INTELLIGENT transport

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Creating a safer more efficient, higher quality and sustainable transport infrastructure for everyone

HIGHWAYS AGENCY

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INSIDE: How Intelligent Transport Systems, can make travel less polluting, cheaper and better informed

How Intelligent Transport can help protect the natural environment and the historic fabric of or towns and cities
How Intelligent Transport can help ensure the safety of motorists, vulnerable road users and pedestrians
How Intelligent Transport can deliver on a wide range of European Government objectives, beyond those directly associated with transport

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Where is EU transport policy going?

European countries have a common interest in in co-operating in a number offields of activity, perhaps most obviously as regards the environment but also in other economic sectors. Murdoch Mactaggart **learns from EU Transport Commissioner Antonio Tajani something of the current thinking on transport issues and ITS.**

It's just over a half century since what has now become the European Union was established, in major part a response to the ravages and privations of two major recent wars. Contrary to the facile claims of those both hostile to its development and ignorant of European history it was conceived of as a social and political organisation from the start, the economic dimension being the engine of regeneration and growth with the aim of eventual free movement of people, as well as of goods and services.

"Most people are in favour of trade and travel but some tend to forget that they both require transport."
Antonio Tajani

The original group has grown from six to 27 members, with further expansion expected. Roughly half the land area of the US but with a population half as big again, the EU's GDP is also slightly larger than that of the US and therefore around 70% per head of that there. With 16 EU countries in the eurozone and a further 11 non-EU countries using the euro, the currency has become that with the highest cash circulation in the world.

"The Treaty of Rome was based on the idea that the elimination of barriers with the free movement of persons, good, services and capital would ensure economic and social progress for the peoples of Europe. " says EU Vice-President, Antonio Tajani. "The original principles of economic integration have been reinforced by those of social cohesion and sustainable development. Most people are in favour of trade and travel but some tend to forget that they both require transport."

Managing transport without cutting mobility

Demand for transport immediately runs up against environmental considerations as it contributes an estimated 25% of CO_2 emissions, with some 71% of those deriving from road transport, according to a 2006 review of the EU transport white paper. Further, transport is expected to grow some 15% in the decade from 2010. Internet and web use has dramatically changed communication and many aspects of trade but the modem to send people or goods as email attachments has yet to be developed. Attempting to reduce personal mobility would be a deeply unpopular policy while reducing the movement of goods is an approach which may become necessary but which is an extremely difficult question to consider on account of wider economic implications, both positive and negative.

"The EU has been supporting R&D efforts in the area of ITS for about twenty years."
Antonio Tajani

"For the time being and as far as economic integration at European and global level continues, the so-called "decoupling" between transport and GDP is too harsh a way to fight the negative effects of transport activity." says Tajani. "We think that it is better to fight directly those negative effects than to reduce mobility altogether. Logistics and ITS offer some margin to have the same mobility with less vehicle movements and less derived nuisances by eliminating inefficient practices such as the empty running of trucks or low loading factors."

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"The EU has been supporting R&D efforts in the area of ITS for about twenty years, particularly through the R&D framework programmes FP2 to FP7." he adds. Some prominent FP6 projects in the area of ITS, and more specifically dealing with cooperative systems, are still on-going and should be completed in early 2010. A number of projects were launched in January 2008, under FP7, in the specific domains of intelligent vehicles and mobility services and in cooperative systems. These include intelligent freight management-related projects such as EURIDICE or road data exchange platforms such as ROSATTE. There are additional calls for proposals in preparation and these should target the deployment of field operational tests or aspects of smart urban mobility.

Problems of congestion

Congestion and safety, perhaps most particularly in respect of road transport, are possibly the two central issues of concern. Accidents are local and as resultant road deaths are typically in small numbers and so primarily of relevance to those directly involved, the sheer scale of the problem and its consequence is not widely understood by the public. For instance, if an aeroplane carrying perhaps 120

"To reduce congestion on our roads is an important objective. Every day about €300 million is wasted on Europe's roads in lost time and extra fuel."
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passengers crashed daily with all lives lost then the public response would be hugely different to its current broad acceptance of around that same number of road deaths each day. Road congestion certainly has other non-lethal consequences but can also be a factor in accidents.

"To reduce congestion on our roads is an important objective." says Tajani. "Every day about €300 million is wasted on Europe's roads in lost time and extra fuel. The authorities can act either by adding new capacity, where at all possible, or - the faster and cheaper solution - by using existing capacity smarter with the help of ITS, for example through better traffic management."

Perhaps counter-intuitively, it's now understood that building new road systems has the effect of increasing the overall traffic volume; that is, there may be initial traffic flow benefits but these rapidly get lost as the new roads make vehicle use more attractive so increasing volumes.

"To better protect pedestrians and cyclists we need a combination of active and passive safety measures."
Antonio Tajani

"In order to keep the traffic flowing it is of utmost importance to lock in the benefits." adds Tajani. "Here ITS can certainly contribute by regulating traffic demand better: it can support access management to certain areas such as city centres or motorways, perhaps through ramp metering by installing traffic lights at entrances. Road pricing and congestion management are powerful instruments and ITS can provide necessary tools to make these more effective and fair by taking account of parameters such as emissions, vehicle category, time and day, location, distance and so on."

Improving public transport use

In many cases private vehicle road use is both largely habitual and driven by uncertainty as to the reliability or even existence of public transport alternatives. This is an area where ITS is developing fast and where the EU is encouraging and supporting various initiatives. Road pricing has value, perhaps particularly in urban areas, but it's important to develop coherent policies using a range of approaches.

Tajani explains: "Let me mention, also, an interesting experiment based on reward recently carried out as a fifty-day trial in the Hague region of the Netherlands, the Spitsmijden project. Three hundred frequent drivers were encouraged to look for alternative to driving in morning traffic and were rewarded if successful with the result that the number of participants driving during peak morning hours was cut in half."

"Obviously, to make such a system successful you need to offer good public transport alternatives. Increasing the frequency of public transport, especially during peak hours, remains both financially and technically a challenge. However, ITS can also help in better informing the traveller before starting the journey. A modern traffic control system can integrate communication between control centres and trains, trams and buses, but also other ITS applications can be used such as dynamic passenger information given by panels at bus stops and better park-and-ride systems. Another important step is implementing more electronic ticketing by smart cards or mobile phones."

As with managing traffic flows and reducing congestion, improving safety is rather more complex that it might at first seem requiring, as it does, a range of approaches involving drivers, other road users, vehicles and the road and support infrastructure. And although aeroplanes and rail transport have very good safety records the consequences of failure can be much greater for a given accident and safety on these and other modes of transport is treated seriously.

Safer driving

"For two decades the EC has supported many research, development and demonstration projects to improve road vehicle and infrastructure safety using ITS." explains Tajani. "Typical examples include advanced driver assistance systems such as lane keeping/departure or collision avoidance warnings and intelligent cruise control.

The EC also supports initiatives such as eSafetyAware to raise understanding among policy-makers and end-users. We have also issued a legislative proposal for the mandatory introduction in the near future of specific ITS components – such as Electronic Stability Control, for example - in cars and commercial vehicles."

The 112 emergency call system, begun in 1991, is now well established through the EU and in several other countries such as Switzerland or Colombia and in fact extends world-wide through the GSM network. A development of this, e112, adds location services, and a further development, the EC's eCall initiative, aims to deploy in road vehicles systems which will automatically send at least the position of the accident and impact sensor information to local emergency services in the event of an accident. Time can be critical in many cases and eCall should facilitate extremely rapid emergency response and so save lives.

"More generally," adds Tajani, "Cooperative Intelligent Transport Systems (CITS) that are based on vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communications hold the promise of great improvements both in the efficiency of the transport systems and in the safety of all road users. These can provide safety-related services but can also help to reduce traffic congestion and so lead to less damage in the case of accidents. For example, the European Commission is supporting the deployment of the EasyWay project with 21 Member States, an intelligent infrastructure which will help inform road users about downstream incidents and reroute them around accident sites."

The importance of standards

For such systems to work well and duly reach their potential it's essential that common standards be adopted both as regards data gathering and exchange and subsequent wireless interoperability. In August 2008 a Commission Decision on the harmonised use of radio spectrum for safety-related applications of ITS was adopted. This provides a single EU-wide frequency band – 30MHz of relatively interference-free spectrum around 5.9GHz – that can be used for immediate and reliable V2V and V2I communication and will facilitate the development and testing of appropriate applications in the EU by providing a common and long-term spectrum access to the automotive industry and to road operators.

"ITS can very much optimise the operations of intermodal hubs and facilities by improving the information exchange between them and by tracking and tracing the goods over different transport modes."
Antonio Tajani

This spectrum is to have been designated by 6th February 2009 by national authorities across Europe to road safety applications without barring other services already in place, such as amateur radio services or fixed satellite services, for instance.

"Full interoperability is also required from different car-makers as to communication between vehicles and different types of road systems," he adds, "and too ensure true Community-wide interoperability essential parts of the standards would need legal enforcement measures. ETSI, the European Telecommunications Standardisation Institute, has created a Technical Committee on ITS in order to accelerate the development of the necessary standards at European level. Further, the International Vehicle Safety Communication Workshops, held annually at the ITS World Congresses in which Europe plays a prominent role, are working to find the necessary consensus to achieve international standardisation."

Safer walking

Roads are also used by cyclists and pedestrians of various kinds and safety is an important considerations, most particularly in ordinary town streets and on country roads. The "shared space" concepts of the late Hans Monderman suggest that removing the conventional demarcation between vehicles and pedestrians by dispensing with road priority management systems such as kerbs, lines, crossings and signals can improve safety by imposing on road users obligations to take account of others' behaviour in ways which are lost when rules and priorities are imposed. As yet no specific ITS support exists but this may change in time.

"To better protect pedestrians and cyclists we need a combination of active and passive safety measures." claims Tajani. "Passive measures help to reduce injury levels on impact by providing softer surfaces, for instance, at the front of vehicles. Active measures alleviate the conditions under which impact may take place, for example, by reducing impact speed. The European Commission has proposed that cars need to be fitted with Brake Assist Systems (BAS) from 2009 and in fact if the complete European car fleet were fitted with BAS as many as 1,100 pedestrian lives might be saved annually."

"As for shared space, it's an interesting concept which challenges common traffic segregation ideas. Within the Interreg programme the EU has funded a project testing the concept in five different countries. However, at this stage there is no particular support of ITS as it is more a principle of design. However, one could expect that in the future cars or trucks might have systems to sense other vehicles, cyclists or pedestrians and these would be useful in such situations."

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Free flowing freight

In an ideal and efficiently planned European transport system long distance movements of goods would be done by rail or sea with intermodal hubs providing access to road delivery vehicles for relatively local collection and delivery, whether by container or in smaller units. As yet, however, cross border rail transport can be difficult on


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occasion and there are still instances where manufacturers or retailers prefer the generally greater flexibility of road freight even for longer distances despite the financial and ecological costs involved. Nevertheless only some 8% of EU freight goes by rail compared with around 40% in the US, that despite the relatively poor US rail network compared with that of Europe.

"The European Commission has recently proposed a "Greening transport" package which aims in particular to internalise the external, or social, costs caused by transport and to encourage the use of environmentally friendly transport modes." explains Tajani. "ITS will be a crucial instrument to achieve these objectives. In particular, it will allow the introduction of road pricing and improve congestion management and other demand management strategies for all users. However, as we highlight also in our logistics action plan, ITS can very much optimise the operations of intermodal hubs and facilities by improving the information exchange between them and by tracking and tracing the goods over different transport modes." "ITS can also reduce the number of documents accompanying the goods. The idea is to build a parallel information channel to the physical transport chain containing information on the characteristics of the goods, their position, the required documents and other relevant matters."

Greening transport

The Greening transport package, introduced in July 2008, focuses particularly on making transport pricing reflect more accurately the real costs to society so that environmental damage and congestion can be reduced while boosting the efficiency of transport and, through that, of the economy as a whole. In November 2008 the Final Report of the EU eSafety working group on ICT identified specific areas where ITS could help to achieve goals of transport cleanliness and efficiency, claiming that overall reductions of 25% in fuel consumption and CO2 emissions were possible.

"In fact," adds Tajani, "the Commission believes that the widespread deployment and utilisation of ITS can have a significant impact on climate change. It is clear that coping with the growing traffic in a smart way, will not only ensure a more efficient network and a reduction of congestion, but will also lead to a reduction in energy consumption, coupled with a reduction in CO2 emissions. Alongside the use of renewable energy sources for transport (such as biofuels, hybrid or electrical cars) and a better fuel efficiency, intelligent traffic management systems will contribute to the reduction of environmental impacts."

Importantly, the eSafety Final Report noted that for a 25% reduction to be achieved it was necessary that all Green ITS measures should be implemented together and "within a long-term concerted European programme supported by all key stakeholders". All too often this is the sticking point, a failure to cooperate for wider mutual benefit when narrower commercial or proprietary interests are involved.

"One of the most important barriers to ITS deployment is the lack of co-ordination between the many stakeholders involved." explains Tajani. "The European Commission ITS Action Plan aims to improve the situation. We propose the creation of an ITS committee which would allow the European Commission, together with the member states, to decide on specific technical issues. And through the setting up of a European Advisory Group the involvement of senior representatives of stakeholders, especially from the private sector, would be ensured."

"It is clear that coping with the growing traffic in a smart way, will not only ensure a more efficient network and a reduction of congestion, but will also lead to a reduction in energy consumption, coupled with a reduction in CO2 emissions."
Antonio Tajani

Accelerating ITS deployment in the EU

EU road traffic is significant and increasing, leading to more traffic jams, higher fuel bills, increased CO2 emissions and significant levels of death and injury. These are problems which, according to the European Commission, cannot be solved by building more roads or by extending existing ones.

ITS, however, can help to make transport safer, more efficient and competitive, more sustainable and more secure. It does this by applying the latest ICT approaches to transport problems, transmitting critical information instantly to remote locations and using computers' number-crunching capabilities to turn masses of data into information.

However, the use of ITS in European road transport is still uneven. There's a patchwork of national, regional and local solutions which slows down overall deployment and fails to provide seamless services. In order to tackle this problem the European Commission has developed an Action Plan for ITS Deployment, seeking to accelerate and coordinate the deployment of ITS applications and services for road transport and their connections with other modes of transport in order to ensure seamless access and continuity of services throughout the EU.
There are specific measures proposed in six areas:

- Optimal use of road, traffic and travel data
- Traffic and freight management
- Road safety and security
- Integrating ITS applications in the vehicle
- Data protection and liability
- European ITS coordination

A European ITS Committee and a European ITS Advisory Group will be established to assist the Commission. The Committee, with representative of the EU countries, will exchange information and decide on actions. The Advisory Group will comprise senior representatives of industry, transport operators, users and relevant bodies and associations.

The direct benefit, says the Commission, will be a faster, better coordinated and harmonised use of ITS which will contribute to more efficient, cleaner and safer transport. This will benefit the industry by showing a clear policy and offering a wider potential market for ITS services. It will also benefit users who will find much improved and safer transport facilities and who will benefit from earlier and wider availability, at lower cost, of ITS products and services.

And it really needs to be done at an EU-wide level to get over problems of interoperability and to achieve reliable and seamless exchange of information across borders. Once the relevant directive comes into effect the Committee and Advisory Group can be established and work can start immediately, says the Commission, as action points and timetables have already been drafted.

Improving European scientific R&D

The EU's Framework Programmes (FP) for Research and Technological Development are the main financial tool used by the EU to support mainly scientific R&D in the Community. They've been in place since 1984 but were given new emphasis by the signing of the Treaty of Amsterdam in 1999, which obligated member states to conduct European research policies and implement European research programmes. At least for the more recent programmes, projects need to be transnational – that is, managed by consortia of partners from different member states – and also interdisciplinary.

FP6 ran from 01/01/2002 to 31/12/2006 and some of the ITS-related projects are still on-going. As is ordinarily the case, the preliminary year of its successor programme, FP7, overlapped with its last full year. FP6 had a budget of €17.5 billion and a major aim was to improve research co-ordination and integration in Europe so contributing to the creation of the so-called European Research Area.

The current programme, FP7, has a longer timescale than any of its predecessors, running in fully operational form from 01/01/2007 and continuing to 31/12/2013. It's intended to build on FP6 to develop further the European Research Area. There are four subsidiary programmes, or streams, corresponding to basic components of European research and identified as Cooperation, Ideas, People, and Capacities. The FP7 budget is €51 billion.

Antonio Tajani

A former journalist, with a law degree from Rome's la Sapienza University, Antonio Tajani was one of the founders, with Silvio Berlusconi, of the Forza Italia party. He was elected to the European Parliament in 1994 and in 1999 became the leader of Forza Italia and President of the Christian Democrat Group of the EPP-ED within the European Parliament.

In May 2008 Tajani was proposed and duly appointed as a European Commissioner, becoming a Vice President of the Commission with responsibility for transport.

