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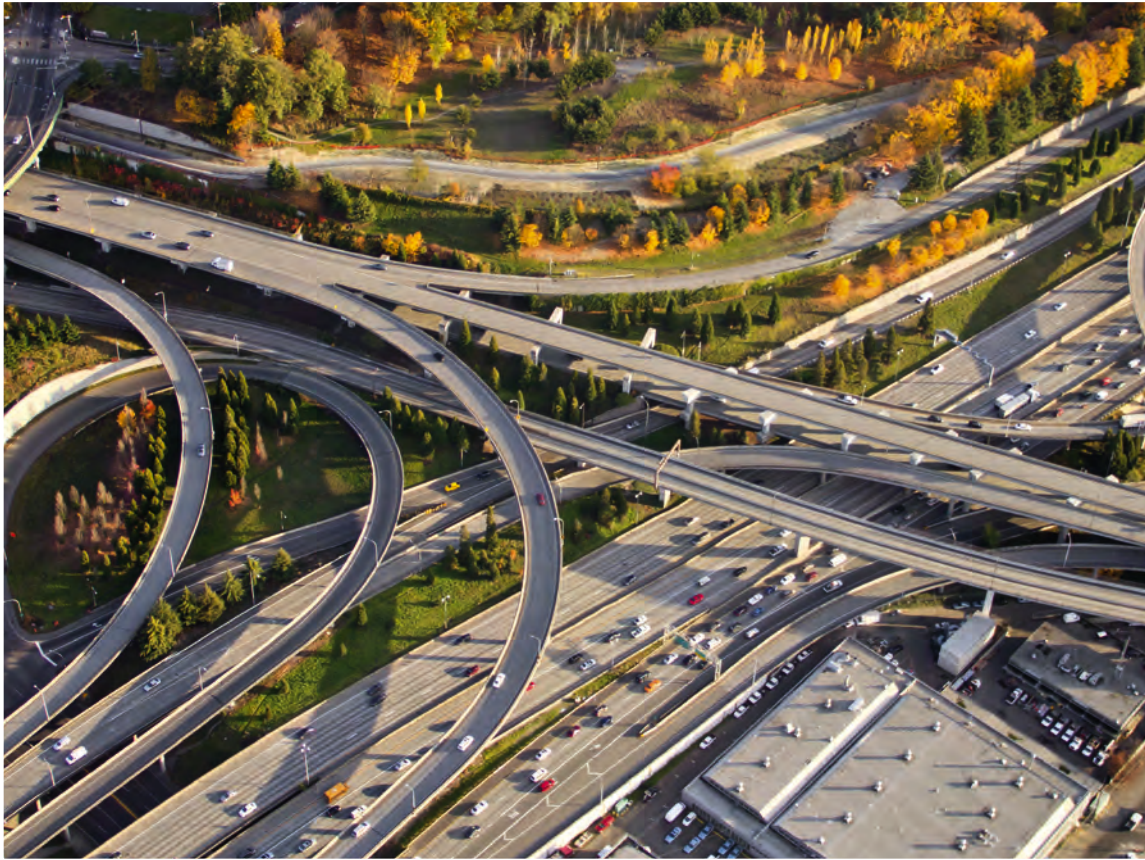
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Mobile technologies are set to bring us multimodal travel on demand

Jan Stojaspal asks if subscription-based services will soon become more attractive than owning a vehicle

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Editor's letter



This year's ITS World Congress in Bordeaux powered the industry forward at such a rate that it made the previous gathering in Detroit, just 13 months earlier, seem almost retro by comparison. Representatives from the space industry were in attendance for the first time and they made

a massive statement about the potential of their technologies in transportation. The ever-falling prices of satellite communications mean that now, for the first time, it is viable to include them as a backup system for connected vehicles – keeping them 'visible' when terrestrial systems fail, and making the dream of total connectivity a reality. There was even a 'proof of concept' in the shape of a British police car, unveiled for the first time by the UK's independent Satellite Applications Catapult. You can read more about it in our exclusive report at traffictechnologytoday.com/police.

Not everything in Bordeaux seemed quite so futuristic, however: after each day of excitement at the Congress, the *TTI* team was inevitably brought back down to earth with a bump by the €40 (US\$45)

taxi fare back to our hotel. While it didn't seem like a World Congress-worthy transportation solution, it did bring sharply into focus another major theme of the week – Mobility as a Service (MaaS). Representatives from ITS Finland did an excellent job of promoting the concept, with a stand featuring a display of how mobility 'packages' could be sold, much like cell phone ones are today, with users being able to pick and choose their inclusive minutes (or in this case, miles). Could this really work? Based on calculations done ahead of a forthcoming MaaS trial in sparsely populated Lapland (which you can read more about on page 10), unlimited taxi use will come in at less than €10 a day – a figure that made getting around Bordeaux on a taximeter fare feel less like a service and more like an anachronism.

What's more, the fact that MaaS will also one day include seamless access to public transit, as well as driverless cars, explains why many are predicting that the days of widespread private car ownership are now numbered. How exactly will this radical shift come about? Turn to page 36 for our thought-provoking cover story.

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The views expressed in the articles and technical papers are those of the authors and are not necessarily endorsed by the publisher. While every care has been taken during production, the publisher does not accept any liability for errors that may have occurred.

Traffic Technology International USPS 012-893 is published bi-monthly – in February, March, April, June, August, and October by UKIP Media & Events Ltd, Abinger House, Church Street, Dorking, Surrey, RH4 1DF, UK. Annual subscription price is US\$125. Airfreight and mailing in the USA by agent named Air Business Ltd, c/o Worldnet Shipping USA Inc, 155-11 146th Street, Jamaica, New York 11434. Periodicals postage paid at Jamaica, New York 11431.

US Postmaster: send address changes to *Traffic Technology International*, c/o Air Business Ltd, c/o Worldnet Shipping USA Inc, 155-11 146th Street, Jamaica, New York 11434. Subscription records are maintained at UKIP Media & Events Ltd, Abinger House, Church Street, Dorking, Surrey, RH4 1DF, UK. Air Business is acting as our mailing agent.

published by **UKIP**

abc Member of the Audit Bureau of Circulations

Average net circulation per issue for the period January 1-December 31, 2014 was 17,408
Annual subscription US\$125/£78
USPS Periodicals Registered Number 012-893

ISSN 1356-9252

Traffic Technology International

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

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Driving ahead

From autonomous trials and driverless pods, to data security and buses, **Mark Hall** rounds up the latest headlines in the field of autonomous and connected vehicles

Autonomous Vehicle TEST & DEVELOPMENT Symposium 2016

Don't miss the latest autonomous-vehicle research from the industry's leading experts at the Autonomous Vehicle Test & Development Symposium 2016. Find out more about the call for papers and book your delegate pass at autonomousvehiclesymposium.com

Simple setup

Scientists at the Singapore-MIT Alliance for Research and Technology (SMART) have demonstrated golf buggies that run autonomously, using a relatively small amount of technology. "They are not as heavily instrumented as, say, the Google car," says Daniela Rus.

Watch the video here traffictechnologytoday.com/smart

Autonomous Aussies

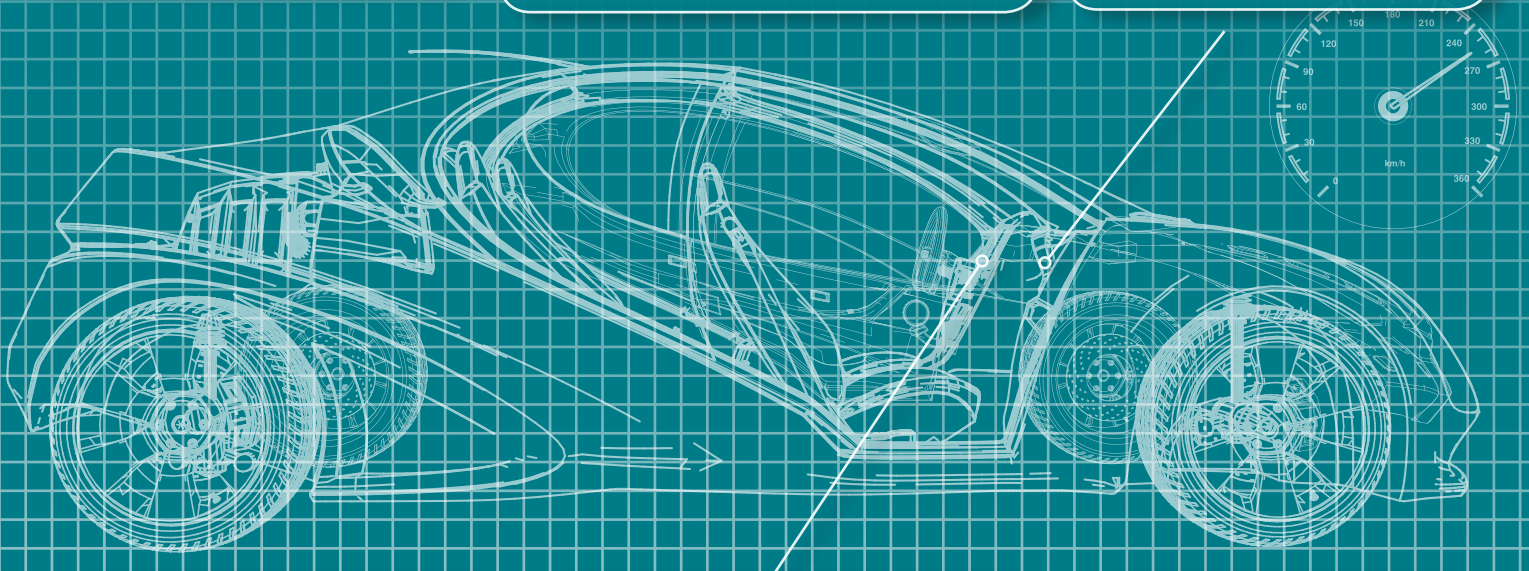
Laws allowing for the on-road trials of driverless cars were recently introduced in South Australia. The state's transport and infrastructure minister, Stephen Mullighan, introduced the bill, which positions the state at the forefront of an industry projected to be worth A\$90bn (US\$63bn) in 15 years. The bill provides exemptions from existing laws to allow trials to take place on public roads.

Find out more at traffictechnologytoday.com/southaustralia

Data security

The connected car of 2020 will create 350MB of data every second. As such, data security is a prime concern for car manufacturers and consumers alike. IBM has analyzed the types of information at risk and is investigating how the threat can best be managed.

Watch the video here traffictechnologytoday.com/ibm



Driverless bus trial success in China

In September, China's leading bus maker, Yutong, successfully completed a self-driving trial on the intercity road from Zhengzhou to Kaifeng. The 20-mile (32.6km) intercity route included 26 sets of traffic lights. The autonomous bus completed a series of complex driving maneuvers, including automatic lane changes, overtaking and responding to traffic signals.

Find out more at traffictechnologytoday.com/bus

The day hackers took control of a car

The story, from *Wired* magazine, of how two hackers were able to take control of a Jeep remotely as it cruised down the highway made international headlines earlier this year. The stunt exposed vulnerabilities in the vehicle's infotainment system, which alerted the industry to the potential risks of connectivity. Jeep quickly released a patch to fix the problem. Nevertheless, this video still serves as a timely warning to other manufacturers.

Watch the video at traffictechnologytoday.com/jeep

UK's self-driving pods unveiled

The first of three 'pod' vehicles has been unveiled in Milton Keynes, UK, as part of a project to trial automated vehicles in pedestrianized areas. The pods, which have a maximum speed of 15mph (24km/h), will be able to map and 'learn' their environment and run autonomously along set routes around the city.

Find out more at traffictechnologytoday.com/pod



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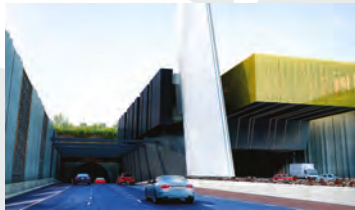
Critical infrastructure

Lloyd Fuller highlights the latest developments in road tunnel and bridge management, operations and safety

Intelligent operation

New Zealand tunnels to get advanced management system

 Spanish technology company SICE is to design, supply, install and commission the ITS management and control systems for the Waterview Tunnels Project in Auckland,



New Zealand. SICE is already working to deliver all the mechanical and electrical systems for the twin bore 1.5-mile (2.5km) tunnels and soon its SIDERA software platform will control the tunnels' traffic and plant devices. The SIDERA platform will enable the New Zealand Transport Agency and Auckland Transport to keep their 'One Network Operation' concept, as SICE's solution can be interfaced to their current back office system. The interface will be built using the lessons learnt in the two most recent projects delivered by SICE for RMS (Roads and Maritime Services) in New South Wales, Australia.

National asset

Algerian tunnel to undergo ITS modernization

 Algeria's Bouïra tunnel, which is situated on the strategically important East-West highway, is to be modernized. The project, which aims to adapt the tunnel's systems to Eurocode, the European quality and security standard, will run for 15 months. Indra will supply



its Horus intelligent traffic and tunnel management system, enabling centralized control of the tunnel's different ITS. The tunnel will also be equipped with automatic incident detection and video surveillance systems using CCTV, signaling systems, fire detection, communication, lighting control, ventilation and SOS posts. The high level of automation will aid operators with quick and accurate management of everything that happens in the tunnel, both for daily control, as well as during emergency situations.

Air support

Drones could be used to improve bridge safety in Minnesota

 The Minnesota Department of Transportation (MnDOT) has been exploring ways to control cost and manage risk on the state's 24,862 bridges by using drones. A recent study has looked at the effectiveness of employing unmanned aerial vehicles (UAVs) – or drones – to aid in bridge inspections, by gathering images without the use of an under-bridge

inspection vehicle. You can view a video of the test here traffictechnologytoday.com/drones. The research team used drones on four bridge inspections and found that the high-quality images and video footage gathered by the UAVs, correlated with the findings in previous bridge inspections that used conventional methods. The drones also captured data from infrared cameras and data

needed to construct maps of bridge areas and 3D models of bridge elements.

The goals in phase two of the study, which begins this autumn, include operating the drone without a GPS signal and gathering images from the underside of bridges.



Forward thinking

Delaware's bridges are about to get smart

 The bridges belonging to the Delaware River Joint Toll Bridge Commission are to undergo a complete toll collection system overhaul. The modernization project will cover virtually every aspect of the toll systems: manual cash collections, conventional toll-lane E-ZPass transactions, highway-speed open-road tolling, and future all-electronic tolling at the Scudder Falls Replacement Bridge. An important part of the project will involve the installation of next-generation electronic toll tag readers, enabling the Commission to read transponders from non-E-ZPass agencies once national interoperability is decided on and implemented.



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Open wilderness

Mobility as a Service (MaaS) is a subscription-based concept commonly thought only to be viable in big cities. Now, pioneers in Finland are hoping to prove it can work, even in their most remote region, as **Tom Stone** discovers

Following the announcement of the MaaS (Mobility as a Service) Alliance at the ITS World Congress in Bordeaux (see *Reaching critical MaaS*, below), one of the concept's chief proponents, ITS-Finland's CEO Sampo Hietanen, has revealed details of his country's next MaaS trial exclusively to *Traffic Technology International*. It is hoped that the pilot will prove that the concept (described opposite in more detail) can work – even in one of the world's least densely populated areas.

The Aurora pilot is to take place in Finland's northernmost region, Lapland, early next year (February 2016) and, significantly, will be public in its nature, in that a subscription to the service will be offered to all tourists who visit and may even be extended to local residents.

"Lapland is a really remote area where Santa lives... and no one else," jokes Hietanen. "We calculated a business case for tourists because they often say that they hate having to rent a car.



So we said, what if with your accommodation you get free MaaS? With a 15-minute guarantee that you'll be picked up and taken anywhere." The concept is certainly compelling. But in an area of the world that is famed for its untouched wilderness rather than population density, will the numbers really add up? Hietanen believes so. "As it's a remote area, you might think that this isn't going happen, because it will be too expensive," he admits. "But once you put all that demand in, we found that the price per day



Reaching critical MaaS

The Mobility as a Service Alliance promises to enhance the concept's scalability



At the ITS World Congress in Bordeaux, France (October 5-9), European organizations joined forces to establish the first Mobility as a Service (MaaS) Alliance.

"ERTICO – ITS Europe is coordinating the alliance and there are

already something like 40 companies joining in," says Jonna Pöllänen, project officer for ITS-Finland (*pictured*). "The idea is to make business rules for MaaS so that these new players can scale straightaway and not just do it locally, but go global as fast as possible."

The MaaS Alliance builds upon the momentum and drive achieved during the last European ITS Congress in 2014 hosted by Helsinki, where MaaS received political support from the Finnish government.

More than 80% of commuting in the USA is done by car, and alone.

"Why are there all these people driving alone?" says Pöllänen. "Mobility as a Service is all about answering your personal needs. There will be different service levels depending on your different needs. Now, the question I get asked most is, 'Why isn't it already here?'"



(Left) Transportation can often be a challenge in sparsely populated Lapland, Finland's northernmost region

(Below) Sampo Hietanen and Jonna Pöllänen get animated about the MaaS concept in front of a display at the ITS World Congress, likening the idea to cellphone packages



worked out at less than €10 (US\$11.40) for unlimited taxi use."

Reija Viinanen, managing director for Tunturi-Lapin Kehitysyhdistys (the Lapland Fell Development Association), is excited about the new project coming to her region.

"My organization is owned by municipalities in the Lapland area," she explains. "We recently had a very fruitful discussion with our operators in Finland because they were searching for a region to test projects like this – because if it works in Lapland, it works everywhere."

"We have tried to design and create MaaS for a very rural area – in this region we have only 14,000 inhabitants and four municipalities, but more than a million visitors a year. That's why it's interesting not only to do this test, but to show how we can go further with MaaS."

"We don't only want to create mobility for people, but also extend it to delivering food and medicine and serving local needs. It's not an easy thing at all, but we are going to do that. And we will succeed. We only started planning seven months ago and it is already huge."

Indeed, Hietanen agrees that this trial could easily snowball. "I was talking recently with the guys from the hotel side and the guys who are running taxis," he says. "And I said, 'You understand that you're not going to get money for each ride? You're just going to get this fixed monthly income?' And they said they would make more money this way. And then people from local companies said, 'If it's only about

€10 per day for the tourists, can I get it too?' So we're getting more people into the system and that means it's going to cost even less."

