SWEDE SIXTEEN

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

Illustration by Ben White

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

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

HIGHLIGHTS

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

Written by Jo Versavel, Traficon, Belgium

Automatic incident detection for Europe's longest bridge

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

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

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

> "With AID, all incidents inside each section of tunnel – stopped or slow-moving vehicles, traffic congestion, smoke, etc – are detected within two seconds"

carries more than 60,000 travelers a day – visitors as well as local commuters. The bridge's four-lane road carries six million vehicles a year, and two train tracks carry another eight million people each year.

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

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

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

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

TS089
Thurs, Sept 24
14:00-15:30
16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Bas van Bree, Buck Consultants, the Netherlands

Pilot scheme tests truckload of anti-accident systems

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

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

The objectives of the pilot were to measure the impact of the large-scale implementation of AAS on traffic flow, to reduce the number of accidents involving trucks, and to map out the impact on traffic safety. Systems tested in the FOT participants. In fact, it is unique that all manufacturers participated in one pilot via their branch association, the RAI Vereniging.

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

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

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

One of the key challenges was to involve as many stakeholders as possible in the process, such as branch associations, transport companies, truck OEMs, and system suppliers. The transport companies and their branches (TLN, EVO, KNV, VERN) were crucial partners for the success of the FOT, and the Dutch branches of DAF, Volvo, MAN, Scania, Iveco, Renault, and Mercedes were also active stand still for a couple of hours per truck for installation. In the competitive transport sector working with tight timeframes, this turned out to be more difficult than anticipated. Open communication with clear agreements between supplier and company was therefore required, which was established with help from the BOVAG Truck Dealer Association.

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

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

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

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New traffic theory eases tunnel traffic problems

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

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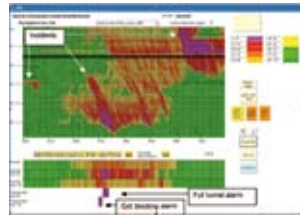
through the network with a 10km/h speed of approach. Other less severe moving jams are also shown (dotted arrows). The colors represent the spot speed at detection points: more intense colors indicate low speeds (red = 10-20km/h and violet = <10km/h). As the incident is cleared at 07:45, the moving jam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

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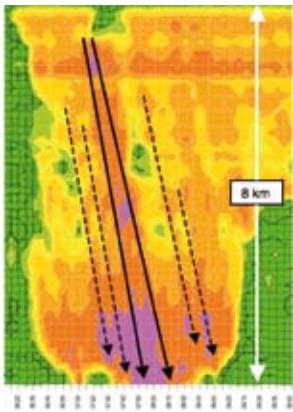
the 3.5km-long highway tunnel Södra länken (Southern link) has been developed. The system gives a warning to the operators in the TMC up to 15-30 minutes in advance, allowing for accurate traffic information and a well-prepared launch of the tunnel-closing procedure.

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

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

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

Performance analysis framework for GNSS RUC

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

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

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

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

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

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

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

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

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

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

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

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

Written by David Carels, Ghent University, Belgium

Simulation aids optimization for ad hoc networks

Architecture and scalable testbed for cooperative systems in NextGenITS

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

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

A big challenge lies in the optimal usage of the VANET

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

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

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

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

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

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

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

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

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

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

TS029
Weds, Sept 23
11:00-12:30

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

Hitching a lift to work has never been easier

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

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

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

management software, MOVILOC. Position and time information sent wirelessly by the OBUs is received by this software in a control center for processing and storage. The trial's approach was to use this service to collect information from each participant's OBU and automatically compute the timetable of each driver. To protect personal data, this information was published on a website for the group only. In

> "If people can quickly locate others who live and work near them, with similar schedules, will they use this information for ride sharing?"

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

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

To process the information, GMV adapted its fleet

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

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

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

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

Written by Tomas Julner, Swedish Road Administration, Sweden

The decider in winning or losing in road management

Integrating traffic management using decision support at Trafik Stockholm

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

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

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

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

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

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

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

are suggested out of the 1,000 plans available.