Paying only for what you use: the new vision for toll charges

We all want less traffic congestion and a cleaner environment – without giving up our cars. Can it be done?
By Joanna Bawa

Like any socio-political problem traffic management is a complex, delicate and emotive topic on which most people have an opinion. A healthy road system is one which finds an acceptable trade-off between the conflicting demands of business, society and the individual for improved traffic flow, improved driver safety and reduced environmental impact. According to Austrian company, Kapsch TrafficCom, the most effective means of achieving this is electronic fee collection (EFC) technology. "The only meaningful and sustainable way to discourage driving and car ownership, to improve driver behaviour and to alter patterns of congestion is to charge for road use," says Erwin Toplak, COO of Kapsch TrafficCom. This is not charging in a simplistic way, simply through road tolls, but an increasingly subtle and intelligent system built on an array of sensitive technologies which generate detailed information which in turn feeds into planning and design for future traffic management systems.

Cheaper to park than to look for parking

"Road charging is an investment, which can be set up to benefit drivers as well as councils, local authorities and government bodies,"
Erwin Toplak

Like all organisations involved in traffic management Kapsch is concerned to make more of the existing infrastructure, given the limited resources for developing it further. Charging for road use is becoming more common throughout Europe and gradually an understanding is emerging among the driving public that charging is the only realistic way of improving and maintaining a safe, managed road network. "Our systems enable governments to demonstrate positive benefits for road users and are not a way of punishing or harassing drivers," says Erwin Toplak. "Information gathered by our systems is used intelligently to define and even predict traffic flows so that appropriate measures can be put in place in advance of a problem." He explains that there are usually a number of possible routes to reach a specific destination, although most drivers tend to choose the same one. By using technology to understand traffic flows and pressure points, it becomes possible to redirect traffic through under-utilised routes at times of day known to be busy. "Of course there is a delicate balance to be struck between, for example, motorway use versus town centre driving, and often this may be down to political decisions – what voters value more," Toplak comments. Even so, with sufficient intelligence it becomes possible to optimise this trade-off.

"If drivers are paying to drive, they are entitled to enjoy the process. This might mean quiet, safe road surfaces, or simply the confidence they will reach their destination at the time they expect to."
Erwin Toplak

"Road charging is an investment which can be set up to benefit drivers as well as councils, local authorities and government bodies," continues Toplak, citing parking management as a relevant example: "Drivers typically circulate in an area looking for on-street parking, hoping that next time they enter a particular street a space will have become available." What Kapsch can do is integrate a dynamic parking concept within defined congestion charging zones. Dynamic parking is a time-based approach whereby the vehicle is charged for total time spent within a defined zone. "If the system is sufficiently intelligent it need not be unfair," explains Toplak. Firstly, the same system which detects a car circulating can be set up to transmit detailed information via text message about off-street parking to that car, including charges and location. "Of course the charge for off-street parking would be less than the charge for continuing to circulate," Toplak adds. By encouraging more dedicated parking, he says, the roads become clearer and traffic flow improves, improving safety and reducing pollution. Eventually, the money gained from congestion and circulating charges can be used to build new car parks, and in the longer term can be invested in alternative transportation such as electric buses, trams or cycle paths.

The UK – a special case?

The UK faces a specific set of challenges which other European countries do not have. Although congestion is a major problem in many cities and on many roads, there are only a few tolled crossings and roads in existence and UK drivers are simply not used to paying to use the road network on a per-use basis. Coupled with the current recession, asking people to pay extra to use the roads is unpopular.

Even so, the problem of congestion still remains. Politicians must find ways to alleviate driver fears about 'spy-in-the-sky' technology and to publicise the positive benefits of congestion management, such as more predictable journey times, reduced congestion and pollution, increased money spent on road network improvements and public transport. The systems are much more sophisticated than simply charging machines, and the data generated can be used to feed real-time traffic information systems, for example data on how long it will take to reach the station or hospital. The same technologies that are used for road charging can also be used to create 'Low Emission Zones' as in London, where more polluting vehicles are deterred from entering the city, or to create charge-free corridors which direct through-traffic on to specific routes where they can drive for free.

If you only pay for what you use, and gain discounts for travelling out of peak hours, we have the beginning of a powerful argument for re-designing our entire approach to commuting and even working hours."
Erwin Toplak

Buying a better driving experience

Electronic fee collection is sometimes perceived as an 'easy' way for governments to collect money from citizens who have no choice about whether to drive or not, or which roads to use. As the technology to monitor traffic flows and initiate charging procedures becomes more sophisticated, so it becomes politically necessary to explain more clearly why toll charges are a good thing and where the money goes. Perhaps most obviously, road tolls contribute to the maintenance and upgrading of existing road systems, including the monitoring and collection mechanisms themselves.

A less tangible, but arguably more important, investment is the improved 'driving product' which road users gain. "Traffic management is an economic activity like any other, which must be deployed in a way which benefits the developers and operators as much as the authorities and the drivers," says Erwin Toplak. "If drivers are paying to drive, they are entitled to enjoy the process. This might mean free-flowing traffic, rapidly dispersed congestion, quiet, safe road surfaces, or simply the confidence they will reach their destination at the time they expect to." According to Toplak, there is an obligation on operators of EFC systems to communicate the purpose and benefits of electronic charging, or the ways it operates. "It is a sophisticated system," he explains, "and it is possible to make charges sensitive and flexible, such that road users do have choices about when and where they drive. If you only pay for what you use and gain discounts for travelling out of peak hours, we have the beginning of a powerful argument for redesigning our entire approach to commuting, and even working hours."

Czech Republic embraces On Board Units

Kapsch TrafficCom is the architect and operator of an extensive multi-lane free-flow toll system for trucks now operating in the Czech Republic. Running across 1200 kames of the country's highway and expressway network, the microwave-based system identifies and charges trucks with an accuracy in excess of 98% – higher than the 95% rate specified by the Czech Customs Authority. It is mandatory that participating vehicles in the Czech toll system have an in-vehicle on board unit, and a total of 370,000 in-vehicle on-board units (OBU) are currently active in the Czech toll system. To support the administration of OBUs throughout the country, Kapsch established and operates over 240 distribution points along the highways, motorways and near border crossings and at an additional 15 contact points within provincial towns of Czech Republic. The OBUs are self-installable on the inside windshield of the vehicle and available for immediate use after initialisation.

The Czech toll system includes a comprehensive stationary enforcement regime, enhanced by mobile enforcement which is carried out around the clock by a total of 25 especially equipped vehicles. The Czech Customs Authority is responsible for mobile enforcement, and for ensuring that trucks, namely vehicles of 12 tonnes or more, are equipped with the mandatory OBU and that the toll is correctly paid. Plans exist to extend this requirement to vehicles weighing more than 3.5 tonnes.

In 2008, toll revenue for the Czech Republic reached around 245 million euros. "The Czech toll system is a success due in part to the fact that it corresponds with our business philosophy," concludes Erwin Toplak. "We put the complexity in the system and keep it away from the user: an electronic toll system must be free of discrimination and be absolutely as simple as possible. This is a requirement we place on ourselves."

How does it all work?

Electronic fee collection (EFC) systems are based on four primary processes:

- Automatic vehicle identification: identifies a specific vehicle according to defined parameters, such as number plate or information contained in an OBU
- Automatic vehicle classification: classifies physical characteristics of a vehicle, typically to determine the appropriate tariff level
- Transaction processing: data collected from specific toll points are processed for payment, etc.
- Toll enforcement: methods to manage toll evasion.

Today there are three main technologies used for EFC:

- Dedicated Short Range Communication (DSRC) (tag and beacon) microwave technology
- Vehicle Positioning Systems (VPS) based on a combination of satellite technology (GNSS) and mobile communication networks (GSM/GPRS)
- Video-based Automatic Number Plate Recognition (ANPR) technology.

The technology choice depends on the objectives of the road user charging scheme.

Raising the road user's information quotient

You may believe that motorway signs and other road warnings appear by magic but, as Murdoch Mactaggart **learns, there's a great deal of hard work and careful thought behind providing accurate, current and reliable information to road users.**

Snow and inclement weather is a problem for road users and also for those dealing with the consequences, people like the police and other traffic officers or ambulance crews and many others. Incidents such as the dramatic event of a plane crashing one evening on the M1 in Leicestershire in January 1989 are fortunately rare but many other more directly driving-related incidents occur daily, risking safety and affecting the reliability of journey estimates.

"The most important part of my role is making sure that we provide ... as much information as possible in as near to real time as we can"
Denise Plumpton

The common factor is the importance of getting accurate and timely information out to road users. This may mean advising proactively that repair work will lead to delays or it may be a case of responding to events, perhaps taking measures to effect a better traffic flow. Sometimes it's making sure that the increasing numbers of road users planning their journeys can get up to date information on which they can rely.

Denise Plumpton has been Director of Information for the Highways Agency since January 2005, moving to the public sector from her position as IT Director of the former Birmingham-based mobile handset manufacturer Sendo and from similar positions with TNT UK and others.

"The most important part of my role is making sure that we provide our travelling customers with as much information as possible in as near to real time as we can." she says. "It's about collecting data in terms of what's actually happening on the road and so providing information to help them make decisions about their journeys on our roads."

Thirst for information

Information comes from the agency's traffic officers on patrol, from the police, from gantry cameras used to measure and analyse traffic flows, and particularly from sensor loops buried in road surfaces. Weather information is added by the Met Office and the four terabytes or so of data processed at the National Traffic Control Centre (NTCC) headquarters at Quinton, Birmingham, is sent out as local information using a variety of approaches ranging from dynamic gantry or roadside signs through to radio broadcasts, enquiry centres and web pages.

"The more people trust the accuracy and usefulness of our information the more they will act on it"
Denise Plumpton

At one point during the severe weather of early February, for instance, the agency's trafficinfo pages were getting 20% of the normal half million monthly visits every hour, while information line enquiries peaked at a call every eleven seconds. DAB radio listener figures were no doubt also substantial.

"We offer a dedicated traffic radio service on digital radio and over the internet." explains Plumpton. "At peak times it's updated every ten minutes, every twenty minutes otherwise. That's a spoken loop which runs for fifteen minutes so you can pick it up as convenient, knowing that at least every fifteen minutes you're getting all the current information."

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Providing information is all very well but the real trick is getting people to access that information and duly take it into account when planning journeys. That's not necessarily always easy.

Accuracy is vital

"That is the challenge." agrees Plumpton. "And that's why it needs to be accurate because the more people trust its accuracy and usefulness the more they will act on it. We strive very hard to be as accurate as we possibly can be. I don't mean about signs saying that the travel time to the next decision point is so many miles and so many minutes. Those are accurate, of course, but it's quickly updating changing information that's essential. If there's been congestion because of an incident then it's really important that when the congestion is cleared we update or remove the sign. It's leaving things which are wrong that leads to mistrust and that leads in turn to inaction."

"It's really about keeping the economy moving," adds Plumpton "advising customers both what's happening in real time and planned ahead. If you look at our website on TrafficEngland.co.uk you'll see our future plans for lane closures, for example, up to three months in advance."

It's now recognised by traffic planners, if not fully appreciated by the travelling public, that when major roads become congested greater throughput can be achieved by lowering the speed limit, perhaps helped by opening up the motorway hard shoulder as a temporary extra lane.

"It's a really interesting point that most congestion is not caused by traffic incidents but brought about through traffic volumes." explains Plumpton. "As the flow speeds reduce we'll reduce the permitted speed limit slightly ahead of that so that the traffic flow becomes much smoother. A steady 50, say, will get you through more quickly that racing up to 70 then having to drop right back again."

"It's a really interesting point that most congestion is not caused by traffic incidents but brought about through traffic volumes"
Denise Plumpton

"And by opening up the hard shoulder we can move from three lane to four lane capacity to increase throughput." she adds "When we do that we have our regional control centres permanently monitoring what's happening so that they're able to close that hard shoulder quickly by putting a red cross over the lane sign if a vehicle stops on the hard shoulder. It's been very successful."

Reliability is essential

The main aim of these various measures is less to increase the flow rate of traffic than to provide a better degree of certainty about how long a journey might take, something which also lies behind another information initiative, namely part of the web site which provides a visual indication of the flow state of selected roads.

"What we've found with our customers, particularly those moving freight, is that they're not so concerned about absolute speed but reliability. They want to be able to plan their schedule of deliveries more accurately and so that's what we're about there." Plumpton says.

ITS, or vehicle telematics as it was earlier known, has long been part of the agency and the NTCC's approach to traffic management. MIDAS (Motorway Incident Detection and Automatic Signalling) loops and dynamic signage have been mentioned but Plumpton is looking at other ways to collect and disseminate information in order to keep travellers informed and ultimately to ensure that traffic keeps flowing steadily and safely and with as little environmental impact as possible. In October, for instance, the agency agreed to provide data to Google so that Google maps could carry overlays showing by colour the state of congestion on motorways. Now it is completing arrangements with a number of media groups to carry regionalised traffic data on their newspaper websites and live information on their associated mobile platforms. The BBC and various other broadcasting organisations already offer traffic news, of course, and Plumpton sees this as a useful complement to the agency's own sources of traffic information.

"We're always looking to see what's happening with technology" Plumpton explains "and working with technology companies so that we can improve the services we provide. It's keeping abreast of what's happening in the automotive industry in terms of what technology is being developed for inclusion in vehicles for the future. Will SatNav become a standard fit, for instance? It's understanding how the automotive industry is moving options forward."

"My real challenge is making people aware of the services we provide to give them information about journeys they're planning, perhaps getting them to ask themselves whether they need to drive at all. If they then take a conscious decision that they wish to drive, then doing that in a fully informed manner about what's waiting for them on the road."

The Highways Agency

The Highways agency is one of the executive agencies of the Department for Transport and was created in March 1994. Transport is partially devolved to the other governments within the UK and so despite the agency's name its remit is purely England. Further, and perhaps also somewhat confusingly, it doesn't even deal with all public roads or even all main roads but has responsibility for what's called the strategic road network, amounting to some 4,500 miles of motorway and the more important A roads.

Although the road system was earlier named and numbered logically (essentially radially in a clockwise direction around London) much has changed since then and the agency concerns itself with what are really the obvious core routes crossing England: for instance the A30, largely displaced as a trunk road by the earlier more minor A303, is ignored until it joins with the latter at Honiton to continue west. Around two-thirds of English freight journeys and a third of all English road travel occurs on agency-managed roads.

The agency's responsibilities are ultimately to make that road network properly usable and to this end its responsibilities range from maintaining, repairing and even extending the road infrastructure, through managing traffic flow and improving safety as well as the vitally important task of providing information to road users of all kinds.

The agency has had a chequered history and has variously been charged with gross waste and overspend by the National Audit Office and the Public Accounts Committee of the House of Commons and by MPs. Seperately, in March 2007, the Nicholls Review slated its governance capabilities, particularly in respect of managing major schemes. Its excessive spending on consultancy services and its ploughing ahead with inappropriate public-private partnerships were considered particularly egregious.

Other critics have pointed to the naivety whereby such arms-length government agencies too often come to believe themselves business entities operating in a commercial world but without properly implementing what's actually needed. Manic ideology and the solemn intoning of the mantras "vision" and "customer" aren't valid substitutes for dedicated, straightforward public service and proper budget management and project control.

Fortunately, following some recent management changes, the agency appears to be taking serious stock and so matters may start to improve for both road users and taxpayers.

Intelligent Transport: a far-sighted approach

With growing pressure on our transport systems and the increasing diversity of intelligent transport solutions and systems available, falling prey to the best marketing campaign by manufacturers is a distinct possibility. But there are some keys to finding the most efficient, cost effective and sustainable solutions. By Anne English.

Despite increases in tele-working and flexible hours offered by many employers, as well as moves from the solo commute to public transport, the physical movement of people, goods and data still underpins our move to the knowledge economy.

"You need to stand back from the manifest issues and take a more holistic view…"
Ian Patey

Successful centres of business build economic success on factors such as accessibility and attractiveness of location. Urban planners are continuously striving to ensure a sustainable supply of the amenities that contributes to an effective, sustainable conurbation. Technology is central to facilitating the free movement and ease of access of all modes of transport while ensuring that the citizen retains choice and that there is as little impact as possible on the environment.

Pressure on systems and conflict of interest

With the increased pressure on our transport systems and growing use of consumer systems such as GPS, we are seeing a disparity between the priorities of manufacturers and those of national and local road authorities.

According to Ian Patey, Traffic Operations and Technology, Business Unit Director, with consulting and business services group, Mouchel, "The key to addressing the pressure on systems and disparate interests is to look forward and consider the various scenarios – political, social, economic for the management of movement and to address the various developments taking place within the ITS community. At Mouchel, we seek to gain an understanding of how far various developments have progressed, what is being considered and developed and to understand where the gaps are in the market."

An unbiased view on interoperability

"You need to understand the dynamic of how government and local authorities work in each market, what makes them tick, how their processes work…"
Ian Patey

As a greater dependence on in-vehicle systems develops, the issues of liability and responsibility become more important. For example, if a system is to be relied upon, the driver has to maintain the system properly. According to Patey, "The technology will soon be there to allow cars to avoid problems and even drive themselves but will manufacturers take the liability for accidents that occur? If we come to rely on these systems they will have to be maintained and calibrated appropriately."

