its expenditure is widening. A situation like this places tolling and road user charging in a very positive light. We need to emphasize the need for the user to pay for transportation. This was the original intent of the fuel tax – to serve as a proxy for a direct user charge – and yet it's become confused, especially with diverting the tax to non-transportation purposes. Tolling helps to preserve the nexus between payment for the system and use of the system. If we can educate the general public and our public officials to the value of that nexus, then we may be able to have a revolution in the way transportation is funded, managed, maintained and operated."

His closing comment on the matter is also encouraging: "Public opinion for the most part is already there. The average person is well ahead of the typical legislature in seeing how these issues should play out." ∎

The IBTTA's 77th Annual Meeting & Exhibition takes place at the The Hyatt Regency, Chicago, from September 13-16, 2009. For more information, please visit the IBTTA's website by logging on to www.ibtta.org

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ALTHOUGH PREVIOUSLY A FAIRLY QUIET PRESENCE ON THE INTERNATIONAL STAGE, STEFANO MELLINA IS NOW READY TO TELL THE WORLD ABOUT HIS SYSTEMS

Interviewed by Louise Smyth/Photography courtesy of Valter Pallaoro

Famas System is not hugely well known beyond the borders of Italy, its home country, but 2009 has been the year that the company's CEO, Stefano Mellina, has intensified efforts on the global stage. The mild-mannered Italian has headed Famas System since its inception in 1994, when he and other founding members formed the new venture from the ashes of a previous company, which was also known as Famas. Prior to being involved in the traffic industry, though, Mellina worked for the IT giant IBM, so brought with him a deep understanding of high-end technology, which perhaps influenced Famas's somewhat niche product direction – solutions for traffic meteorology and environmental data collection and dissemination.

However niche, though, in the 16 years since inception, Famas has flourished in designing, commercializing and maintaining products and systems for this sector, evolving from being a five-person outfit to employing 30 people and now turning over more than Euro 6 million a year.

PROVIDE AND CONQUER

On Italy's roads Famas has a very high profile indeed. "We are present in one form or another within all of the main administrations (whether they cover motorways, counties or cities) that manage roads," Mellina says. But although naturally proud of this dominance, he is ready to set his sights elsewhere, by starting to build up a distributor network to market Famas's products in other regions. "Our idea is to become a leading company not only inside Italy but outside as well," he says.

You get the impression that these plans for going global are very much now or never. Having spent a number of years concentrating solely on the domestic market, honing the technology he believes in, Mellina is now of the mindset that if Famas can conquer Italy, the company can conquer any country. He explains that Italy is generally a complex region for data collection and distribution, with mountains and valleys and their associated networking problems presenting unique challenges. "Try getting a good GSM signal up a mountain!" he says. Additionally, deploying technology in Italy's historical cities involves reams of red tape that is designed to prevent modern infrastructure from impacting adversely on the surrounding environment. "Whatever the problems associated with coverage, you'll find them here," Mellina adds. "We have had to develop solutions for all of these specific issues over the years, and we think it's a good time to share our expertise elsewhere."

Two key products are actively being promoted to the international audience: the Star and Mobiltraf ranges. But as Mellina details further, Mobiltraf is so new that it isn't quite ready for market yet. The company is eagerly awaiting the response when the product starts shipping and begins being deployed in the coming months: "It's an entirely new unit for mobile traffic counting and classification that supplies highly accurate data in terms of vehicle count, speed and length. You install it beside the road, and it's based on similar technology to our Star product in that it relies on microwave technology and has been designed to provide an out-of-the-road solution that can be a viable alternative to inductive loops.

"We have spent a lot of time looking for products on the market that could be an alternative to loops because more and more customers have been looking for out-of-the-road solutions to avoid the maintenance problems associated with in-road systems," Mellina says. "They couldn't find any valid replacements in terms of cost or performance and neither could we, so we began developing our own solutions."

According to Mellina, Famas System is the "first company worldwide" that offers a solution "as good as loops in terms of price and performance", although he is also keen to highlight benefits such as flexibility: "Mobiltraf, for instance, comes in two versions depending on your application. The 300 is a more compact unit, while the Mobiltraf 500 has divided detection units in two housings so it can adapt to the application. In cities you want to have units that are close together, similar to having lots of small loops, as traffic is often stationary or queuing. On motorways where you normally have free-flowing, high-speed situations it is preferable to have the units further apart from one another to promote a higher accuracy in the measurement. This allows us to respond to customer requirements, whether that be higher accuracy or actual dimensions," the 49 year old explains.

One of the first projects to showcase Famas System technology at an international level is a trial of the Star product currently under way in Switzerland. Although a test installation, it's at a live site that is undergoing an extended period of roadworks. In undergoing such maintenance, this might mean that in-road loops could be damaged, resulting in gaps in the availability of data – which is where the Star units come in. "It was a very important road and the data that could be gleaned from it was equally valuable, so rather than miss anything they decided to use Star, which is being used for counting, classification, speed, occupancy and stopped-vehicle detection. The long-term performance will be assessed and I suppose they'll decide if

"People have spent 30 years using loops, so it's natural that it will take time for them to understand the concept of a new technology, a new way of working"

it's the right system to replace loops and how it can be used to aid traffic monitoring in Switzerland."

SEE FOR YOURSELF
If anything will bring Famas System international success, it is this kind of approach. For all of the product showcases at industry events (of which there have been many in 2009) and advertising campaigns, Mellina knows that it is only when people witness the performance of his products for themselves that they start to believe the 'replacement for loops' tag is not just a marketing slogan. "We welcome performance tests such as the Swiss one and actively encourage people looking to replace loops to trial our technology and see for themselves. The industry has spent 30 years using loops, so it's natural that it will take time for them to understand the concept of a new technology, a new way of working."

Of course, the greater number of schemes that products such as Star are used for, the greater the number of emerging applications as well. One fairly new task that goes beyond just counting and classifying is real-time traffic flow monitoring. "In Italy – as in many areas – it's now a big trend to open the emergency lanes of a motorway to normal traffic during peak times. You need to know if any vehicles are stopping on the emergency lanes; you need to know exactly what's happening on the road. The Star is finding these new applications in Italy already, and there is also great interest from other European countries experiencing the same demand-management issues."

Instead of competing against other technologies in the field, such as video detection, Mellina believes there is potential for such solutions to work in tandem, helping to achieve the bigger picture: "Video is mainly used for incident detection where you are looking at 100m or 200m of road, whereas the Star is used for making very accurate measurements on smaller sections of road – measurements that are completely unaffected by conditions such as snow or rain. It makes sense that they will be integrated together: video cameras for looking at big sections of road, and the Star for conducting precise measurements that are not dependent on the weather."

This bigger picture is an essential component of another facet of Famas System's business: its integrated systems for traffic data, meteorological data and environmental data. "We had this idea of a 'three-in-one unit' when we started the company, and now the MPG 500 Evo system is in its third evolution. It can count, classify and monitor stopped vehicles – all the traffic data needed by a road administrator – but it also collects information about the road conditions and meteorological conditions. It assesses whether the road is wet or dry, if there is salt or ice present and how heavy the precipitation is – the most important environmental data connected to traffic. This provides a complete overview, which is really valuable when considering the connection between traffic speeds and number of vehicles and how that relates to the meteorological conditions and pollution levels. If you can better understand why certain situations occur, you can better manage your road." Famas currently has more than 200 MPG 500 Evo stations installed in Italy, which continuously monitor road conditions in real-time.

Mellina is now tasking his R&D team to focus efforts on improving the power consumption of the products and come up with solar-based solutions wherever possible, to ensure that they can be competitive in all locations, even rural areas that do not have ready access to electricity supplies. Along with a more global outlook, such plans are what the Italian hopes will enable his ideal vision for the next 10 years to become reality: "Our target is to double our turnover and number of employees and to be present in all continents with qualified distributors. One of our USPs is that we not only transfer technology know-how but how that technology can actually be used. It's not always directly clear from a data sheet what you can really do with a system. You need to be able to explain how a product can help to improve the level of service to the road users." Such a determined and clear-cut approach will no doubt mean we'll be hearing a lot more from Mellina and Famas System in the years to come. ∎

Virtual Weigh-in-Motion Systems
To Protect Your Infrastructures

Does your State have accessible routes that allow commercial vehicles to exit the interstate and bypass a fixed weigh station? If so, excessive damage and premature deterioration of your interstate could be occurring as these trucks are not being weighed and continue to travel overloaded. Also, most of the bypass routes are not designed to handle these heavily loaded vehicles, so these roads are being damaged. Needless to say, this creates unnecessary commercial traffic on local routes.

Solution

METTLER TOLEDO has designed, tested, and proven Virtual Weigh In Motion (VWIM) systems to help protect interstate and local infrastructures. The system includes Weigh In Motion (WIM) sensors (Figure A) that are installed in the travel lane of the bypass route. Along with the WIM sensors, we can install an overview camera–optional License Plater Reader (LPR) – and a roadside cabinet housing a computer running the METTLER TOLEDO VWIM software (Figure B).