Hietanen has been promoting the MaaS concept for many years, but now it is really starting to move into the mainstream, and he's impatient to get going. "It's just that nobody's packaged these things," he says.

"Nobody's taken on the demand or the risk and said, 'Okay, just go.' And everybody says to me, 'Yeah, you can't give a free pass, because people are just going to misuse it and use too much.' But why on earth would you want to sit in a taxi, just for fun? You might do that for the first week, but that's it."

"We have to figure out, why do people have cars? It's not because they really love it. People have cars later and later in life because they find they can't survive without them. And then they get suburbanized and they have their second kid and they realize they have to get a car. What if I were given an extra guarantee that I'd have access to a car, in all cases?"

Now, with the formation of the MaaS Alliance, it looks like Hietanen's perseverance may finally be paying off: "When I first started talking about it in 2006, people thought I'd lost my marbles! But slowly they are coming around to it."

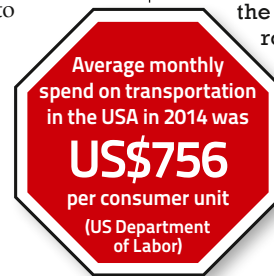
For more from Sampo Hietanen, MaaS projects and the other multimodal solutions that are set to revolutionize mobility, turn to The end of private car ownership? on page 36

What is MaaS?

The idea of Mobility as a Service is beautiful in its simplicity. You take the money you normally allocate to transportation each month, and instead of spending it with multiple vendors and using it to maintain a car that sits idle 90% of the time, you pay a subscription to one single provider. This might include, for example, unlimited public transportation, a certain number of taxi miles, some carpooling, and occasional private car hire.

"At the moment, you might take the bus and pay for that and then you transfer and take another service and you pay for that too, but we envisage only one price for everything," says Jonna Pöllänen, project officer for ITS-Finland.

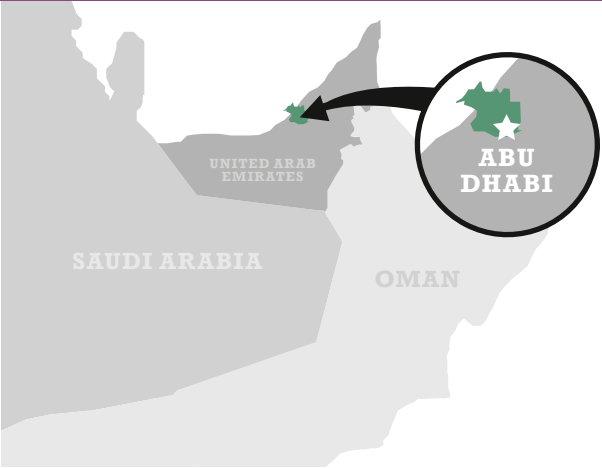
What the model predicts is that it will cost users much less to pay for their transportation like this. What's more, it will be more convenient than owning a car. Plus, it will encourage greater use of public transit and carpooling, meaning the number of cars on our roads will be reduced.



“We don't only want to create mobility for people, but also extend it to delivering food and medicine and serving local needs

Reija Viinanen, managing director, Lapland Fell Development Association



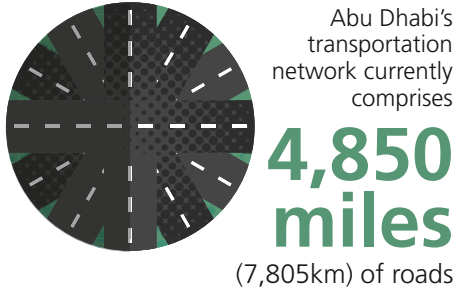


Growth strategy

In response to an expanding population, economic prosperity and increased land development, road authorities in the UAE capital, **Abu Dhabi**, are investing in tougher traffic management and safety policies

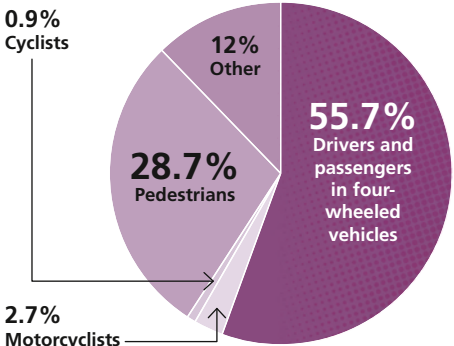
Infographics: Ben White

Abu Dhabi's roads are governed by the Department of Transport and are patrolled by the Abu Dhabi Police



The population of Abu Dhabi is estimated to be **2.65 million**

Traffic fatalities in Abu Dhabi



Penalties for breaking the speed limit range from

AED500 (US\$136) to **AED900** (US\$245) and six traffic points



Abu Dhabi's roads are most congested on **SUNDAY MORNINGS** and **TUESDAY EVENINGS**



DID YOU KNOW?

In July 2015, Abu Dhabi Traffic Police unveiled its latest weapon against crime – a US\$3m hypercar. The Lykan HyperSport contains a state-of-the-art surveillance and detection system, and is capable of going from 0-62mph in 2.8 seconds

Abu Dhabi operates about 650 buses on 95 service routes, annually transporting more than

50 million passengers



In Abu Dhabi it is illegal for pedestrians to cross the road anywhere other than at designated crossing points. Anyone caught breaking this law is fined

AED50 (US\$14)



The cumulative delay for an average commuter with a daily 30-minute trip is an extra



43 hours per year

The number of daily trips in metropolitan Abu Dhabi is expected to increase to



10 million by 2030 (there were 2 million in 2008)



Although the number of registered vehicles in Abu Dhabi rose by 12% between 2010 and 2015, the number of traffic-related fatalities fell by 59% over the same period

Is DSRC being muscled out?

DSRC (dedicated short-range communication) has been in development for use in connected vehicles for a decade. But, while it is still touted as ideal for safety-critical functions, recently app-based solutions have begun encroaching on DSRC dominance. Can DSRC maintain its grip on V2X? **Tom Stone** investigates

Illustration: Ben White

USDOT's three new V2X pilots

In New York City is one of three new connected vehicle test beds recently announced by the USDOT. DSRC technology will be installed in 10,000 vehicles and at intersections on two avenues from 14th to 66th Street



With each passing month mobile network coverage is getting better and the devices that run off it are getting faster. Could there come a point when it's so good that it starts to be viable for use in connected vehicles? For Matt Ginsberg, CEO of Oregon-based startup Connected Signals, that moment has already arrived.

"The US government first embarked on this DSRC mission a decade ago," says Ginsberg. "At the time it was the right thing to do, because there was no competing technology in place. DSRC was the only way to connect vehicles, but now the world has changed."

Ginsberg's system tells drivers what traffic lights ahead are going to do, via its EnLighten smartphone app. This app runs off signal timing information provided by municipalities, who have agreed to share it. It reaches the TMC and Connected Signals via the internet and is disseminated via the 3G/4G LTE network.

"We partner with cities to get the real-time data they already collect," says Ginsberg. "Our app tells you what color the next light is going to be and if you are going to make or miss it. The idea is encourages you to be safer and more fuel efficient and it also de-stresses you a little."

The app has already gained the confidence of BMW, which last month announced that it would allow the information to be integrated into its dashboard displays. "This technology can save the world 30 billion gallons of gas a year," says Ginsberg. "We can move the needle on global warming, because car companies estimate a 10% reduction in fuel use if drivers know what the signals are doing."

"I think connecting urban intersections via DSRC is an incredible mistake," continues Ginsberg. "In the US we have about 300,000 traffic lights; 150,000 of those are urban. A hundred thousand of the urban lights are already connected to the internet. To take a light that is already connected and spend about US\$20,000 putting in DSRC radio on that intersection is a mistake."



There's no other way to describe it. We typically end up costing municipalities \$20,000 per city."

Latency problems?

Of course, some argue that the real mistake is to entrust safety-critical information to unreliable mobile networks. However, Ginsberg is adamant his system is safe. "Latency is not a problem in any of the applications involving cars and traffic lights," says Ginsberg. "At an intuitive level the reason is that the signal system has been designed not to be second-by-second critical because people often don't react that quickly and if they do, they often do things wrong. People who run red lights just as they are turning red are invariably doing it on purpose. The way we work is to tell the driver a block away, the next light they encounter is going to be red when they get there. That means that the latency, which is only about a second, really isn't an issue."

However Carl Andersen, connected vehicle program manager for the FHWA, who discussed



2 A second test bed in Wyoming will focus on using connected vehicle systems to enable safe movement through the I-80 corridor, which often encounters extreme weather. Particular attention will be paid to freight and snowplow activity

150,000
The number of urban traffic signals in the US that could potentially be connected to vehicles via 3G/4G networks



3 Tampa, Florida, is the third location to get a share of the USDOT's recently announced US\$42m federal funding. Here it will be used to attempt to solve problems with the city's reversible express lanes and will also include pedestrians in the trial, who will be connected to vehicles via DSRC-enabled smartphones

the situation with *Traffic Technology International* at the recent ITS World Congress in Bordeaux, believes that, useful as cellular-based systems may be, to totally disregard DSRC could be to miss out on an additional stream of useful safety information.

"It is my understanding that, when used for speed advisories, cellular-based systems have been shown to help drivers maintain a more optimal speed along an arterial," says Andersen. "It is my belief that a hybrid system that uses cellular to provide information along an intended course, with DSRC to provide real-time information for the next intersection, will likely prove to be an essential way to provide drivers with suitable information (near-real time for distant intersections, and real time for the near intersection) while helping to reduce the channel load on DSRC. The overall safety impact will likely depend on how drivers use the information from the application. Do they continue to monitor the signal status while

following the speed advisory? Or do they trust the speed advisory so completely that they don't look at the signal? The intent of the Connected Vehicle program is to establish a common architecture that will foster commercial applications in addition to those developed by the USDOT."

Graham Hellestrand, founder and CEO of Embedded Systems Technology, who works on detailed simulations of connected vehicle environments, agrees there's a powerful argument for app-based V2X solutions. "I think it is technology in the mix," he says. "The big problem with DSRC is that there isn't the infrastructure to support it. With 4G there's already the tower infrastructure, so you don't have to instrument traffic lights. If we're not careful, DSRC won't have the economics to back it up.

"I think it's going to be economics that dominates this and the 4G/5G people are very good at getting revenue. The DSRC people seem

“If V2V is only 60% efficient, you still have the potential to save 10,000 lives a year



Carl Andersen, connected vehicle program manager, FHWA

“There’s already 3G/4G coverage... economics may dictate who wins

Graham Hellestrand, founder and CEO, Embedded Systems Technology



“Our technology can save the world 30 billion gallons of gas a year



Matt Ginsberg, CEO, Connected Signals

to be hanging around waiting for the government to put all the infrastructure in, and I just don’t think that’s realistic. To put the DSRC throughout New York, or even worse in Los Angeles, which is spread out, would be hugely expensive and there’s already 3G/4G coverage there. So the economics may dictate who wins.”

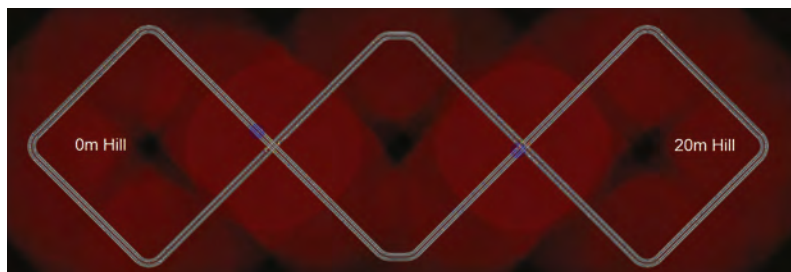
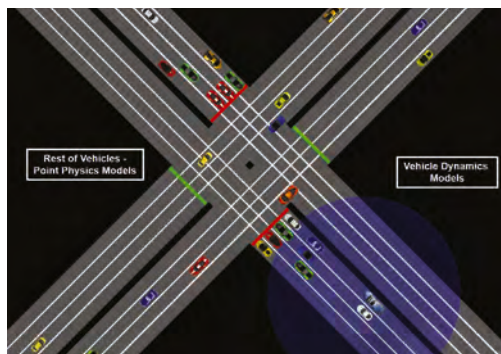
All that said, even Ginsberg has to admit that due to limitations in cellular coverage, perhaps 3G/4G won’t be the ideal solution in rural areas. “There 150,000 signals in the USA in rural areas, where DSRC may still be the way to go,” says Ginsberg. “Nobody’s going to lay a cable to those lights. It’s much cheaper to put in DSRC, so do it that way. Do whatever is most efficient.”

V2V applications

If DSRC is being muscled out of at least some of its previously undisputed territory in V2I, what of the central promise of connected vehicles – safety improvements through V2V collision avoidance? Is DSRC’s dominance also under threat there?

“DSRC has a major advantage in that it is probably the only communication mechanism with a high potential to track conflicts,” says Hellestrand. “If you are tracking vehicles in a kilometer radius [the current maximum range of DSRC], the chances are that you will know what’s coming at you for quite some time before you reach the potential collision situation. Neither radar nor lidar do that. So wi-fi seems to be the only mechanism that’s currently being thought about with that range.”

Andersen agrees: “If you’re talking about safety-critical information – that is, are two vehicles going to occupy the same point at the same time? I don’t want to send it over 4G LTE and have my provider say, ‘we might be able to do that for you.’”



However, Hellestrand also points to the fact that his models have shown that DSRC is far from being a perfect solution. “The problem is when it is being used in collision avoidance in heavy traffic,” he says. “The wireless channels congest when there are about 100 vehicles in reception range. And in an urban area it’s very easy to get a 100 vehicles together at once. For collision avoidance my suggestion is DSRC for tracking threads from a long way out into near range. Then radar and LED technology. DSRC potentially enables you to get information about the other vehicle’s control system. LED will allow you to do that, albeit at very short range. And radar will give you distance, speed and tracking information. So I think a combination of all these technologies will be important.”

Andersen, however, isn’t so sure that DSRC should be written off so easily for short-range collision avoidance. While real-world testing conducted by USDOT agrees with Hellestrand’s models that there are limits to how much data can be loaded onto the network, he puts them somewhat higher. “We’ve actually tested 200 DSRC transmitters in a less than 300ft radius and we had them transmitting at 40Hz rather than 10Hz, and that’s when we started to see an increase in packet drops and other errors. But the drop-off tends to be for vehicles further away. For vehicles that are closer you still receive the majority of the transmissions. You might not get every signal, but

(Left and above) Models from Embedded Systems Technology test the limits of DSRC communications



(Left) New BMW cars can now integrate signal timing information into their dashboards, via a smartphone app

2,820
The total number of intersections with traffic signals on Manhattan, New York City

if you get six out of 10 every second you have enough information for active safety.

"We're going to find out in New York [part of the USDOT's new Connected Vehicle Pilot deployment]. New York City has proposed to have 10,000 instrumented vehicles operating in midtown Manhattan and to equip intersections along two avenues from 14th to 66th Street. There are going to be a lot of messages in a very confined area so it will help to test the limits of what is possible."

Furthermore, Andersen points out that to expect any system to be 100% efficient is perhaps unrealistic and misses the point that a high level of connectivity will still save lives, compared with what is available at the moment (i.e. nothing). "Even if the DSRC messages are received at 100%, what safety pilot data showed us is that the efficacy of the warning is only about 60% because the drivers ignore it or don't hear it, because they are so distracted. So we're not talking about achieving 100% effectiveness, even if we give drivers 100% efficiency in the signal. If V2V safety can potentially address 80% of crashes involving unimpaired drivers, and it's only 60% efficient, the potential is still there to save up to 10,000 lives a year in the USA alone."

With arguments like this it becomes clear that it would be foolhardy to sideline DSRC completely in favor of any other system. Rather, the host of new technologies that are now becoming available to vehicles – from 3G and 4G (and soon 5G) to lidar, radar, video and even LED – should be brought in to help DSRC with its task of making our roads safer, freeing up valuable wireless spectrum and ensuring that the technology is still able to deliver on its decade-old promise. ○

For more comment on this topic don't miss Mike Schagrin's column on page 59

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Despite carrying less traffic, around the world accidents on rural roads account for the most fatalities. In the USA, **Steve Albert** is the man at the forefront of making 'quieter' routes safer

Interviewed by Max Glaskin



American popular songs often conjure up an image of a country road to represent the way back to family, safety and security. Steve Albert is happy to play a small part in protecting the reality behind this image, as the director of the Western Transportation Institute (WTI) – a world-class center of research for rural roads.

"It was a family road trip from Nebraska to Connecticut when I was in junior high that first piqued my interest in urban planning and transportation," he says. The second spur to action came a couple of decades later. "I was working in Washington DC when I realized our National Parks were being loved to death and I wanted to help solve problems surrounding some roads being overused."

So just two years after the WTI had been founded – in 1994 as a joint venture between Montana Department of Transportation, Caltrans and the College of Engineering at MSU – he headed up research into country roads at MSU in Bozeman. "We were one and a half people strong, with a US\$75,000 annual budget," he recalls. Today there are 85 people with a US\$10m budget, developing solutions for state and local transportation agencies in rural areas.

To some, it's a surprise that ITS is high on the list of tools that WTI applies. They ask, "What's the point of investing in technology for rural roads when the proportion of US citizens who live there is below 20%, and falling?" Albert gives a practiced answer, having presented testimony to three Congressional committees.

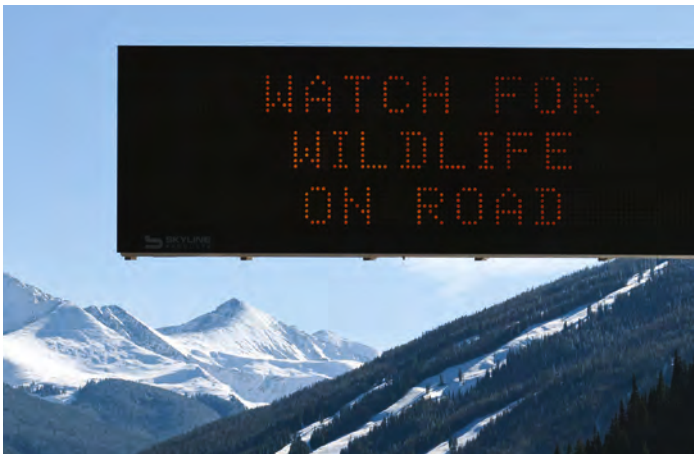
"It's really about safety and context," he says. Only 39% of vehicle miles travelled in the USA are on rural roads, but the network is three million miles long. Emergency response takes twice as long, which partly explains why it's where 61% of road fatalities happen. "So if safety is the mantra, why not put money into rural roads?"