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

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

TS005
Tues, Sept 22
11:00-12:30
18th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Steven Shladover, University of Berkeley, California, USA

How cruise control helps drivers to mind the gap

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

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

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

the vehicles. This CACC vehicle can follow the other vehicle at time gaps of 0.6 seconds, 0.7 seconds, 0.9 seconds, and 1.1 seconds (compared to the available time gap settings for the normal ACC of 1.1 seconds, 1.6 seconds and 2.2 seconds). At these shorter gaps, it is less likely that other vehicles will cut in front of the ACC vehicle,

> "If this trend continues through the second group, it will have strong implications for the potential of CACC to increase the effective capacity of a highway lane"

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

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

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

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

TS008
Tues, Sept 22
11:00-12:30
18th ITS WORLD CONGRESS
STOCKHOLM 2009

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

How to make sure the heavyweights pay

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

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

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

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

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

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

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

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

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

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

Written by Karl E. Schedler, micKS, Germany

Safer driving, whatever the weather

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

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

The device has one serial interface within which all the temperature. Finally, it can measure road surface conditions based on the dielectric characteristics of the cover.

The ARS31-UMB sensor device measures the freeze point temperature by cooling and heating up a small sensitive area on top of the sensor surface, allowing the measurement the actual freeze temperature of the liquid solution on the pavement.

> "For traveler information, a service operation platform processes meteorological and road weather data sources, producing TMC-coded warnings"

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

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

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

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

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

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

Written by Paolo Dalmasso, Centro Ricerche Fiat, Italy

Integrated communication increases driver awareness

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

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

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

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

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

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

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

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

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

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

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

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

Have confidence in future communication systems

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

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

a secret key (hybrid data encryption).

Although it is agreed in the IEEE 1609.2 draft to use a very efficient cryptographic scheme (i.e. elliptic curve cryptography, or ECC), the demand for computational resources and over-the-air overhead is rather high. The computational costs of ECC for V2X applications can be achieved only with expensive, dedicated cryptographic hardware.

> "Privacy in V2X communications systems can be guaranteed by regularly changing all broadcast identifiers under certain conditions"

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

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

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

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

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

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

Groundbreaking technology set to transform highways

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

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

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

IntelliDrive equips vehicles with sophisticated computing and communications devices

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

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

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

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

The use of readily available technologies, such as laptops and GPS devices, has been successfully demonstrated in Michigan. That success has

approaching an accident he or she can't see. It could warn a driver that he or she is close to running a red light, or it might sound a series of loud chirps or vibrate the seat if sensors detect the driver is veering onto the hard shoulder and perhaps falling asleep.

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

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

Cooperative driver assistance functions

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

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

The driving safety support systems (DSSS) – which use infrared beacons for vehicle-to-infrastructure communication – is one of the UTMS activities and is now developing a vehicle-to-infrastructure cooperative safety support

Nissan's customers has recently been completed. Functions tested at nine intersections in Japan's Yokohama City included stop sign recognition enhancement, signal recognition enhancement, and crossing collision prevention. The cooperative driving assistance functions can be easily added to a vehicle by reprogramming the car navigation system.

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

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

A large-scale field operational test by 2,000 of

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

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

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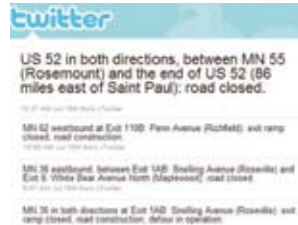16th ITS WORLD CONGRESS
STOCKHOLM 2009

Written by Kristin Virshbo, Castle Rock Associates, USA

Sometimes it pays to take a step back in technology

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

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

And yet, as 2010 approaches, a humble, low-fidelity, back-to-basics medium with texts is finding a way to send clear, relevant information to people when they need it, within 160 characters.

This is not the first time the industry has faced this challenge. In the 1980s, RDS-TMC was one of ITS's key achievements. It specifies how roadway event details – something that can be surprisingly difficult to describe – can be squeezed into a very
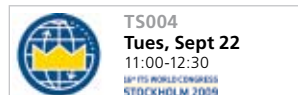
> "The simple, 160-character plain text message is where many in the ITS industry are creating the most innovative applications"

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

is emerging as one of the most important tools: the text message, or SMS. Even as web applications grow more pervasive, the text is becoming one of the primary means by which people worldwide perform tasks previously done on their PCs. They use it to stay in touch, receive alarms from their calendars, to get air travel information, look up addresses and phone numbers, and even to conduct personal banking.