Figure A

The system checks for gross over weight, axle weights and bridge formula violations just as a traditional sorting lane application. In addition to weight information, the system captures a digital overview photo image of the vehicle and, if an LPR is included, a close-up of the license plate. Because the system must operate on a 24/7 basis, infrared lighting is used to allow images to be accurately recorded and transmitted even after dark. Additionally, the system time stamps each vehicle as it passes over the WIM sensors.

Figure B

Information recorded by the Virtual WIM system is bundled together as a vehicle record. The vehicle record, which includes WIM data and images, is immediately accessible on the web server by law enforcement personnel who may be patrolling in the area. Using a wireless Internet connection, they access the enforcement server and have images and data displayed on their laptop–directly in their patrol car for reference and assistance in apprehending the violators (Figure C).

Economies of Scale

Weigh station plazas are not only expensive, they consume time and resources for planning, design, construction and implementation. With the vast cost and resource requirements differential between a traditional inspection/enforcement weigh station and the more economical Virtual Weigh In Motion (VWIM) system alternative, METTLER TOLEDO anticipates this technology growing rapidly in popularity throughout the U.S.

Figure C

For additional information on METTLER TOLEDO's Virtual Weigh In Motion system, visit www.mtwim.com or contact Bob Susor directly at 614-638-1162.
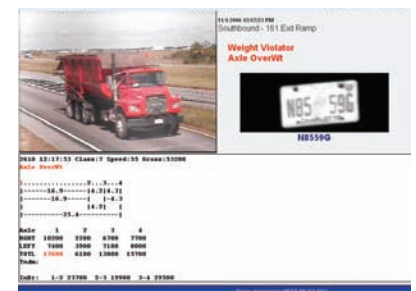
METTLER TOLEDO

Highway patrol

The capability to monitor pavement and atmospheric conditions allows authorities to maintain better roads and save lives. But fixed RWIS by their very nature cannot cover entire stretches of roads. New mobile systems can fill in the gaps in the weather network

by Melanie Scott, Quixote Transportation Technologies Inc, USA

Over the course of the past 35 years, government agencies in the USA and Europe have relied on fixed RWIS sites to monitor road weather conditions. Helping decision-makers to maintain safe driving conditions on their roadways, RWIS stations have become fairly advanced and are capable of detecting de-icing chemicals on the road, measuring the freeze point of liquid on the road by actually freezing a very small amount of liquid, and even monitoring conditions non-intrusively with sensors on the side of the road.

The use of RWIS by road maintenance authorities has proved to increase the level of service, which in turn means better road conditions and lives saved. But the major challenge road authorities face with RWIS is the difficulty in authorizing enough sites to provide a dense weather network needed for accurate decision-making. What is needed is a solution that can assist in filling in the gaps between data points with a much smaller investment in infrastructure, while still providing data similar to that of RWIS sites. This new data network would not replace the existing RWIS station, nor stop the addition of stations, but would instead add to the network of road weather information.

ON-VEHICLE SENSORS

RWIS collects pavement temperature data at specific locations, but what about in between sites? This is where mobile technology and using sensors 'on-vehicle' can fill in the gaps. Collecting weather data using a vehicle first began with the creation of a vehicle-mounted infrared pavement temperature system in the 1990s. These systems have become very popular, and today nearly all winter maintenance vehicles in the USA are equipped with such a system. The sensors are installed to give supervisors the ability to see pavement temperature around their area of responsibility, and give snowplow operators one last decision point before applying chemicals. Quixote Transportation Technologies (QTT) offers a mobile pavement temperature sensor, known as Surface Patrol. This innovation is a non-contact infrared temperature sensor that reacts quickly to the changing temperatures of the road surface, and measures the air temperature from a separate sensor hidden from the sun and engine heat. The data is then transferred back to an in-vehicle display unit mounted on the dashboard of

Providing road authorities with better weather data enables them to make smarter maintenance decisions

the truck, providing instant feedback to the driver on the pavement temperature throughout their route. As an alternate solution, the data can be connected to a chemical spreader and display temperatures within the cabin.

THE DEW POINT

Nobody would argue against pavement temperatures being the single biggest weather variable to monitor, but another weather condition – dew point – can also be an important factor in determining road surface conditions. Dew point has seen little attention over the years, most likely as a result of a lack of understanding as opposed to its importance – but this poorly understood weather parameter has a huge impact on road transportation. The reason for this is that the problems caused by dew point on our roads go unnoticed by the driver. Heavy rain, ice or snow has a very visible impact on the road, and drivers typically take notice and make adjustments to their behavior. Atmospheric moisture values, on the other hand, are nearly impossible to see, making them even more deadly due to the lack of change in driving behavior. Pavement temperature and dew point can change dramatically over short distances. We only need pavement temperature or dew point values to change by 1°C to cause pavement temperatures to drop below the dew point. Monitoring conditions as we move through different microclimates would be highly valuable.

FILLING IN THE GAPS

QTT has developed a mobile sensor solution for collecting dew point and relative humidity in addition to pavement and air temperature. Indeed, QTT is the first company in the world to commercially offer a sensor product that incorporates pavement and air temperature, dew point and relative humidity in a single mobile platform. The product, known as Surface Patrol HD, is an enhancement to the company's standard Surface Patrol product discussed above. By collecting pavement, air temperature and moisture data you begin to create a true mobile weather station from a vehicle.
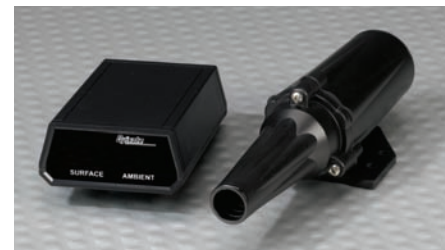
Both the standard Surface Patrol and the newer Surface Patrol HD offer advanced methods of collecting valuable weather data
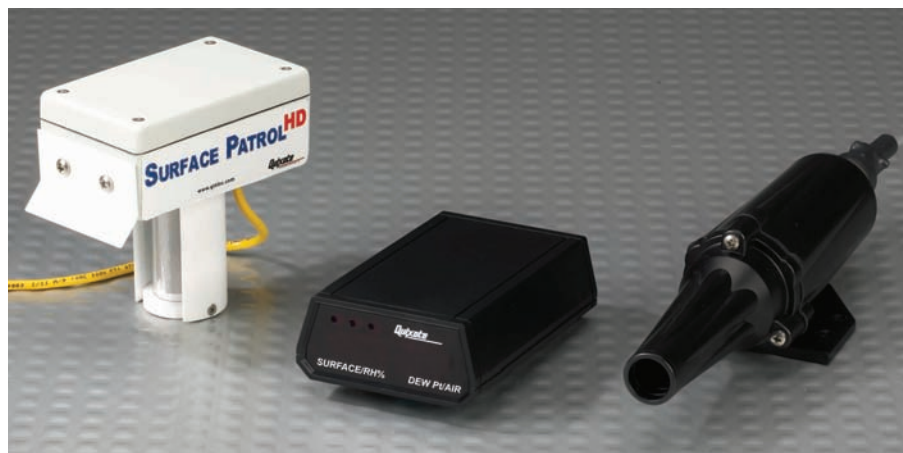
The biggest benefit of the Surface Patrol and Surface Patrol HD is the addition of data points between RWIS stations, making the entire road weather network rich with data. The vehicles provide the infrastructure needed to offset the lack of RWIS data. They can be equipped affordably and they move around, which makes them an excellent source of additional weather data points. These extra data points can provide decision-makers with better information, resulting in better operational decisions. In the example of dew point detection, areas of frost or black ice could be identified, unlike today where we sometimes rely on the first accident to trigger a response. Mobile weather data is the future of road weather information – not replacing RWIS but instead enhancing and improving the overall weather network.

In the future, additional weather parameters could also be sensed by a moving vehicle, providing even more information about the conditions on the roadway. QTT is researching ways to increase its offerings in this field. One slightly surprising outcome of collecting dew point and relative humidity from a vehicle is that it opens up several non-winter applications. For instance, the processes of applying roadway paint markings and vegetation control both require real-time knowledge of the humidity levels in the air. The Surface Patrol HD sensor has the ability to provide operators with this humidity data at the desired location. ■

To find out more information, please contact Quixote Transportation Technologies by calling +1 314 569 1002, emailing melanie.scott@quixotecorp.com, or visiting the company's website at www.qttinc.com

Fit for the future

By deploying blown fiber networks throughout an ITS, not only will you be integrating the latest in data-handling capability, you'll ensure that any investment will deliver a wide range of long-term benefits for authorities and commuters alike

by Kirsteen Graham, Emtelle, UK

Given the amount of data involved and the critical conditions in which an intelligent transport system operates, it's clear that the technology used should be easy to install, offer limitless bandwidth and be future-proof. Fiber – specifically blown fiber – is the technology that best meets these criteria.