"And if your mission is congestion relief, in rural areas there are special events, often seasonal, that have to be accommodated," Albert continues. "Furthermore, when there are extreme natural events such as hurricanes and earthquakes and people flee for safety from cities, rural roads are actually the primary escape route. Nobody wants to find them inadequate at those times of need." In other words, you can't make a distinction between urban and rural; the US road network has to be treated as one comprehensive system.

Finding the dollars

Despite such arguments, persuading people to loosen their purse strings to pay for much needed research is a constant challenge. "Organizations like ours depend on grants (or 'soft money'), which means you have to go out there and bring it in, and there are a lot of proposals to write," says Albert. Yet after almost two decades championing country roads, he believes there is change in the air. "USDOT Secretary Foxx has just recently announced that more money should be put into county roads," he says.

WTI has accumulated plenty of evidence that ITS is good for rural roads. One of its



(Left) Dynamic message signs aren't only for use in urban areas



 | A transportation leader

There are many lanes to Steve Albert's career. Before joining WTI he worked for PB Farradyne, in Washington DC; Metropolitan Transit Authority of Harris County in Houston, Texas; and the Texas Transportation Institute of the Texas A&M University in Houston. He received a Lifetime Achievement Award from the Institute of Transportation Engineers in 2010 and the inaugural award for administrative leadership, bestowed jointly by the Council

of University Transportation Centers and the American Road and Transportation Builders Association, in 2013. Albert serves on the US DOT's ITS Program Advisory Committee. He chairs ITS America's Rural ITS Committee and is President of the Council of University Transportation Centers. He has also served with several transportation research organizations, including the American Society of State Highway and Transportation Officials and the Transportation Research Board.



A rural roads project requires consideration of engineering, ecology, hydrology, meteorology, psychology and other disciplines

on long road trips need trip assistance that isn't bound by state lines. In the past they'd have had to check each state's website along the route. At the NWP/OTIIS website, they can enter their start and end points, and planned departure time, and see weather, road work, camera images, cautionary zones, rest areas and recreational opportunities along the entire route.

International reach

Albert and his team are not bound by state lines or even national borders; they work across 45 US states and 17 countries worldwide. They also cross disciplines with many projects. "A rural roads project might require consideration of engineering, ecology, hydrology, meteorology, psychology and other disciplines," says Albert. "ITS may be one part of a wider-ranging solution. For me there's always the challenge of being the facilitator, to help our many well-respected staff understand each other and what they are trying to achieve. It keeps me on my toes and makes every day different and very interesting."

So next time you hear a crooner invoking a country highway or byway in a wistful ballad or broken-hearted lament, step back from the romantic image. Someone has to make sure those rural routes can lead back to safety, family and security. The chances are that Steve Albert and the staff at WTI have had a hand in it. ○

For more on recent advances in rural ITS, turn to our report on risky intersections, Danger Ahead, on page 44

longest-running programs, set up in 1998, is California Oregon Advanced Transportation Systems – COATS. "It's an ongoing program of ITS deployments for Caltrans and ODOT [Oregon DOT] in a large rural area near the border between the two states," says Albert. "Rural ITS is often seen in terms of hotspot applications. COATS, though, is a program of projects including icy curve warning systems, road weather information systems, oversize vehicle detectors, work-zone ITS and dynamic message signs. When we started, no one else was doing this type of work in rural areas, and we are still doing ITS research and technical assistance for these states to this day."

National Parks overload

Albert has also been able to address an issue that first prompted him to move from metropolitan transportation – the risk of some locations being "loved to death". For example, WTI has tested ITS in Rocky Mountain National Park and Grand Canyon National Park to see if real-time traveler information could ease congestion and encourage visitors to use alternative transportation to and within the parks.

Dynamic message signs have been tested in one pilot, displaying information about times of the day when there's less crowding, information about shuttles, and locations of park-and-ride lots. As a result, there has been an increase of 40% in the numbers who travel by shuttle. Another pilot used ITS to inform travelers of potential delays and alternative routes while a major park road was under rehabilitation.

The WTI's remit is broad. "One of the most satisfying tasks has been the USDOT North/West Passage Operations and Travel Information Integration Sharing Project grant," says Albert. The lengthy project name (NWP/OTIIS for short) reflects its complexity. It brings together eight states, from Washington to Wisconsin, providing information along the I-90 and I-94.

Albert believes that integration of systems and sharing of data across state lines are the way forward. "Travelers do not see jurisdictional boundaries," he says, "so we have created a single seamless system that you can use for crossing almost the whole USA."

For several years individual states have provided traveler information, but travelers



Snap happy

The success in recent years of red light enforcement cameras is leading to similar technology being harnessed to penalize motorists for flouting other traffic regulations. **David W Smith** looks at how 'blocking the box' fines have caused controversy in the UK and the lessons this provides for authorities worldwide

Illustration: Justin Metz

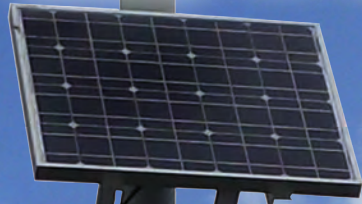




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Despite their propensity to anger motorists – with many claiming they are installed simply to make money – red light enforcement cameras are becoming more common in jurisdictions all around the world. Now the same kind of technologies are increasingly being used to enforce other traffic rules – resulting in even more impassioned protests. Box junctions, often represented by hashed lines in the center of crossroads, are a case in point. In the UK the lines are yellow, earning them the name ‘yellow box junctions.’ In the UK it is forbidden to drive into such an area unless the exit from it is clear – i.e. no stopping is allowed – or the driver is waiting to turn right.

The ways of indicating this type of junction vary enormously around the world. In the US the most common practice is simply to use signs saying ‘Don’t Block The Box’. However, some US cities also use road markings, too. Meanwhile in most parts of the EU outside the UK, rules state that every intersection is classified as a box and drivers may not enter unless there’s a clear space on the other side.

Although some cameras that are already installed at US junctions can also be used to penalize those who break other traffic laws, including the rules for entering junctions, enforcing red light violations is by far the most popular use. Nevertheless a handful of cities are already using ‘block the box’ cameras, while others, such as Seattle, have recently been begun researching their viability. As part of this research, they might do well to take note of the ire of motorists who have been fined for the same type of infringement in the UK.

Moneybox junctions?

A couple of years ago the British press focused on a certain yellow box junction in West London, where cameras were catching more than 100 drivers a day. It was dubbed the ‘moneybox junction’. The story, and others like it, helped to propagate the notion that cash-strapped authorities were deliberately creating sources of revenue. However, Transport for London (TfL) maintains that the use of cameras has improved driver behavior. It says that the number of

Camera compliance?

These figures could be taken as evidence that enforcement cameras in London are changing driver behavior for the better

4,989,923

Total penalty charge notices (PCNs) issued in London in 2013/2014

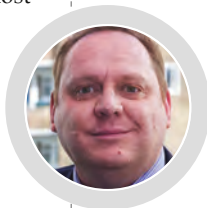
4,746,219

Total PCNs issued in London in 2014/2015

A drop of 243,704 or nearly 5%

“At TfL all revenue from penalty notices gets invested back into transport schemes. It doesn’t disappear off to the Exchequer and we think that’s a common-sense approach

Paul Cowperthwaite, general manager of road user charging, Transport for London



penalty charge notices (PCNs) at TfL’s yellow box junctions has fallen from 140,000 two years ago to 100,000.

Paul Watters, head of road policy at The Automobile Association (AA), says the imposition of PCNs can be severe. “The rules sound fine – you don’t enter the junction until it’s clear. But in the busy flow and sudden halts of London traffic, drivers can sometimes get caught even if they have

the best intentions. It can be enough to go just a few inches into the junction, so it can be harsh. The moneybox junction was a good example. Drivers complained that it was hard to see beyond the box junction to what the traffic was doing. It netted huge sums.”

Steve Gooding, director of the RAC Foundation, says that whenever there are large numbers of transgressions at a yellow box junction, the cameras are failing to act as a deterrent. “Endless penalty notices are telling you something that can be used as management information. They suggest the junction is not intuitive enough.”

A boxed history

The use of cameras to monitor yellow box junctions was authorized by the London Local Authorities and



Transport for London Act 2003. It decriminalized 30 moving offenses and transferred their enforcement from the police to local authorities. "They became civil offenses whereas they had been previously been traffic law contraventions. It allowed local authorities to enforce them through the civil system. This process had started with parking back in 1994 and proved to be quite successful," Watters says.

The contentious part of the 2003 Act was not the decriminalization. It was the decision to allow authorities to retain the income from penalty notices and use it in order to fund

TfL, however, argues that the authorities are justified in reinvesting the money into the road network. "At TfL all revenue from penalty notices gets invested back into transport and road-safety schemes. It doesn't just disappear off to the Exchequer and we think that's a much more common-sense approach."

TfL's red routes – major roads where vehicles are forbidden to stop – form a network of 5% of London's roads but carry 30% of the city's traffic. Cowperthwaite says the yellow box junctions are positioned at busy intersections where it is

“Endless penalty notices are telling you something... They suggest a junction is not intuitive enough for most drivers

Steve Gooding, director, RAC Foundation, UK



imperative to keep traffic flowing. He points out that since the introduction of cameras, PCNs for the yellow boxes have dropped considerably.

"We've done a lot of work to educate people in how to use a yellow box. Many drivers were confused about what they should, or shouldn't, do," he says. "What you have to do is wait for the exit to be clear before entering the box, but some people just keep following the car in front and end up blocking traffic. We put two videos on YouTube – one about the yellow box junctions and one about loading goods vehicles on red routes – and they've received a million views."

A fair assessment

Cowperthwaite also argues that the TfL procedure for issuing PCNs at box junctions is fair for drivers. Trained operators man the cameras and gauge whether a motorist has deliberately contravened the rules, or



(Left) The flouting of box junction rules can quickly lead to chaos in big cities like New York

enforcement and the improvement of highways. Parking fines had already developed a reputation for enriching local finances. Now other contraventions would suffer from the same stigma.

Gooding says that authorities will forever be dogged by the popular belief that "it's all about making money" as long as the income from fines accrues to them. "The thought will always be ticking away at the back of a driver's mind that it's all about making money. That might not be what's happening, but the average motorist receiving a notice will suspect it," he says. "It's legitimate to have camera enforcement and it's legitimate to have fixed penalties if drivers flout the law. But let's put any money from the fines into a consolidated fund at the Treasury and spend it on hospitals. That gets rid of all suspicions."

Paul Cowperthwaite, general manager of road user charging at



Yellow boxes vs blue lights

Could a system of automatic 'junction blocking' fines have serious negative consequences in an emergency situation?

A poll conducted by the AA suggested that many drivers are reluctant to move out of the way of emergency vehicles if they think they might get a fine.

The AA Populus poll revealed that 13% of the 18,026 AA members surveyed would not stop in a box junction to allow emergency vehicles to pass. The figure rose to 19% for Londoners.

AA president Edmund King was keen to stress that the majority of drivers do move out of the way: "Drivers think, 'There but for the grace of God go I.' Because next time that

emergency vehicle could be for them. And that is why most drivers will risk a penalty charge to save a life."

Nevertheless, he said that some authorities have issued penalty notices even if drivers were avoiding emergency vehicles. This could have a negative effect on driver behavior. "Too many bus lane, yellow box junction and moving traffic offense enforcers seize the opportunity to dish out a penalty. Inevitably some drivers won't take the risk and it only takes one to hold up an ambulance. The councils operating enforcement cameras say they take into account the presence of an on-call emergency vehicle before issuing a penalty, but too often that's not the case."



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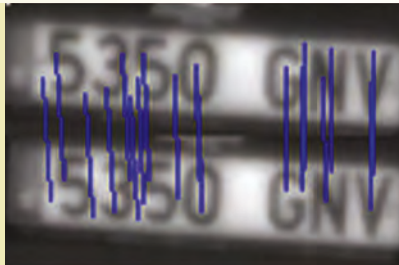
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“Each case is judged on its own merits and there is a two-stage process. The camera operator observes the whole junction in real time and, if they see someone is blocking it, then they zoom in and capture the evidence. That evidence is later reviewed by a different operator. They consider any special circumstances and information from the DVLA. There is a lot of discretion. If it’s a first-time offense, for example, we might consider letting them off. Most camera enforcement in London boroughs is done by people as opposed to using license plate recognition.”

Professor Richard Allsop, an emeritus professor at the University College London (UCL) Centre for Transport Studies, has spent much of his career studying junctions and is a supporter of camera enforcement as long as the administration of fines is a flexible process. But he disapproves of automatic penalty notices that rely purely on technology in order to trap offenders.

“As long as operators review the process carefully to weed out genuine mistakes, and punish blatant offenders, I am in favor of using cameras to patrol yellow box junctions,” he says. “Otherwise there’s a danger of creating a widespread perception that it’s overly harsh. That’s a mistake because the system depends on retaining the compliance of drivers.”

Artificial intelligence takeover

Last year, Redbridge Council in East London contravened Allsop’s guiding principles by introducing an automated CCTV system to catch motorists breaking the rules at four yellow box junctions. Videalert’s automatic license plate recognition (ALPR) technology “captures more



Beyond the reds

Red light cameras are still the main type of intersection enforcement – and new technology is making them more versatile than ever

The new red light cameras commissioned by TfL and London’s Metropolitan Police actually have more than one use. In addition to enforcing against red light running, they can record vehicles breaking the speed limit. Two hundred and fifty sites are due to be upgraded with these cameras by October 2016.

Meanwhile, TfL also began upgrading the capital’s 350

speed cameras with spot-speed digital cameras last year. When sited on the central reservation, these new cameras can monitor speed in both directions, providing a wider area of enforcement. Work to upgrade the existing speed camera network will also be completed by October 2016.

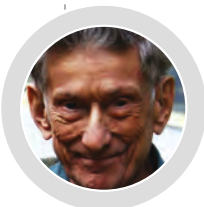
Studies show that safety cameras have reduced road casualties in recent years. At

locations where such cameras operate in the capital, the number of people killed or seriously injured fell by an average of 58% last year. Ben Plowden, director of strategy and planning at TfL, says, “We are committed a 40% reduction in the number of people killed or seriously injured on the capital’s roads by 2020 [compared to 1998 figures].”



“As long as operators review the process carefully to weed out genuine mistakes and punish blatant offenders, I am in favor of using cameras to patrol yellow box junctions

Richard Allsop, emeritus professor, Centre for Transport Studies, UCL, UK



offenses than can be achieved by traditional solutions”, the council has since claimed.

The CCTV sends its evidence to the back office system, which issues the PCNs. It can also catch drivers ignoring restricted-access signs. The AA’s president, Edmund King, reacted by expressing “concern that this automated system is more about milking motorists for money and profit than deterring bad driver behavior”. But Redbridge Council says the footage is reviewed before PCNs are issued to prevent accidental errors being unfairly penalized.

It’s possible, though, that imminent advances in technology will help drivers negotiate yellow box junctions and reduce the chances of

error. Gooding says the next generation of high-end satnav equipment will provide much greater assistance. “I envisage having the satnav on and it acting like a co-driver in a rally car. It would keep talking to you and keep you in the picture. It would say ‘watch out there’s a yellow box junction coming up and there have been a high number of violations here,’” he says.

Allsop also argues that new cooperative systems will assist drivers at yellow box junctions. “Increasingly, the vehicle as a box of tricks will communicate continuously with the traffic-control system and vice versa. Vehicles will also communicate with each other.

“This exchange of information opens up new possibilities. At yellow box junctions, the driver could get a signal not to go into the box if it’s not clear. Further in the future, the system would take over from the driver as part of the gradual move toward autonomous vehicles. Wholesale automation will take longer than some say, but for instances such as this, we’ll get there much sooner.”

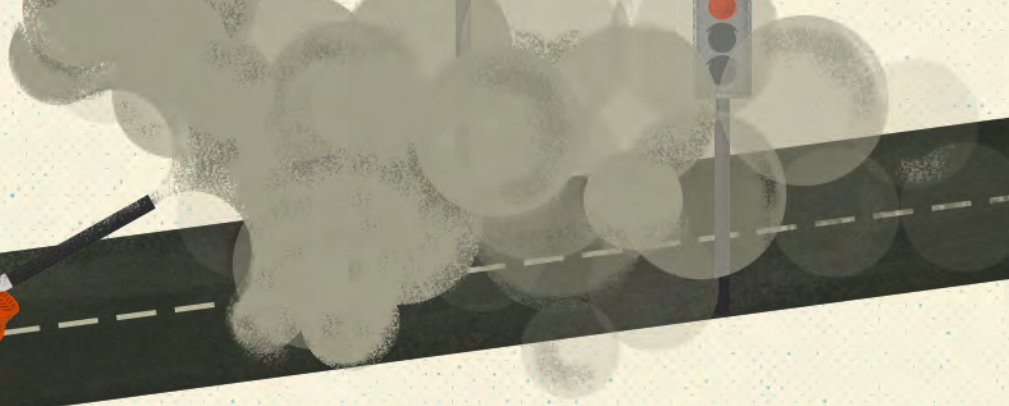


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Outsmarting Pollution

As traffic control centers become more advanced, forward-thinking jurisdictions are harnessing them for more than just congestion relief. **Saul Wordsworth** takes a trip to Germany to find out more about trailblazing cities using ITS to tackle vehicle emissions

Illustration: Ben White

Our world has never been busier. Swelling populations and increased wealth mean more vehicles clogging our roads, and more pollution. Fast-growing megacities with limited road infrastructure and building topology equate to poor dispersal of emissions. The World Health Organization (WHO) estimates that 1.3 million people a year die as a result of city pollution – 10 times those that are killed in road collisions. Earlier this decade Beijing posted a particulate reading that was 40 times the WHO recommended limit. This state of affairs begs for a dynamic balance between mobility and environmental safety.