In the absence of any standards the potential for these systems to work co-operatively diminishes, yet the potential benefits from co-operation could clearly be significant.

"There is no point in putting in something that is more efficient if you cannot recycle the old equipment...."
Ian Patey

Patey explains, "We seek to use our involvement in the intelligent transport community to influence and stimulate debate and as we are independent of suppliers we are able to take an unbiased view. An example of this is in-vehicle systems. Manufacturers produce various new systems to aid safety or efficiency, but there is no linkage with the operators of highway networks who are investing heavily in new infrastructure and systems to improve safety and reliability of journeys."

Blending solutions

One of the driving forces behind Mouchel's approach to bringing these disparate strands together is recognising that the real issues at hand may not be the presenting ones. For example, a highway agency or local authority may believe that they need to replace legacy software systems with the latest technology or deploy more staff to a certain area or project. However, this is often not the solution. According to Patey, "You need to stand back from the manifest issues and take a more holistic view. The answer often lies in getting to the root of the problem and restructuring or building on existing

processes as opposed to re-inventing the wheel, not to mention incurring the expense that large-scale new ITS systems involve." Scope for improvement often lies, therefore, in stakeholder management and understanding the behaviour of the provider, the driver, pedestrian and indeed the public transport user.

Mouchel's highways division works with clients to analyse their needs as well as those of the end user and to offer bespoke strategic and policy advice, management consultancy and project management, design services, operational support and asset management. Mouchel's core business serves the UK. Patey says, "You need to understand the dynamic of how government and local authorities work in each market, what makes them tick, how their processes work, how they communicate and collaborate, and all of the regimes in which they operate, as well as the behaviours that drive the end user."

An independent approach

Mouchel does not put itself forward as a technical guru, nor has it any allegiance to specific solution providers. However, it does work with a wide range of partners across a broad array of projects. Particularly in the current leaner economic environment, the people at Mouchel prides themselves on being able to carry out finely-honed requirements analysis and give unbiased advice. This could be a combination of streamlining current decision-making processes, auditing or automating workflows to dynamic Web 2.0 oriented flowcharts or maps that guide the users simply through processes. Patey says, “We continue to build a business that is in tune with the society it serves, finding new ways to deliver public services and infrastructure efficiently and profitably through partnerships between the public and private sectors.”

This fact has probably played no small part in enabling Mouchel to lay claim to the title of ‘trusted adviser’ for the Highways Agency and Transport Scotland as well as being a foundation member of ITSUK. “We are Foundation Members of ITSUK and work within that community and others such as the World Roads Association, to understand and influence developments across the world.”, says Patey.

Safe sustainability

No discussion about transport would be complete without a look towards sustainability and the environmental consequences of increased transport capacity. According to Patey, “Active Traffic Management, such as the use of hard shoulders during congested periods, can contribute to meeting air quality and carbon reduction targets. But we also need to look very carefully at how we power the increased technology that we are now using. We need to further explore and implement sustainable power such as solar panels or wind farms.” “Not only is this necessary but highway waste needs also to be recycled. As more efficient equipment, such as signals above a road - is put in place the old equipment should be recycled, so reducing waste.” According to Patey, “There is no point putting in something that is more efficient if you cannot recycle the old equipment. We look for innovative ways to do just that.”

Peek Mouchel

Peek Mouchel is a joint venture that unites Peek Traffic Limited and Mouchel and implements and maintains all aspects of the Highways Agency’s technology systems. The single operating company offers a complete service of management, design, manufacture, maintenance, operation, asset management and consultancy skills that spans more than 20 years of highways technology and support commissions. This service is underpinned by the management systems and people within each organisation having strong and committed technical and project management expertise and a strong customer service ethos. While the joint venture was formed to meet the changing needs of the Highways Agency (HA) in particular the TechMAC commissions, it has the capability to deliver a far wider range of services.

The East TechMAC, in particular, will form a core part of the Agency’s preparations for managing the movement of the participants, officials, volunteers and spectators for the 2012 Olympics. TechMACs provide the Agency with the opportunity to develop and pilot various new technology applications for the motorway and trunk road environment – working in partnership with various stakeholders to improve travel within these areas and beyond.

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The carbon balance of Intelligent Transport

Mouchel is actively addressing the carbon balance and cost of intelligent transport, proving that technology, in the form of ITS, can be harnessed to reduce harmful emissions, enhance air quality and reduce the effect on climate change from CO^2. Although there is a CO^2 cost associated with constructing and operating an ITS scheme, this can be far outweighed by the resulting reduction in congestion and corresponding emissions.

In a 2007 paper published in the Proceedings of the Institute Civil Engineers, Patey puts forward a model to establish CO^2 savings before and after ITS implementations, stating that it is possible to estimate both the carbon costs and savings from an ITS scheme over a period of time and make an assessment of the overall carbon balance. (Proceedings of the Institute Civil Engineers, *Engineering Sustainability,* 161. Sept 2008. Issue E53 pages 1-4)

Will ITS revolutionise mobility?

Ambitious claims are made for the benefits which ITS can bring to people's mobility. Murdoch Mactaggar**t talks with an organisation promoting ITS and with the goal of a European road network with zero accidents and zero delays.**

"Very advanced ITS technologies are already available on all the issues we cover." **Hermann Meyer**

The discipline of Intelligent Transport Systems has been acknowledged for over twenty years yet remains largely unknown to the public, perhaps on account of a lack of clarity over just what it is. Drivers are familiar with enhancements such as airbags or adaptive cruise control but have rarely heard about emergency call systems or information systems to connect cars with each other and with the road infrastructure.

However, ITS is now developing fast and there are clear indications that dramatic benefits can be had if the technology is widely deployed. ERTICO – ITS Europe sees its role as midwife to the new arrival.

The technology already exists

"The barrier to implementing ITS widely does not lie in the availability of suitable technologies." says Hermann Meyer, ERTICO's CEO. "Very advanced technologies are already available, or close to maturity, on all the issues we cover. The main point is to develop a business model where the different stakeholders involved can see the benefits for them."

"It's a very complex environment with many different stakeholders, private and public. Throughout Europe, for instance, there are all the different member states of the EU with differing legal frameworks and infrastructures. Customer acceptance is a major issue. While the customers can readily see the value of an airbag, for example, they may not so easily see the value of other systems which can prevent accidents in the first place and so don't understand why they should spend money on them."

Meyer, an environmental economist by training and with subsequent academic, public authority and industrial experience, is an enthusiast for ITS, believing that it has the potential of dramatically changing road transport and bringing considerable social and environmental benefit. ERTICO's ambitious target is to work towards 'intelligent mobility', a situation with zero accidents, zero delays, a reduced environmental impact of road transport and a population with the tools to make fully informed travel choice decisions.

The political dimension

If the public is unaware and confused, what about politicians? The European Commission is certainly supportive in promoting the development and deployment of ITS in the EU by bringing together various interested parties, supporting financially research and deployment orientated projects and seeking to achieve interoperability and seamless functioning throughout the EU. There are many R&D projects which are funded through the current Framework Programme 7 (FP7) as well as through earlier programmes.

The European Parliament, as well as national parliaments, has also taken a keen interest in ITS. Too many politicians, however, often do not properly understand the range and limits of technology, looking on it as a silver bullet to solve what are often social problems. Further, the issue is a complex one not only on account of the many interests involved but also because of the inherent synergy and this perhaps inhibits the development of political momentum.

"We do not want to convince politicians to promote ITS for its own sake." says Meyer. "Politicians have first to consider what they want to achieve in order to improve social welfare. They might, for instance, want to reduce accidents or fatalities, reduce CO_2 emissions or improve mobility. We can then show that ITS can make major contributions in these areas."

"However, there will come a point when particular technologies or services have to be considered." he adds. "Once the political target is clear then politicians need to look at what is or might become available, consider the costs and the benefits, and decide where to push. Industry does its own cost/benefit analyses, of course, but that's in respect of its own markets and the political side has to go wider, include social effects as well. It's far more difficult to analyse the impact of deploying ITS, where many stakeholders are involved and where the effects can be so wide ranging and sometimes indirect."

It's nevertheless important to attempt this analytical task, to try to work out what ITS can contribute to specified political targets over a five or ten year period and to establish what the costs might be in various areas.

Public and private procurement

Public procurement as an approach to stimulate market development has always existed slightly uneasily with the ideology of free

"In the future your vehicle will literally be able to see round the corner ... so that you'll always know what's happening and can let others know as well."
Hermann Meyer

market economics but is finding increasing favour in the European Commission and elsewhere, including the UK. Subsidiarity is an important EU principle and member states don't take kindly to being told firmly what to do as part of the community but there are certain issues, perhaps pre-eminently climate change and the environment, with effects and consequences well beyond that of a single state and which require cooperative action.

"Public procurement could be of extreme importance ... but I would look also at the large private use sector, particularly around improvements to energy use and safety."
Hermann Meyer

"Public procurement could be of extreme importance." agrees Meyer. "It could help create the market for supplying these technologies and services but it would also provide a way of testing and developing certain technologies, particularly where critical user mass is needed."

"But I would go beyond public procurement and look also at the large private use sector, particularly around improvements to energy use and safety." he adds. "Both of these issues are right at the top of the agenda of large fleet operators, for example, but they may not be aware of what's possible with ITS. We need to raise that awareness."

Risking reckless behaviour

One of the charges made against vehicle enhancements is that they can give a false sense of security. A driver is ultimately responsible for the control of a potentially lethal weapon and being cocooned in warmth and comfort with little in the way of ambient auditory feedback, coupled with a lack of real practical understanding of the physics keeping the car in contact with the road surface, may engender reckless behaviour. Too often the victims are vulnerable road users such as pedestrians and cyclists.

"Yes, there are concerns that systems may sometimes reduce attention because the driver relies too much on the technology" says Meyer "but overall the safety benefits will nevertheless be enormous. Navigation systems let you focus on your driving rather than being distracted by reading maps or getting angry because you can't find where you want to go. Personally, I'm always amazed looking at road traffic just how people manage. And if technology makes that easier then in the end it will improve safety."

A dramatic future

Despite the long history of ITS we're just at the start of the major changes in road use which ITS might bring. Some changes may be fairly trivial, useful mainly in providing additional convenience. Navigation systems may develop to provide more location-based services, for example, perhaps making it easier for drivers to avoid rip-off motorway food by finding nearby better quality at reasonable cost.

Other developments, however, will dramatically change road use patterns and related services and will have major impacts on matters such as energy efficiency and safety.

Reliable and flexible public transport is necessary but providing easily accessible and accurate dynamic information about alternative modes of transport is a very important development which ITS can facilitate.

"What really excites me is the potential of co-modality and of what improved communications, vehicle to vehicle and vehicle to infrastructure, can bring. By 'co-modality' I mean using different forms of transport on their own or in combination to achieve optimal travel results. ITS will be the main enabler of this because it can help the traveller become fully informed. A person will learn before a journey which transport modes or combinations are possible, how much each costs, how long each takes, and so can make informed travel decisions. I believe that will substantially change how people travel and will impact on the present social divide."

"In the future vehicles will not only receive information but will send it as well. It's like an information brokerage. It's like the internet where, content is increasingly provided by users. So if congestion develops, nearby cars can be advised and immediately routed elsewhere. If there's an accident not only will other cars be alerted immediately but so also will be the control centre and emergency vehicles and so you'll get help far quicker. In the future your vehicle will literally be able to see round the corner, ahead and behind, so that you'll always know what's happening and can let others know as well."

ERTICO - ITS Europe

ERTICO – ITS Europe is a public-private partnership founded in 1991 with the support of the European Commission and industry leaders. It brings together organisations working in vehicles telematics, now more usually known as intelligent transport systems and sometimes as intelligent mobility.

The organisation has over one hundred members – which it calls "partners" - grouped into the five sectors of Industry, Public Authorities, Infrastructure, Users, and Others. The Industry sector is by far the largest, with nearly half the total membership. It includes car manufacturers such as BMW, Volkswagen and Nissan and others involved with communications or software or engineering such as Ericsson, Oracle and Siemens. Twenty of the EU's 27 members have one or more of their public sector organisations as members while non-EU countries such as Norway, Switzerland and Saudi Arabia are also represented.

ERTICO's essential remit is to encourage the development and widespread deployment of ITS. It works with its partners to define ITS development and deployment needs, liaises with the European Commission and other bodies to raise awareness of and support for ITS, and seeks out and may take on the management of publicly funded ITS projects for its members.

ERTICO also runs demonstration events and European and World Congresses to showcase ITS technology and to bring together those with interests in the sector. In September 2009, for instance, it is organising the 16th ITS World Congress in Stockholm, a major event with an anticipated 5,000+ attendance.

Controlling the black cabs

Airports are busy locations with consequent considerable traffic movements. Murdoch Mactaggart **hears how Heathrow airport manages this.**

Airports Council International (ACI) is a non-profit trade organisation, based in Geneva, with some 95% of the world's air passenger traffic carried by its members. It's a good and generally reliable source of data relevant to airport operators and until recently has issued regular upbeat comment about strong passenger growth of between 4% and 9% annually. This changed greatly from summer 2008 and its most recent figures, comparing November 2008 with a year earlier, show global passenger traffic down 8% and global freight traffic with a 15% drop.

"Facilities such as car parking and managing taxi services can form an important part of airports' commercial, income-generating, strategy."
John Torrie

The earlier dramatic oil prices surge now followed by the impact of the banking-led financial mayhem makes running an airline a precarious business, even before climate change pressures are factored in, and the trend in falling passenger numbers will certainly accelerate. Fewer passengers mean fewer flights and that reduces airport revenues directly, particularly in cases where, as with BAA at London Heathrow (LHR), income is substantially dependant on retailer rentals and the proceeds of issuing trading licences to service suppliers such as taxi companies. With revenues falling costs need to be managed carefully and contained where possible and in these situations efficient applications software makes a huge difference.

"Only registered vehicles and drivers can get anywhere near sensitive areas but the system also provides a means of managing demand for taxis."
John Torrie

Managing security, demand and revenues

"Registered drivers like the system because it makes things smoother and fairer for them and improves availability."
John Torrie

"Facilities such as car parking and managing taxi services can form an important part of airports' commercial, income-generating, strategy." says John Torrie, CEO Steria UK. "Heathrow also has to monitor vehicles from a security standpoint. The project that we run, where we control and track vehicles in a busy and secure airport, is crucial to BAA's success from both security and commercial perspectives and actively helps it deliver a better customer experience."

LHR is the busiest international passenger airport in the world and recent air travel growth has led to an airport increase in both general service vehicles – such as operational or emergency vehicles – and taxis. General service vehicles need access to many ordinarily restricted parts of the airport, including airside areas, whereas taxis are normally restricted to the entrance/exit roads and to areas close to the terminals. BAA manages the movement of airport operational vehicles using its own vehicle access processes but it uses Steria's Taxi Management (TM) system to manage the movements of the registered taxis allowed on site. The system uses RFID, specifically UWB (Ultra Wide Band) enabled, to track vehicles.

"With the Steria TM system both the driver and the vehicle are registered with security passes" explains Torrie "and this allows different drivers for the same vehicles. These passes are read electronically at relevant points so giving appropriate access and allowing monitoring of vehicle locations. This not only provides security – only registered vehicles and drivers can get anywhere near sensitive areas – but in the case of taxis also provides a means of managing demand."

A single system

Steria's system was first deployed at Charles de Gaulle airport, supporting 15,000 taxis and covering six terminals. The LHR system is numerically smaller, supporting half the number of taxis at five terminals, but its scope is wider and it's designed to be expanded as needed.

"Historically airports ran several different systems for managing security and dealing with their commercial needs" says Torrie "but the modular Steria system means that they can do all that with just the one system. Some of our continental European clients have added our Car Park Management system, giving a capability to monitor vehicle flow in real time. This is backed up by automatic number plate recognition both to counter fraud and to check for stolen vehicles against the police database. It also easily enables capacity management reporting and provides financial analysis, all with the aim of reducing costs and maximising revenues. It can really change the way vehicles are identified and deployed on site."

Smoothing peaks and troughs

"Registered drivers like the system" he adds "because it makes things much smoother and fairer for them. We can improve availability by evening out the peaks and troughs of demand and so taxi firms can work rotas and send cabs where they're needed the most. Taxis go first to a holding area, the Taxi Feeder Park, and from there to the terminals according to demand.While waiting in the Feeder Park drivers can leave their vehicles to go to the Cabbie's Restaurant while keeping their place in the electronic queue."

Steria has deployed similar systems at Orly airport, Geneva, Frankfurt and Jakarta and is currently looking at additional markets in the Middle East, New Zealand and elsewhere.

"Most other airports in the UK are too small for the system we run at Heathrow." says Torrie. "Although the ROI is good there are significant costs attached to the system itself and so you've really only got Heathrow, Gatwick, Manchester and Birmingham at a scale that is commercially viable."

"We're also working on adding vehicle asset management facilities to the system." he adds. "This will provide the tools to utilise vehicle assets better for commercial benefit. Traffic flow can be monitored and detailed information on parking and taxi availability can be delivered direct to passengers."