"We provide and develop end-to-end Fiber-to-the-X (FttX) passive network solutions," says Tibor van Melsem Kocsis, group marketing and business development director, Emtelle. "Our high-speed fiber solutions carry crucial data between remote locations and control centers, generating benefits for ITS operators, engineers and commuters – such as better traffic flow, fewer accidents, and reduced fuel consumption."

Emtelle has successfully completed ITS projects worldwide. Among these deployments is the M8 Motorway in Scotland, where the company provided tube bundles for mole plowing applications. Fibers were blown from a center point, enabling splice points every 2km. Initial usage is for traffic matrix signs, but the fiber can also be used for emergency telephones, CCTV cameras and other traffic-monitoring systems. On the other side of the world, the Perth Bunbury Highway (Australia) is one of a series of Australian projects in which Emtelle's technology is being used to create systems that can detect incidents and congestion – in doing so allowing proactive traffic management. The equipment involved includes emergency phones, CCTV cameras, vehicle detection systems, and VMS.

CONSIDERED APPROACH

It is important to remember the real-world benefits of ITS. Accidents can be reduced and smooth traffic flows can reduce CO_2, NO and hydrocarbon emissions. Smooth traffic flow can also cut fuel consumption by up to 20% compared to stop-and-go traffic.

To minimize disruption, blown fiber offers different installation methods, including trenching, mole plowing and mini-trenching, as well as traditional dig. A range of ready-to-use products (all immediately compatible) will accommodate the requirements of local environments and conditions.

An ITS demands consistent, high-level network performance – sustained downtime can be extremely problematic. Also, should a network require maintenance or upgrades, the quicker the recovery time, the better. With blown fiber technology, fiber is simply blown in and out of already established ducts: network modification can be conducted with ease, ensuring maximum uptime, enhanced efficiency and a high level of operational security.

In terms of investment costs, a blown fiber solution offers benefits in terms of reduction of the civil work, required skill levels and ease of repair. A fiber-optic infrastructure also saves on energy and therefore on operating expenses (OpEx).

The high speed with which ducts and fiber can be installed is especially valuable when traffic management or road closures are involved. This flexibility also creates freedom should an ITS infrastructure need to be expanded, upgraded or repaired.

Given these benefits, investors in an ITS network can realize a return on their investment surprisingly quickly – flexibility and scalability following the demand for services, reduced day-one capital expenses (CapEx), and lower OpEx, for example.

The convergence of infrastructures has been identified as an important trend, with passive network technologies and applications moving closer together. The same modular passive infrastructure used in ITS can also connect cities and communities with fiber to enable high-speed (>100Mbs) broadband connections. "Clients can capitalize on their ITS investment by partly deploying it for other applications, and can enjoy additional revenues by leasing the infrastructure to third parties," van Melsem Kocsis concludes. ■

For more information, please contact Emtelle by calling +44 1450 364 000, emailing kirsteeng@emtelle.com or visiting www.emtelle.com
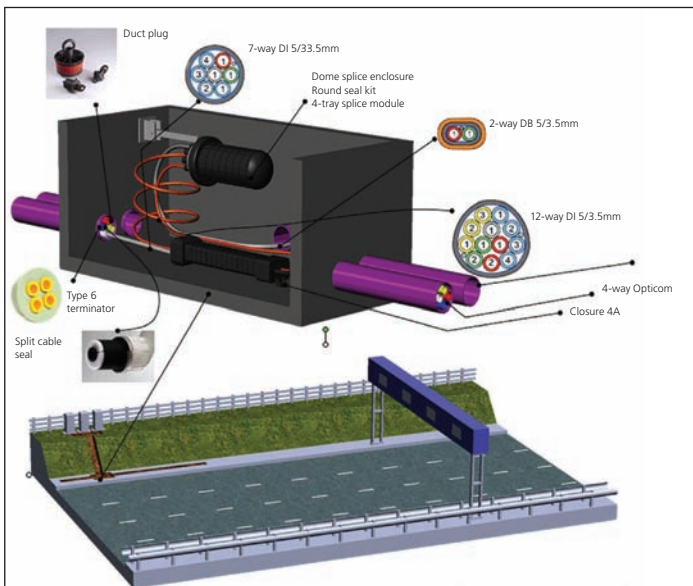
← **Blown fiber solutions are extremely useful for many ITS applications, and are particularly popular for work on motorways**

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Heavyweight ranking

An established player in the weigh-in-motion field is finding new applications for its existing technology, while also reacting to current trends so that it can bring brand-new offerings to market

by Richard Stokes, Central Weighing, UK

Although the use of Slow Speed WIM (SSWIM) for fleet management and law enforcement has been established for more than 25 years, a new market has recently evolved – deploying vehicle classification and weighing systems on toll roads.

In many countries, toll checkpoints are used as convenient locations to inspect large volumes of trucks for overloading, without causing delays for legally loaded vehicles. When such systems are in use, vehicles that are over the legal limits produce an instant visual and audible overload warning and report. Drivers of those vehicles can either pay a fixed penalty fine at the checkpoint, or be directed to a weighstation further down the highway for enforcement teams to deal with.

The UK-based weigh-in-motion specialist Central Weighing has completely redesigned its standard range to meet the demands of this new, rapidly growing market. Its Supaweigh 5000 system, for instance, can now weigh vehicles traveling at speeds of up to 30km/h, and is capable of processing more than 300 vehicles an hour. Despite such speeds, however, it still achieves high levels of accuracy and reliability compared to high-speed systems, which have traditionally been the only option for such tasks.

The system has a capacity of more than 40,000kg per axle, while its instrumentation is sealed to IP 67. With more than 4,000 WIM systems installed worldwide, it carries UK, EC and OIML International approvals. Such operational experience has proved invaluable when designing the new systems, especially as the market reaction has been encouraging, with orders for more than 200 systems taken in the first months after launch, from countries as far afield as Colombia and the Philippines.

EASE OF INTEGRATION
Advanced software has been written specifically for this new market and can be fully integrated with the existing tolling software in any country. Operators can see the vehicles being processed from several lanes at once and benefit from automatic reports and weight analysis for any vehicle that exceeds the legal limit in any country, as

The slower traffic at a toll plaza makes it the ideal location for weighing vehicles

Central Weighing has installed more than 4,000 WIM systems

well as collecting valuable weight data from all vehicles passing through the plazas. The system can also be integrated with AVC and ALPR cameras to provide a fully automated weighing and enforcement station.

The detailed management reports of all weighings include an automatic calculation of equivalent standard axles, which is vital to road concessions and developers alike, providing road wear and design statistics at the touch of a button. In many developing countries, this highlights the fact that many overloaded vehicles are causing up to 30 times the road damage of a legally loaded truck, with the obvious implications for premature road failure and increased road accidents. The investment in this new system

is proving to be a sound commercial decision that saves scarce financial resources.

The new fixed Supaweigh systems are being complemented by the timely introduction of an advanced portable truck scale called Cheklode Freeweigh. Cable-free and in-motion weighing design features separate this product from its competitors. Vehicles are weighed at speeds of up to 6km/h and the wheel, axle and gross weight information is stored in the system's flash memory. Weight tickets can be printed using the integrated high-speed printer or downloaded to a PC using either of the standard USB or Ethernet communications options. The system also features a memory stick facility whereby data can be transported easily and securely to a management PC for further analysis and data storage. It has extensive software capabilities in the operating console and is supported with a comprehensive Freeweigh for Windows software package for the management PC. This can be set up and put into operation by one person in a matter of minutes and will provide a valuable alternative to the fixed products in many countries. The new products are supported by an international network of sales and service distributors in more than 35 countries. ◼

For more information, please contact Central Weighing by calling +44 1299 251242, emailing rstokes@centralweighing.co.uk, or by logging on to www.central-weighing.co.uk

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Brains for roads

Greater tolerance

In the electronic tolling sector, equipment downtime means loss of revenues for operators, with confusion and delay for drivers on the road. But using fault-tolerant design can go a long way to increasing reliability in ORT systems

by John Emerick, TRMI Systems Integration, USA

Whenit comes to Open Road Tolling (ORT), system reliability is far more critical than with traditional single-lane collection systems. If a single-lane collection point fails, the impact is usually minor, and no revenue is lost. Moreover, since the revenue collection is usually distributed over multiple single lanes, the failure of one lane does not impair the operation of the others.

Component failure in ORT, however, can wreak havoc upon the entire system and cause revenue loss. Reliability and maintainability are crucial to the continued collection of tolls and free-flowing traffic. Mean time between failures (MTBF) and mean time to repair (MTTR) are measurements used to characterize system reliability and maintainability. Availability is the operational continuity of the system measured over a period of time, calculated as:

Availability = MTBF/[MTBF+MTTR] = [Uptime/Total Time]

The overall reliability of the system is dependent on the reliability of the individual components. If you can increase their reliability, you will increase the system's availability. But if you increase the component count as a means of boosting availability, you reduce the system's reliability.