The world's first low-emission zone was established in Sweden in 1996. Many countries followed suit, notably Germany, Holland and the UK. London has stated its intention to establish an ultra-low-emission zone from September 2020. This ambitious program will mean all vehicles will be required to meet stringent emissions standards, or pay a daily charge – effectively a fine. To some this seems draconian, static and restrictive. What if there was a softer approach that tackled traffic flow as a means of reducing pollution?



Softly, softly

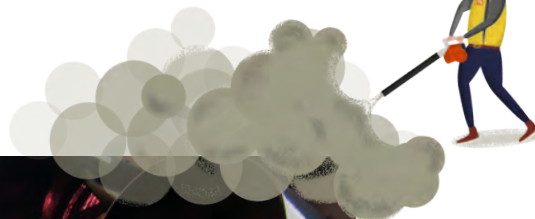
In 2011 the German city of Potsdam recorded 55 days of particulate levels above the official limit. Something had to be done. The following April the city began a pilot to reduce particulate matter up to 10 micrometers in size (PM10) and nitrogen dioxide (NO₂) that could yet change the face of emissions management.

“Since 2012, and in collaboration with the EU, we have been operating a novel system to reduce air pollution,” says Reik Becker, the city’s director of traffic management. “The environmentally oriented traffic control system tracks levels of air pollution. If the concentrations of NO₂ exceed a specified value, the traffic lights at heavily polluted places are adjusted so that the traffic flows again. At the same time, vehicles coming into the city can be diverted so that there is less traffic in residential areas.”

The system, Sitraffic Concert and Sitraffic Scala by Siemens, collects

“If the concentrations of NO₂ exceed a specified value, the traffic lights at heavily polluted places are adjusted so that the traffic flows again

Reik Becker, director of traffic management, Stuttgart, Germany



Mexico City

Mexico City has 20 million citizens, and more than six million journeys are made by car every day. Its relatively low population density (2,784 people per square kilometer) compared with other metropolitan areas means longer distances must be traveled, leading to greater pollution. The city has a policy of encouraging the use of cars, including the building of new roads. It looks set to only encourage further drivers and heighten pollution.



traffic data and generates guidance strategies designed to ensure that traffic flows more efficiently and produces fewer pollutants. It collects live vehicle quotas and roadwork information from sensors scattered around the city, along with closed road data and meteorological feedback regarding temperatures and winds, all of which is fed to Potsdam’s central control center. The system then uses this information to calculate a pollutant profile of individual streets in real time.

By turning all traffic lights green in areas of denser particulates, for example, traffic is guided away from emissions hot spots and into areas of lower pollution. Similarly periods between green lights may be shortened as a means of breaking up slow-moving lines of cars.

“An impact analysis was carried out from 2013 to 2014,” says Becker. “A 5% reduction in the annual mean value for NO₂ can be achieved.”

Valley city

A similar project has been established in Stuttgart. The city, known for its valley location, has experienced high particulate levels for many years. A pilot has been established to study the degree to which steadying the follow of traffic can reduce emissions. The city’s Integrated Traffic Management

(Left above) Potsdam’s system collects and analyzes traffic data (Left) Green lights guide traffic away from emissions hotspots in Potsdam

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Center collects data from the Stuttgart Office of Public Affairs, the Stuttgart Civil Engineer Department, public transport operator SSB AG and the local police. This includes vehicle waiting times at intersections, traffic light video data and vehicle speeds. A central computer in the Stuttgart control center responds accordingly, altering traffic light timings and parking guidance systems. It also provides data to dynamic message signs, enabling drivers to make optimal decisions based on all information available, in turn easing traffic flow. All data can be easily accessed by operators, who can program light changes accordingly.

The objective of the pilot is to reduce NO₂ by 10% and PM10 (by 15% through improved traffic flow.

One step beyond

The German city of Braunschweig is also running a similar pilot. The service provider on the project is Bellis, which specializes in green solutions. Through its collaboration with a number of partners it has developed an environmentally oriented traffic management system.

“Environmental influences such as high air pollution can be automatically responded to with measures to reduce emissions,” says Stephan Fischer, the city’s engineer for traffic. “It is possible to harmonize traffic flow in road sections via the adaptation of signal circuits. But benefits for the main traffic direction mean disadvantages for the secondary directions or pedestrians, so these measures are taken only when they are necessary in order to handle air pollution.”

The solution can be broken down into two distinct stages. Dynamic environmental monitoring is modeled on

emission measurements that are already available. These calculations are verified with the aid of measuring containers operated by the state’s environmental authority, then uploaded to a centralized control center and presented graphically as a map of the city. With this data, Braunschweig is able to set in motion module two – efficient traffic control. A series of traffic control measures – be they traffic-light changes or innovative parking control systems enabling drivers to find spaces faster – are deployed to create an optimal mix of measures to smooth traffic flow and fight the build-up of harmful emissions.

“Since this is a research project in the test phase, there are no reliable statistics on the frequency of use and

Beijing

More than most congested cities, Beijing is a victim of its own success. Streets once flooded by bicycles and buses are now jammed with endless rows of black sedans. Car ownership has nearly tripled since 2005. According to IBM the city is tied with Mexico City as the world’s worst commute. The average weekday journey takes 100 minutes. Traffic jams lasting four or more hours are commonplace, especially during bad weather.



New Delhi

Recent research revealed that New Delhi has the world’s second-highest number of deaths as a result of air pollution. Last year the WHO labeled it the most polluted city in the world, with the highest concentration of

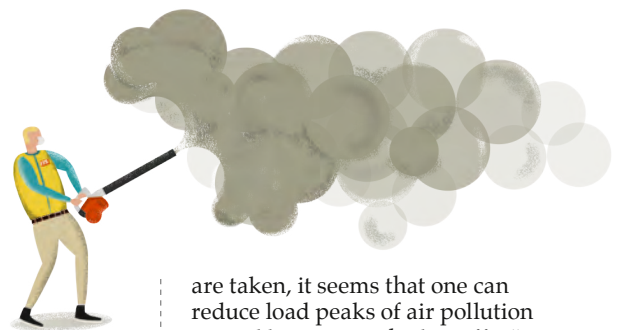
particulate matter. In a population of 23 million, there are 8.5 million registered vehicles, with 1,400 added daily. Long cycle times at intersections exacerbate congestion.



effectiveness,” says Fischer. “The general problem of excessive air pollution in stretches of major roads is certainly not completely solved by an environmentally oriented traffic management system. But, depending on the intensity of the actions that

“Benefits for the main traffic direction mean disadvantages for the secondary directions or pedestrian crossings, so these measures are taken only when necessary to handle air pollution

Stephan Fischer, traffic engineer, Braunschweig, Germany



are taken, it seems that one can reduce load peaks of air pollution caused by motor vehicle traffic.”

Braunschweig’s plan is to soon add a forecast element to the system that is already in place that will enable preventive measures to be taken.

The way ahead

“The annual average level of recorded pollutants in some districts of Potsdam still exceeds the maximum,” says Becker. “We need to develop

(Above Left) Traffic signal control via tablet in Stuttgart



Istanbul

A journey that should take 30 minutes will in fact last 62 minutes in the world's most congested city. It has been estimated that commuters spend an average of 125 hours a year motionless in their cars. With bridges connecting Europe and Asia, Istanbul has the worst evening peak traffic worldwide, topping out with a congestion level of 109%. Congestion costs the city £5bn (US\$1.6bn) a year. Tunnels connecting the European and Asian sides of the city are near completion.



additional ideas. Among the measures being considered is a new parking space management system. If our initial success continues and we find we can further reduce pollutant emissions, we will introduce our environmentally focused traffic management system throughout the city."

In addition to Germany, pilot schemes have been established in Norway, Poland and the UK. As this issue went press, Transport for Greater Manchester (TfGM) in the UK announced the beginning of year-long project – SimplifAI – to explore how its Urban Traffic Control team can benefit from the collection of average traffic speed, wind speed, temperature, NO₂ emissions and route geography, to increase traffic flows and reduce airborne pollution. The project could ultimately enable TfGM and other transportation authorities across the UK to give live air quality information to road users, and automate traffic flow.

"Congestion is a significant contributor to air pollution in Greater Manchester, and we're committed to developing new ways of managing the roads to improve air quality across the region," says Peter Molyneux, TfGM's head of highways. "This project should help us to plan better and make better-informed,

Low-emission London

Instead of reacting in real time, in London, pollution levels are monitored with the hope of building long-term, sustainable solutions

Transport for London (TfL) owns some air quality monitors originally installed to monitor the impact of the Low Emission Zone, and is able to access data published by sources such as King's College and Ricardo, which services and ratifies data from monitors owned by the boroughs. TfL uses this data to understand trends in air quality over time, identify sources of pollution, monitor the impacts of specific measures and identify hotspots.

The London Atmospheric Emissions Inventory is published by the Greater London Authority (GLA) every two to three years in order to better understand sources of pollution. The Inventory, which is produced by TfL, features estimates on total emissions in particular areas based on observed activity data (such as traffic counts and gas consumption) and also makes estimates for future years.

These emissions are fed into models to create a view

of air quality across the whole of London and can be validated against the data collected via monitoring. The full Inventory is made publicly available, giving boroughs, developers and academics access to information on the sources of pollution and associated activity.

Having this sort of information enables TfL to develop targeted measures such as the Ultra-Low Emissions Zone and the roll out of retrofitted buses.



(Right) Stuttgart's traffic management center is equipped to re-time signals based on vehicle emissions data

Los Angeles

LA has been the most congested and polluted city in the USA for the past 20 years. The city combines the highest population density of any US urban area with the fewest number of miles of freeway

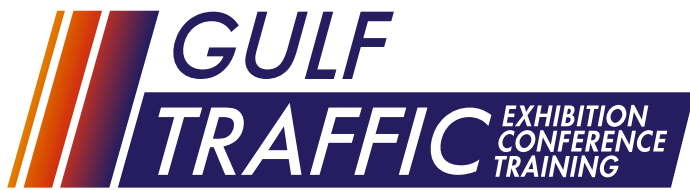
per capita. The worst day to travel is Thursday, with people trying to escape for three-day weekends. LA boasts 4,398 traffic lights. As of 2013, each one can be monitored and controlled remotely.

real-time decisions when balancing traffic flows on the network."

Unlike the more punitive low-emission zone approach, a solution that provides dynamic data to traffic management centers to ease traffic and therefore cut pollution concentrations, is non-invasive and occurs without drivers being aware. Siemens claims it is possible to reduce emissions by up to 25% in certain areas. The future surely lies in such an approach, allied as it must be to improved vehicle emissions reductions and a focus on other, non-polluting forms of transportation.

"Traffic management measures can make a contribution to cutting emissions," says Becker "But it will not be fighting the cause, only the symptoms." ○





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The end of private car ownership?

Smartphones and tablets have opened up a new world of multimodal travel information. Now, as **Jan Stojaspal** discovers, such apps are gearing up for the next evolutionary step: to becoming subscription-based services that will soon become cheaper, faster and more convenient than a private car

Photography: Andreas Gradin

It was a six-month experiment to see if the residents of Gothenburg, Sweden's second largest city, could trade their cars in for a mobile app that would source all their transportation needs from among public ferries, buses and commuter trains, shared bikes and cars, and, at a pinch, rental cars and taxis. It turned out that 69 of the 70 participating households could, and that their various members not only got to work and school on time, but also found the solution flexible enough to handle medical emergencies and even travel to an out-of-town wedding.

What's more, they saved money and reduced their carbon footprint in the process, says Magnus Kuschel, founder of Commute Greener, an open innovation platform underpinning the Gothenburg experiment, named UbiGo. According to Kuschel, an average

household enrolled in UbiGo saved more than €100 (US\$112) a month in transportation costs. And by the time the experiment concluded in the spring of 2014, with more than 10,000 individual journeys traveled, total savings in CO₂ emissions amounted to almost 45,000kg (45 metric tons), the equivalent of burning 5,283 gallons (20,000 liters) of gasoline.

With their ability to steer people away from private cars and toward more sustainable forms of transportation, multimodal mobility projects such as UbiGo – described as multimodal for their mixing and matching a variety of transportation modes – are emerging as a promising new front in







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Europe-wide efforts to fight traffic congestion, and a less restrictive alternative to congestion charging or reductions in hours of access.

Road (and rail) blocks

Before multimodal systems start to receive widespread adoption, there is still a lot that needs to happen. That's partially because a successful multimodal mobility solution needs to involve more than an intelligent trip planner – ideally in the form of a mobile app with an easy way of booking and paying for trips. It must also integrate a broad choice of transportation options, and these options must be easily accessible both for the beginning of a journey and transfers within different modes of transportation while in transit.

"Integrating a payment and ticketing system is relatively easy because much of it can be done using software," says Paul Kompfner, head of urban mobility at ERTICO – ITS Europe. "But in terms of making a physical interchange very easy to use, this is down to interchange design, and it needs a lot of coordination between the different operators."

More often than not, there are also legal issues and competitive pressures to work out. UbiGo, for example, had to shut down after losing an exemption that allowed it to issue public transportation tickets. And SMILE, a multimodal mobility platform trialed in Vienna with some 1,000 commuters, came to a halt earlier this year when two key participants, ÖBB (Austrian Federal Railways) and Wiener Linien, the public transportation company in Vienna, decided to go their separate ways.



Rural mobility

In Germany, rural areas seem oddly resistant to multimodal mobility schemes, but the search for the perfect fit continues

Multimodal mobility and urban areas are an obvious fit, particularly as alternative modes of transportation become more numerous and pressures to limit private car use increase.

Scarcely populated rural areas are a different story. The need for alternative modes of transportation is there too, particularly as public transport companies reduce services, residents get too old to drive themselves, and young people would rather spend money on the latest in mobile gadgetry than private cars. The problem is that little of what has been tried in the countryside makes economic sense.

"The model projects don't work in rural areas," says Christoph Menzel, a teaching

professor and traffic safety management specialist at Ostfalia University of Applied Sciences. "A whole lot of field trials have been done, and none are really working. One idea is to put car sharing in rural areas, one car per village, which is not the worst idea for the people living there. But from an economic point of view, the cars aren't used very much. They stand for three or four days in a row, which makes them expensive to run."

Another approach trialed in and around Kassel, Germany, was a scheduled taxi service

financed by a combination of public transportation tariffs and passenger surcharges.

But it was abandoned after it turned out that individual transportation needs were

"too individual to be scheduled," Menzel

says. And so, only communities

that double as popular tourist destinations

have so far shown promise for commercially

run car- or bike-sharing schemes (see page 10 for more on this).

Still, the search continues, if not with profit in mind, then out of a sense of obligation to provide an affordable means of transportation to everyone.



Integrating a ticketing system is relatively easy. But making a physical interchange easy to use needs a lot of coordination between operators

Paul Kompfner, head of urban mobility, ERTICO – ITS Europe



"Close cooperation between stakeholders is essential, and although UbiGo managed to prove a commercial viability for each stakeholder, the willingness to change among public and private partners is still just emerging," Kuschel says.

Still, advances, at least when it comes to the various constituent parts of multimodal mobility, are being made all over Europe, where more than 100 multimodal journey planners already exist, according to the European Commission, and where alternative modes of transportation are fast gaining in popularity, particularly

when it comes to bike sharing and free-floating car sharing.

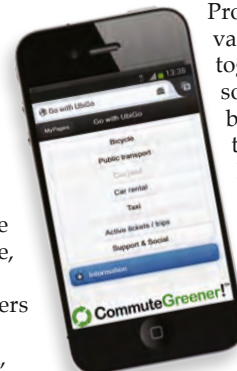
Germany, for example, already has some 750,000 people registered for car sharing, according to Christoph Menzel, a teaching professor and traffic safety management specialist at Ostfalia University of Applied Sciences. And it is also telling that cities as small as Halle and Magdeburg are now offering bike sharing.

Joining the dots

Progress on stitching the various constituent parts together in ever more sophisticated ways is also being made. In this respect, the Nordic countries are leading the way.

Last year, UbiGo showed that it was possible for people to ditch their private cars and embrace alternative modes of transportation without major inconvenience.

The city of Helsinki announced plans to sideline private car ownership within 10 years, by





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building a smartphone-based system that would coordinate an easy, on-demand mobility service for everyone. And this February, MaaS.fi, a consortium of 23 organizations in Finland, was formed to cooperate in the establishment of the world's first mobility-as-a-service operator.

Elsewhere in Europe, the German port city of Hamburg stands out with Switchh, a multimodal mobility project conceived and operated by the public transportation company Hamburger Hochbahn, which on top of integrating public transportation with bike sharing, car sharing and car rentals has taken the extra step of also building physical infrastructure – so-called mobility stations – to make interchanges as easy as possible. There are currently seven such stations around Hamburg, with plans for three more by late 2016.

Breaking down borders

Meanwhile, the European Union is racing to put the finishing touches to MOBiNET, a Europe-wide business-to-business marketplace

for intelligent mobility and transportation services, such as real-time travel information, online parking reservation and payment, and support for roaming traveler services.

On show at the 2015 ITS World Congress in Bordeaux, MOBiNET is not meant to compete with private initiatives, according to Kompfner. Rather, it aims to play the role of enabler and market-magnifier for service providers, particularly for cross-border services, where integration has barely begun.

“There are a lot of separate closed businesses, and MOBiNET is not interfering with their business model,” he says.



“If a public company is operating a platform, it's easier to invite [multiple commercial partners], which is much more convenient for the user

Manfred Mühlberger, managing director, ETA Environmental Consulting



“We are just trying to make it easier to offer travel and transportation services with extra features or with multiple segments, so users don't have to pay separately for different legs of their journey, or work out on their own how and where to find the best connections.”

What everyone seems to agree on is that the space is becoming ripe for integrators to start bringing together the ever-growing array of transportation offerings. And most seem to favor public transportation companies for the role – if not for any other reason than for being above bias when it comes to dealing with private transportation providers.

(Left and Below) One of Hamburg's mobility stations, built to make switching between different modes of transport as seamless as possible



“Daimler will hardly want to let BMW offer their services over its platform,” says Manfred Mühlberger, managing director of ETA Environmental Consulting, which worked on the SMILE trial. “And then you only have one car sharer on the platform, and, at least in Vienna, we have already five or so. If a public company is operating a platform, it’s easier to invite [multiple commercial partners], which is much more convenient for the user.”

Last exit for private cars

Far less agreement exists when it comes to how to structure multimodal mobility offerings so that they appeal to large numbers of people and ultimately rival private cars in convenience and comfort.