The passive revolution

'Passive-safety' is becoming increasingly important in the development of roadside features such as lighting columns. But what is roadside passive-safety and how is it affecting street lighting design? Susan Venables **explores some of the implications and benefits.**

Despite efforts to improve road safety through engineering, education and enforcement measures, road crashes by their random and multi-causal nature, continue to happen at an unacceptable rate. In the UK alone, it is estimated that there are 100 deaths and 3,000 injuries each year involving vehicles colliding with a roadside feature.

"Clever minds have addressed the challenge of making roadside furniture passively-safe and have come up with exciting technical solutions….."
Neil Capstick

In order to reduce the number of deaths and injuries across Europe, there has been a drive to support the construction of 'passively-safe' roadside street furniture - such as lighting columns and sign posts. Due to the 'forgiving' design of these features, their specification is such that they reduce the risk of serious injury when a vehicle collides with them.

Although not a new concept much more is now being done to encourage and develop an improved understanding of the current standards, advice and issues relating to the provision and maintenance of safer roadside features, and both engineers and manufacturers are playing a major role in making roadside passive- safety a reality.

Bright hope

"The passive-safety revolution has unlocked a huge amount of creative energy. Clever minds have addressed the challenge of making roadside furniture passively-safe and have come up with exciting technical solutions and no more so than in the design of street lighting," states Neil Capstick, Managing Director, Tecnopali UK Limited. "In particular, these advancements are clearly beneficial for the UK at a time when many of the 6.5 million existing street lights are now due for replacement."

The new columns not only have passive-safety features but they offer an extended life and relatively low maintenance as compared to the original steel and concrete structures, plus provide better lighting levels and reduced light pollution. "However the other major advantage is that as Local Authorities and the Highways Agency introduce renewal schemes for street lighting, working with manufacturers such as ourselves, they are better able to make assessments as to the cost-benefits and suitability of introducing passively-safe columns in certain locations," adds Capstick. "Plus with advances in technical design standards, lighting columns can now be erected to ensure sustainability against environmental conditions such as weather, land topography, altitude, soil type and road vibration loads."

Making a difference to road safety

Although efforts have been made over several decades to make lighting passively-safe – that is ensuring that the column readily yields, shears or deforms when hit by a vehicle thereby reducing the impact forces suffered by the occupant – legislative developments have been instrumental in its uptake, particularly in the UK. Issued by the European Commission in 2000 and updated in the UK in 2007, BS EN12767 provides the standard by which manufacturers of any lighting columns, intended to be passively-safe, must measure their products against.

"There is no doubt that the introduction of this standard and others have helped to introduce consistency and an ability to determine the passive-safety classification at a test speed," explains Capstick.

"Depending on the dimensions, thicknesses, foundation design and column material, the column will return a particular energy absorption and safety level. This is vital as it helps to ensure that the energy absorption classification level of the column is appropriate for the location. For example at Tecnopali we produce High-energy absorbing (HE) columns that slow down and stop vehicles with a short, yet gradual retardation, meaning that these should be specified where it is necessary to restrict the ongoing movement of the impact vehicle – such as where a pedestrian route carrying significant traffic lies behind the column."

"Also important to mention is the fact that these columns have been designed to have the ability to disconnect the electricity supply within 0.4 seconds of impact ensuring any potentially exposed cables do not cause vehicle fires or passenger electrocution."

Lighting the way

Not only is ensuring the safety of columns high on the agenda, many Local Authorities are acutely aware that the standards and energy efficiency of street lighting has been long overlooked. This is why there is a drive to introduce new lighting systems that use less energy, reduce the potential for light pollution and are controlled through remote monitoring systems.

"By working in partnership with the Local Authorities, the Highways Authorities and the alike, we are now developing solutions that are creating a more 'user friendly, safer night time environment'," says Capstick. "And with the introduction of remote monitoring systems the levels and performance of street lighting can be controlled centrally resulting in significant cost savings and reduced energy consumption."

"The 'passive revolution' taking place within the roads industry is likely to continue for many years and certainly the development of lighting standards and solutions still have some issues that need to be addressed. However, to-date there is no doubt that considerable progress has been made in terms of introducing significant safety benefits to our roads and streets."

Snow can't stop hot date

Providing personalised, context-aware travel information with the facility to offer realistic alternatives in the event of disruption could benefit travellers hugely. Murdoch Mactaggart **learns of an ERTICO-led initiative to develop a standard platform for such services.**

Things were getting really interesting with Sophie when Jeremy's smartphone rudely interrupted his dream, the crescendo signalling an important alert. An absence of traffic noise outside the window confirmed the message that the heavy snowfall had made the road north out of the valley impassable. The road south was clear, apparently, but should he risk looping round and back to Dorchester further east or take the longer but flatter route south to Weymouth station instead?

"We felt there was a need to be able to provide seamless information to travellers."
Gary Bridgeman

"5.30!" he exclaimed, realising that the SmartTraveller service had factored in the likely delay and woken him 30 minutes early. He clicked on the blinking SmartTraveller icon on his laptop to see possible travel options presented as isochrones, travel lines coloured according to expected travel times, here with the added refinement of estimates of accuracy. He could drive himself to Dorchester in an estimated 48 minutes, he saw, but there was a 17% chance of his not arriving in time. Risky! He could drive to Weymouth in 32 minutes with a 92% chance of not being delayed but what was even more interesting was that a local ShareMyTaxi with one space free could collect him at 06.35, comfortably in time to catch the 07.25 to London.

A couple of mouse clicks booked both train and taxi and he immediately heard the characteristic beep-bip of the electronic vouchers reaching his mobile, sounds repeated as he entered the taxi and the train, touching his phone in each to the reader to authenticate his tickets. An hour later, just as he was finishing breakfast – a default service he'd specified for all longer train journeys leaving before 9.00am – his smartphone again raised a SmartTraveller alert. "Minimum 30 minute delay at Brockenhurst." he read "Wrong kind of snow on the lines – possible train termination. Update follows within 10 minutes."

"If you can aggregate information from a wide variety of sources into one traveller system then you can give users the ability to make informed choices about what mode to use."
Gary Bridgeman

Jeremy sighed. He checked that the Northern Line was running, whether sufficient taxis were available and how long they were taking to the terminal. At least there was some leeway. And if he missed Eurostar SmartTraveller would book him automatically on the next service. He settled down to wait, absorbed in the latest Marlon Wolff thriller.

Seamless travel information

SmartTraveller doesn't exist, of course, but ERTICO's Connected Traveller project should see similar services become a reality in due course. There are currently numerous travel services of various kinds but these are specific, partial and nearly always proprietary in format. No such service moves seamlessly to whatever device a consumer is currently using, drawing relevant information from anywhere in the world and pushing update alerts.

"The consortium of ERTICO members in the Connected Traveller project felt there was a need to be able to provide seamless information to travellers." explains Gary Bridgeman, Connected Traveller Project Manager. "At the moment we operate in silos, with unconnected islands of information, and so it's difficult to grab all the information we need and combine these to arrange a fully connected, complete trip."

ERTICO's Connected Traveller project isn't looking to develop a travel service but, rather, to produce an open platform on which such seamless services with Europe-wide and possibly fully international applicability can run.

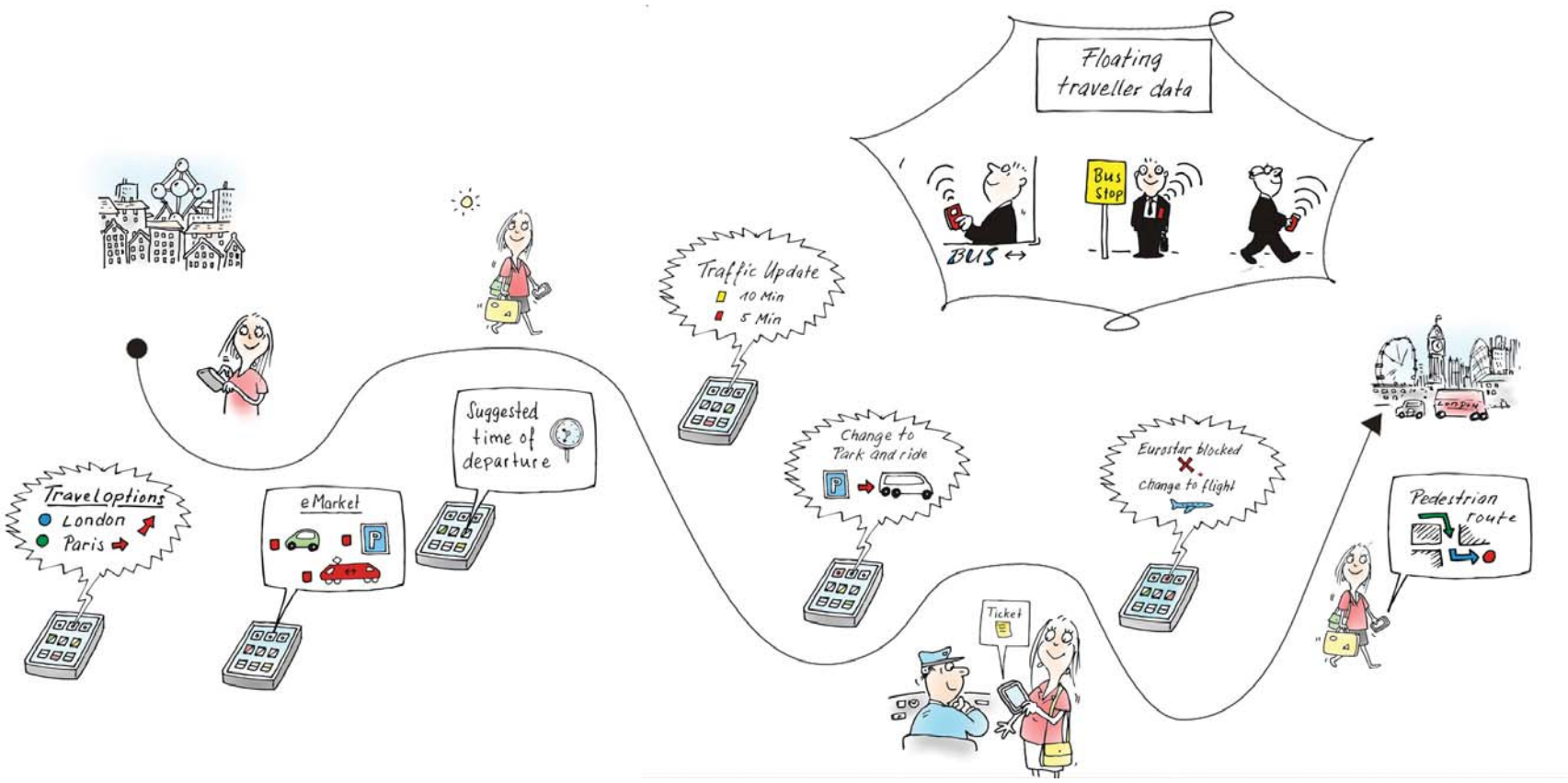
"There's a very good travel information service, TransportDirect.info, available in the UK." adds Bridgeman. "This lets you consider alternatives for door to door travel, showing you time and costs and other factors so that you can make informed choices. But even that doesn't give absolutely up to the minute information and if I go to another country I'll have to find something else entirely."

Aggregating disparate information

Bridgeman points out that there are some 670 different bus information systems in Europe but that they're really only of use while actually at the bus stop. You can find out the supposed arrival and journey times beforehand but that's not necessarily up to date and if you'd known in advance that the bus was going to be thirty minutes late you might have taken a different service, or perhaps walked or driven, in order to arrive on time.

"If you have the ability to take the information from all the different sources and aggregate it into one traveller system then you can give the user the ability to access everything at once and so let him or her make informed choices about what mode to use." explains Bridgeman. "This doesn't force him on to public transport but if he sees that, say, the next bus will arrive in five minutes and that he's got a five minute walk at the other end, the ten minutes that he might save by driving he'll probably decide it just isn't worth it, considering the relative costs, the environmental impact, and the parking problems."

ERTICO's Connected Traveller project began in 2007 and is in three stages. The first stage, funded by the European Commission's Directorate General for Research, sets the groundwork, looking at the architecture, the needs, the benefits the platform might bring both to



users and to service providers, and the business processes involved. This phase is scheduled to run to around the middle of 2009 and will be followed by a technical development phase, funded separately, where the actual coding will be done. A third phase planned for 2010, again with separate funding, will involve practical demonstrations of the platform.

"In parallel with this project work and our funding applications we're building a community of companies who are interested in the concept." says Bridgeman. "We'll try to get them together and prepare some small pilot test sites in the next few months, perhaps in Belgium, where we can prove the concept with examples and with some of the companies themselves, to try to get the concept out there."

Facilitating machine interaction

Since the launch in 1999 of perhaps the first serious approach at facilitating what's now more usually known as web services, HP's e-speak, followed a few months later by Microsoft's rather wider platform, .NET, the growth of interoperable machine-to-machine interaction over the internet has been considerable. Closely related to this is the growth of the approach known as service-orientated architecture (SOA), a means of aggregating individual and services at different levels of granularity and perhaps from entirely unconnected locations – such as authenticating a user, completing a form, retrieving a currency exchange rate, displaying an image, making an online purchase, and so on – into unified business processes.

Despite a reasonable degree of agreement over approaches and standards, distinct sets of protocols and methods exist and this has hampered wider interoperability. In some cases remote servers are instructed to run processes and deliver data while in others services are based on passing messages. In any case, there needs to be some process to allow discovery of available services and methods need to be in place to facilitate legitimate interaction, to ensure the integrity of the data delivered and to protect the service provider. Concerns about these issues, coupled with certain practical implementation and interoperability difficulties have therefore tended to restrict interaction to reasonably known partners rather than throwing the process as fully open as had earlier been hoped.

"Some of our project partners are still quite cautious about how they approach the project" says Bridgeman "because they're afraid of opening themselves up to competition which they can't control. In one way that's quite correct because others will indeed connect direct with your customer. But the benefit to you as a service provider is that instead of customers having to navigate to your site you'll be able to push your services to them, just when they're needed. Explaining this, and the consequent benefits, is one of our hardest communication problems with our commercial partners."

Unlimited customers

The Connected Traveller platform will make available to service providers a set of technologies, services, interfaces, procedures and good practice endorsed by that community and operating in a framework based on open standards. These will allow members of what ERTICO calls the i-Travel e-Marketplace to have a virtual shop window of unlimited scale to supply tickets, hotel rooms, travel times, taxi and restaurant or other services and much more according to need and availability.

For the traveller it will be as if a virtual assistant is discreetly but constantly monitoring travel plans, looking ahead to future needs, placing orders automatically with trusted suppliers as necessary, offering travel options where appropriate, providing maps and advice on walking, dealing with disruptions, and generally ensuring that the travel experience is as comfortable as possible.

"A really important side benefit is collecting floating data" says Bridgeman "and using that through feedback loops to help both travellers and service providers. Suppose we have, say, a couple of thousand people enquiring about metro services from a certain station at a certain time, for example, the service could alert the train company that extra capacity is likely to be needed. The system would be saying, 'here's this big pool of anonymous data about travel movements; do you want to use it for capacity planning?' Or it could automatically offer on-demand bus or shared taxi services as people enquired, and so get over the mismatches we have at the moment between need and availability."

And Jeremy? Well, his luck seemed really out that day. He reached Folkestone late to find that a small tunnel fire had stopped the service. However, knowing his urgent need to get to Paris that evening, SmartTraveller had already booked a fast ferry crossing, a connection to Paris, and arranged taxis between the station and the port at each side and a taxi to his hotel. And Sophie? Jeremy really had more interesting things to say to her than to explain how SmartTraveller saved the day.

Becoming wise about ITS

Transport is an essential element of the global economy and is growing steadily. However, it's far less efficient than it might be and this has economic, social and environmental implications. Murdoch Mactaggart **learns from the UNECE how ITS can transform things.**

United Nations Economic Commission for Europe

Transport is an essential adjunct to most trade, information and financial services perhaps excepted. And while trade between different continents may require air or sea transport, intra-continental trade depends heavily on road freight and on rail. Well over 70% of the UK's trade is with other European countries and as much the same applies generally throughout Europe there's a considerable and growing demand for road transport, even allowing for the present economic slowdown. Add in the fact that European citizens have become used to the convenience and flexibility of private cars and the European Commission's estimate of a 15% growth in road traffic in the decade from 2010 seems modest.

"We are in a global crisis with regard to road safety and the figures are appalling!"
Eva Molnar

Road traffic accounts for nearly 18% of CO2 emissions and pressure on the existing road infrastructure is considerable, even before allowing for growth. Yet simply building more roads is not a viable solution.

A related problem is road safety. Around 3,000 people worldwide die daily in road accidents, some 1.2 million annually, while a further 40-50 million are injured. Road accidents are currently the ninth cause of premature death or disability but by 2020 are estimated to become third, overtaking both HIV and tuberculosis. And the direct global economic costs of road accidents is substantial, estimated at some €403 billion a year.