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

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

TS004
Tues, Sept 22
11:00-12:30

Written by Lars O Landerfors, Swedish Road Administration, Sweden

Do variable speed limits improve road safety?

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

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

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

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

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

> "If this trend continues through the second group, it will have strong implications for the potential of CACC to increase the effective capacity of a highway lane"

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

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

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

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

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

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

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

TS057
Weds, Sept 23
14:00-15:30

Written by Li Xuelun & Sean Haw Kuan, LTA, Singapore

Electronic VMS hailed a success for city's parking

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

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

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

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

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

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

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

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

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

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

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

Written by Oscar Lazaro, Innovalia, Spain

How close cooperation could be ITS's savior

The importance of improved sustainable mobility of cooperative ITS is clear

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

The European Commission estimates that road traffic congestion costs Europe around E50 billion per year, or 0.5% of community GDP, and this is expected to increase to 1% by 2010. The majority of European citizens live in urban areas where there is increasing demand for mobility of people and goods. Given that urban environments do not generally allow for building additional roads to deal with this situation, wireless vehicular cooperative systems are an

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

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

attractive solution to improve road traffic management.

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

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

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

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

Written by Paul Blakeman, TRL, UK

Using variable speed limits to reduce flow breakdown

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

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

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

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

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

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

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

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

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

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

TS057
Weds, Sept 23
14:00-15:30

Written by Peter Ummenhofer, Kapsch, Austria

Is dynamic tolling the key to reduced congestion?

Next-generation traffic management can reduce congestion and air emissions

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

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

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

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

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

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

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

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

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

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

TS116
Friday, Sept 25
09:00-10:30

The ITS technology showcase

Watch this space…

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

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

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

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

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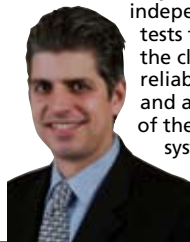
www.skymetercorp.com

A big push on ALPR

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

The Carmen ALPR engine is used in a number of high-profile projects around the world. In 2009, there have been two big success stories for the product – Vietnam's Can Tho Bridge ETC system, and the modernization of the South and North Hai Van Tunnel Toll Plaza on National Highway 1. Carmen is also used in the access control system for the local police HQ in Valladolid, Spain and for the Border Information System in Slovakia.

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

www.arhungary.hu

Embedded intelligence

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

For Advantech to expand its ITS market share in the coming years, van Unen believes that "state-of-the-art technique, fit-for-use computer platforms" are the way forward. "Modern embedded PC-based technologies are cost-efficient open platforms, designed to fulfil the need for safe, comfortable, efficient and environmentally protected applications," he says. "The fanless and rugged hardware design, the diskless embedded real-time operating system, and powerful computing technology enables us to deliver reliability and flexibility. Touch-screen panels with sunlight-readable transflective displays provide a user-friendly interface to the driver." Mobile communication technology is one area where such technology thrives, partly due to the popularity of new machine-to-machine applications for the transport sector.

Advantech has also recently been involved with a project called 'eCar Center', about which van Unen details more: "Our customer was looking to implement advanced operating software that was intuitive and easy to use, while being powerful and functional. They required the ability to interact with maps on-screen down to a single street, and be able to view multiple vehicles on-screen at once. The system provides detailed reports for monthly distance tracking, average/top speeds, suburbs visited, driving times, waiting times and more. All of these functions needed to be established in their new eCar Center." The company's embedded vehicle controller UNO-2053E and flat-panel touch-screen FPM-3060G monitor products are put to good use here to monitor and control the advanced system functions.