According to Sampo Hietanen, CEO of ITS Finland and chairman of MaaS.fi, getting rid of single-occupancy vehicles is entirely possible, but it will only happen through a multimodal mobility product that is truly comprehensive, that covers a substantial geographical area, and that is as simple to buy and use as a cell phone contract.

“If you want to beat actual car ownership, you can’t start too small,” he says. “You have to make an offering and actual service-level agreement that is competitive with the privately owned vehicle. And that means that you have to put together all modes, all means of transportation.”

At least this is what MaaS.fi is trying to do. Armed with some

(Right) The Kutsuplus minibuses are small public transit vehicles that function to provide bespoke, on-demand services



“ [With mobiles] people might call more if they have unlimited calls. But I don’t think [unlimited access will mean] they’ll be traveling too much more

Sampo Hietanen, CEO, ITS Finland



€2m (US\$2.25m) in seed capital from a handful of members, it plans to launch, in the second quarter of 2016, a service that would give people in Finland, Estonia and perhaps Sweden access to public transportation, shared bikes and cars, rental cars, taxis and possibly also car leases, both on a pay-as-you-go basis and as part of a monthly subscription plan.

According to Hietanen, the offering, which may or may not include a plan with unlimited usage to start with, will evolve as people become more accustomed to buying mobility services as opposed to the means of mobility, such as a car.

And it will likely follow the path of the telecoms industry in how it’s packaged and sold.

“If you follow the telecoms, mobile phones... first you paid by usage, then you started having these flexible subscriptions where you had this much data [included] and so on,” he says. “But once the masses were big enough, it was just easier to say, ‘OK, you have the whole [unlimited] access.’ And I think it’s even more doable in this field, because people might indeed call more if they have [unlimited] free calls. But I don’t think you’ll be traveling too much more.”

It’s estimated that an average EU citizen spends approximately €300 (US\$337) a month on transportation. If that money were to be redirected, it would be more than enough to fund ambitious programs like the MaaS.fi project. But cost savings alone may not be enough to tip the scales, Hietanen warns. “You need to give something extra,” he says. “What we need is to give you back your 90 minutes of using your hands and a wheel. ... You need to give people back their time. That’s what they want.” ○



Personalizing buses

An on-demand service that could play an essential role in urban mobility

Public transportation is central to any multimodal mobility solution, but it often makes for a poor customer experience. A crowded public bus on a hot summer day is anything but pleasant. And fixed routes and schedules can also be a problem. Enter Kutsuplus, Helsinki’s innovative fleet of 15 minibuses that combines the efficiency of public transportation with the flexibility of a taxi service – with a bit of ride-sharing thrown in.

With only nine seats and no standing, a Kutsuplus minibus will never get crowded. And being entirely demand-based, the service typically comes with a five- to 10-minute pick-up from 1,500 locations within the Helsinki metropolitan area, ordered via an app. Tickets are much cheaper than a taxi fare.

In all fairness, Kutsuplus is not for everyone. “If you are in Lapland alone, a private car is better,” says Kari Rissanen, program director at Helsinki Region Transport. “If you are

going from the center of Espoo to the center of Helsinki, a bus is better. But a bus is only efficient when there are a lot of people. If your starting places and destinations are all scattered, Kutsuplus is the optimal solution.”

With only 15 minibuses in operation at the moment, the city has to subsidize up to 80% of operating costs. But with enough scale, which Rissanen puts at 100-1,000 vehicles, it will more than pay for itself.



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Intertraffic

Danger ahead

As rural intersections continue to prove perilous to motorists in the USA, **Max Glaskin** finds out how innovative ITS can be used to share information, raise driver awareness and, ultimately, improve safety

Image: Krivosheev Vitaly

There are three million miles of rural roads in the USA. The nation's vehicles cover 40% of their annual distance on these remote strips of blacktop. Yet despite their relative tranquility, 57% of road deaths happen here.

Making these roads safer would help the USA substantially reduce its fatality figures. However, some of the hazards on rural roads need creative solutions: the majority of rural road deaths are alcohol-related; greater distances means medical aid can

take 30 minutes longer to arrive than in urban areas; and 89% of animal collisions take place here.

Rural intersections are particularly ripe for an ITS safety treatment. At these junctions in the USA there were 6,947 fatal crashes in 2013 – almost a quarter of the national total.

“The intersection crash problem isn't regional – it's a national issue,” says Scott Petersen, an ITS consultant at SRF Consulting, Minnesota. “Drivers exhibit similar

behaviors nationwide. A major cause appears to be the drivers' acceptance or rejection of gaps in the traffic flow." Stop signs and white lines are not triggering safe behavior in enough drivers.

Active measures

The Federal Highway Administration's enterprise program is pooling resources from many partners to deploy ITS consistently and in the best way, to make rural intersections safer. They're applying a combination of vehicle sensors, static signs and flashing beacons to dynamically warn drivers of imminent conflicts.

At intersections there are tried and tested systems to alert drivers on the major route of vehicles entering and to help drivers on minor routes to select gaps. Usually they consist of post-mounted or overhead signs and flashing beacons triggered by loop detectors. There's nothing wrong with these, and statistical analysis shows they reduce crashes by as much as 27%, on average, compared with rural intersections with no such technology. They are also highly effective in terms of investment (see *Balancing the books* sidebar).

Dynamic control

Despite the success of current systems, it is thought that ITS could help even more – with dynamic and responsive systems installed at





Balancing the books

Investing in traffic technologies pays back in safety and in money

AVERAGE ANNUAL CRASH COST AT RURAL INTERSECTIONS

US\$202,000 for two-lane + two-lane intersections
US\$220,000 for four-lane + two-lane intersections



MAINTENANCE AND OPERATIONS COSTS (ANNUAL)

Minimum: US\$625, Maximum: US\$3,400
Average: US\$1,074 for two-lane + two-lane intersections, US\$1,933 for four-lane + two-lane intersections



AVERAGE COSTS OF CRASH MITIGATION FEATURES

US\$41,500 at two-lane + two-lane intersections
US\$106,200 at four-lane + two-lane intersections



LIFESPAN

System: 10 years
Loops: Five years



COST/BENEFIT ANALYSIS:

1:35 at two-lane + two-lane intersections
1:13 at four-lane + two-lane intersections



Source: ENTERPRISE ICWS Webinar Series, Webinar 2 April 23, 2015 by Scott Himes of VHB and Evaluation of Low Cost Safety Improvements Pooled Fund Study

locations such as isolated intersections. First, though, their potential and limitations must be evaluated.

This is what Dan Middleton and his colleagues at Texas A&M Transportation Institute are doing right now, so that standards can be set before new vehicle detectors are deployed at high-speed rural intersections. They're assessing video, microwave and Doppler radar, hybrid detectors and magnetometers using a section of the university's airfield. Next, they will test the selected technologies at high-speed intersections in Texas.

They're running motorbikes, sedans, pickups and a truck tractor unit through the test area at 50mph and 70mph in dry, wet, day and night-time conditions. GPS data from every test run of each vehicle is compared with the detection performance of each system to see which could work best.

Elsewhere, simpler solutions requiring smaller budgets are being trialled. Taek Kwon, professor of electrical engineering at the University of Minnesota Duluth, has been developing a low-cost approach to improving safety at rural intersections, code-named ALERT, with funds from the Minnesota Local Road Research Board.

“

The system warns a driver on the major approach if there's a vehicle stopped or entering the intersection from the minor approach

Taek Kwon, professor of electrical engineering at the University of Minnesota Duluth, USA

“Initially our goals were to develop a low-cost, low-maintenance, dynamic interaction warning system based on the presence of traffic, to reduce the speed of vehicles on the major approach to the intersection,” says Kwon. “The system warns a driver on the major approach if there's a vehicle stopped or entering the intersection from the minor approach. Likewise, a driver on the minor road would be warned if a vehicle is on the major approach.” If it worked, it would reduce the probability of a conflict at the intersection.

To keep costs down it was important that the system used off-the-shelf technologies and could be easily assembled by traffic or sign technicians without the need for cabling. Therefore radar was chosen for vehicle detection, a solar array for powering each unit in the system, and wireless technology for communicating between units.

(Left) Niels Agerholm of Aalborg University ran a project to promote car pooling and lift sharing

Low power LEDs were selected in preference to the alternative of higher powered beacons.

The first version, ALERT-1, was installed at a blind intersection that carries 600 vehicles daily on the major road and 200 on the minor. Radar sited at the intersection detects traffic on the minor road and triggers LEDs to flash on a sign on the major road and warn drivers that there are vehicles ahead, crossing their path. There's another radar on the major road, located 700ft from the intersection. If this second one detects vehicles approaching, it triggers flashing LEDs to draw the attention of drivers on the minor road to a sign at the stop line, warning that traffic is approaching.

It worked to some extent, reducing speeds on the main approach and increasing the wait time for vehicles on the minor approaches. Roll-throughs from the minor roads at moments of potential conflict almost stopped completely. The next step was to eliminate roll-throughs at the stop sign, because there had been an increase at times when the LEDs weren't flashing.

So a second version, ALERT-2, was installed at another intersection, with higher traffic volumes. It had similar units installed but, importantly, the radar on the minor approach was shifted 500ft in advance of the junction. This triggers LEDs on the stop sign to flash for 10 seconds and then, as the car approaches the stop line, LEDs on a vehicle approaching sign flash.

"This sequence is designed to make the motorists feel as if



(Above) The ALERT-2 system installed in Minnesota

the stop sign and approaching vehicle information is personalized to them," says Kwon.

The result? All roll-throughs have been halved and average speed on the major approach has decreased by 3.89mph, giving 0.93 seconds extra reaction time. Notably, it improved gap recognition for drivers on the minor approach.

Idaho Transportation Department (ITD) has followed an even less costly approach and has still seen a 35% reduction in intersection crashes over nine years. It has implemented an audit that makes sure intersection signs are within a driver's field of vision and are up to the latest standards. The cost? US\$155 per intersection, on average.

“There’s an avalanche of apps for helping people to share journeys but, so far, they’re for cities or for long distance, not rural areas

Niels Agerholm, associate professor, Aalborg University

Information everywhere

ITS also has a role to play in accelerating the sharing of timely information about rural road networks. A new system based on tablets that run a bespoke app and communicate via roadside wi-fi has



Community spirit

Rural car pooling will reduce traffic and increase mobility

Social media can improve the efficiency of transport for people in the countryside. In Denmark, 12% of the population live rurally, but some people, particularly the elderly, find access to travel difficult. Now, Niels Agerholm (pictured left), associate professor of engineering at Aalborg University has run a project in two villages to promote lift sharing.

"There's an avalanche of apps for helping people to share journeys but, so far, they're for cities or for long distance," says Agerholm. "In rural areas people typically need lifts into the local town and back."

After surveys, two villages, each with under 1,000 residents, were chosen to trial the QGroups app for SMS text messaging to arrange local lift sharing.

"It's a very simple app," says Agerholm. "If we were developing it now we'd do some things differently, because smarter apps have since become available."

Since its launch in September 2014, car pooling has worked increasingly well in the village with a strong community, but has failed to take off in the other. Agerholm is now seeking funding to extend the project.



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(Left) Wyoming's app-based road weather information system

been trialled by Wyoming Department of Transportation (WYDOT) to get accurate weather-related road condition information from rural areas to the traffic management center (TMC), operations teams and travelers more promptly.

"Our aim was to reduce radio and cell phone traffic by sending data directly to the TMC and a public website, to streamline TMC processes, reduce the amount of data entry for our dispatchers, improve

the data is stored until connections are re-established.

Wi-fi was deemed necessary so that larger files could be easily handled by WyoLink, such as weather maps and radar images, and could then be downloaded onto the tablets. Wi-fi beacons have been installed at 13 locations, including at the roadside sand sheds. Depending on the terrain and aerials, it's been found that some have a coverage of a mile or more.

Although the project's final report is yet to be published, there are hopes that the app will be enhanced by the addition of time reporting, email, a vehicle inspection form, damage repair reports, hazardous material identification and weigh-in-motion (WIM) data. "A second grant is allowing us to expand the wi-fi and add more tablets," says Kelly.

66 Our aim was to reduce radio and cell phone traffic by sending data directly to the TMC and a public website

Mark Kelly, communications systems supervisor, WYDOT, USA



the timeliness and accuracy of condition reports and to provide more information for maintenance personnel," says Mark Kelly, communications systems supervisor at WYDOT. It was also designed so that several reports could be sent to the TMC at once, instead of by separate radio communications.

With a grant from the FHWA, 20 Samsung Galaxy 4 tablets with the app have been piloted for eight months in districts where 420 miles of the I-80 and I-25 run. Internal GPS helps with some location functions, and other data is entered quickly by the operator using the touchscreen. The fact that the operator enters data through the touchscreen, rather than a keyboard, means they're not contravening legislation that prohibits using mobile devices in vehicles. The tablet, mounted on the dashboard, can transmit data via the established WyoLink P25 radio system or by the newly installed wi-fi network. If neither are available,



(Left and right) Intersection monitoring equipment in Idaho



(Above and right)
Sensors gather road weather information on Idaho's rural roads



investment has saved almost US\$25m in costs to society.

"ITD views the winter performance measures as an evolving system with the goal being a 100% automated reporting system," he

66 ITD views the winter performance measures as an evolving system with the goal being a 100% automated reporting system

Bob Koeberlein, HQ operations engineer, Idaho Transportation Department, USA



says. "We're in discussion with the vendors to include modifications for functionality and improved reporting to achieve this goal."

The appeal of the quiet, remote open road will persist as ITS is applied increasingly to rural locations. Travelers on these more peaceful highways will benefit from better information and safety, as will the authorities that operate and maintain them. ○

Counting on safety

Crash reduction where intersection conflict warning systems have been implemented



ON TWO-LANE + TWO-LANE INTERSECTIONS

Crash type	Crash reduction
Fatal & injury	30%
Right angle	20%
Rear-end	57%
Night-time	N/A*
Total average	27%



ON FOUR-LANE + TWO-LANE INTERSECTIONS

Crash type	Crash reduction
Fatal & injury	20%
Right angle	15%
Rear-end	N/A*
Night-time	39%
TOTAL average	17%

*The data analysis didn't produce a statistically significant result (Source: FHWA Evaluation of Low-Cost Safety Improvements Pooled Fund Study)

Seasonal intelligence

Idaho Transportation Department (ITD), meanwhile, in collaboration with Vaisala, has developed ITS to enhance winter maintenance, increase safety and save money. From the sensors gathering road and weather data, through crunching the numbers, it automatically identifies road surface grip loss so that ice prevention treatments and de-icing can be improved. From fall 2011, a storm severity index was

combined with the time taken to recover road grip to give an index figure that guides decisions for maintenance.

The improved precision means that, since then, the annual maintenance bill has fallen from US\$30m to US\$15m and accidents have fallen by 27%, from a three-year average of 1,256 to 912. Bob Koeberlein, HQ operations engineer at ITD, calculates that the US\$16m



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Desert command

Taking place December 7-9 at the Dubai International Convention & Exhibition Center, Gulf Traffic 2015 will showcase transportation in a booming region. **Tom Stone** uncovers the highlights delegates should seek out



Economic growth in Dubai is expected to top 5% in 2015, while the city's budget will have an operating surplus of US\$1bn (Dh3.6bn), despite government spending increasing by 9% over the previous year (to a total of US\$11.2bn (Dh41bn)). Against this backdrop Dubai's construction boom continues apace, with ever more impressive skyscrapers springing up from the desert floor. Moreover, the city is becoming a transportation hub – the airport already caters for more than 70 million passengers a year and there are plans to expand it to cope with 200 million. Meanwhile cargo at the Jebel Ali seaport increased by 12% in 2014 and it's on course to become the biggest container port in the world by 2030.

Dubai's rate of growth spills out to, and is reflected across, the UAE and the wider gulf region, but none of this construction and expansion is sustainable without developing new ground transportation infrastructure to match, while ensuring that existing assets work as hard as possible by harnessing the latest technology. It is no surprise then that the region's premiere transportation expo – Gulf Traffic, hosted in Dubai – is also experiencing rapid growth.

"We are always adding value to Gulf Traffic for our visitors and exhibitors," says exhibition director

Richard Pavitt. "Last year's new initiative was the Parking Zone and Parking Summit. It worked so well that we added a mid-year conference [in June], which we are now looking to run every year.

"For 2015 we are doubling our conference agenda. Parking, ITS and safety will remain, and we will be adding an infrastructure stream as well, with

separate conferences on road construction, tunneling and bridging. The event covers the whole industry from software, and policy, through to breaking ground."

Ideal for investment

It is not only economic growth that makes the Middle East a focus for the installation of the latest transportation technology. The added combination of strong population growth and plentiful available land, means that cities in the region are able to expand

at a faster pace than in most other areas in the world. "It gives governments the opportunity to start projects from scratch and use the very latest technology available on the market," says Pavitt. "The appetite and finances are there, despite low oil costs, for

regional governments to complete huge infrastructure projects such as the World Cup in Qatar and Expo 2020 in Dubai."