Regardless of reliability, individual components will fail, and if they are critical to operation the system will not function properly until they are repaired. One method TRMI uses to increase reliability in its ORT 2.0 systems is fault-tolerant (FT) design. FT is a design approach that permits a system to operate continuously in the event that one or more of its components fails.

The efficacy of an FT system when a component failure occurs can range from transparent, continuous operation to an acceptable level of operation in a degraded mode. In a well designed FT system, no system-critical single point of failure should exist. The system must be able to continue its basic function (collecting vehicle and revenue data in an ORT system) as well as report the component failure, so that full functioning can be restored.

Two variations of fault-tolerant designs are: replicated systems with units operating in parallel so that 'failover' is transparent (N+1 power systems are an example); and redundancy, where components are duplicated so that a secondary source can be used when the primary fails.

FAULT-TOLERANT DESIGN

Designing an effective FT system requires a number of key steps. The critical functions of the overall system that require continuous operation have to be identified. In an ORT/AET application this is generally the lane equipment and the toll zone controller (TZC), which collects and stores the vehicle classification, AVI, and VES data.

If this data is continuously collected and stored, it can be processed later to generate transactions and violations to the customer service center (CSC). Although the central
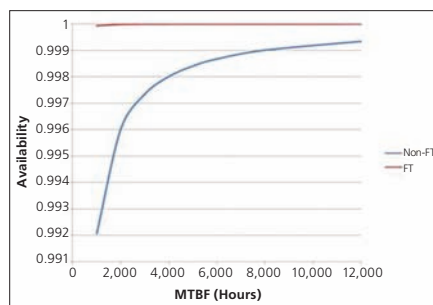
toll database requires high data reliability and should have data redundancy, it generally does not require continuous operation.

Next it is necessary to identify the key components that are essential to continued operation. For example, it may be acceptable to lose a single straddle antenna temporarily and to rely on video tolling as a backup.

Once the functions and components are identified, a strategy for implementing fault tolerance can be designed. Interdependencies need to be examined, especially if redundant components are configured to increase performance in a fully operational system.

Finally, it is important to validate the fact that the design achieves the desired result and that no critical single point of failure exists. Other design considerations must take into account environmental factors, physical trauma, electrical paths, and other issues.

FT's main benefits are increased system availability, improved maintainability and better performance in some configurations. But FT design is not a panacea. It does not remove the need for careful analysis and design, nor the need for the selection of quality components. However, it does permit a system to run with near continuous availability and simplifies equipment maintenance. Overall, FT design is one of the best ways to keep ORT up and running. ∎

For more information, please call TRMI on +1 845 626 8655, email gjameison@trmi.com, or visit the company's website at www.trmi.com

↖ **Functional redundancy of different component types can achieve diverse fault tolerance**

↑ **FT and non-FT system availability using the same components with a two-hour MTTR**

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Connect and serve

The future of transport organization could be defined by the deployment of cooperative systems. A European scheme is showing the value of effective integration, without forgetting about the end user – in this case, the driver

by Alexander Frötscher, AustriaTech, Austria

The advantages of real-time location-specific traffic information and its effectiveness within advanced traffic management are clear. An important European project dealing with this topic is COOPERS (Co-operative Systems for Intelligent Road Safety), which was launched in February 2006, and is currently being demonstrated in six European countries on several motorway corridors.

COOPERS is an integrated project co-funded by the EC (DG Information Society and Media) in the Sixth Framework Programme (FP6). Under the coordination of AustriaTech, 37 partners from 15 European countries are participating. The concept connects vehicles on the motorway to the road infrastructure via continuous wireless communication. It provides vehicles and drivers with safety-related and location-specific real-time information on the current traffic infrastructure status. Ultimately, it will define, test, and validate the potential of infrastructure-to-vehicle communication (I2V) to improve traffic management while enhancing road safety and efficiency.

The validation work will take into account a variety of communication technologies, ranging from broadcast media (DAB, DVB) to cell-based variants (GSM, GPRS, WiMAX) and short- and medium-range media such as CALM-based IR. Project partners have defined and developed an I2V and V2I solution based on two media that complement each other, which has been proposed for the demonstration phase and will be tested with a large number of users.
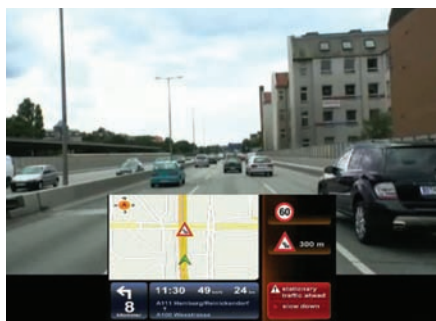
Demonstrating the COOPERS system on the A100 (a busy motorway corridor) in Berlin

A test drive in the COOPERS vehicle, showing in-vehicle HMI

THE COOPERS CONCEPT

COOPERS will be showcased at four sites so that different technologies and user reactions can be tested. These differ in their layout regarding Trans-European Networks (TEN), their approach to traffic information, and their targeted objectives concerning efficiency and/or safety. But the project does not only focus on testing the communication technologies with the defined COOPERS service set. The end user plays a vital role and is taken into account in terms of driver acceptance and user behavior: the impact of high-quality in-vehicle traffic information is being validated by more than 200 drivers in Europe. The safety and efficiency impact of cooperative traffic management on Europe's motorways will also be assessed.

Demonstration site one starts at Nuremberg in Germany and heads south to Munich and the Austrian border at Kufstein, passing Innsbruck and the Brenner Pass onto Verona, Italy. Along the 500km, short-range communication networks have been installed in three segments of more than 20km, which focus on high-speed data distribution using communication technologies such as IR, DAB and DVB.

GPRS and WiMAX are used on the second site on the Belgian/Dutch corridor between Antwerp and Rotterdam, one of the busiest motorways in Europe. The demonstration will focus on the effects of information services tested in the transition period of cooperative systems, in which not all the vehicles are fully equipped with safety systems and road infrastructure safety systems are non-homogeneously available on the international road network. The driver's behavior will be subject to analysis and system validation.
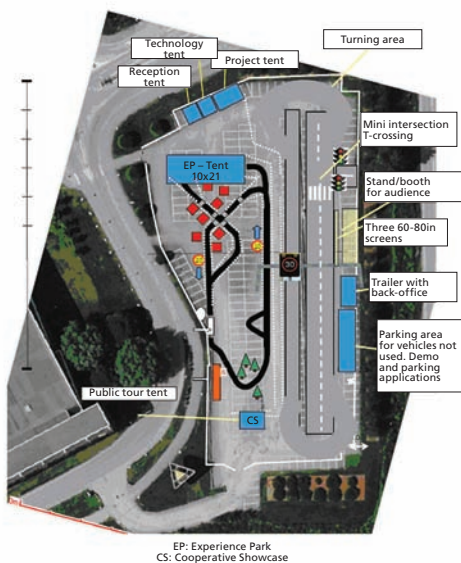
Demonstration site three is on the A100 in Berlin. The aim is to evaluate the transmission of safety-related information based on broadcast-based technologies (DAB) in a city motorway corridor with quickly changing traffic conditions.

Demonstration site four is in France, near Lyon. Here, the impacts of including large numbers of users in the generation of high-quality traffic information is an additional evaluation topic for the future scalability of the COOPERS concept. The communication technology used is GPRS.