Travel kills

"We are in a global crisis with regard to road safety. The figures are appalling!" exclaims Eva Molnar, Director, Transport Division, UNECE. "This is not just a transport issue, however. It's also a health issue, a social issue and even an economic development issue because in lower-income countries less attention is given to the problem and less financing provided and so casualties are higher."

"UNECE has actually become the centre for international agreements concerning vehicle standards and surface transport ... as well as for regulations on the transport of dangerous goods and other sensitive cargos."
Eva Molnar

ITS can play a major part in making roads and vehicles safer, claims Molnar. Driver fatigue contributes to accidents and the introduction of mandatory rest periods for truckers with compliance enforced through tachograph recordings have certainly contributed to reducing accidents from driver error. Perhaps it's time to look at what additional services, such as vehicle tracking or road toll paying, can be added to tachographs, she suggests.

A UNECE Working Party, The World Forum for Harmonisation of Vehicle Regulations, works to develop a legal framework of vehicle regulations around matters such as safety, environmental impact, energy efficiency and vehicle theft. While ITS is not directly part of the working party's remit ITS technologies are increasingly considered in relevant areas. Examples include on-board diagnostics, anti-lock braking, adaptive lighting and electronic control systems among others.

"The UNECE is heavily involved with regulations covering vehicle ITS technologies" says Molnar "with electronic control stability systems arguably the most important among these in terms of safety contributions. Some specialists say that such control systems will save as many lives - if not more - than seat belts. This kind of activity is at the heart of UNECE's work."

"But ITS is far broader than just around vehicles." she continues. "It's not enough to have good vehicle ITS solutions - you need to have an interaction with the infrastructure as well. ITS is actually broader even than that as it also covers ICT's transport applications."

Catching up with business

Molnar is certain that ITS is vitally important to the future of efficient transport processes. Yet governments and other decision making bodies, including the UNECE, lag behind business in their understanding of the capabilities and potential of ITS.

"Business is ahead of governments and international organisations and it's our task to catch up, to learn how to use these solutions to better implement transport policy goals." she says. "Right now we're asking questions but we don't necessarily know the answers. UNECE has actually become the centre for international agreements concerning vehicle standards and surface transport – that is, road, rail and inland waterways – as well as for regulations on the transport of dangerous goods and other sensitive cargos and so we are obliged to learn, in addition to being the gateway for disseminating best practice. And I believe, perhaps particularly where road safety issues are concerned, that good cooperation between the UNECE and the ITS community would be beneficial for everyone."

Interoperability is essential

For historic and legacy reasons it's actually quite difficult to move rail rolling stock across national borders and lack of interoperability remains a major obstacle to rail network development. Molnar is concerned that similar interoperability problems should not bedevil rail-related ITS deployment across Europe and beyond. This is an area where, through its regulatory work, UNECE could make a major contribution.

"Unless we're careful to achieve full interoperability between intelligent transport devices we risk creating an electronic curtain across Europe."
Eva Molnar

"Vehicles travel across borders" she says "but infrastructures are local and if you don't have proper interoperability, including between the different local infrastructures, then the technology becomes a hindrance rather than a help. Consider electronic road pricing or toll charges – if you needed a different appliance for each country visited you might even end up with no room left for the driver! We got rid of the Iron Curtain in the 1990s but unless we're careful to achieve full interoperability between intelligent transport devices we risk creating an electronic curtain across Europe instead. This is an absolutely crucial area, not just for the UNECE countries, but for the world as a whole."

"ITS is much more than technology. It's a new culture ..."
Eva Molnar

It's sometimes overlooked that ITS is not just about vehicles and transport infrastructure but also has a social dimension even where pedestrians or the public generally is concerned. There have been trials in Tokyo using RFID (Radio Frequency IDentification) to provide information at street corners to help guide blind and partially sighted people and in Prague there was a pilot project developed with the support of the Czech Association of the Blind which used censors in walking sticks to advise on the route numbers of buses arriving at stops.

Improving mobility equity

"ITS can also help mobility and can help bring equity in mobility." says Molnar. "People with reduced mobility – perhaps on account of disability, or aging, or because they're with small children – can find travel very difficult and imaginative use of ITS can help greatly. More generally, ITS can definitely make public transport more customer-orientated, with higher levels of service. So ITS is very important but, of course, won't of itself solve social problems or even public transport ones."

"Interestingly, ITS can also help the equity problem which lower-income countries may have. Particularly in the case of landlocked low-income countries, often remote from ordinary travel routes, trading with other countries can be difficult and expensive. If ITS is used to improve local transport efficiencies such countries can in turn improve the development of their economies. As a UN organisation we are very supportive of such goals and of matters such as border crossing facilitation."

Various working parties of the UNECE are looking at different aspects of transport interconnectivity and at improving these in order to improve the opportunities for trade. These include the Trans-European Motorway project, the Trans-European Railway project and, most recently, the Eurasian Transport Linkages project, this last aimed at facilitating trade between Europe and Asia, a focus which is also very much part of European Union thinking.

ITS brings a new culture

"In many of these cases ITS can help develop more efficient infrastructure" explains Molnar "and at UNECE we could use our procedures to disseminate knowledge and awareness of best practice, for instance through activities that promote regional coordination of investment planning.

"ITS is technological innovation, yes, but it's not just technology." she adds. "It's much more than that. It's a new culture for doing business and a new culture for governments to accomplish what they have to as public bodies and it's a new culture for international organisations. And, of course, ITS should never be a goal in itself but a facilitation mechanism."

"At UNECE we work closely with other bodies such as the European Commission, the OECD and its International Transport Forum, ERTICO and many others. We intend to play our part in supporting what ITS can do to improve transport efficiency and, through that, trade and economic development."

Facilitating European economic cooperation

The United Nations (UN), set up in 1945, seeks to facilitate international cooperation in a range of areas such as security, human rights, social progress, international law and economic development. A further major aim is promoting world peace. The General Assembly and the Security Council, and perhaps the International Court of Justice based at The Hague in the Netherlands, are the best known of the administrative bodies of the UN but as an organisation spanning almost the entire world – 192 countries are members - there are many specialist UN agencies such as the WHO, UNESCO, the IMF and the ILO among numerous others.

There are also five regional commissions with the broadly similar focus of promoting economic and social development and regional and international cooperation. Apart from the UN Economic Commission for Europe (UNECE), there are individual commissions for Latin America, Western Asia, Asia-Pacific, and Africa. UNECE has 56 member countries, primarily European but including also Canada and the US, the Central Asian Republics, and Israel. Most of its transport instruments have global coverage.

With a budget of some €40 million and headquarters in Geneva, UNECE provides analysis, policy advice and assistance to governments and it works with a number of organisations throughout the world to promote pan-European economic integration. It also plays a major role in developing regulations appropriate to, for instance, vehicles and transport in general and it works towards gaining international agreement for these. The TIR Convention, for instance, established an international customs transit system, now with 68 country members, with the practical effect of significantly lowering the time spent on checks at intermediate borders, and hence transport costs, while maintaining adequate security against customs fraud.

The real information superhighway

More and more cars, same road surface area. It doesn't take a genius to see we can't go on like this.
By Joanna Bawa

Roads, by their nature, cross boundaries, be these town, county or regional, and the negotiation of such boundaries requires the co-operation of many bodies. Generally it has not been hard to gain agreement between local authorities, mainstream government, and building contractors that new roads start at one point and terminate at another point but such simple decisions are no longer relevant in a country where the construction of new roads is at a virtual standstill. Instead, the focus of more recent years has been on the development and implementation of traffic management systems, comprising network cabling, signals and other control and monitoring devices, which run alongside the physical road network. Since many of these are focused on town centre traffic they tend to be local and developed without reference to wider national systems. The consequence is a proliferation of disparate systems, each serving a town or road segment effectively but unable to contribute to a broader picture of national traffic flow.

"We can't tear up the road networks and start again, so we must find ways to manage the growing traffic load we have" **Jeremy Cowling**

"We can't tear up the road networks and start again, so we must find ways to manage the growing traffic load we have," comments Jeremy Cowling, Commercial Director at Peek Traffic Ltd, an established supplier of traffic technology solutions. As for so many industries, the key to improving the movement of physical objects is better information. "Better information about traffic speed, location, congestion and queuing is essential if we are to get more out of our road network," continues Jeremy Cowling. "Equally importantly, the information we gain – through, for example, sensors and cameras – must be delivered in a format appropriate to the technologies and individuals who are able to respond to it."

Urban Traffic Management and Control

Peek is one of a consortium of local authorities, engineering firms, other government bodies and transportation companies involved in the Urban Traffic Management and Control (UTMC) programme, initiated in 1997 to help local authorities gain the most from Intelligent Transportation Systems. The key objective of UTMC systems is to allow the different applications used within modern traffic management systems to communicate and share information with each other, enabling a more robust and intelligent system to meet current and future management requirements.

"Better information about traffic speed, location, congestion and queuing is essential if we are to get more out of our road network" **Jeremy Cowling**

Peek's capability in Urban Traffic Management and Control forms an integrated part of its wider network management and information system approach – key to the success of UTMC. Its UTC system can be combined with automatic vehicle location for signal priority, and exchanges data with this and other systems, which can then be used to provide meaningful information to the travelling public. The system is complemented by variable message signs, signals, controllers, vehicle detection and monitoring outstations. A recent project with the city of Coventry upgraded the entire UTMC system through the supply of outstation devices, controllers and management software. The whole system runs across a wireless communications network, successfully trialled previously by Peek in Glasgow.

Politics and motorways

"Traffic management inevitably has political consequences," Jeremy Cowling continues. "Part of our role is to reconcile the different priorities of those involved in transportation and help everyone agree on the direction we move." As an example, Cowling explains that the needs and priorities of the Highways Agency, which operates the motorways, are often in direct opposition to those of the local authorities, which operate local and town centre road systems. This problem became the focus of the M25 Sphere project: "Local authorities are trying to find the best way to get traffic out of the town centres, especially during rush hour," he says. If this works effectively, the result can be congested slip roads onto the motorways, tailbacks, queues and frustrations for motorway drivers, which the Highways Agency might try to address by restricting slip roads, forcing traffic back into the towns.

"Resolving this conflict requires technology which is sensitive to quite small changes in traffic flow and intelligent enough to recognise patterns according to time of day, for example." In such a situation an integrated traffic management system is the best way to find a compromise which suits everyone. It can enhance town and local road systems through traffic light sequencing changes, which relieves the pressure to get to the motorway. It can also monitor movement on to the motorway, via ramp metering and incident detection equipment, and adjust speed limits accordingly, slowing traffic as pressure rises. Information about queuing further along the motorway can be displayed on roadside signs, encouraging drivers to leave the motorway if they can.

Another key motorway technology initiative is the Active Traffic Management (ATM) project on the M42. This test-bed section of the motorway runs over the 17km stretch between junctions 3a and 7. Handling over 120,000 vehicles per day, it is an area of extremely variable traffic flows. The ATM test section opens up the hard shoulder to traffic along the entire stretch, giving a four-lane motorway each side - three lanes plus the hard shoulders. The infrastructure, including lighting, gantries, electronic and static signing, emergency roadside telephones, refuge areas, CCTV and advisory speed limits,

"In the long term, what ITS can deliver – and what suppliers hope to achieve – is attitudinal and behavioural change which benefits our environment, our resources and our citizens"
Jeremy Cowling

combines new technologies with established motorway traffic management techniques, including mandatory variable speed limits (such as those in use on the M25), enhanced driver information signs and a new congestion and incident management system. "This system means operators can open and close any lane on that stretch in order to help manage congestion at busy times of the day, or if an incident causes traffic build-up," explains Cowling. Anxieties about safety when the hard shoulder is in use have been allayed by the introduction of video-monitored 'emergency refuges' every 250m, so cars can pull safely off the road if need be, and the system itself integrates more widely with digital enforcement systems to ensure road user compliance.

In search of long term behavioural change

What of the future? Although the technology and systems deployed by Peek are undoubtedly capable of wringing more, better and safer use out of our existing road systems, the fact remains that no additional road surface is likely to become available, for economic, social, environmental and political reasons. So no matter how traffic flows are rejigged, ultimately, congestion and queuing will recur as the number of vehicles on the roads increases. "More intelligent traffic management is at best a medium-term solution," agrees Jeremy Cowling. "Its value to the longer term is more complex. For example, by reducing traffic flow in town centres we facilitate the growth of public transportation, such as buses and trams, which attracts more people to them and stimulates their wider use. Similarly, greater intelligence on the bus networks means they can be used more efficiently, reducing overall fleet size and hence cost."

Depending on the government policies behind it, ITS can be used directly or indirectly to encourage greater use of public transport, to discourage town centre driving, or to persuade drivers to choose smaller, greener or fewer cars. "Politics is always an influence in what we do, and our systems inevitably contribute towards political goals," says Jeremy Cowling. Goals might include eliminating the rush hour through genuinely flexible working hours; greater use of car pooling, better ways of monitoring and charging for road use, or visibly greater investment in other services as a result of road charges. But real traffic management is beyond the resource of any single company. As Cowling concludes; "In the long term, what ITS can deliver – and what suppliers hope to achieve – is attitudinal and behavioural change which benefits our environment, our resources and our citizens."

Key technologies in ITS

A lot of products is one thing, integrating them is quite another. Key to the success of ITS products and systems is the ability to build controlled and integrated communications networks which collect, analyse, interpret and disseminate a wide array of information from multiple sources, enabling automated devices as well as human operators to make purposeful and timely decisions.

• The Chameleon is Peek's universal Outstation for junction control, capable of providing the interface to traffic signal controllers under all operational modes. In remote monitoring mode, the Chameleon can interface to a monitoring device over a standard dial up telephone circuit or via GSM, to provide a full alarms and monitoring capability. Chameleon has been designed and developed by Peek as a result of its work on a variety of UTMC development projects, and contains a powerful processor enabling local control, detection and data processing to be carried out at the roadside, as well as a flexible approach to interfaces, operating over fixed line, wireless or hybrid communications infrastructures.

• The Peek PTC-1 is a traffic controller which offers fully integrated modern communications interfaces together with a flexible operating system. It has a large CPU board memory which enables multiple configurations and applications to be stored, selected and activated. All safety functions are continuously monitored by a separate safety processor which provides standard safety monitoring, or an enhanced safety monitoring which exceeds UK and European standards. Designed for the next generation of traffic control equipment the controller has IP (Ethernet) and USB interfaces and is able to drive and monitor low voltage LED signals directly, fully utilising the energy saving advantages of the latest LED signals.

The new drive for more intelligent driving

Building transportation networks used to be about spades, trucks and tarmac. Now the focus is cables, servers and IP addresses, and a whole new set of contracting companies is moving in.

By Joanna Bawa

The building of transportation networks has always been the province of heavy and civil engineering firms and over the centuries road and rail construction projects have been a mainstay of every economy. But, like the market for vehicles, the space available for transportation networks is finite. If a nation is geographically small, economically advanced and relatively wealthy, the rate at which it uses up its land mass beneath road and rail has traditionally been fast – a situation increasingly affecting much of western Europe. Transport network construction therefore slows down but as demand for vehicles and travel grows this leads inevitably to increased traffic congestion, pollution and safety concerns. Redesigning road surfaces, flyovers and vehicles can help with these worries but any transportation policy which seeks only to fit more cars on more roads is unlikely to be popular or effective.

"We need new ways of using the transportation infrastructure we have so that travel becomes cheaper, cleaner and more pleasant."
Robert Herritty

"We can no longer focus exclusively on building new roads," says Robert Herritty, Vice President of Transportation Markets for Alcatel-Lucent. "It's not cost-effective, politically desirable or environmentally friendly. Large land masses and under-developed nations may have the space to invest in physical transportation infrastructure but this is not true in Europe and many developed economies. Instead, we need new ways of using the transportation infrastructure we have so that travel becomes cheaper, cleaner and more pleasant." Between them, these issues have pushed transportation to the top of the political agenda in nearly every developed nation, with governments seeking to find ways around the inexorable demand for private transportation.

The cost of driving

Tolls and road charges certainly make drivers think twice before setting off on a long journey but simply limiting travel is not the long term solution. The secret, Herritty suggests, is adding intelligence to existing roads. "Solving the transportation problems of developed nations is never going to be quick or easy," he continues. "Like many socio-economic challenges, the issues are multiple and deeply rooted. By the same token, the solution must be many-pronged, impacting at a political, social and behavioural level." In Singapore a staggering 16% of the land surface its under tarmac but even this high figure has failed to stem congestion. Car ownership is now controlled by a 'Certificate of Entitlement', a document costing several thousand pounds which simply entitles the bearer to spend several thousand pounds more on a car. Once behind the wheel Singaporeans are subject to high road tolls which are controlled by technology sufficiently advanced to raise the cost of driving according to the amount of traffic on the road.

Adding intelligence

The underlying theme to traffic management in developed economies is the need to make road networks more intelligent – that is, more aware of vehicular activity on road surfaces, better able to respond to that activity quickly, and able to respond in a way which minimises congestion, queuing and pollution. Such intelligence relies on information and mechanisms for analysing, interpreting and – crucially displaying that information for the benefit of road users.