Gulf Traffic is an event that makes doing business in this booming region that much easier. "We have

91
The percentage of visitors to Gulf Traffic 2014 who plan to return to this year's event

73
The percentage of visitors who arranged business with a new supplier at Gulf Traffic 2014



(Left) Innovative safety technologies will be demonstrated at Gulf Traffic

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↙ | Six of the best

Gulf Traffic exhibition director Richard Pavitt picks his session highlights from a packed agenda at the show

1. Case Study: A Step from Electric Vehicles to Wireless Power Transfer (WPT)

Akin Adamson, director, Middle East Region, TRL, Qatar
13:05, December 7, Zone A

2. GSM, Satellite, GPS, Sensors and GIS: Tools for Traffic Management

Abdul Aziz Al Mutawa, SVP, Technology Innovations, Etisalat Group, UAE
11:15, December 8, Zone A

3. Case Study on 'Opticities': Connecting Six European Cities with Urban Mobility

Gilles Vesco, councillor and board member, Opticities, Metropole of Lyon, France
14:15, December 8, Zone A

4. Planning and Implementing Advanced Technology in Developing Cities

Rupert Green, smart design lead, WSP Parsons Brinkerhoff, UAE
10:45, December 8, Zone A

5. Transport Hubs and their Impact on Cities

Rachad Norcharli, regional business director, traffic engineering services, Hyder Consulting Middle East, UAE
10:45, December 8, Zone B

6. Big Data Comes to Parking

Blake Laufer, vice president of research, T2 Systems, Canada
12:10, December 9, Zone A

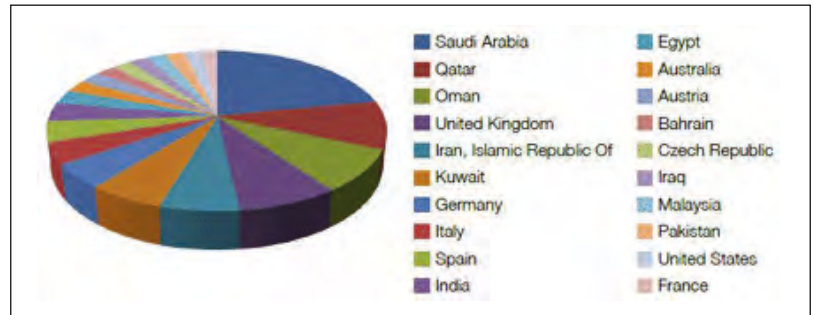
partnered with a company that specializes in business matchmaking," says Pavitt. "There's a link on our website that takes you to an online platform where visitors and exhibitors can arrange meetings at the show. This is the first time we have done this and we are excited to see how it works."

Of course, sometimes low-tech methods can be just as effective in making new contacts, which is why this year the dealer/distributor lounge in the exhibition hall will have a wall where visitors can add their contact details and list the products they are looking to source. "We hope it will be a great way for exhibitors to make sure they follow up all potential sales leads, as well as giving visitors an area where they can sit down and meet with clients," says Pavitt

Going automatic

Given its legendary appetite for technology, it's no surprise that the UAE is already embracing the concept of autonomous vehicles. The UK's Transport Research Laboratory (TRL) will be hosting a conference session on the subject at Gulf Traffic, and Dubai's RTA (Roads and Transport Authority) already has a task force in place to look at ways to move forward with testing. Mattar Al Tayer, chairman of the board and executive director of Dubai RTA, recently said, "We have set up a team to study the use of autonomous cars and map out a strategy and a work plan for addressing the latest developments

(Right) The top 20 Gulf Traffic nations, by total number of visitors, excluding those from the UAE (Below) Local attractions include a desert safari



“ We have some of the world's leading authorities sharing their experience and knowledge

Richard Pavitt, exhibition director, Gulf Traffic



in this field. We want to identify the standards and specifications required in these vehicles along with the needed infrastructure and safety legislations needed. In this context, the RTA has approached a host of international manufacturers of smart vehicles to examine the technological alternatives on offer and plan for real-life experiments using such vehicles in Dubai under the supervision of the RTA."



Getting the most out of a visit

As well as sessions on connected and autonomous vehicles, the packed conference agenda will feature presentations from many other parts of the industry, and it is completely free of charge. "We have some of the world's leading authorities sharing their experience and knowledge – from the latest on big data and how to use it effectively to manage roads, right through to cutting-edge research on tires, and everything in between," says Pavitt.

Beyond the Convention Center walls, first-time visitors to Dubai might want to make time for a little sightseeing. "The Big Bus Tour is wonderful," says Pavitt. "The fountains at Souk Al Bahar are a real highlight of Dubai and the Madinat is great. It's also possible to get out of the city and into the desert. For example, if you have time, a desert safari is fantastic fun and gets you away from the bustle of Dubai. I could go on for hours about what to do here."

Turn the page for Gulf Traffic exhibitor highlights you won't want to miss, from Traffic Technology International supporters

Advanced enforcement

Youssef El Hansali, Vitronic Middle East, UAE

Stand: H20

What can visitors expect to see on your stand?

Visitors will see the next generation of traffic enforcement and monitoring systems based on the latest PoliScan product and software developments. In particular, we will be showcasing our Enforcement Trailer, which mobilizes traffic enforcement solutions. The French Ministry of the Interior has already ordered 150 of these units.

What is your latest news?

Dubai Police recently awarded Vitronic a contract to replace all existing radar speed systems on Sheikh



Zayed Road with new PoliScan FM1 systems.

Where have your systems recently been implemented?

We recently built an automated enforcement management system in Abu Dhabi. The project comprises a network of more than 800 PoliScan speed spot enforcement systems

and 120 PoliScan seco point-to-point speed enforcement systems. In addition to the enforcement hardware, Vitronic delivered software solutions for interconnection of enforcement sites, case processing and asset management. We have also recently completed large-scale projects in Oman, Iraq and Saudi Arabia.



Why is enforcement important in the Middle East?

The excellent new roadway infrastructure enables driving at high speeds. However, with an increasing number of vehicles on the roads, there is a high rate of traffic-related accidents and fatalities in certain areas. There is a need to increase traffic safety through enforcement but also the need to deploy systems that enable authorities to optimize traffic flow.

Weight watchers

Rish Malhotra, IRD, Canada

Stand: E37

Why is the Middle East an important market for IRD?

There is a realization in the Middle East that intelligent transportation systems contribute to safety and help protect infrastructure investments. Indeed, IRD has supplied equipment for 23 weigh stations in Qatar. These sites weigh trucks in motion, capture images of suspected overloaded trucks, and



transmit the vehicle information and images to an enforcement facility downstream.

IRD has also recently installed access control systems that integrate truck tolling in the region. The Haya waste water treatment facility in Oman, for example, uses our iToll system for accurate and auditable high-volume toll collection with integrated reporting. In the UAE, IRD has supplied technology for a toll system for trucks exiting limestone quarries.

What will you be exhibiting at Gulf Traffic?

We will be demonstrating our Vehicle Information in Motion (VI²M) systems, which use VectorSense tire sensors. VectorSense is a new in-road sensor technology that provides individual tire footprint data. This additional vehicle data



offers agencies more accurate vehicle classification and lane position information for traffic data and toll systems. The system also enables enhanced safety checks, such as detection of under-inflated tires, for commercial vehicle screening.

What trends are you noticing in the industry?

We've noticed a trend toward incorporating more advanced vehicle detection and tracking technology. It is realistic now for projects to reduce operating costs while improving safety



and environmental sustainability. Agencies are also investing in more sophisticated connected systems that can screen vehicles against databases.

IRD has also recently won some major contracts in the USA. In Indiana we will be providing weigh-in-motion (WIM) and virtual weigh-in-motion systems (VWS) including site and sensor installation, maintenance and repair. In Oklahoma IRD will build, implement and maintain innovative port-of-entry (POE) electronic screening systems (ESS) for trucks.

TRUVELO

Certified solution

Tomas Pospisek, Kistler,
Switzerland

Stand: G30



What will you be presenting at Gulf Traffic?

We will be showcasing our weigh-in-motion (WIM) equipment for traffic data collection, weight enforcement and weight-based toll collection applications. Visitors will have the chance to see Kistler's OIML-certified WIM system, comprising the Kistler WIM Data Logger and Lineas quartz WIM sensors, which can be easily integrated into existing applications.

What is your latest news?

Kistler has become the first WIM manufacturer to receive the OIML R-134 certificate for vehicle weighing via strip sensors at speeds of 3-65km/h (2-40mph). With this certificate, Kistler's WIM systems can be used for legal weighing applications. OIML-certified WIM systems promise better results in applications such as road pricing with weight-based toll collection, automatic enforcement of weight limits, weighing at ports and terminals, industrial weighing, and weighing at mining facilities.

What trends are you noticing in the industry?

Trends pushing the growth and deployment of WIM

systems include: the need to understand traffic loading to enable better designs for new roads and to plan maintenance activities; the need to detect overloaded vehicles to protect the infrastructure and increase traffic safety; and the need to finance road expenditures by applying new pricing concepts, such as weight-based toll-collection schemes.

Why is WIM important in the Middle East?

This region is seeing a substantial investment in road infrastructure and an increase in road transportation. WIM helps to achieve sustainable development. It offers a means to monitor the impact of increased traffic loading and a tool for more efficient enforcement of overloaded trucks. It can also be the base for financing road expenditures if used for toll collection. We have already deployed WIM solutions in Iran, Saudi Arabia, Qatar and Bahrain. We want to continue to support these and other countries in the design and deployment of WIM solutions.



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Effective speed reduction with automated enforcement

Speeding is one of the leading causes of road accidents around the world. With safety a constant priority, road authorities are always looking for more effective ways to manage and reduce the speeds of vehicles. Research has shown that maintaining free-flow travel speeds to within 5-10mph of the posted speed limit contributes to a substantial reduction in fatal road accidents.

A comprehensive speed management strategy comprises engineering, enforcement and education. It is essential to apply road design and engineering measures that encourage drivers to maintain an appropriate speed. At the same time, speed limits must be rational, safe and reasonable. Highly visible enforcement equipment can also



Need to know

An advanced speed enforcement solution has been engineered to improve road safety

- > Automated speed enforcement (ASE) solutions can increase safety for law enforcement officers, as they can be installed in areas where the roadway design makes it dangerous or simply not feasible for officers to stop
- > With low power consumption, ASE technology provides a continuous and reliable enforcement solution
- > Automated solutions provide minimum distraction for drivers, which means that traffic flow is not affected

help deter people from breaking the speed limit.

"Automated speed enforcement (ASE) systems are an important element in speed management and can be very effective in preventing speed-related crashes," says Corrado Franchi, CEO of Italy-based ITS solutions provider Tattile. "Our technology is designed to provide smart solutions that meet the needs of the industry. We are always looking for new ways to improve road safety. We use our skills and experience to engineer devices that make roads safer and protect human life."

Sophisticated enforcement

Tattile's latest product, Vega Speed, is a technologically advanced speed enforcement camera. The device uses a combination of the company's embedded ALPR (automatic license plate recognition) cameras and a new multitracking radar to perform both instant and average speed enforcement functions.

(Above) Tattile's solutions can be used in free-flowing traffic (Right) Vega Speed facilitates instant and average speed enforcement

Small and compact, and weighing just 5kg, Vega Speed can be easily installed on a gantry or a pole at the side of the road. It has been developed to withstand the most extreme weather conditions and has a very low power consumption.

The system scans two lanes of vehicles simultaneously. The radar can detect vehicles up to 100m away and it keeps tracking them for up to 30m while the camera takes a picture of the vehicle and initiates ALPR.

The device outputs two black and white images, and two color images. All images contain the date, time, license plate registration, and country of origin. With all information provided automatically, there is

no need for manual identification of the license plate.

Dual benefit

It is now widely accepted that a combination of instant and average speed enforcement sees the best results in terms of speed reduction.

"Once installed, our cameras can provide instant speed measurements but the images with the related timestamp can also be used for average speed," says Franchi. "The system simply compares the timestamps between two checkpoints."

Furthermore, ALPR enables the creation of databases that can



(Above) The light, compact camera is suitable for use in harsh conditions

be used for vehicle tracking, as well as crime, insurance and tax enforcement. As a result, the road network becomes much more controlled and safe for users.

"The first Vega Speed systems will be installed in Turkey in the second half of October," Franchi reveals. "The system has been thoroughly tested for over a year on a gantry over a three-lane road. The results are excellent, both in winter and in summer. We are expecting the system to have a huge impact on driver behavior."

Forward thinking

Looking to the future, Tattile will continue to improve and update its products to meet the needs of road authorities who want to ensure road-user safety. "Technological improvements in the future will make our devices more smart, connected and powerful than they are now," believes Franchi. "We will also be developing our solutions within an urban context and will consider enabling communication with other devices." ○



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The USDOT's connected vehicle pilot awards will expand awareness and opportunity

“Is there a viable market for consumer-based consumption of DSRC technology and services; one that will attract private sector investment, beyond V2V safety?”

Recently, the USDOT made its first three connected vehicle (CV) pilot deployment awards to try to help answer this question. The awards went to New York City; Tampa, Florida; and the state of Wyoming. Each location is focusing on different elements of the CV environment (all using some element of DSRC), but collectively they will address issues with safety (vehicles, infrastructure and vulnerable road users), congestion and freight movement.

What is interesting about these site selections is that it further extends the geographic reach of the DSRC/CV activities in the USA from what it has been over the past several years. These awards substantially increase both the level of activity and recognition that connected vehicle opportunities are available everywhere, even in the rural state of Wyoming. What else is interesting is that none of the early adopters (Virginia, Michigan and California) were recipients of an award. Without having knowledge of the behind-closed-door discussions at the USDOT, it's hard to say why. At the very least, they're saying it's not business as usual.

Over this next year, these three sites will continue to evolve their system concepts. Once the sites complete this first phase and receive the go-ahead from the USDOT, they can then proceed into their design/build/test phase. So, it will still be another two years or so before we see much in the way of actual operations. And it will be even longer until we see if there are sustainable business models for CV/DSRC.

Given there were roughly 40 or so proposal submissions, what will those sites that did not win an award do now? Michigan and Virginia have already begun moving forward with non-federal funds. Will they continue to expand? Recently I attended the ITS California meeting. As they were one of the sites that did not receive an award, what will their next move be? Their proposal was based on three major regions (San Diego, Los



“Connected vehicle opportunities are available everywhere, even in the rural state of Wyoming”

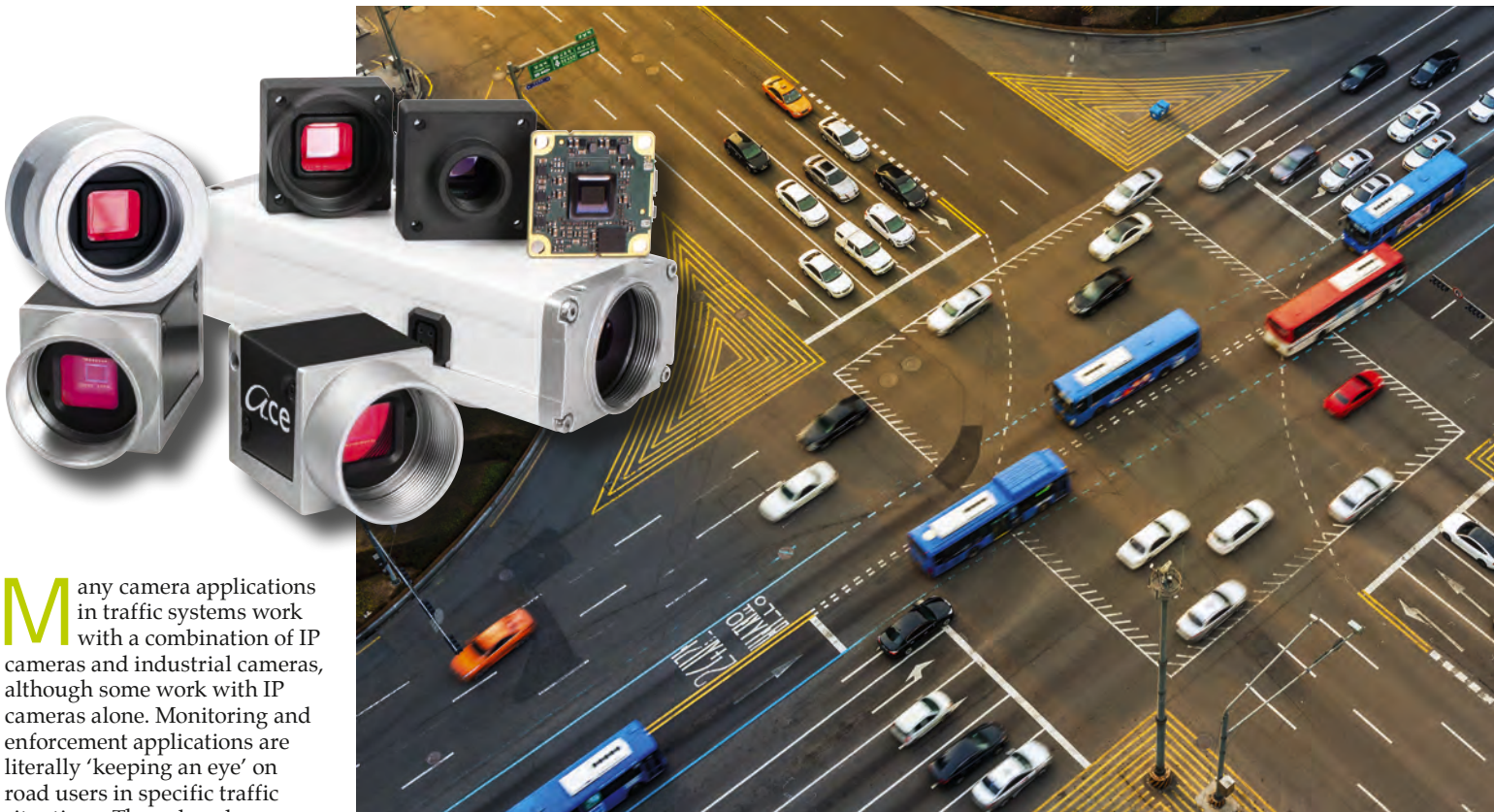
Angeles, and the Bay Area) working collectively on DSRC/CV solutions. Will they continue in a collective manner or will they separate and move in different directions, if at all?

Furthermore, the story of this first round of awards is still not over. The USDOT has told some sites that if supplementary funds are available by December of this year, then additional awards may be made. So, we could possibly see up to three more sites being given awards as part of this first wave of activities.

So while the CV pilot sites are building up over the next couple of years, the question remains, 'Is there a viable market for DSRC outside of the proposed mandate for V2V safety?' For now, the jury is still out.

Mike Schagrin is former program manager for the ITS Connected Vehicle Safety and Vehicle Automation research programs at the USDOT's ITS Joint Program Office. He has now established Schagrin Consulting International, supporting clients in connected and automated vehicles mike@schagrin-consulting.com

IP cameras take a sharp look at traffic violations



Many camera applications in traffic systems work with a combination of IP cameras and industrial cameras, although some work with IP cameras alone. Monitoring and enforcement applications are literally 'keeping an eye' on road users in specific traffic situations. They also play an important role in increasing road traffic safety in general.

Speeding and red light violations are among the most common traffic violations. They are subject to enforcement by authorities and therefore require reliable monitoring. To provide as much versatility and flexibility as possible, and to meet the technical and regulatory requirements of multiple countries, industrial cameras with (for example) Gigabit Ethernet (GigE) or USB 3.0 interfaces can be used either alone, or in combination with IP (network) cameras. The industrial camera delivers two or three still images, which is sufficient evidence in some regions. Combined with an IP camera, the vision system can

also provide additional video streams, as required in the USA.