SEE FOR YOURSELF

In parallel with the demonstration phase of the COOPERS project, the partners will present an insight into the technical content of the work at the 16th World Congress on ITS in Stockholm (September 21-25, 2009) with the chance to experience a 'virtual test drive' on one of the demonstration sites at the EC's booth. In the outside area of the
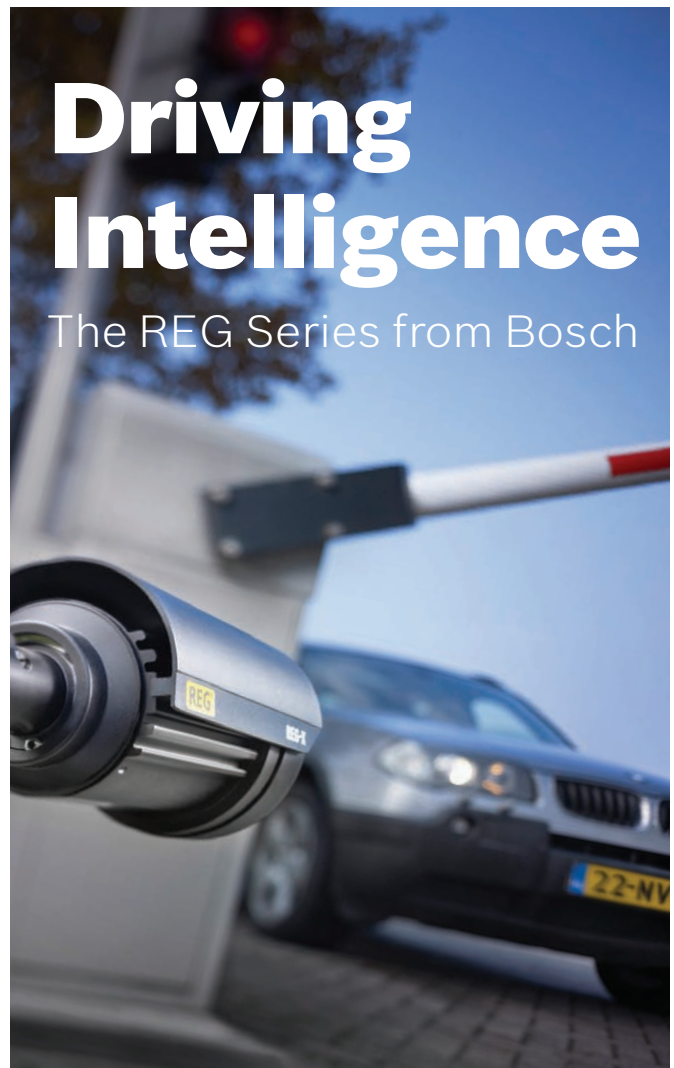
ITS World Congress, visitors can participate in a short public demonstration drive of a COOPERS-equipped vehicle on the roads of Stockholm, which is being organized in conjunction with the European projects CVIS and SAFESPOT. Participants can experience in-vehicle traffic management information such as roadwork warnings or dynamic speed advice. They can also gain an insight into technical elements of the projects and discuss intermediate results of the assessment, and the evaluation procedure, with the industry and research partners.

Technology tent · Project tent · Turning area · Reception tent · Mini intersection T-crossing · EP – Tent 10x21 · Stand/booth for audience · Three 60-80in screens · Trailer with back-office · Parking area for vehicles not used. Demo and parking applications · Public tour tent · CS

EP: Experience Park
CS: Cooperative Showcase

← An aerial shot showing the layout of the demonstrations at the ITS World Congress 2009 in Stockholm

    The unique approach of COOPERS to define and validate the specific role of road infrastructure operators has been recognized by many authorities in the sector as a great change in the concept of cooperative systems. It is not only technical aspects that must be considered: user acceptance, impacts on safety and efficiency, and legal and administration barriers all have to be analyzed and solved, hence the need for field-operational tests at a European level. ∎

To find out more information, please contact Alexander Frötscher by emailing alexander.froetscher@austriatech.org, or visit the COOPERS website at www.coopers-ip.eu

Another dimension

Weigh-in-motion technology continually evolves, with new features being added to promote much faster processing and higher throughput, leading to benefits for the general public, road operators, authorities, truckers, and even the environment

by Bob Susor, Mettler Toledo, USA

Due to rising commercial truck traffic, many existing weighstations no longer have the capacity to check and process such increased volume, meaning that countless violators bypass or continue along the highway without being checked for compliancy, as weighstations are closed due to frequent highway backups. To increase weighstation capacity and ensure that all vehicles are checked, Mettler Toledo has developed a system that includes the integration of weigh in motion (WIM) scales, vehicle dimension in motion (VDIM), license plate readers (LPR), and an overview image of the vehicle. This all-in-one system performs compliance checks in-motion and at highway speeds.

Types of data collected in-motion include weights (wheel, axle, axle groups, front and rear bridge, gross), axle spacing (axle to axle, bridge, overall front to rear), classification, speed, vehicle dimensions, and an overview image. If a vehicle exceeds in-motion thresholds (weights, dimension, LPR database search, speed or just a random selection), it will automatically be directed to a static scale for further investigation and static weighing. Non-violators are immediately directed back to the highway.

In-motion data is used during the static weighing process to determine front and rear bridge thresholds, identify dimensional violators, and for auto calibration of the WIM scale. From this point, if a vehicle does not exceed any static thresholds (axle, axle group, gross, front or rear bridge, king pin, dimension), the system automatically informs the driver to exit. If any thresholds are exceeded, it alerts the operator audibly and visually, and also allows the operator control of signs to instruct the vehicle positioned on the static scale to park, back up, pull forward, or proceed for inspection.

SYSTEM BENEFITS
Weighstation throughput is greatly improved as only vehicles with high probability of violation are directed to the static scale and stopped for investigation. But other features allow the system to operate unattended:
Center of Gravity (COG) – Determines the location of all axles on the static scale so that
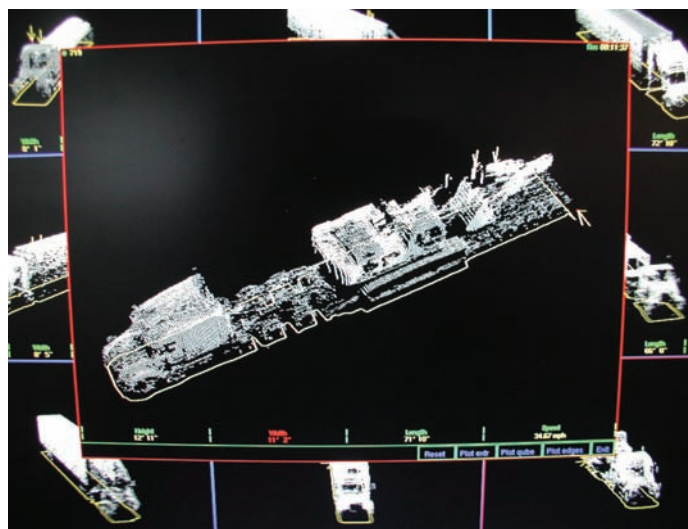
Vehicle dimensioning in motion (VDIM) provides a scanned image of each vehicle. Operators can rotate the image, thereby providing them with the ability to view all vehicle angles. Verification is simple as the image details the longest, highest and widest points

Actual screenshot showing the operator GUI

weights can be checked based on axles per platform or bridge limits.
Static scale auto release – Automatically releases non-violators from the static scale, or alerts the operator of violation.

At every installation, these features have increased inspection and enforcement activities as the system allows officers to focus on vehicle condition, tax registration, and the driver. As a result of its wide-ranging benefits, many stakeholders are served, including the public (improved safety), the DOT (reduced infrastructure wear), the FHWA (better data), the state enforcement office, the trucking industry (reduced waiting time), the environment (fewer emissions), and even Homeland Security.

The system also has the capability of providing planning data per FHWA standards, information of traffic flow within each facility – including average delay time for vehicles directed to static scales – and daily counts for vehicles entering the facility, and daily counts for vehicles statically weighed. The feature allowing the system to sort by LPR and database search can interface with many databases, further benefiting enforcement/safety activities.

So far, users of this Mettler Toledo system have seen immediate results. It provides them with the ability to process every vehicle that passes, their weighstations no longer need to close due to heavy traffic volumes, and hazardous highway backups have been eliminated – in fact, the long lines of vehicles waiting to be statically weighed have reduced by 80% (15 minutes down to three minutes). In addition, the Mettler Toledo system has also increased the detection rate of violations as it provides operators with all of the required data within the graphical interface. Integrating to existing facilities is possible and with the modular design, components can easily be added in the future. ∎

For more information, please contact Mettler Toledo by calling +1 614 638 1162, emailing bob.susor@ mt.com, or alternatively log on to the company's website by visiting www.mt.com

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Road fatalities are on the rise in many countries across the globe. Sagem Sécurité has addressed this problem by developing a wide array of modular solutions for its clients, ranging from automated speed measurement and red light running solutions to automated number plate recognition.
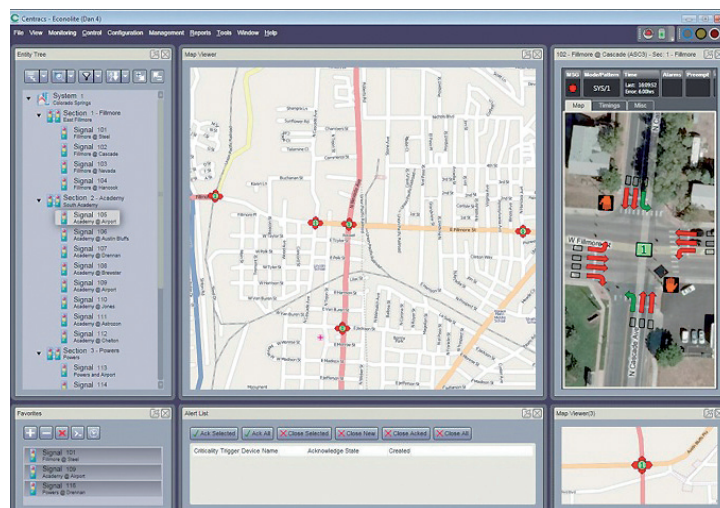
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Road to efficiency

Providing a centralized platform for traffic signal control, ITS field device monitoring and control, information management, and graphical data display, this new ATMS software package could help more effectively manage your increasingly choked roadways

by Frank Provenzano, Econolite, USA

Solving traffic congestion problems can be a bit like your typical home improvement project. Many times it's not what new tools you add to your toolbox that determine whether a job is perceived a success, but how resourceful you are with the tools you already have. With home improvement projects, a trip to the local hardware store to purchase the ultimate power tool usually ends in futility when you realize that the expense doesn't justify the 'hit' to your family budget. As a result of ITS technology, there are tools available to help solve today's congestion problems and with some creativity and ingenuity, you eventually realize that your existing toolbox – coupled with a simple, easy-to-execute approach – can help solve your problem effectively and within agency budget restraints.