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

www.advantech.com

Active participation

STAND H40

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

In his sector of the market, Hübner notes further integration of vehicles into traffic management and control applications. "The magic words here are 'cooperative driving'," he says. "They will be floating probes that detect traffic problems, dangerous situations, and environmental conditions. Our applications currently only work with fixed sensors at the road;
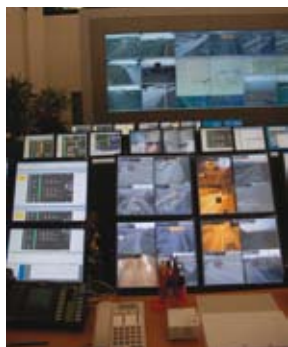
direct information to the driver requires VMS. This will change and we must follow these developments closely."

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

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

www.heuboe.de

Get smart about ITS

STAND Q20

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

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

Getting out and about at industry events such as the World Congress allows Rose to keep a close eye on current trends, and over the past months he has noticed a definite shift in the way that

organizations think about procurement costs. "They are moving from a focus on costs to a focus on performance. It has been interesting – especially in this economy – to watch transportation organizations worldwide seek out traffic detection devices that provide feature-rich data, as opposed to lower-cost alternatives that only identify general traffic flow."

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

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

www.wavetronix.com

Educating America into a smart technology future

STAND Q20

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

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

decision-making and progress on these fronts."

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

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

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

www.itsa.org

The voice of experience

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

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

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

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

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

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

www.trl.co.uk

Dynamic player

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

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

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

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

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

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

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

www.kapsch.net

STAND Z141

Seeing me, seeing you

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

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

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

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

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

www.amparosolutions.se

STAND C10

Making sense

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

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

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

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

www.sensys.se

STAND E10

Adopting a new surveillance strategy

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

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

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

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

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

www.neavia.com

STAND I10

Enhancing safety and efficiency with cooperative systems

As part of its involvement with ITS Austria, **AustriaTech** is exhibiting on a combined stand, with partners such as Asfinag, ITS Vienna Region and Smart Spectors. As well as the exhibited information and technology on the ITS Austria stand, there are several site activities too, including a technical tour showing cooperative systems on the road, and a workshop on E-Frame that can be visited.

Reinhard Pfliegl, AustriaTech's managing director has noticed a distinct pattern emerging in the traffic sector.

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

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

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

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

www.austriatech.org

Joined-up thinking for improved modeling

In Stockholm, **TSS – Transport Simulation Systems** will be officially launching Aimsun 6.1, the highlight of which is the Legion for Aimsun plug-in. Over the past 18 months, Legion and TSS engineers have worked together to integrate Legion's pedestrian movement engine into Aimsun. Managing director of TSS, Jaime Ferrer, describes the result of this partnership. "For traffic engineers who wish to design solutions that promote road safety and improve connectivity between different transport modes, this is a marriage made in heaven," he says. "Legion for Aimsun combines the unparalleled quality of Legion's patented movement algorithms with Aimsun's characteristically user-friendly interface. This makes it uniquely able to study the true interaction of pedestrians and vehicles at crossings with or without signal control. Boarding and alighting pedestrians onto/from public or private vehicles is another key feature of the new offering."

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

Ferrer has observed two key trends emerging in the field – large-scale modeling and modeling being used for real-time decision support. "Aimsun has been used to model a large part of Manhattan to evaluate congestion-mitigation measures. Rather than focusing on a small area, the idea is to understand the impact of infrastructure or operational changes over the entire metropolitan area at different times of the day. Also in New York, Aimsun was deployed by KLD Associates in a system that evaluates and optimizes – in real-time – signal control for a busy arterial."

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

www.aimsun.com

Upholding the law

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

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

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

www.vitronic.com

Combined force in AID

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

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

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

Scientific, the local system integrator in Dubai, will be incorporating Siqura IP switches into the FALCON ITS architecture to connect all IP-based data streams within the network. With temperatures reaching 50°C during the hottest months, it was vital that the field equipment could withstand operating temperatures of 75°C.

Products used in the Dubai contract, as well as many other Optelecom-NKF systems, including TrafficServer, will be shown in Stockholm.

www.optelecom-nkf.com

Bringing safety to developing nations through enforcement

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

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

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

www.robot.de