Combined vision solutions

In most cases, effective enforcement needs at least two images: a typical application for industrial cameras in ITS might require one high-contrast image of the vehicle's license plate, plus another overview image of the driver, the vehicle and the surrounding scene. In red light enforcement applications, the overview image is usually a sequence of two or three images to prove the violation, such as when the vehicle has completely crossed the stop line and the intersection. Automatic license plate recognition (ALPR) programs include algorithms that identify the vehicle's owner.

Together with the overview image, the material provides sufficient proof of who committed the violation.

To collect evidence to establish beyond doubt whether a red light violation has been committed, the video streams of an IP camera complement the still images. In such a combined setup, the IP camera replaces the 'overview camera'. In some regions, two or even more still images might not provide sufficient evidence for legal enforcement actions. Hence, video footage showing a vehicle's movement when failing to obey a stop signal or red traffic light is mandatory in addition to the camera images. In such cases, IP cameras ideally complement industrial cameras by providing

a short video sequence supporting the prosecution process. Modern compression formats such as H.264, MPEG-4, or MJPEG minimize the storage space needed for a high-quality violation video, and enable the integrator to provide long-term storage for 24/7 traffic surveillance together with the regular 'on-demand' enforcement video footage.

The right sensor

To deliver images or video footage that leaves no room for interpretation, the cameras must be equipped with components that best match the requirements of the application. Choosing the 'best' sensor therefore depends first and foremost on the goal of the ITS



(Main) Modern vision technology keeps a watchful eye on today's traffic (Inset, above left) Industrial and IP cameras make an effective combination in many ITS applications

application. There are usually specific forensic requirements for images to be considered as legally admissible evidence. Modern CMOS sensors with global shutter technology and a large dynamic range provide clear detail and strong contrast, even with extreme differences in brightness. This means that within an image the sensor can simultaneously reproduce the dark areas – for example the driver inside the vehicle – and very bright areas such as a bright reflection from a license plate. Both areas are displayed with rich contrast and precise

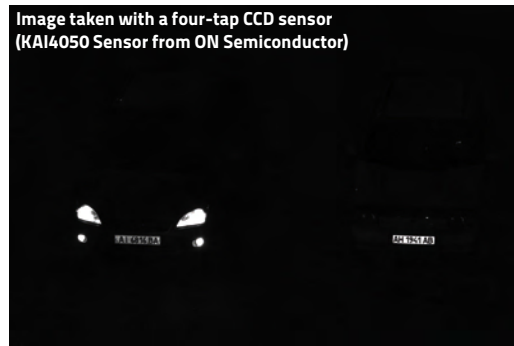
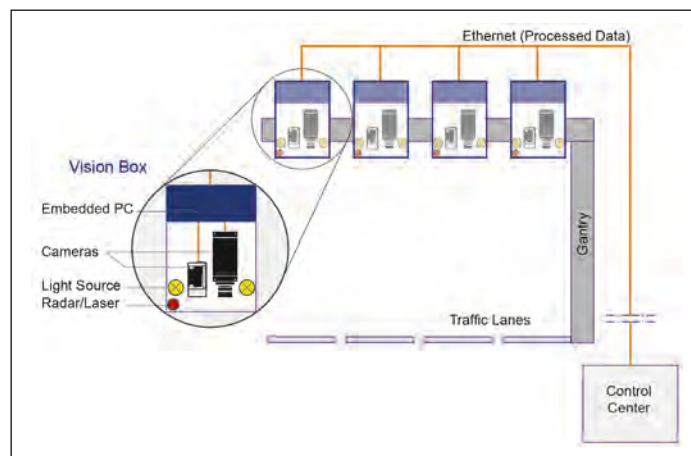


Image taken with a four-tap CCD sensor (KAI4050 Sensor from ON Semiconductor)



Image taken with the new Sony CMOS sensor IMX174



(Above) The image on the right shows a higher dynamic range as it allows for the driver as well as the license plate to be better recognizable within one and the same picture (Left) The industrial camera delivers raw still images while the network camera compresses the recorded video data before transmitting them to the computer

for individual images and compressed streams. Uncompressed images ensure that no image data is lost through compression and that image material is available for further forensic analyses as required for ALPR, for example. The camera works at a speed of 30 frames per second and delivers images in full HD resolution. With this combination of a single triggered shot with (for example) IR/white light support plus constant video stream, this camera is able to cover both tasks – the single shot and overview video – in one single camera approach for various enforcement setups.

Whatever enforcement application it is designed for, an industrial product in this market must be flexible and, of course, price-competitive. A smart combination of both IP and industrial cameras makes that possible. ○

i | Need to know

A strategic combination of IP and industrial cameras enables flexible enforcement

- > The newest members of the Basler ace family, which feature the Sony IMX174 CMOS sensor, use state-of-the-art global shutter technology and offer 2.3MP resolution
- > The new ace cameras have a high quantum efficiency, a wide dynamic range, and extremely low noise levels
- > Even in the most difficult light conditions, and comparable only to CCD sensors, the cameras achieve an outstanding image quality

detail. This is a major improvement for many ITS applications that are frequently challenged by demanding lighting conditions. The term 'dynamic range' has a twofold meaning in this context. It describes the sensor's genuine dynamic range within one single image, and must not be confused with the approach of many IP cameras that define dynamic range by acquiring several images that are laid on top of each other in order to cover a large dynamic range by means of several images. As this approach would produce images with motion blur, it is unsuitable for ITS applications.

To fully exploit the advantages of modern CMOS technology, Basler equips one of its IP camera models with the Sony IMX174 sensor. The camera combines global shutter technology, real-time trigger, and uncompressed YUV images

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An integrated approach to traffic and public area monitoring

The demands on equipment in modern control rooms and control centers for security and emergency services continues to increase. Where in the past there was a whiteboard, a beamer or a set of CRT (cathode ray tube) monitors to survey safety-related areas, and to plan and conduct operations, modern control centers provide a much wider range of possibilities using the latest technologies.

Camera signals from the area of responsibility, TV signals from events, video and audio messages from the emergency services in the field, tracking systems for the control of vehicles, interactive maps and video management software, all provide a comprehensive overview of the situation and are the basis for operator decisions in the control center.

To use this wide spectrum of different systems and sources in an intuitive and efficient way, careful planning is needed. The system should not only be modern, but also controllable. In addition, there should be a high level of sustainability, which means integration of additional tasks or systems should be possible without remodeling the entire installation.

Nerve center

To keep up with the growing amounts of traffic that needs to

(Right) Optimized operations at the traffic control center in Dortmund, Germany



be surveyed and controlled, and the increasing demand for surveillance of public spaces, the Interior Ministry of North Rhine-Westphalia invested in numerous new control centers in Germany's most densely populated federal state. One such center has been incorporated into the police headquarters in Dortmund. Careful planning has ensured that the modern system facilitates the tasks of the employees at the police headquarters.

The video technology installed by Bosch Security Systems ensures that all available video images arrive at the police headquarters. These include traffic camera signals,

CCTV images from public areas and live images from staff in the field, as well as signals from private organizations. The management and integration of incoming signals is independent of the source system manufacturer. This not only reduces the effort required for integration, but also reduces costs. It is also possible to process a variety of signal types, such as analog and digital camera images or network streams.

To display the images, the control room in Dortmund – and most of the other installations in North Rhine-Westphalia – chose a set of Eyevis rear-projection cubes. Three video walls comprising 60in type EC-60-LHD-CP rear-projection cubes were installed in Dortmund. Two two-by-two video walls of four cubes each provide the images to staff in the control room. A further eight cubes in a four-by-two format provide an overview of major events and emergency situations in the adjacent crisis room. The police benefit from full-HD resolution and a high level of image reliability.

Image integrity

The Dortmund control center is operational 24 hours a day. From there, patrolling police cars in Dortmund and Lünen, and on around 620 miles of motorway down to the Hessian state borders, are coordinated. The large video wall in the main room is only used for major events, such as demonstrations, sport events or very bad accidents. The video walls mainly display camera signals.

Overview maps and other documents can be displayed in high resolution, and as a result of the thin bezels of less than 1mm between the cubes, the video and image data can also be displayed across multiple cubes or the entire surface of a wall, without disturbing gaps affecting the image.

The three video walls are controlled by two netPIX graphic controllers and the eyeCON wall management software from Eyevis. To adapt the visualization on the screens quickly to new situations, the signal distribution and the display of the images is mainly controlled through preset configurations. It is very simple



(Left) The staff room at the Dortmund police headquarters is full of modern technology

Understanding the use (and abuse) of social media

“

Like many, I am following the US presidential campaign with increasing interest. As with every presidential race, big data firms are trying to predict who's in the lead. However, unlike past elections, not even a few hours go by without some full-blown coverage about a candidate's latest comment or tweet – and we are still more than 14 months from the big day!

Even more intriguing is that this media coverage is often created by consumers, not actual news companies. In a recent poll, Deez Nuts, a fictitious candidate created by a 15-year-old as a practical joke, had higher poll numbers than the other well-known candidates. This was all driven by the immediacy of social media. So who's really driving today's conversations? Is it really that easy to shift consumer behavior with a smartphone app? I recently had a conversation with a company that specializes in the use of social media to drive political issues. They remarked how easy it is to make a dozen activists look like a large majority. With one highly targeted social media campaign, they stopped the construction of a highway that was, in reality, opposed by only a few local residents.

Today's consumers have constant access to social media and advertising all designed to shape their opinions, reactions, needs and wants. With a simple click, my entire network knows how I feel about a topic and, in response, their opinions form instantaneously. Less than a decade ago, the general public had strong opinions about a few issues that form public policy. Today, there are countless issues, with new ones hitting the airwaves instantly. These 'instant issues' are changing public opinion with 'immediate reaction' rather than deliberate consideration.

Historically the tolling industry has focused on government and B2B relationships. We stay in contact with customers to collect their money, but we should be broadening our services beyond account maintenance. Are we providing information to customers in a manner they want? And are we listening to what they say?

While it's scary to put ourselves out there, the far greater risk is being taken



“We need to use the bandwidth we're providing to listen and not just to talk”

down by a movement or company that promotes the consumer-first approach. Say a tech company decides it wants to be a player in the transportation payments business. The media campaign begins: it advertises innovative technology, then markets it to a specific political audience that looks like thousands of supporters. Without really having any proof points or product, they've already embedded the concept and won market share.

Can toll operators really become players in the social media arena with the challenges of exorbitant costs and mandated procurement processes – without being accused of ignoring consumers, crony capitalism or corruption? We need to use the bandwidth we're providing, to listen and not just to talk. We must master these new avenues of communication to service our existing customers and sell new concepts to the public. Equally important, we must use it to counter opposing views – as instantaneously as a presidential candidate's tweet!

JJ Eden is the director of tolling at Aecom.
james.eden@aecom.com

i | Need to know

Sophisticated control room upgrades ensure safety and security in Germany

- > By consulting security and control room technology partners, all police requirements could be met
- > For the planning and implementation of the control centers, the Ministry of Interior NRW relied on Bosch Security Systems, WEY Elektronik and Eyevis
- > This combination promised a trouble-free installation, since the interfaces between all companies and their systems had proven interoperability

to perform optimizations or reconfigurations with the wall management software. It is possible for both the users and the technicians to work individually with the walls.

For the officers in the control room and the head of operations in the crisis room, the new solution guarantees responsive, intuitive and target-oriented work through a simple and user-friendly operation, as well as a clear representation of the required video images and graphics. ○

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New methods for improving traffic safety in Germany

Excessive speed remains the main cause of many accidents on the world's roads. In Germany it is becoming increasingly difficult for authorities to reduce the number of traffic-related deaths any further. The downward trend of the past few decades has become stagnant. While many institutions and organizations are involved in road safety, it remains one of the indispensable core tasks of the police. Reducing the number of severely and fatally injured victims is an essential part of police road safety work. Against this backdrop, the German federal state of Lower Saxony aims to reduce the number of road accidents by one third by 2020 through targeted and concrete problem-oriented road safety activities under its road safety initiative (VSI) 2020.



(Above) Section control in Lower Saxony, Germany
(Left) Laser technology in a compact housing

This has called for new strategic approaches to safety, in addition to proven mobile and stationary speed monitoring. As such, a nationwide pilot project involving so-called 'section control' is being conducted under the aegis of the state of Lower Saxony. Section control will first be tested in Lower Saxony during this pilot project, which is set to run for 18 months.

In February 2015 the traffic solutions division of Jenoptik won the bid for the pilot project and by the end of March it had delivered a system based on its TraffiSection product series.

The solution will monitor speeds on a 3km (1.8 mile) stretch of the B6 federal highway, south of Hanover. The system was installed in April and preparations are in full swing. When approval

is obtained from Germany's Physical Technical Institute (PTB) the system will go live.

Proven technology

The Jenoptik TraffiSection system uses laser scanning technology for section control. This determines a vehicle's average speed over a long section of road using measuring systems and cameras at the entry and exit points. Every vehicle is registered at both checkpoints and is identified via its license plate. This data is anonymized immediately after capture at the entry point and encrypted so that no conclusions can be drawn about the actual vehicle or personal data at any time during the measurement.

All data for vehicles that have not exceeded the average speed limit is held in temporary



approved in those countries serve as the basis for the German pilot, which has been extended to meet German guidelines.

Advantages of the system

Section control with the TraffiSection system offers important advantages for traffic monitoring. With the goal of improved safety, the speed limit is monitored effectively, because road users keep to the prescribed speed limit over the whole section. This harmonizes the flow of traffic and fewer tailbacks occur as a result. The technology also facilitates indisputable identification and documentation of violations, suitable for use in court.

As a result of its modular design, the TraffiSection system is suitable for both stationary, longer-term applications, such as in tunnels, and for mobile

storage only for the duration of passage between the checkpoints, and is erased automatically as soon as the vehicle has left the section.

If the average speed of passage is above the permitted limit, a conventional high resolution frontal picture with driver recognition is taken on leaving the measurement section. The system automatically documents data such as the license plate number and driver's photograph for punishment for the offense.

Adherence to the strict requirements on data protection is a prerequisite for acceptance and use of this new approach for speed measurement in Germany. Jenoptik has already gathered extensive experience using the TraffiSection system in Austria and Switzerland, and the data protection concepts

Need to know

A pilot project in Lower Saxony will examine the impact of section control on driver speeds

- > Jenoptik also offers multisection solutions for complex stretches of road with junctions and turn-offs
- > Such a system is used for stationary section control in the BinderMichl-Niedernhart tunnel on the A7 in Upper Austria, which is used by more than 200,000 vehicles every day
- > This modern system has also successfully improved traffic safety in the UK, Switzerland and Kuwait

(Right) Camera and flash on anti-vandalism pole



short-term use in work zones, for example.

Above and beyond

To further reduce the number of accidents on Germany's roads, the state of Lower Saxony is now introducing the section control method on its out-of-town roads. After Saxony-Anhalt and Mecklenburg-Western Pomerania, people in Lower Saxony had the statistically third-highest risk of dying in road traffic, with 57 deaths per million inhabitants in the past year. Straight highways situated out of town are particularly dangerous. No less than 65% of those killed in traffic accidents lost their lives on this type of road. There is still some way to go on the path to realizing Lower Saxony's road safety initiative (VSI) by 2020.

Section control has been in use in Austria and the Netherlands for many years. "Experience in neighboring countries has been positive, with traffic flows harmonizing and clear evidence of improved safety at road works and in tunnels," says Lower Saxony's interior minister, Boris Pistorius. "Among other things, the driver is no longer able to brake just before the speed

trap, and right after floor the accelerator again."

Back in 2011, Switzerland's federal road agency (ASTRA) investigated the effects of checks to measure average speed on the driving behavior and incidence of accidents in relation to the section control system in Switzerland's Arisdorf tunnel. It revealed that the speed behavior of road users was always influenced positively. Harmonization of speeds over the entire section of road is achievable, with an overall more homogeneous traffic flow.

In contrast to fixed point speed measuring systems, drivers reduce their speed, not just on a small section of road either side of the speed measuring system, and keep to the permitted limit over the entire section of road. Section control systems have also discouraged drivers from braking dangerously just before a speed trap. ○

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Improving safety for the most vulnerable road users

Pedestrians are the most vulnerable type of road user and local authorities have a responsibility to implement solutions that meet their needs. Dealing with traffic can be very stressful for some pedestrians and a feeling of security needs to be created. Research projects have shown that this goal can best be achieved if clear information is presented, especially at traffic lights. With simple operations, reliable information and clear signals, pedestrians feel protected and are more likely to show the necessary patience when waiting for a green light.

Germany-based RTB has developed different types of traffic light push buttons to help the most vulnerable pedestrians feel more comfortable in traffic situations. The first device,



(Above) The Loc-ID system keychain
(Right) RTB's acoustic units
(Opposite) Sensor push button unit

structures and traffic problems are often individual.

A modern approach

As traffic systems become increasingly complex, it becomes more and more difficult for blind and visually impaired persons to orientate themselves. Modern solutions like RTB's Loc-ID system can help. Communication with the system is possible via a smartphone app or a handheld transmitter. The signals are transmitted via Bluetooth.

If a person with an active Loc-ID approaches a traffic light, the acoustic orientation signal increases. This makes it possible to easily locate the mast. During the approach, the sound increases step-by-step and reaches its final output volume when the person reaches the traffic light. If the person remains in the direct environment of the signal group, the blind requirements function is activated. Intervention by the user is not necessary. This is possible as a result of an accurate distance measurement between the Loc-ID transmitter and reception unit.

Need to know

An slimline solution avoids the need for many cables at various traffic signals

- > The power supply for the push button and acoustic units, as well as the transmission of selected control signals, flow through a single signal transmission cable between the external facility and the control device
- > This means that expensive earth work is unnecessary. Effective use of existing grounding cable nets is also possible, making retrofitting existing facilities even more attractive

a sensor push button, includes a screen with a large surface, which makes the traffic light easy to use. The second device, a mechanical push button, uses the same basic design as the sensor push button. Both are available in a wide variety of voltage possibilities.