Congestion is the kind of traffic management problem that needs constant attention, and perhaps a major renovation if it persists. The FHWA estimates that over 75% of the approximately 260,000 traffic signals "…could be improved by updating equipment, or by simply adjusting and updating the (traffic signal) timing plans". It is further estimated that "poor traffic signal timing accounts for 5 to 10% of all traffic delay, or 295 million vehicle-hours of delay on major roadways alone. Traffic signal retiming is one of the most cost-effective ways to help traffic move and is one of the most basic strategies to help mitigate congestion."[1]

A modern Advanced Transportation Management System (ATMS) such as Econolite's new Centracs ATMS can assist agencies in developing effective traffic signal management processes and implementing effective signal timing practices. A well-utilized ATMS eliminates the need for a reactive 'fire-fighting' approach to solving traffic problems and compensates for an agency's budget constraints or insufficient operation and maintenance resources.

CONGESTION MITIGATION TOOLS

An ATMS like Centracs provides the Traffic Management Center (TMC) with basic functionality designed to facilitate efficient traffic network operations. ATMS applications today focus on IP-based networks that enable the agency to remotely communicate with the signalized intersections in their jurisdictions. These networks communicate with field devices using Ethernet hardware and IP-based communications, whether it be spread-spectrum wireless radios, fiber-optic interconnect, or Ethernet-based copper cabling. Centracs supports remote intersection monitoring and control, including receiving signal status and uploading/downloading field data and control parameters from each traffic controller and cabinet device.
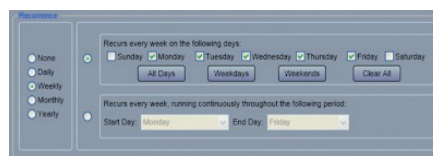
THE SCHEDULER

Today's ATMS isn't complete without a way to 'schedule' various traffic signal operations. One very simple but effective way to execute a variety of signal timing plans is to use a scheduler to handle changing timing plans at different times throughout the day, day(s) of the week, or weekend-only occurrences. In essence, the ability to schedule when a specific timing plan is executed allows the agency to automate the process of changing timing plans to accommodate distinctive traffic patterns.

At first look, you might not consider a simple scheduler as the most effective congestion mitigation tool available to the traffic engineer, but when you consider the known traffic patterns in your region, you can probably anticipate what times roads are most congested. For example, using one timing plan that focuses on moving traffic through a major arterial during the morning commute, say before 09:00hrs, and then reverting back to another more relaxed timing plan after 09:00hrs to accommodate the local traffic does reduce congestion by

← **Centracs has been designed for scalability and efficiency, and features an intuitive user interface**
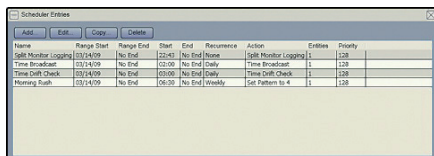
↑ **The Centracs Scheduler – invaluable for managing special occurrences**

↑ **Weekly recurrence spanning multiple days can be set up with the recurrence setup tool**

smoothing out traffic flow and reducing stop-and-go traffic, especially during critical peak-hour times.
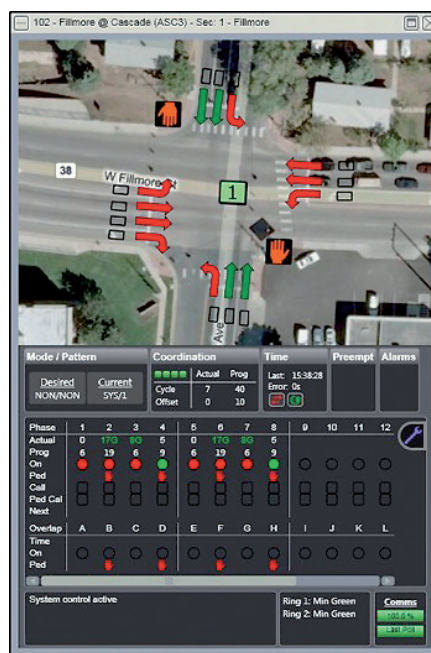
A scheduler used for initiating signal timing plans is perhaps most effective for weekend traffic and holiday travel patterns, when fewer people are on the roads and commuter traffic is greatly reduced. A scheduler is also invaluable for managing special occurrences, such as sporting events and concerts, which are typically organized well in advance and attendance can be predetermined. This level of versatility and automation gives traffic engineers a means to provide a dynamic congestion mitigation solution, which is both effective and adaptable to a number of different congestion scenarios.

USING SCHEDULER IN CENTRACS
Most operations that are time-based – either recurring operations or those that are set to happen at a single, particular time – are configured using the Centracs Scheduler. Such operations include pattern selection, special functions, time broadcasts, time-drift checks, signal upload and compare, and more.

Once you have selected a Scheduler action and specified its associated parameters, you must decide what kind of recurrence you want. Recurrence is a way of specifying the days in which the action should be run. It suggests that an action can be set to run daily, weekly, monthly, or annually. Perhaps the most common and easiest to understand is 'weekly' recurrence, which lets you think of the calendar in terms of one week where you specify the days within the week in which the action should run. Then, because of recurrence, each succeeding week would be treated the same.

Recurrence specifies the particular days in which the action should be run. Without any further specification, the action would be run on those days forever – from now to eternity. The date 'range' gives you the opportunity to put boundaries on the date that the scheduler should start performing the specified recurrence, and on what date it should end. You can also use the 'repeat every year' option, which allows you to set

up seasonal scheduling, telling the system to start and end the scheduled entry every year.

Finally, we must consider the time of day that the action is run. We know what days the action should run based on the recurrence and the boundaries of the start and end dates. The times specify when the action should start and end on each of those days.

Another way of specifying weekly recurrence is to specify an action that should start on one day of the week and end on another. The action is essentially left running for more than one day. In this case, the start and end times are not applied to each day, but rather the action is started at the specified start time on the specified 'start day' and ended at the specified end time on the specified 'end day'.

Daily recurrence can be specified so that the action occurs only once (as previously shown) or so that the action repeats at some specified interval throughout the day. In the latter case, the start and end times are used to specify when the repetition should start and when it should end within each day. As a result, you can set up an action to repeat

Centracs makes it easy to configure, monitor, and control field assets, such as this intersection control display
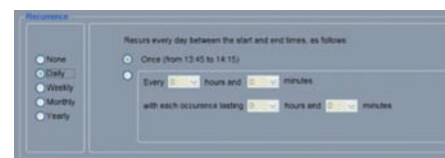
Daily recurrence can be specified within the Daily Recurrence setup tool

once an hour beginning at, say 06:00hrs and ending at 19:00hrs. In this case, the action has duration, and that duration is specified by the period applied in the 'daily recurrence setup'.

CONCLUSION
Often the simplest solutions provide the most effective results. With technology today, such as Econolite's Centracs ATMS, many features, modules, and utilities can assist the traffic engineer in providing an effective means to deliver on an agency's congestion mitigation objective. Our congestion mitigation toolboxes are plentiful, so the challenge is to find creative ways to utilize what we have already deployed. You might be surprised at what you find inside! ∎

References
[1] *USDOT – FHWA. Focus on Congestion Relief, http://www.fhwa.dot.gov/congestion/toolbox/ service.htm, 2009*

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Statistical evaluation

The deployment of a new traffic management system aimed at reducing congestion and improving journey times for all road users in Bucharest, Romania has already generated some remarkable results. Further expansion is on the cards

by Richard Neumann, Swarco, Austria

The Bucharest traffic management system (BTMS) is an ambitious, integrated system that relies on advanced telematics solutions for a number of applications, such as adaptive traffic light control, public transport fleet management, multimedia travel information, and mobility forecasts. The system was implemented as part of a joint venture between Austrian organization Swarco and its Romanian cooperation partner UTI. The project tender was won in 2007 and the scheme was executed in several stages, with the final stage being completed recently. Now, 100 intersections are equipped with new technology, so enabling full intersection coverage and management of the entire public transport fleet. There were several goals in mind when designing the system, including significantly decreasing traffic congestion, reducing total travel time by at least 15%, and giving priority to public transport vehicles at intersections. The contractual portion was completed in just over a year, as a result of a joint effort between Swarco Project Management, its affiliated companies (Mizar Automazione, Swarco Technology, Swarco Futurit and Swarco Sicor), as well as UTI.