"Intelligent information requires serious investment in a comprehensive technology infrastructure," explains Robert Herritty. Essentially, this can mean miles and miles of cabling lining roads, railways and increasingly, airports, or the use of new wireless technologies. Optical networks and fibre cables carry core traffic data – how many vehicles, their speed, location and motion patterns. Multiservice transmission networks carry and distribute new types of traffic flows such as voice, data and video, allowing real-time communication and information to be transmitted to road users via GPS devices, mobile phones and roadside digital displays. Data is generated by devices such as cameras, card readers, road sensors, and lasers, each of which has its own IP address, enabling precise location, identification and fine-grained adjustment.

Supplying technology to any national transportation infrastructure is a huge task, and Alcatel-Lucent is one of a handful of organisations with the size, reach and track record to do this successfully. One-time owner of French transport engineering firm, Alsthom, Alcatel-Lucent has been developing intelligent transportation system technology for decades, gaining experience which makes it uniquely able to integrate multiple large-scale technologies for public use. At the application level, variable message signs, weather stations, emergency phones, speed enforcement, trunked and operational

"We believe the most sophisticated technology should also be the easiest to use and the most reliable."
Robert Herritty

voice communication, height and weight systems are integrated together with CCTV applications such as video surveillance, automatic number plate recognition, traffic counting in order to enhance, renew or build next generation intelligent transportation systems for tunnel or non tunnel portion of highways. Supported by the organisation's telecommunications research division, Bell Laboratories, few organisations can match this capability.

The new enabler

With road and rail networks increasingly engineered to make the most of communications technology, how will life for the travelling public improve? "The rate of adoption is subject to a wide range of forces – economic, political and social," comments Herritty. "Even so, the transition to digitally-based wireless information networks will reach a tipping point where the benefits become more apparent and the deeper, longer-term changes to transport policy and the way we organise our lives become more worthwhile." To support this, Alcatel-Lucent invests heavily in both integration strategies and techniques, and also user-centred product development. "We believe the most sophisticated technology should also be the easiest to use and the most reliable," Herritty adds.

"Intelligent signalling means more trains on the same track, providing a faster, safer and more frequent service with no other changes being made."
Robert Herritty

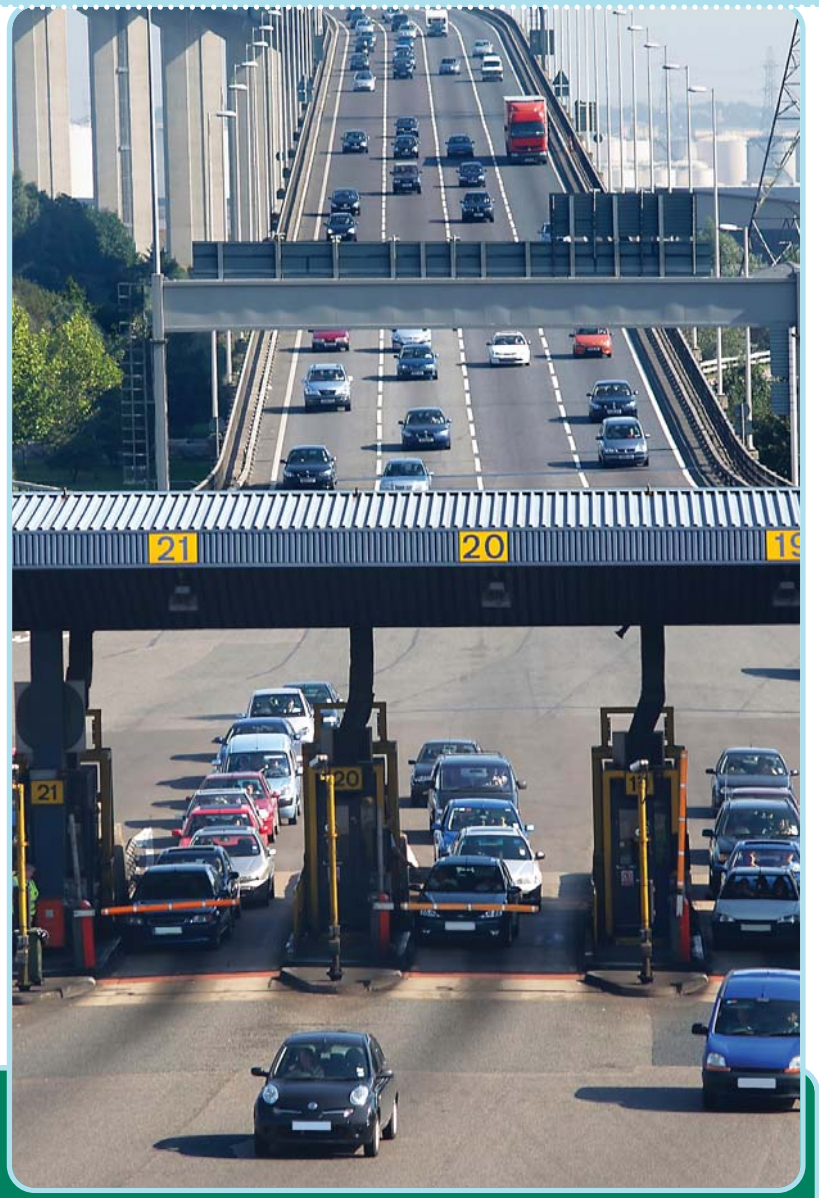
The vision is a situation where public transport is genuinely the first choice for travellers – clean, reliable, efficient and cheap, and which supports passengers with good information and gets them where they want to be. In Hong Kong, Singapore and some other densely populated areas this is already true but to achieve it across Europe still requires huge investment and many years. "But it can be done," Herritty concludes. "The technology exists, and Alcatel-Lucent is finding new ways to integrate every element to achieve that vision.
Small steps, but we'll get there."

Railways read the signals

When the roads are choked with cars too expensive to run, the idealists say, we'll all be forced to return to the trains. But the reality is that trains are expensive to board, often run at inconvenient times, and are perceived as unreliable and frequently late, dirty, uncomfortable and slow. Ironically, a good rail system is the single thing that could most drastically improve current road traffic issues, by providing a clean, cost-effective alternative to private cars. So why is intense pressure from both government and the public taking so long to translate into better railways?

"A significant underlying problem is the signalling system," explains Robert Herritty of Alcatel-Lucent. Railways represent a relatively ancient element of a nation's infrastructure, taking many years to design and build, and a lot of investment to maintain. Like any pioneering economic advance, rail travel has been superseded by faster, more convenient alternatives, primarily private cars and low cost airlines, but the concept of mass transportation offered by the rails remains an ideal. Originally built within well-defined national borders, physical rails and their signalling systems were unique to each country and have had no reason to support trans-European operations. On mainland Europe, investment in a single European rail signaling standard is of clear benefit, although the efficiency benefits are relevant to any nation seeking to get more out its rail system.

"Many signalling systems comprise dated technology using traditional red, amber and green lights, which imposes significant limits on the frequency of trains and therefore the schedules that passengers demand," says Herritty. These limits mean that large sections of line must remain empty because the train currently passing through that section has not yet signalled its exit, even though it would often be possible to fit several more trains on the same section - if they were location-aware and could stop safely. "Traditional signalling means extremely limited train throughput. By contrast, intelligent signalling means more trains on the same track, providing a faster, safer and more frequent service with no other changes being made," Herritty explains.



This issue is being addressed across Europe by the European Train Control System (ETCS), a signalling, control and train protection system designed to replace the many incompatible safety systems currently used by European railways, especially on high-speed lines. European railway networks grew as separate national networks that have little more in common than standard gauge, rendered incompatible by different voltages, coupling systems, signalling and control systems.

ECTS is part of the EU-backed initiative, ETRMS, the European Railway Traffic Management System, which has been designed by the European railways and the supply industry, and is supported by the European Commission to meet the future needs of the European Railways. ETCS makes it possible not only to transmit permitted speed information to the train driver, but also to monitor constantly the driver_s compliance with these instructions. Key to this is the GSM-R, network, based on standard GSM but using various frequencies specific to rail as well as certain advanced functions. It is the radio system used for exchanging voice and data information between the control room and the train.

ERTMS offers long-term cost reduction and the possibility of major reductions in trackside equipment required. This in turn enables better utilisation of assets, lower maintenance costs, increased capacity and higher operational throughput, addressing a number of the current concerns which governments and travellers have about rail transport in general. Another significant benefit, and one just as welcome, is that better information generally means a safer mode of operation – something that is primary to every rail operator in the world. Railway networks become interoperable across national boundaries, and cross-border operations cease to be a technical issue. Longer term, this bodes well for the environment as people and goods move back to the railway. Perhaps most importantly, the trains will be frequent and ontime.

Visualisation and the traffic control room

The use of 'smarter' technology in traffic management has become essential for ensuring smooth traffic flow as well for improving mobility and safety. And for those control centres, whose responsibility it is to manage this flow, advancements in visualisation solutions are making the achievement of their objectives a reality. By Susan Venables

Transport is a key factor in modern economies. However, there is a permanent contradiction between society, which demands ever more mobility, and public opinion, which is becoming increasingly intolerant of chronic delays and the poor quality of some transport services. But as demand for transport keeps increasing, the community's answer cannot be just to build new infrastructure, it is a case of optimising what is already there and improving existing transport systems. And certainly no more so than on the road networks which has witnessed the greatest increase in usage over the past 20 years.

"With the advancements made in visualisation technology control rooms are key determining factors of ensuring smooth traffic flow and subsequent reductions in congestion."
Carl Peeters

According to the US Department of Transportation the annual vehicle miles travelled in the US will increase from 2.8 trillion in 2000 to 4.2 trillion by 2020. Truck freight volumes are expected to nearly double and the average motorist will spend 36 hours a year in gridlocked traffic. In Europe the European Commission's 2010 Transport Policy White Paper highlighted that the number of cars has tripled in the last 30 years and that road now makes up for 44% of goods transported, meaning that almost 25% of driving time is now spent in traffic jams. It is no wonder that finding solutions to manage and monitor traffic flows has become a key priority.

The need to manage traffic

As road congestion continues to increase, so does the economic cost in lost productivity and wasted fuel. "Take Europe for example, a recent study showed that if nothing is done the costs attributable to congestion will account for 1% of the EU's GDP by 2010. But not only does it affect economies it penalises road users by slowing journeys and increasing the risk of accidents," explains Carl Peeters President Security & Monitoring Division, Barco. "As a result many governments realise the economic and social obligation they have to help combat congestion and improve road safety to protect the individuals' right to mobility."

"It's not surprising then that road traffic management has become an increasingly important sector along with the development of integrated traffic management control centres." Peeters goes on to say. "And with the advancements made in visualisation technology control rooms are becoming one of the key determining factors of ensuring smooth traffic flow and subsequent reductions in congestion. And with over 30 years invested in the development of visualisation technology we know it works as over 200 traffic management centres are now equipped with Barco solutions."

Getting the bigger picture

"Really it's about bringing visibility into the control room through the provision of content-rich seamless display walls, displaying and manipulating key information in real-time. This allows operators to explore cross relations and share knowledge on screen, resulting in better and faster decision-making," explains Steven Ooms, Market

Director Traffic & Surveillance, Barco. "And with the ever increasing complexity of traffic movements having this facility enables control room operators to detect and anticipate incidents to ensure rapid responses to situations and maintain safe and smooth traffic flow."

"But what's key is our technology enables operators to use their displays intelligently and interpret a complex set of data into something that is real and meaningful. This has been made possible by introducing a range of controllers which means operators can interface with their displays, use image-processing tools to highlight events and potential solutions and communicate this visually with other users either in the same location or remotely."

Having this functionality also means that traffic management centres are becoming integrated in terms of collaboration and cooperation with other organisations such as the emergency services, public authorities and highways agencies resulting in coordinated responses to traffic situations.

Future-proof

"Our vision, like our technology, is future-proof and that's because we know and understand the complexities involved in monitoring and managing traffic and that 24/7 traffic needs to be monitored and managed 24/7," concludes Peeters. "So delivering superior intelligence in the control room requires smarter technology, and a reliable, scalable and dependable visualisation solution does just that."

"..it's about bringing visibility into the control room through the provision of content-rich seamless display walls, displaying and manipulating key information in real-time, allowing for faster and better decision making in traffic management."
Steven Ooms

Giving Oslo a bird's-eye view

Ever since its establishment in 1990, the Oslo Traffic Management Centre (OTMC) has been responsible for the surveillance and monitoring of traffic in Oslo and the larger area of eastern Norway. The Centre monitors traffic flows 24/7 across an elaborate system of ring roads, main roads, bridges and tunnels, helping to alleviate road congestion and improve road safety. And as well as providing real-time traffic information – which is fed into the roadside electronic notice boards and shared with local radio stations - they also work closely with the emergency services coordinating their activities during incidents.

A combination of additional tunnels being constructed and an increase in both traffic and traffic monitoring – with over 800 CCTV cameras deployed – meant that the Centre needed to find a solution to upgrade its outdated surveillance system based on traditional mimic boards and intelligent ventilation monitors. And because of the increasingly complex traffic situation it was felt necessary to provide operators better access to visual information to give them a more detailed overview of all traffic flows.

In August 2008 the original system was replaced by a Barco videowall and controller which was installed by Barco's Norwegian distributor VideoSystem AS. The reason for this choice, according to Kai Gundersen, Head of the OTMC was because: "We recognised Barco as being the reference beacon in control rooms and their solution simply provided the best answer to our many rigid requirements. Plus we also wanted a turnkey supplier that could deliver 24/7 availability 365 days-a-year and a four hour repair time in case of problems."

"The feedback on the new installation is unanimously positive. Operators praise its user-friendliness and the exceptional brightness and contrast of the displays, which is a must in a room with big windows and lighting at night, and for the management this tool is great for helping us to fulfil our mission objectives," explains Gundersen. "And now that operators can obtain a general overview of traffic flows and other relevant details on the large screen they can quickly share information which has resulted in better decisions and faster response times, plus collaboration with the emergency services has improved. In reality what this means is that the OTMC can provide better, safer and more environment-friendly traffic coordination, and with the scalability of our new solution we can increase capacity as and when demand grows."

Keeping South Yorkshire on the move

Improving the transport network has been an essential element for regional regeneration in South Yorkshire, so much so that over £22 million has been invested in transport schemes to improve and expand the existing road networks. A key element of this scheme has been a transport project known as the South Yorkshire Intelligent Transport System (syITS) which was completed in December 2008. Partly funded by the European Regional Development Fund's Objective 1 Programme, syITS has created a centrally controlled traffic management and information system for South Yorkshire to enable travellers to make best use of the transport network.

One of the key components of the syITS project has been the establishment of a state-of-the art South Yorkshire Traffic Control Centre to monitor and manage the road network operation using CCTV and automatic traffic detection. Now fully operational its main purpose is to keep traffic moving, minimising delay for travellers whilst improving the safety of their journey, all of which has been made possible through the innovative use of sophisticated technology.

"Previously we had been using a number of disparate systems and outdated monitoring tools which made it difficult to collate all the necessary information regarding traffic flows. So creating the Control Centre from scratch meant we could design and develop it specifically to suit our requirements," explains Peter Bull syITS Project Manager. "Working with Thinking Space Systems – specialists in the provision of technical furniture for control rooms – we have been able to create a 'complete ergonomic working environment' for our operators, ensuring that the design and furniture conforms to all necessary standards and health and safety requirements. Thinking Space also introduced us to Barco who supplied the most crucial element of our operations, the videowall."

Consisting of 8 x 50" rear projector display cubes the videowall is controlled by a Barco graphic controller and management software. Optimised to work through a multi-screen arrangement the videowall provides a crystal-clear display so operators can easily monitor and switch between images being provided by the 50 CCTV cameras and other visual sensors. The other main benefit is the ability to quickly change the layout of the screens, not only on the main display but on individual control room consoles. This provides operators with a global view of the network enabling them to react quickly and make fast accurate decisions regarding incidents and conditions on the roads.

"With over 50,000 vehicles using the main roads throughout the region, the Control Centre is now making it possible to manage the road network and work towards achieving our targets laid out in the South Yorkshire Local Transport Policy," states Bull. "What's been key is that through the sophistication of the Barco technology information being gathered is now meaningful so that we can help to minimise congestion and improve road safety. As a consequence communication and collaboration with the emergency services has also improved as well as links to other highways agencies and neighbouring authorities control centres. Having real-time traffic flow information also means we can provide information for variable message signs warning of delays, weather conditions and potential hazards."

"Now we have the 'bigger picture' we are confident that not only will journeys and travelling times improve but the social, environmental and cost benefits will be considerable," concludes Bull. "And certainly Barco has provided a crucial element of syITS which now has the flexibility and scalability to grow as the use of the roads will undoubtedly continue to increase."