RTB's push buttons can be complemented with acoustic units that are designed to help blind and visually impaired pedestrians. The natural limitations for blind people and those with limited vision can be overcome to a certain extent with the help of intelligent technology. All of RTB's acoustic units operate on the basis of ambient noise volume and can be adjusted individually with a remote control. The users get optimal signals and the residents in the area are not inconvenienced.

Both single and combination devices are available. Single

devices have their own electronics and a separate loudspeaker. Both the walk signal and the guide signal are available as single devices. Combination devices save money as they boast both a walk signal and guide signal.

The acoustic units can also be combined with push buttons, as can be seen in RTB's PiT and Plus models. The guide signal of the PiT is controlled by the central electronics of the acoustic unit. The users hear the guide signal from the loudspeaker of the acoustic unit and from the push button. Thus, it is much easier to locate the traffic light. The Plus model includes a vibration element, which is activated by the electronics in the acoustic unit.

RTB's push buttons and acoustic units are currently in use worldwide. Technical solutions of this kind must meet a variety of demands, since



As a safeguard for residents, the acoustic signal generator can be switched to silent mode and only gets activated if a Loc-ID transmitter is detected nearby. Different options like a needs-based edition or differentiated signal tones are possible.

Ensuring mobility

The updated German standard DIN 32981 will help to improve the auxiliary facilities for blind and visually impaired persons using traffic lights in the future. The current draft includes experiences from the past two decades. There are new requirements for testing signal transmitters in a variety of environmental conditions. Furthermore, it will be possible to have different switch timings to differentiate between pedestrian crosswalks. Both points will help to improve the safety of blind and visually impaired pedestrians. ○



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We need to find an alternative way to define intelligent transportation systems

“ I don't think ITS is an industry. Now, that should get somebody's juices going. I'll explain my thoughts behind this. While intelligent transportation systems are designed for the public good, folks can't buy an 'ITS' and probably don't even know our name even after 25 years as an 'industry'. Everything ITS does is called something else and sold as something else.

For example, one of the most valuable companies in the world is an ITS company, sitting on the board of ITS America. They don't use any ITS technology. They depend on GPS, an app, the wireless network and the banking system. They provide on-demand ride services. Of course you may know them better as Uber.

It all reminds me of an ad campaign some years back developed by a chemical company. Their slogan was "We don't make the products you buy, we make the products you buy better." They weren't selling their products but rather their contributions to the products of others. I had no idea why they felt the need to spend millions on that campaign, but I never forgot their tag line.

Today we could apply that approach to ITS. I would define ITS as 'enabling mobility'. It's not the ride-share company, or payments processor, the connected vehicle or the signal system. It's making the trip better. We have for years defined ourselves by an extremely complex variety of products and services: public clients, car companies and consumer products. Instead why not define ourselves by what we accomplish? We enable mobility.

The definition of 'enable' is to give someone the means to do something. To offer a tool or a solution to let someone accomplish their purpose. The focus is on the traveler, not on the tool but on what is being accomplished. And that is mobility: the movement of people in a population, as from place to place. It's what we do. We make transportation systems better.



“Why not define ourselves by what we accomplish? We enable mobility”

For years I've struggled with the cocktail party question of "So what do you do?" I had the option of going down memory lane and saying that I started E-ZPass, the problem being that it was 25 years ago. The alternative being trying to explain ITS. Now I can just say that I help to enable their mobility.

Why do I mention this now? It's because ITS America (ITSA) is at a crossroads of success and anonymity. Maybe both. ITSA just celebrated 25 years and brought on a new president, Regina Hopper. I do hope that you do get a chance to meet her. She is terrific. She has started a process within ITSA to re-examine what we do and how we do it. While ITS applications are gaining traction, from Uber to autonomous vehicles, ITSA is not associated in the press with leading the charge. However if we redefine our role as an enabler of mobility, we can make all new products better and truly secure our legacy.

Larry Yermack is strategic advisor to Cubic Transportation Systems, USA. lyermack@gmail.com

An intelligent approach to traffic monitoring

In 1987, the first automatic motorway signaling system in the world was installed on the M1 in the UK. The real-time software for the system was written by Louis Thompson, managing director of Simulation Systems Limited (SSL). The M1's AID (automatic incident detection) system, which evolved into a MIDAS (motorway incident detection and automatic signaling) system has had a profound effect on improving motorway safety. Furthermore, as a result of its key role in controlled, managed and smart motorways, and other large-scale motorway control systems, it has saved countless man years in terms of commuting time, as well as millions of pounds for the UK economy.

Some 21 years after this installation, SSL designed and

Need to know

Bluetooth technology is a reliable, cost-effective way to manage traffic and optimize road safety

- > Requiring little or no electrical, communications or structural infrastructure, a BlueTruth unit can be installed in as little as 15 minutes
- > BlueTruth can detect queues and deliver real-time journey time data
- > A central, intelligent cloud-based system delivers real-time maps, graphs and DATEX2 feed
- > Costing around 1/10th of the cost of an equivalent ALPR installation with virtually no maintenance costs, BlueTruth is a great option for fast results



manufactured the UK's first Bluetooth traffic detection system – BlueTruth. By leveraging Bluetooth traffic detection, SSL has created an extraordinarily simple and low-cost way of carrying out traffic monitoring. BlueTruth traffic monitoring involves 'sniffing' the radio waves at fixed points for passing Bluetooth MAC addresses (which are globally unique), and then correlating reading point data to deliver accurate journey time, queue formation, and traffic density information.

Innovation and acceptance

SSL, as holder of the Queen's Award for Innovation, is well known for delivering new technologies that optimize

performance while maintaining cost effectiveness. However, it was difficult to convince the industry that a low cost, easily deployed solar-powered device, such as the BlueTruth unit, could reliably yield key traffic flow data as effectively as ALPR (automatic license plate recognition) technology, which is more than 10 times more expensive.

It was down to early BlueTruth Technology adopters like Somerset, Dorset and Devon County Councils to prove that Bluetooth technology was indeed as good as it promised to be.

"BlueTruth has been an ideal replacement for the standard ALPR camera approach," says an ITS representative from



(Above) BlueTruth doesn't require a complex or expensive infrastructure (Left) The solution can be used to monitor traffic signal performance

Poole Borough, who were another early adopter of the technology. "Not only are the units a low power replacement, the initial investment and maintenance costs are far lower."

Six years after SSL's first system was deployed in Glastonbury and more than 3,000 BlueTruth installations later, Bluetooth is now accepted as a strong contributor to the ITS world.

"It is wonderful to see that the technology is being put to work, providing all of the capabilities we built into it, including journey time, queuing, speed and origin-destination," says SSL's Thompson. "It is being used for demographic analysis, traffic signal tuning and route discovery."

With the developments in mobile technology and the IoT, BlueTruth and other Bluetooth-based traffic monitoring technologies are set to become more accurate, cost effective, and more viable than ever. 

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Simplifying the modern traffic control center

Modern traffic control rooms are complex areas, full of complicated equipment. In this environment, UK-based connectivity specialist Adder Technology describes its IP-based KVM (keyboard video mouse) switch hardware as a 'silent hero'. Running invisibly in the background, the KVM switch enables command and control centers to separate their computers from users by almost any distance with huge benefits to operators.

"In traffic management, every control room is based around safety and security," says Natasha Laslett, market development manager - control rooms. "Our system enables them to focus on making decisions and not whether their keyboards are working properly. Traffic managers have to control many applications in their networks, including CCTV, cameras and signaling systems. The KVM switch enables one person to move easily between disparate systems."

i Need to know

Clever, ergonomic solutions optimize traffic control room productivity and organization

- Adder's worldwide list of clients includes the traffic control rooms at Transport for London and Dublin City Council
- The company also works with operators in many other mission-critical environments, such as the space industry (NASA), energy (the Chinese State Grid), broadcasting (the BBC) and aviation



(Above, from top to bottom) **AdderLink XD150; AdderLink InFINITY Dual 2020; Adder CCS-PRO4; A.I.M** (Left) **Adder's solution provides access to several computers with one keyboard and mouse**

It turns out that one of the biggest causes of errors in traffic control rooms is boredom. Much of the day will be monotonous, but managers have to stay alert in case the unexpected happens. "We tend to think it's always frantic in there because in the movies there's always a crisis in a control room," says strategic sales manager Jamie Adkin. "But mostly they are static and quiet places. It's about creating an ergonomic environment to keep operators' concentration levels high, so when things go wrong they can resolve problems quickly."

Simplicity is key

Adder manufactures and develops the technology, but it rarely works directly with the users. Instead, it has built a global network of integrators and suppliers who install the systems. "The first thing is to

get the computers outside the control room, so you can focus on the ergonomics and layout of the room," says Adkin.

The KVM switch system is endlessly reconfigurable, which is what makes it effective in so many diverse industries, but there are certain common themes to the installations. The infrastructure is designed to provide access to lots of computers using one keyboard and mouse, and the cables are removed from under desks so that nobody trips up.

"Locating the PCs outside the control room means there's no extra heat or fan noise; this helps to create a comfortable, clutter-free space," says Laslett. "You see control rooms with multiple keyboards stored in multiple drawers, all labeled up so managers know which one to use for a given application. The complexity

of the process is stressful and unnecessary."

Separating computers and users also makes it much easier for engineers to carry out maintenance work. "The system also has a lot of redundancy built in so clients can move to a backup system while the engineers carry out repairs, or modifications," says Laslett.

A recent installation of Adder's KVM switch technology for Dublin City Council located the computers about 150m from the control room. They were rack-mounted and stored in an air-conditioned room. The KVM signals were extended across a mixture of copper and fiber cabling into the control room where operators sat at their desks monitoring the displays. There was also a feed onto a video wall.

"They were able to watch live footage coming in from cameras and CCTV," Adkin describes. "The technology is pixel-perfect so it's not necessary to use a huge amount of compression to move video around. The system enhanced Dublin's situational awareness, so they could grasp the bigger picture." ○

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Mission-critical communications rely on unbreakable wireless networks

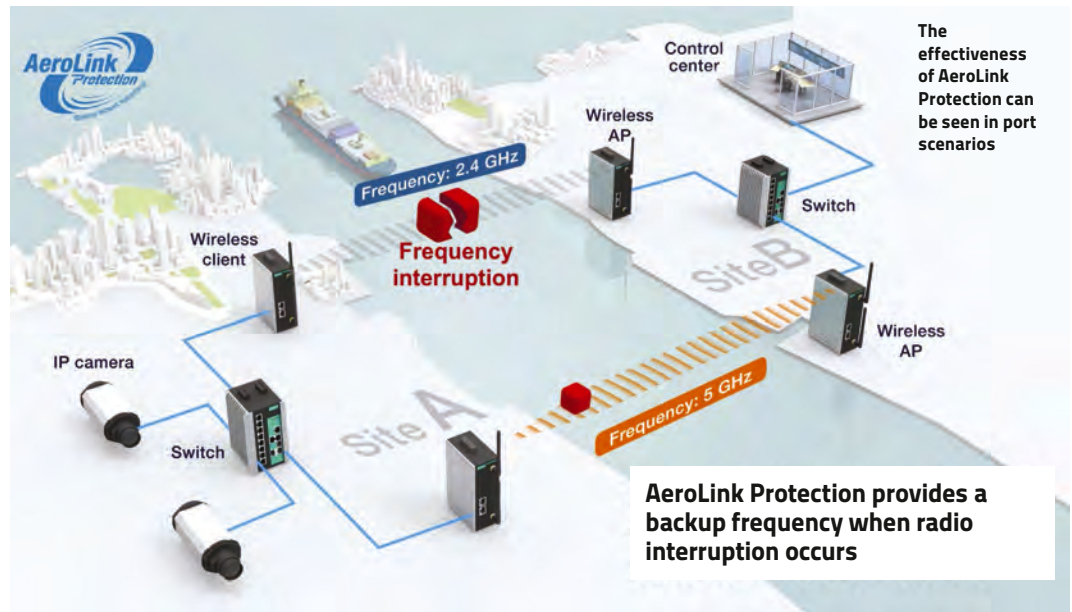
Wireless networks should be saving money and improving flexibility for industrial users and public transportation operators. However, in the past, reliability concerns have hindered adoption. Now, new technological innovations are making low-cost wireless as reliable as old-fashioned wired networks.

Wireless networks can bring huge cost savings and efficiency gains compared with wired networks – especially for hard-to-wire industrial applications – as a result of their lower installation and maintenance costs, and their easier network scalability. The challenges are tough and the stakes are high: for example, a high-speed train could potentially be unable to send vital location and maintenance updates for tens of seconds because a brief power disturbance has rebooted a critical wireless node. But the rewards from a reliable wireless network, in cost savings and flexibility, are also high.

Critical protection

Industrial, control and automation networks are converging. This makes machine-to-machine communication smarter, but it also makes network reliability more important than ever. A single point of failure can cause widespread network downtime and the loss of vital systems. Operators need more reliable wireless redundancy to avoid tremendous cost and time wastage.

At the same time, wireless frequencies are becoming ever more crowded as a proliferation of consumer and industrial devices contends for limited bandwidth, increasing the risk of interference that can knock



(Below) Moxa's solution prevents downtime in critical applications



mission-critical wireless network links offline.

In industrial applications, such as train-to-ground communications, a reliable wireless bridge is essential to minimize system downtime and

maximize system availability. When using old-fashioned wireless bridge or WDS connections, the link is exposed to at least one of two types of risks – device failure and wireless link failure. Moxa's AeroLink Protection provides a reliable wireless bridge between two networks.

With Moxa's solution, a network has two or more AeroLink Protection-enabled wireless client nodes connected to a single access point. One serves as the active node, while the others are passive, backup nodes. If the active node stops sending or receiving data for any reason, AeroLink Protection completely restores the communication link within 300ms by bringing backup nodes online. This includes the time required for network convergence and address resolution protocol (ARP) update. Furthermore, the passive node can be connected to a different access point on a different frequency, providing

Need to know

Combining the reliability of wired networks with the cost savings of wireless

- Wireless connection redundancy can provide a reliable bridge solution and prevent system downtime from a single device or frequency failure
- Moxa's innovative AeroLink Protection technology provides a smart failover method with fast recovery time and scalability
- AeroLink Protection technology is available in the first of Moxa's new generation of A-series AeroLink Protection-enabled devices, the AWK-3131A Industrial IEEE 802.11n Wireless AP/Bridge/Client

The availability of data provides new opportunities and responsibilities



In this second installment of my column series covering

the major issues facing transportation authorities around the world, I'd like to turn my attention to data collection. Last issue I wrote about how authorities can look to forming partnerships with private transportation data companies. However, authorities will always be uniquely responsible for collecting certain information: a prime example being lane closures due to maintenance and construction. DOTs are the only source for this information, and yet few agencies have a reliable way to report lane closures and openings in real time. State DOTs could improve their credibility with the public if lane closures were reported in a timely and accurate manner.

While it's possible that DOTs could be tempted to see their data as a potential revenue source, the big trend in government is to make public data sets readily available for general benefit. Apart from lane closure information, DOTs will also be the primary source for a number of other unique types of transportation data: traffic camera feeds; weather and surface reporting from maintenance trucks; accident reports; and transit vehicle location. The more transparent and usable data sources are, the better public and private partners will be able to make use of it. Some DOTs, such as Massachusetts, have a strong commitment to making data public, and invite partners to develop innovative applications with it.

Of course, in the digital age, some data virtually collects itself. This takes us into the realm of big data: extremely large data sets that are generated by internet-connected devices. As we are aware, every time we use our smartphones, huge amounts of data are being generated and analyzed regarding our behaviors. Companies look through these data sets to find large patterns to predict consumer preferences, or smaller patterns to target individual advertising. In transportation, big data has been initially represented by the location reports of millions of connected cars, trucks and smartphones moving along in the traffic stream.

Companies use this location data to provide real-time speed maps of the US roadway system. In addition, crowdsourcing apps such as Waze use driver reports to identify accidents



“Big data is changing the way we analyze transportation use”

or other roadway incidents. As data analytics improve, these data sets will provide new ways for DOTs to look at project planning and provide access to real-time analytics to better manage the highway system and respond to incidents. Big data patterns may be able to locate incidents before they are reported, or even evaluate traffic operations data and predict where incidents could imminently occur. Purdue University and the Indiana DOT are currently using Inrix probe data to identify the end of freeway queues in real time, and dispatch law enforcement to warn approaching drivers. Big data is changing the way we analyze transportation use; it is important that DOTs stay ahead of the curve.

As DOTs begin to manage data sets comprised of public and private files, they will have a responsibility to certify the private data they report. Multiple private data providers will lead to multiple conditions reported in the same corridor. For accountability, DOTs will have to select the data provider that can most accurately provide information and certify that data is accurate.

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frequency-level redundancy. If there is interference on the active channel, the backup path will transmit the data via a backup device and backup frequency. The technology uses the wireless radio's standard wireless protocol to detect that the link has been disconnected. As soon as a serious interruption is detected, AeroLink Protection takes action. The switchover to the passive node, and full network recovery, takes only 300ms.

Real-world applications

Train-to-ground communication usually relies on wireless networks. If wireless communication fails and can't be restored within a reasonable time, the risk is not only extra maintenance cost and time, but in the worst-case scenario, staff or passenger injury. Therefore, a reliable wireless network for train-to-ground communication is essential. In the past, to protect train communication systems from a single point of failure, users had to double their expenditure by building a fully redundant duplicate network (a so-called red-blue network). Even with advances in switch technologies (such as ring or chain backup mechanisms), the train-to-ground wireless link remains a bottleneck. Now, with AeroLink Protection and Moxa Turbo Roaming technologies, railway system integrators can easily create a redundant roaming system without the expense of duplicating the whole network. ○



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“We have some of the world’s leading authorities sharing their experience and knowledge – from the latest in big data right through to cutting-edge research on tires, and everything in between”

Richard Pavitt, exhibition director, Gulf Traffic

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“When we started, no one else was doing this type of work in rural areas, and we are still doing ITS research and technical assistance for these states to this day”

Steve Albert, director of the Western Transportation Institute (WTI)

A new autonomous shuttle was demonstrated on public roads for the first time, at the ITS World Congress in Bordeaux. The new vehicles were used to transport delegates between the two main sites



Take a ride on the autonomous shuttle with TTI here traffictechnologytoday.com/navya

“We’re using the same set of sensors as the Google car... The project only started one year ago and our cars are already being tested out on roads”

Shinpei Kato, associate professor, School of Information Science, Nagoya University

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