EFFECTIVE INTEGRATION

The BTMS is monitored from a newly built traffic control center and is based on the functional integration of eight main subsystems. These include urban traffic control, public transport management, CCTV, strategy supervisor, fault management systems, network management systems, performance monitoring, and a traffic and travel information interface with a common graphical user interface (GUI). The ITS applications operate in the context of an open modular and scalable integrated architecture, designed and implemented following recommendations that have emerged from advanced EU research projects such as QUARTET PLUS.

Prior to the BTMS, there was constant congestion in the center of Bucharest. Since the new Euro 18.5 million system was launched, however, there has been a visible reduction in congestion in the controlled

← **Bucharest is the capital city of Romania and its metropolitan area has a population of 2.6 million**

area. Indeed, a traffic study conducted in March 2009 by the University of Bucharest set out to objectively evaluate the benefits of the system as compared with a study conducted in March 2008.

The methodology behind the system was to measure two main parameters: total travel time spent by a car on two routes inside the controlled area; and traffic flow volumes. The period of time for assessment was between March 2008 and March 2009. The results are extremely encouraging. Although traffic volumes increased over this period by 5%, total travel time decreased by 20%. The total

The BTMS project encompasses a wide part of the road network in Bucharest

CO_2 emissions reduced by 10%, which is not an insignificant figure, particularly when you consider the long-term benefits of continued reductions. The study estimates the savings as 600 tons of CO_2 per year. As well as being beneficial to the environmental cause, implementation of the system offers savings in terms of hard cash, too, with estimated savings due to improved travel times being around Euro 1.5 million.

A LOOK AHEAD

Further expansion of the BTMS has great potential for the city, with its 1,000 intersections and a fleet of 4,000 public transport vehicles – both in terms of traffic management and the additional environmental benefits. The study suggests that if buses and trams are integrated with the UTC system (thereby enabling public transport priority), passengers could save 25% in travel times, as well as leading to reduced costs for operators. "I hope one day the benefits of BTMS can be brought to other areas of Bucharest, so that all road users can experience reliable journey times and stress-free traveling," concludes Professor Vito Mauro, Mizar's managing director and telematics teacher at the Polytechnical University of Turin. ∎

For more information, contact Swarco by calling +43 5224 5877 45, emailing richard.neumann@ swarco.com or visit the company's website at www.swarco.com

The perfect mix

ATM systems are being widely deployed on roads in certain sections of Europe, with specialised software controlling many sections of freeway. Operators are seeing impressive results in terms of improved traffic flow, fewer accidents and cost savings

by Dirk Hübner and Christoph Schwietering, Heusch/Boesefeldt, Germany

Active Traffic Management (ATM) is a common feature on freeways throughout Germany and Austria. In Germany, about 10% of the 12,360km of freeways have ATM, and in Austria the ratio is even higher – 470km of freeway is equipped, representing more than 20% of the network.

Automatic traffic control – such as speed harmonization based on traffic volumes, weather conditions or congestion warnings – is used on many freeway sections, with Heusch/Boesefeldt software managing approximately 50 different section control systems in Germany and Austria. Alternative route recommendation via travel time information on VMS or specific rerouting signs (using prism technology) is applied in specific areas, including in Rhine-Main at more than 40 locations around Frankfurt. Ramp metering is mainly used in the densely populated Ruhr area, where a large number of commuters use the highways in addition to the through traffic. There are 80 access ramps equipped and controlled by Heusch/Boesefeldt systems, resulting in less congestion and an increase in the traffic's mean velocity of up to 10km/h.

Temporary use of the hard shoulder as a driving lane during peak hours is another popular strategy. At times this increases capacity by up to 30%.

The tidal flow system installed at Hanover is a very special application employed during the Hanover Fair. Here the 2+2 expressway is used in a 4+0 mode to get the Fair traffic

Traffic control system on expressway S1, in Vienna, Austria

– 40,000-45,000 extra vehicles – to the event during the morning peak period, and away in the evening. The technology operates automatically, enabling the number of traffic police needed on site to be greatly reduced, which leads to significant cost savings.

ENABLING AUTOMATION

Automatic operation of a traffic control algorithm is based on the acquisition of traffic and environmental data, such as volume and speed, occupancy, and time gaps, as well as visibility, precipitation intensity and temperatures. All this data is obtained from the roadside units. It is then transferred to the traffic control center at set intervals, which can be every 15 seconds, or any multiple of that number. Following a check for consistency, the data is used
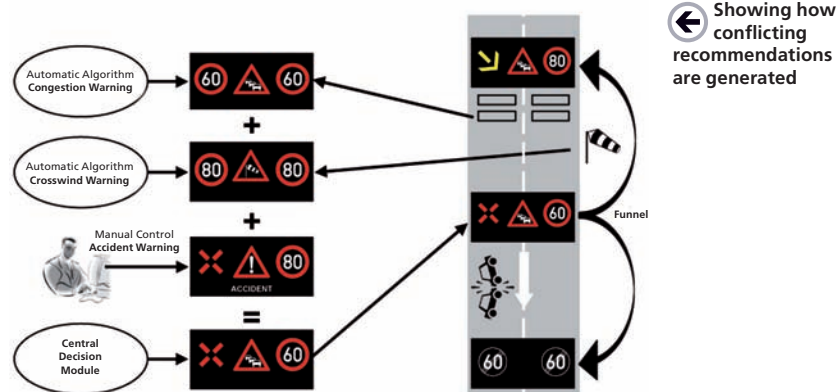
in the algorithms to determine the traffic and environmental conditions. There are algorithms to detect congestion, particularly dense traffic or disturbances in traffic flows. Even issues such as a very high percentage of trucks or a great variance in individual speeds can be detected.

Each of these algorithms results in a recommendation to display predefined messages on the VMS. These have different aims, such as harmonizing traffic flows to avoid congestion, warning of congestion, or imposing speed limits due to slippery roads.

Recommendations may possibly be in conflict with each other so a central decision-making module is necessary. Such a module is able to take priorities and consistency rules into account and only relay those messages which best fit the overall situation.

Depending on topological conditions, road characteristics (such as curves and gradients) and other local factors, the resulting signaling can be assigned individually. To achieve this, the parameters for the control algorithms and the central decision-making module can be adjusted.

In certain situations, decisions taken automatically then have to be modified manually. The ability to manually intervene means that operators can react to incidents such as accidents or other events that temporarily affect the roads. Intervention by the operator may be done in 'manual' or 'special' mode. While settings in manual mode cannot be overruled by the automatic


Automatic Algorithm Congestion Warning

Automatic Algorithm Crosswind Warning

Manual Control Accident Warning

Central Decision Module

Showing how conflicting recommendations are generated

Funnel

components, in special mode the settings are mixed with other recommendations based on the module's priority and consistency rules.

An example would be when a traffic operator closes a lane and imposes an 80km/h speed limit because of an accident. Despite the accident downstream, the traffic algorithms can still adapt the sign settings to the current traffic situation. Manual control remains active either for a user-defined period of time, or for as long as the operator chooses to keep it activated.

Prior to the activation of any signs or signals on the freeway, the settings are laterally and longitudinally adjusted. The system also checks for any hardware
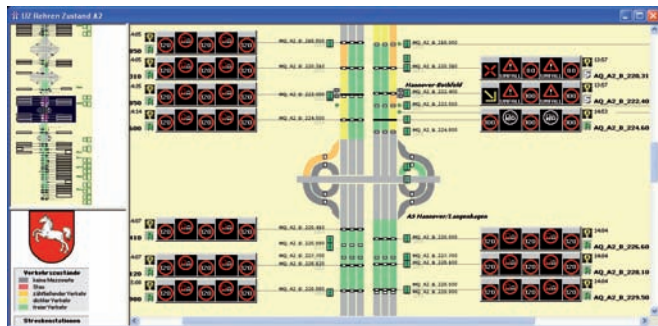
breakdowns that would prevent the required settings being shown. If problems are detected, error treatment rules can adjust the settings so that different traffic control methods can be seamlessly integrated, ensuring that road users still receive logical and coherent instructions.

Modern traffic control systems make use of a variety of proven, widely available control methods. The key factor for success is the integration of the methods employed. There are many possible control recommendations so automated support for the decision-making has to be in place to take reaction times and operational costs into account. A measurable reduction of congestion times of more than 75% has been achieved in certain areas by a combination of these and other traffic control measures. ■

To find out more, please contact Heusch/Boesefeldt by calling +49 241 9669 0, emailing dirk.huebner@heuboe.de, or visiting www.heuboe.de

System status screen of a traffic control system on Highway A2, Lower Saxony, in Germany

Partners in integration

501 Freeway incidents cause injuries, congestion, increased environmental pollution, and cost millions of dollars every year in delay and damage. Minimizing emergency crew response time to incidents is crucial. Rapid response increases the survival rate of those with serious injuries and minimizes jams and potential secondary incidents.