Networked vehicles and the environment

Vehicles contribute to congestion and environmental pollution but are also well placed to gather local information. Murdoch Mactaggart **hears of an initiative to improve traffic flow, safety and environmental impact by using telecommunicating cars.**

The transport sector is a significant emitter of greenhouse gases, responsible for nearly a quarter of the EU's output and with some three quarters of that figure deriving in turn from road transport. Hence limiting the environmental impact of transport has become an important EU priority, underpinned by a range of policy initiatives.

"We want to provide both reinforcement of good driving behaviour and feedback to help the driver understand what brings better results"
Paul Kompfner

ITS has a major part to play in this, both directly by developing tools to support driving in a more fuel-efficient way and because different elements are interlinked. Improving traffic flow improves transport efficiency, reduces costs, ameliorates the environmental impact and by also reducing driver frustration and irritation can in turn benefit safety.

"Looking at systems which are explicitly designed to improve energy efficiency or to reduce environmental impact is a new area of interest and work for us." explains Paul Kompfner, Head of Sector, Efficiency and Environment, ERTICO – ITS Europe. "About a couple of years ago, within a European Commission initiative called the eSafety Forum, a new working group was set up on ICT for clean and efficient mobility. We knew people were already doing very useful work on vehicle technologies – low energy tyres, reducing particulate emissions, stop-start assist and so on. We saw ITS as complementary to that and wondered what opportunities there were to make a difference."

In its recently published report the working group identified seven different areas of relevance selecting two – eco-driving support and eco-traffic management – as likely to give the most important results.

"We then took these ideas to our ERTICO environment partner topic group" adds Kompfner "where we have about 35 out of 105 partners who are specially interested in this topic. The group was keen to advance down the path linking ITS and the environment, to what I call 'green ITS'."

Reinforcing good behaviour

"Imagine the benefits if you can use vehicle sensors to collect information locally and then forward that to share with others"
Paul Kompfner

Kompfner cites eco-driving as an important area where the average driver could save anything from 10%-15% upwards in fuel use and costs. Some recommendations are about mechanical approaches such as checking regularly that tyres are correctly inflated. Yet tyre pressure sensors are an increasingly common new-car option and these can warn drivers proactively that pressure is down by, say, 10% on what it should be. Using ITS it would be possible to provide this low-pressure warning remotely across the internet so that a fleet manager as well as the driver could be alerted if the tyres on a particular vehicle needed attention.

"There are ways to reinforce good behaviour" says Kompfner "but in today's car those are still fairly limited. If someone goes on an eco-driving course then their fuel economy will certainly improve but after a couple of months may drop back. We want to provide both reinforcement of good driving behaviour and feedback to help the driver understand what brings better results. This might be a case of showing in real time how driving affects fuel use or perhaps continuously comparing the results over time for the same trip, trying to improve them."

An interesting extension of monitoring fuel usage is to extend this to all cars in a given locality to identify the effects of ambient traffic conditions such as congestion.

"We could combine these measurements to get a kind of aggregate measure of the traffic temperature in real time," adds Kompfner, describing the 'temperature' as rising when fuel use increases. "This network-wide information could help optimise the traffic management system as a whole to move towards lower overall fuel consumption."

Networked cars

This requires a new approach, a system of networked cars capable of communicating dynamically with appropriate information points. A project headed up by ERTICO and coordinated by Kompfner is working to exactly that end so that vehicles can communicate freely with each other and with the infrastructure. This is the Cooperative Vehicle Infrastructure System (CVIS) project, a €41 million four-year initiative scheduled to complete in January 2010 and funded through the EC Directorate General Information Society and Media.

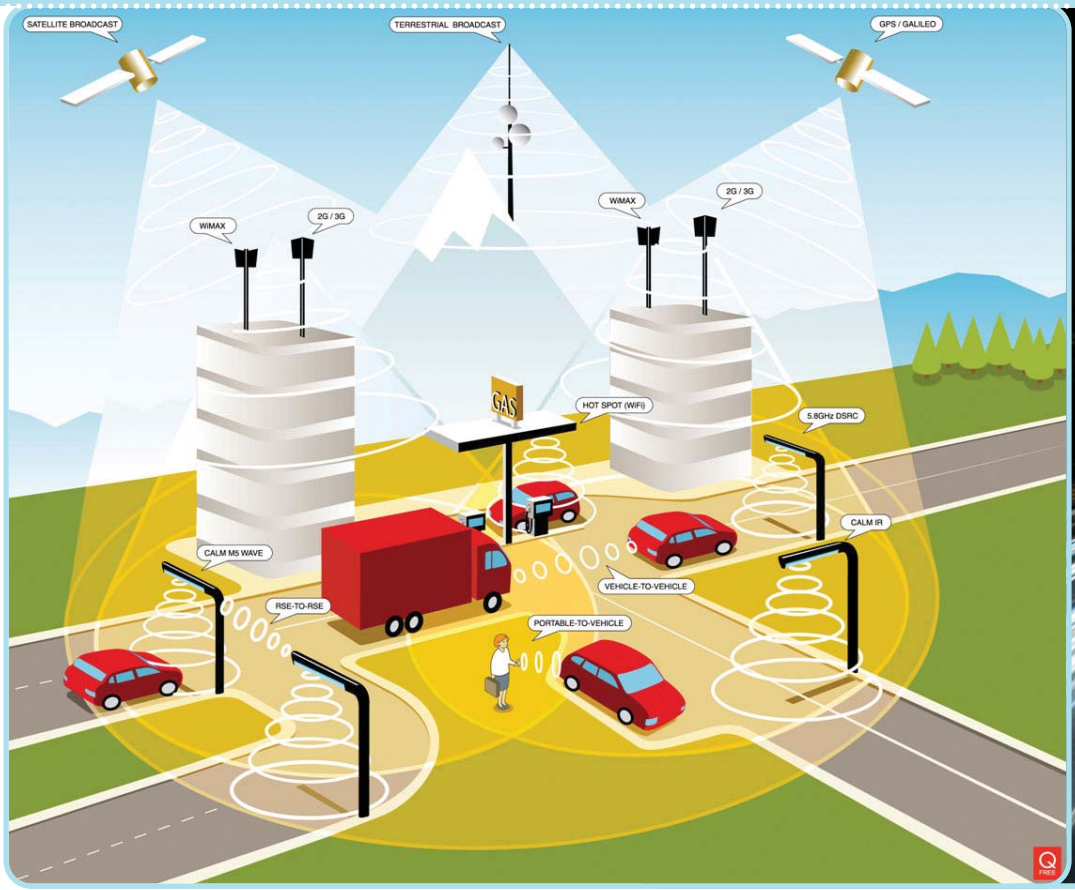
"With over 60 partners involved, it's a large and ambitious project." says Kompfner. "When you're driving, your car will be able to send and receive information. If you get caught up in congestion, for instance, or have an accident then this would be detected by what your vehicle is doing. And with a camera fitted then your car could relay what's happening around it."
An aim of the project is to create standardised vehicle and road side modules capable of communicating continuously and seamlessly, using a range of media such as cellular or other wireless networks including WiFi, microwave and infrared. Location referencing is an important part of the vision and this might be done using local dynamic maps or satellite positioning through Galileo or others.

"Traffic monitoring equipment today is basically fixed and localised – large banks of screens in police or Transport for London offices, say." adds Kompfner. "Now imagine the benefits if you can use vehicles as sensors to collect information locally and then forward that to share with others. You might get an alarm in your car saying that a few hundred yards away there's been a sudden spillage and the road surface is now treacherous."

Tracking hazardous freight

The potential for using CVIS information is considerable. Kompfner gives as an example monitoring the transport of hazardous goods. Tankers carrying dangerous chemicals, for instance, are restricted in

"We're seeking to create the telecommunicating car"
Paul Kompfner



the routes they can use. With CVIS it would be easy to monitor the truck's progress and to alert the driver, and the appropriate authorities as necessary, if the driver strayed in to a residential area for example. It would even be straightforward to use the data obtained to trigger the opening or closing of gates or other barriers.

"Another application we're working on for motorways is ghost driver detection." says Kompfner. "Ghost drivers are those who have strayed on to the motorway in the wrong direction, going against the traffic flow. That's something that actually happens several times a day in each European country. It can cause very serious accidents because no one expects a vehicle coming towards you in the fast lane."

"There are alerts on the traffic news but at the moment it's difficult to interpret for the driver and, of course, the driver has to be listening anyway or have TPS turned on. With this CVIS application, however, the slip road monitoring unit would immediately detect a driver going the wrong way and would warn not only that vehicle but others then at risk, flashing up within a second or two an urgent alert on their screens."

In another example, truck drivers could electronically book parking space for their mandatory rest period at a convenient service centre at the right time. There may be no spaces left at busy times and a driver may then have the difficult choice of joining a potentially dangerous queue stretching back to the motorway or breaking the law by driving to the next service station or off the motorway altogether. With constant communication, monitoring the estimated time of arrival and automatically rescheduling space becomes a simple process.

Improving traffic flow

"There's much more we're looking at doing." adds Kompfner. "There can be considerable benefits in synchronising vehicles with traffic lights for instance. We're also looking at providing customised routes for different vehicles. Most navigation systems offer standard routes but the best route can vary according to the time of day or, indeed, other quite transient factors. If we have access to all this widespread information then we can recommend particular routes to individual drivers to improve their travel times while reducing congestion overall."

"And in another CVIS initiative" he says "we're looking at making more use of spare bus lane capacity. If we know that a bus lane is temporarily free then we can allow in other vehicles, withdrawing that permission and advising them to move out of the lane when we know that a bus is approaching."

Success for these systems is not just a matter of technology. Kompfner and ERTICO are clear that privacy issues need also to be considered and suitable safeguards built into the systems, transparency of data collection and use included.

"We're seeking to create the telecommunicating car" he says "but looking at privacy issues is addressed in one of our subprojects. Our starting point is our development of absolutely open platform running open applications. For instance, a fundamental principle of what's called floating car data collection that individual data are anonymised, with no link between any specific car journey and any particular individual."

Travolution

Ingolstadt, the home town of Audi AG, is the site of an innovative approach to optimise traffic flow by using networked communications between vehicles and traffic lights.

Over the past couple of years, working with its partners including Ingolstadt's Office for Traffic Management, the Department of Traffic Engineering at the Technical University of Munich, and GEVAS Software GmbH, and with the support of the Bavarian Ministry of Economic Affairs, Audi has developed what it calls the Travolution system, investing some €1.2 million in the process.

Software is used to optimise the specified network of traffic lights, significantly reducing stopping and so improving fuel use efficiency. Large trucks can use up to a litre of fuel each time they stop and start and so keeping such vehicles rolling can be particularly important.

In a separate part of the Travolution project three traffic lights and some Audi test vehicles were fitted with communication modules. Cars approaching the lights were advised through the vehicles' computer systems when they would change to green and the computer in turn advised the driver of the speed which should then be maintained in the approach to the junction.

Keeping on track

Set against a background of rising fuel prices and environmental concerns, globally there is a renewed focus on investment in rail by both private and public operators. The drivers for this include growing demand for rail travel and increasing customer expectations along with the need to improve cost and operational efficiencies. Susan Venables **explores how high-speed data communication networks are providing the solutions.**

"One of the most significant breakthroughs has been the development of mobile data communication solutions….."
Nigel Wallbridge

In 2007 the UK Government announced the Rail White Paper – 'Delivering a Sustainable Railway' – which identified the future needs of the railway over the next 30 years. It stated that 'over this period the railway will have to expand its capacity to meet demand; reduce its environmental impact; deliver against increasing customer expectations for reliability, comfort, safety, and information; whilst at the same time continuing to improve cost efficiency'.

But not just a challenge for the UK, these are issues facing most global national and regional rail networks. For example in Europe the White Paper – 'European Transport Policy for 2010: Time to Decide' – outlines ambitious plans to create a single European railway system by 2020 and for rail to increase its market share of passenger traffic from 6 to 10 percent along with a 50 percent gain in energy efficiency. Certainly to help tackle these challenges and achieve many of the objectives laid out in government policies much faith has been placed in the role that technology can play.

Getting connected

"One of the most significant breakthroughs has been the development of mobile data communication solutions that have been specifically designed for the global transportation industry," states Nigel Wallbridge, Executive Chairman Nomad Digital. "This technology is not only transforming rail travel for passengers but is giving Train Operating Companies (TOCs) the ability to significantly reduce their operating costs whilst improving the control and efficiency of their fleets. Really it's about providing better connectivity which is being increasingly demanded by the travelling public and by the operators who want to be able to manage their costly train assets at all times."

"It is wireless technology that can provide this connectivity; something which Nomad has pioneered the development of," continues Wallbridge. "Through the technological advancements we have made, our solutions now make possible data connectivity which allows continuous high-speed broadband wireless connection on trains, even when underground or moving at speeds over 100 miles-per-hour. We see this as being revolutionary and with a huge potential market consisting of 141,000 trains worldwide, transporting 27 billion passenger journeys over 10.5 billion kilometres annually the benefits for passengers and TOCs are considerable."

Transforming rail travel

The system works by connecting the train to wireless base stations along the track, meaning that the train runs along a corridor of wireless coverage, allowing information to be sent and received at speeds 25 times faster than domestic broadband internet access. "Because of its high bandwidth, this technology enables the delivery of numerous on-board services and innovative real-time applications at fixed low-costs," explains Wallbridge.

"For the passenger the aim has been to make their journey more productive, enjoyable and safer. Now they can use their laptops to surf the net, send and receive e-mails and transfer large files quickly, and with a consistent mobile phone reception, use their phones with less risk of being cut off. But not only that, passengers can now be entertained through on-board screens and receive live updates regarding their journey, plus with the sophistication of the technology the implementation of real-time CCTV is now possible making travel safer and secure."

"But for the TOCs the key benefit is information. If you look at modern train fleets they contain an array of sophisticated on-board systems for monitoring, recording and control, but frequently this information remains on the train until it stops. By delivering remote data access it is possible to get real-time information off the train when it is still useful. This provides the ability for TOCs to constantly monitor their train fleet and crews to track performance and address immediately any operational issues, such as delays and equipment failures. The results - improved fleet management and significant operational cost savings!"

Just the beginning

"There is no doubt that global demand for this technology is increasing and it certainly helps to tick all the right boxes in terms of achieving objectives set by national governments and global rail networks," concludes Wallbridge.

"But this is not just about increasing capacity and getting people to switch away from their cars to the train, it's about increasing per passenger revenues, cutting costs and making those all important reductions in energy consumption. And this is just the beginning as only a small percentage of train operators have realised the benefits, but I am sure it won't take long for the rest to come on board."

Making the train first choice for travel

In 2005, in partnership with T-Mobile, Nomad rolled out the world's first broadband WiFi service on trains for the London to Brighton rail route. Since then its technology has been utilised on a number of passenger WiFi internet projects which include the Heathrow Express, proving the first such application in tunnels, and on the Utah Transit Authority's recently launched Frontrunner service where it was the first "free to use" broadband internet service on a US railroad. Other projects in deployment include trains for the Norwegian State Railway (NSB) to provide on-train internet access and an on-board entertainment services and passenger internet on the Dubai Light Rail system.

Automating out human error

In an age of automation, rail track workers still rely on human lookouts to warn them of oncoming trains. It doesn't make safety or financial sense, says Schweizer Electronic.

By Joanna Bawa

Everyday as work continues on maintaining and improving the UK's rail network, teams of workers rely on human lookouts to warn of oncoming trains. Pressure to keep tracks open during repairs means there can be thousands of lookouts, each one a skilled worker, but otherwise unproductive during their duties. In a world where public transport must become increasingly competitive, why can't the safety of track workers be dramatically increased, while at the same time improving productivity, through automating the detection and warning of trains?

Minimising risk

"Where a system relies heavily on people, the most likely cause of problems is human error," comments Stefan Schürch, Business Unit Manager, Work Protection, at Schweizer Electronic. "Research in this area shows that, during periods of concentrated effort, a worker will make one error in every thousand actions. Consider that a lookout requires rest, food and breaks, and his judgement may be affected by weather, uneven terrain or poor light. He may even have to work at night, when he is more prone to fatigue. Given the nature of rail tracks and trains, this raises the error rate to above what we believe is an acceptable level."

"Where a system relies heavily on people, the most likely cause of problems is human error,"
Stefan Schürch

"A reliable and efficient warning system meant plant operators and workers were able to complete complex tasks with the least risk and least interruption"
Wayne Brigden

Swiss-based Schweizer Electronic focuses on automated warning systems specifically targeted at protecting people and equipment on operated rail tracks. A developer of high-security radio and data transmission systems, it has projects throughout Europe in the transportation safety industry.

"Given the relative danger of working on rail tracks and the potentially serious nature of damage to individuals and equipment, our focus is risk minimisation," continues Schürch. Schweizer's core technology is its MINIMEL95 system, a combination of rail-based sensors, cables, a central data processor and a series of audio and visual signalling devices, which offer highly reliable automated protection to work sites. MINIMEL95 is certified by TÜV-Eurorail to a standard called SIL-3 (safety integrity level), which means an allowable failure rate of one error per ten thousand years of operation – effectively, never. Sensors are located on rails at a defined distance from the worksite, and when a train passes over a sensor, a signal is transmitted to a central unit on the site, immediately triggering an audiovisual warning signal. Once the train has passed the worksite, sensors at the far side automatically switch off the alert. The process is classified 'failsafe', meaning that even in the extremely unlikely event of error, warnings are given, enabling the failure to occur safely.