Today's video detection systems set the standard in quick detection and have become a necessary tool for intelligent traffic management. Automatic Incident Detection (AID) technology is proving its worth on roads across the world.

For this year's World Congress on ITS, Traficon, ISG and Optelecom-NKF are joining forces to present the latest solution on the market – IP-based AID. The integration of Traficon's intelligent AID algorithm into Optelecom-NKF's IP video server technology

has led to a new robust and compact video detection platform. It provides traffic authorities moving toward IP solutions with a sophisticated instrument to improve traffic flows and safety. ISG, a local system integrator, will highlight local AID projects and share its expertise in ITS projects.

CONTACT

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Assistance in detection

502 Intelligent traffic cameras that detect jams as they build up are set to help Transport for London (TfL) in its fight against congestion. They are able to automatically spot and alert TfL's control center if congestion builds up, allowing operators to identify and deal with incidents much faster. Operators can focus on dealing with congestion rather than trawling through all 1,200 of London's cameras looking for jams.

The image-recognition incident detection (IRID) technology has

been developed by TfL's technical experts in partnership with Ipsotek. Operators receive between six and 10 alerts each day and around 80% of these are verified as genuine congestion problems. In one month alone, 64 incidents of congestion were picked up via the alerts before operators, police or members of the public were able to flag them. The cameras are positioned at junctions where it is known that congestion can build up onto surrounding roads and have a severe impact on traffic.

CONTACT

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> "If just two thirds of drivers start to use this technology in London alone, the number of annual road casualties could be cut by 10%"
>

Moving beyond ALPR

503 Stemmer Imaging is Europe's largest imaging technology provider, with subsidiaries in Germany, the UK, France and Switzerland – and more than 30 years of experience in demanding markets. The company offers a complete range of imaging components and consulting services required to build reliable vision solutions for the traffic market, and was the developer of the Common Vision Blox software platform.

The main 'know-how' the company offers is how to get a good image, how to handle it, and how to process it – and all in the most cost-effective way possible.

A range of imaging components is available, including illumination, optics, cameras, cables, acquisition, software, systems with smart cameras, PC systems and recorders, as well as all kinds of imaging accessories. This broad range of components and systems, – plus the company's years of experience and its comprehensive support services – allow it to offer everything needed to use imaging technology to perform well in traffic applications.

Capabilities specific to the traffic management and ITS market include vehicle class identification, intelligent traffic systems, light-tolerant ALPR systems, vehicle
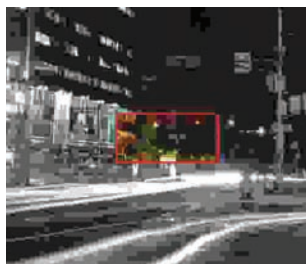
model identification and automatic danger detection. A broad range of applications are covered, from toll booth and congestion charging to parking and enforcement. Other popular applications include high-resolution motorway/traffic surveillance, vehicle stopping/turning identification, traffic sign and road furniture recognition, as well as detection of vehicles against the flow of traffic.

Stemmer Imaging responds to market demands so that it can offer a range of proven, application-driven solutions and the support necessary to make the most of them.

CONTACT

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Continued innovation

504 Nowadays, we are facing a steady increase in the number of vehicles on the roads – both commercial trucks and passenger cars – that has resulted in a similar increase in the number and severity of traffic jams. The increase in heavy goods vehicles aggravates the overload problem, affecting the lifespan of roads, bridges and other constructions. This situation also provides challenges regarding the installation and operation of weigh-in-motion (WIM) systems, and affects WIM technology itself.

Kistler has always been a company that is heavily focused on innovation. To keep up with these changing times and to respond to the needs of the industry, it has developed a new generation of quartz WIM sensor. In order to reduce the complexity of sensor assembly, installation, cable routing and also the price, the double-length Lineas was developed, which is perfect for use in WIM applications. It is fully compatible with the previous version (with a length of 0.75m or 1m). The most noticable difference is that one sensor row covering a traffic lane now consists of only two sensors

instead of four. As a result of the new length (1.5m, 1.75m or 2m), sensor installation and cable routing can be conducted faster and more easily. As a result of this, system and installation costs are lower.

The sensor is based on quartz technology, which guarantees excellent properties, such as high accuracy. It also promises long-term stability and is unaffected by temperature changes. Kistler's latest sensor was brought to market at the end of 2008 and has received a high rate of takeup.

It is being requested more and more often for various WIM applications all over the world, including data collection, weight enforcement and tolling.

CONTACT

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Q

This issue, we ask some of the US DOTs how they are investing in intelligent transportation systems with their federal stimulus cash?

A "Kansas DOT is using approximately US$4 million from the stimulus funds on transit for ITS improvements in our rural areas. This includes US$3.5 million to improve the 800MHz towers that will allow vehicles to communicate with dispatchers over longer distances. Approximately US$500,000 will be used for dispatching software and hardware for both the dispatcher and the transit vehicle. Because the stimulus is 100% federally funded, the equipment will be provided at no expense to the local transit operator. Our operators are so pleased about this, as they would not be able to afford the equipment without this program. This will also allow them to dispatch vehicles throughout their regions, which will provide more efficient service across Kansas."

Lisa Koch
public transit manager,
Kansas DOT, USA

A "The Colorado DOT is incorporating ITS in two high-profile projects in the Denver Metro area. The first is the C-470 state highway project, valued at approximately US$31.5 million. This existing ARRA construction project includes concrete slab replacement, resurfacing, conduit and fiber optics and bike path repairs. This project will provide fiber interconnectivity with the existing I-25 fiber-optics, allow for device connectivity, and provide real-time travel information on the corridor. This project will also provide a redundant fiber ring for the Denver Metro area for sections of I-25. The other project is the future US 36 (for which we are applying for a TIGER grant), which may include technology to implement HOV/HOT lanes, bus queue-jump priority on ramps, fiber-optics, and ITS interconnected and integrated with existing systems to perform these applications."

Ken DePinto
ITS branch manager, Colorado DOT, USA

A "The Minnesota DOT has an allocation of US$502 million in ARRA funding for roads and bridges. We are including ITS components in a number of our projects in the Minneapolis-St Paul area, including upgrades in lighting and signals, improvements in our fiber-optics capability, and additions to our changeable message signs and CMS control shelters. ARRA allows us to add these ITS pieces earlier than we had planned, which will provide great benefit to the traveling public in the near future in terms of safety and traffic management."

Jon Chiglo
Mn/DOT ARRA program manager, USA

A "Pennsylvania faces a variety of transportation challenges and one vexing issue is dealing with traffic congestion. We have an ongoing ITS initiative, which has delivered transportation management centers to the Philadelphia, Pittsburgh and Harrisburg regions, and advanced an ever-increasing network of electronic information signs and more than 400 cameras to help us manage incidents and keep lanes flowing. With President Obama and Congress making US$1.026 billion in money through the American Recovery and Reinvestment Act (ARRA) available to Pennsylvania, we felt it prudent to use a portion of that money to further ITS. As such, we allocated US$79.5 million – or nearly 8% of the ARRA funds coming to Pennsylvania for highways and bridges – to ITS. We are undertaking an expansion of ITS along I-95 in the Philadelphia region, the most heavily traveled route in the state, and in the Lancaster, York, Harrisburg, and Reading regions of Pennsylvania. These projects are helping us to expand ITS and further our goals of managing incidents and traffic in a way to improve the travel experience for the people of – and visitors to – Pennsylvania."

Allen D. Biehler
PennDOT Secretary, USA

A "The Arizona DOT is using a portion of its Recovery Act dollars to fund an ITS project in Southern Arizona. The project – located at the I-10 and I-19 interchange in Tucson – is expected to cost US$9 million. Construction will likely start this fall and should be completed by fall 2010. The project includes the following Freeway Management System (FMS) components: four DMS, 16 CCTV cameras, 10 traffic signal connections, 75,000ft of fiber-optic cable, and 32 traffic detector stations. Several local governments throughout Arizona are also expected to include ITS components as part of their ARRA projects. Arizona DOT oversees the distribution of funds for local government ARRA projects, as required by federal guidelines."

Laura Douglas
public information officer,
Arizona DOT

TTi **READERS ARE INVITED TO ANSWER THE BURNING QUESTION FOR THE OCTOBER/NOVEMBER ISSUE:**

The use of ALPR in ITS is expected to double, possibly even treble, over the next five years. What technological advancements do you predict will improve the effectiveness of such systems in the future? email answers to traffic@ukintpress.com

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