Encouraging safety behaviours has received support through the introduction of Network Rail's 'RIMINI' (risk minimisation) standard. RIMINI is a hierarchy of protection methods, the first being green zone working, which involves blocking one or more lines to trains or setting up protected areas away from running lines. This is regarded as the first choice, followed by red zone working, where trains continue to run and workers are warned of approaching trains via an automatic signal in time for them to get into 'positions of safety'. Least preferred is red zone without automation, which relies on a Lookout Operated Warning System (LOWS) or even, as a last resort, human lookouts. "Schweizer's system means that when the track company has no alternative but to carry out work in a red zone area, the safety level for workers is much greater, and cheaper to implement too," adds Schürch. "

Automated warnings cost less

The savings from redeploying lookouts to the rail work itself is vast - for a national rail operator with up to 200 worksites running in parallel, it can be thousands of pounds per day adding up to millions per year. Add to that efficiency savings when work is completed sooner, and fewer penalties for delayed trains, and the savings multiply. "Automated warning systems are a legal requirement across much of Europe, because of the safety benefits" concludes Stefan Schürch, "but when the cost savings are so huge it becomes an obvious step."

Seven-day rail at Milton Keynes

Carillion plc, one of the UK's leading support services and construction companies, is extensively involved in repairs, maintenance and upgrades to the UK rail network. The company recently asked Schweizer Electronic to provide automatic track warning systems during work on an upgrade to track in Milton Keynes, to improve overall safety and efficiency. The work required some of the line to be closed, but the use of Schweizer's technology meant the remaining lines could remain open, with trains continuing to operate to an almost normal schedule. "A reliable and efficient warning system meant plant operators and workers were able to complete complex tasks with the least risk and least interruption possible," says Wayne Brigden, the project's Construction Manager. "It also minimised disruption to train passengers, supporting seven-day railway and saving time and money for everyone."

Informing personal travellers

Murdoch Mactaggart **talks to an executive public body charged with encouraging innovation about how ITS solutions can improve individual journeys and what's becoming available.**

As the Eddington report pointed out transport congestion is a major and growing problem in the UK and has severe economic consequences. Largely, if not exclusively, a road issue it's one which is also heavily dependant on time and location. Tackling the problem is far more complex that it first appears, requiring a mix of technological, psychological and social solutions.

"We very rarely use just one form of transport for a whole journey and so you need to be able to coordinate everything"
David Bott

People value the flexibility and convenience which access to personal travel brings yet minimising private transport journeys, at least at peak times and in most urban areas, is essential. Public transport services are too often poor and the UK is suffering the consequences of the ill-judged Beeching Report on the railways, exacerbated by a failure properly to develop inter-modal transport networks and hubs to improve freight transport efficiency and cost and minimise environmental impact.

"One way to address these issues is to encourage individuals to make use of rapidly evolving technology to plan journeys more effectively" explains David Bott, Director of Innovation Programmes, Technology Strategy Board (TSB) "and our current call is about informed personal travel. I've tried out some of these pieces of kit and they're mind-bogglingly useful! They give you real-time information on how to avoid problems and how to make your journey as fast, effective and trouble-free as possible."

Promoting and supporting innovation

Established in July 2007 in its present form as a non-departmental executive public body charged with promoting technology-enabled innovation across the UK, the TSB is the successor to the earlier advisory body within the then Department of Trade and Industry (DTI). Its primary funding is from the Department of Innovation, Universities and Skills (DIUS) and it both provides financial support to appropriate projects and works with other bodies to increase the total sums available. It takes a "challenge led" approach and uses the concept of "innovation platforms" to look at key societal challenges and to encourage the growth, and subsequent commercial exploitation, of innovative solutions and developments in technology.

"Unless you trust the information you don't go with it"
David Bott

"Back in 2005 the TSB came up with the idea of taking government activity which changed markets and using that to drive innovation in that market." says Bott. "The first two ideas suggested were Network Security – from the Home Office and particularly the Identity Passport Service – and Intelligent Transport Systems and Services (ITSS), that from discussions with the Department for Transport (DfT). This coincided with the DfT's interest in how road pricing might develop and how it might be be certain of its operating reliably, accurately and affordably while safeguarding privacy. That's an important first step because there's no point in having all the political arguments and then finding that the technology doesn't work anyway."

The TSB has now established five innovation platforms and runs regular competitions to encourage innovative development work around specific topic areas in a given platform. During 2007, for instance, up to £7 million in public funding was offered under the ITSS to stimulate innovative development of telematics and other services for road users, related to the focus on tackling congestion - the Time, Distance and Place (TDP) road pricing competition.
The research challenges specified were to provide confidence in the charges collected while still protecting driver privacy, to reduce the costs of collection of TDP charges, and to ensure that any scheme would operate reliably, accurately and fairly.

One of several competition winners was a consortium headed by Telent Comms to develop what it calls a 3rd Generation Road Side Equipment solution (3GRSE) to support accurate and variable charging of motorists in both urban and rural areas using the existing infrastructure. Another successful consortium led by Kizoom is working to develop a 'Trusted Driver Module' using advanced cryptographic techniques to guarantee the privacy of the road user.

Timely information

Kizoom was also involved with Transport for London (TfL) and Imperial College London in winning the DTI-funded Spring 2006 Competition for its Real-time Integration Programme (RTIP), duly trialled and demonstrated over a three-month period at Blackfriars Station in 2007. The project uses a short-range wireless technology, a development of the contactless card RFID standard, called near field communication (NFC) to exchange data between an appropriately enabled mobile phone and, in this case, special travel maps at the station. A passenger merely enters a destination in the phone and holds it close to the map to get an immediate phone screen display giving a map of the station and real-time travel information.

"We're at the stage where the science underpinning all this is done." adds Bott. "The technology is getting increasingly accurate and the Blackfriars project was a very interesting use of NFC technology to find your way around what's actually a pretty complicated transport interchange."

Bott explains that the current ITSS competition, 'Informed Personal Travel' (IPT), seeks to accelerate the deployment of IPT technology providing real-time information to travellers both during the pre-journey planning stage and to handle the effects of any disruptions once

"As far as the TSB is concerned, we're on a journey - and all this has a lot of potential for improving life in the UK."
David Bott

the journey has actually begun. The competition, which finished on 5th March 2009 and offered up to £8 million in support funding, encouraged participants to look at overcoming barriers which currently interfere with providing integrated solutions for seamless travel.

"One of the problems hidden behind all this" says Bott "is that we very rarely use just one form of transport for a whole journey – you might walk to the bus stop or drive to the station, perhaps even change trains. You need to be able to coordinate the whole journey

and although there are some good applications already available they're really only for pre-planning, using on your computer before you set out."

"We've been doing some interesting work with the South East of England Technology Development Agency." he adds. "They joined the ITSS innovation platform early on to look at systems for providing localised information. They've got a WiMax corridor along the A329 into Reading from the M4 and in the trial they're feeding the information into John Lewis and local government delivery vans, providing them with information to avoid congestion and so achieve much more efficient journeys."

Trust is important

As Bott points out, much of the technology is already there and proved. It's important to develop suitable working applications, an important focus of the TSB's innovation competitions, but getting people both to trust and use what's becoming available is also essential.

"That's critically important." says Bott "If the tube sign says that the next train is in ten minutes you don't go rushing back upstairs to look for a bus. You know from experience that the information is probably correct and you trust it. However, with these other systems we haven't necessarily got to that level of trust but unless you trust the information you don't go with it. The TSB is working with academic psychologists and sociologists who are very interested in analysing what gives people reassurance and feeding that information back to the designers of the systems."

There's the related issues both of trusting computer management or control decisions and of the fact that software developers and project managers can get things seriously wrong.

"It's going to be a long time before we surrender control of a car to a computer because no matter how good the computer is, no matter how many sensors there are, human beings will read, interpret and respond to the environment better than computers." says Bott. "Unlike computers human beings are programmed to survive. But what's certainly going to happen is that the quality of information to help drivers will increase and we'll probably also get to the stage where we can have discussions with the computer about alternatives and then make our own decisions.

"As far as the TSB is concerned, we're on a journey." he adds. "The Informed Personal Traveller is the next step but we're also already considering what to do after that. Once we've unpacked this problem we know we're going to find another one. And then another one. We have ideas but each activity is an experiment we do that enable us to refine what comes next. And all this has a lot of potential for improving life in the UK."

The Eddington Transport Study

In 2005 the Chancellor of the Exchequer and the Secretary of State for Transport jointly commissioned Sir Rod Eddington, former CEO of British Airways, to study the long-term links between transport and the UK's economic situation, taking account of the need for sustainable approaches. The main report and its summary, The case for action, ran to something over 400pp and was accepted by the government and published in December 2006 as part of the pre-Budget Report.

Eddington insisted that economic growth drives transport demand and pointed to the fact that the UK's transport network supports what he called the 'staggering' amounts of 61 billion passenger journeys and 250 billion tonne-kilometres of goods moved annually. He concluded that the existing transport infrastructure was broadly adequate – that is, there was no need to build new motorways or high-speed rail links – and that what he identified as the major problem, that of congestion, was serious and growing steadily but could be ameliorated considerably by enhancing capacity through infrastructure improvements and other measures and that doing nothing was not an option. His report made a very strong case for road pricing while recognising that there were political and other difficulties in implementing that solution, adequate technology not existing and costs currently being unknown.

His recommendations that air transport be expanded and that the planning process be amended to allow fast track consideration by specialist committees of applications of national economic importance, have led to the current battles around Heathrow and elsewhere. Conversely, the report's robust insistence that all modes of transport should meet the full costs of their environmental impact has attracted considerable public support.

‘On the buses’

Providing better public transport on the roads has become a national priority for many countries because it’s seen as key for tackling the problems caused by congestion and for addressing environmental issues such as climate change. But this has brought a new set of challenges for bus fleet operators who need to improve services as demand increases. Susan Venables **looks at how mobile radio technology is helping.**

Congestion is an increasing problem across the world, partly as a consequence of people travelling further and more frequently both for business and pleasure. Congestion wastes time, causes unpleasant driving conditions and pollution and causes journey times to be unpredictable. The European Commission’s White Paper ‘Transport policy for 2010: Time to Decide’ identifies congestion as a major barrier to mobility.

“….technology has become a key enabler in terms of enhancing fleet efficiency and improving customer service.”
Paul Gwynn

Certainly the negative impacts of transport on the environment affect everyone. This also forms part of the reason why there is such a drive in many countries to encourage people to leave their cars at home and use public transport. It is widely recognised that this not only reduces congestion, but reduces energy consumption and carbon dioxide (CO^2) emissions. In North America, for example, the APTA (American Public Transport Association) estimated that greater use of public transport would reduce CO^2 emissions by 37 million metric tonnes annually.

In terms of public transport on the roads, buses are regarded as the most powerful tool for tackling congestion. They allow more people to make the same journey while generating less traffic and they can be deployed quickly in response to changing demand. Such is the faith in this mode of transport, the UK Government’s ‘Future of Transport - A Network for 2030’ White Paper identifies buses as the main form of public transport to help improve the efficiency of the road network and deliver significant benefits, not just for the individual but for the economy as a whole.

Expanding capacity

“..through working with our customers we have been able to develop ground-breaking advancements in the transmission of data.”
Paul Gwynn

But as governments continue to promote the shift from car to bus and ridership subsequently increases, so do the challenges for transport operators, in terms of maintaining quality and reliability of service. According to Paul Gwynn, Global Business Sector Manager – Transport, Tait Radio Communications: “Many transport systems have found themselves operating beyond their design capacity and providers have been confronted with many of the same issues faced by vehicle owners as well as rising capital and infrastructure costs, rising consumer expectations and health and safety considerations. As a consequence many public transport operators are realising that to continue operating their existing systems is not an option.”

“Without a communications infrastructure many of the technology solutions being delivered today could not happen.”
Paul Gwynn

“To increase passenger carrying capacity and improve efficiency requires significant new investments. No more so than in innovative information and communications technology solutions (ICT),” continues Gwynn. “And with 40 years invested in designing, manufacturing, installing and supporting mobile radio communication solutions for the public transport sector, Tait has witnessed how technology has become a key enabler in terms of enhancing fleet efficiency and improving customer service. As a consequence Governments are setting out policy frameworks for public transport that incorporate the use of ICT and the development of intelligent transport systems (ITS) as a way to help support the delivery of better public transportation, and to encourage more people to use it.”

Delivering the new bus travelling experience

Research suggests that the switch to bus travel is happening. A survey from bus transport operator Stagecoach indicates that one in 10 people have switched from their cars over the past three years. “To answer this challenge of increasing use and the public’s demand for even better, faster more user-friendly services, there are several ITS measures now being implemented,” states Gwynn. “And really these have been developed to provide the ability to communicate information not only for the travelling public but for public transport operators as well. Some of these solutions include Automated Vehicle Location (AVL), Traffic Signal Priority (TSP), Real-Time Passenger Information (RTPI), Automated Passenger Counting (APC) and sign communication.”

The benefits that these solutions deliver include: more reliable services; precise real-time information at bus stops and on board buses through visual displays and audio announcements; information delivery via the Internet and SMS text messaging and accurate predictions of bus arrival times. “For the transport operator, however, what’s key is the ability to have communication with their mobile staff and bus drivers when necessary plus the ability to receive regular and timely fleet location data,” adds Gwynn.

"This assists with dealing with the day-to-day operational issues and the efficiency of vehicle management and helping drivers and service controllers to meet their bus schedules. But ultimately it is about empowering passengers, providing them with up-to-date, reliable information that allows them to make informed choices whilst planning their journey and providing them with regular updates once they are on it."

Optimising communications

"But for these technologies to work, it is essential to have a reliable radio 'backbone' to enable the transmission of voice and data communications. Certainly, as more on-board and central applications become available to assist the transport operator, the amount of communications traffic being generated is increasing significantly," explains Gwynn. "And it is only through advancements made within the mobile radio field that these solutions have been able to deliver against this increase in demand."

Although mobile radio is not a new concept and has been used in bus transport communication solutions for many years, in the early days it was totally voice-centric. Today the scales have tipped and most messages to and from the bus are in a data format. "It has been through working with our customers that we have been able to develop ground-breaking advancements in the transmission of data so it is possible to consolidate and increase the capacity of information flow through high-speed data channels in an unobtrusive and bandwidth -efficient manner," says Gwynn. "But what's significant is the fact that our solution, TaitNet Data System (TNDS), has been designed to enable public transport operators to meet not only current and potential future data transmission requirements, but also maintain voice transmission capabilities. This means that it is possible to deliver various communication streams from a single vehicle-mounted platform."

As we have witnessed the growth in popularity for the new systems, such as AVL and RTPI, this has caused issues for the transport operators, system suppliers and systems integrators because of the cost of suitable communications infrastructures - both in terms of hardware and networks. So, by enabling all of the operator's communications requirements to be met within a single system, TNDS cuts both the cost and complexity for all concerned meaning existing trunked networks can be upgraded with TNDS functionality. Plus other benefits include reduced operational and maintenance costs; a customised solution to suit system needs along with an investment in a future-proof solution.

Creating a sustainable future

Despite all the challenges, there are clearly opportunities for bus operators to provide more efficient and seamless services to benefit the passenger, whilst delivering operational performance improvements and cost savings. And there is no doubt that the innovative use of ICT is key and, although mobile radio appears to only represent a small element, its contribution is crucial. "Without a sophisticated communications infrastructure, many of the technology solutions being delivered today could not happen," concludes Gwynn. "And with the progress made by Tait in the development of Digital Mobile Radio (DMR) technologies, this will provide a platform to deliver even better solutions with even greater benefits."

"Creating a sustainable future for bus transportation is an achievable goal and this is the way to go if nations are to achieve their targets of reducing both traffic congestion and CO_2 emissions. The point is that to encourage more people to get 'on the buses' we need public transport networks that are better, smarter, safer and offer more informed choice to the travelling public. This is happening across the globe and at Tait we intend to play our part in ensuring that this trend continues."

Dublin buses: keeping in touch

Servicing 140 routes with 1,200 buses and around 3000 drivers, Dublin Bus services are used by around 150 million passengers each year. As part of its re-investment programme to optimise operational efficiencies and improve the reliability of its services, the transport company has undertaken a major upgrade to its existing communications infrastructure.

Already operating a customised, multi-site TaitNet trunked radio system since 2002, Dublin Bus identified the need to further enhance both its provision of information to the travelling public and the ability to track its vehicles and monitor their performance against set timetables. This has been achieved by adding digital data channels to the existing voice radio system which has enabled the implementation of a real-time passenger information (RTPI) system. The data element of this is being provided by Tait's TaitNet Data Service (TNDS) data transmission solution, unique in that it allows both voice and data to be transferred in parallel over the radio system.

The RTPI system and Automated Vehicle Location system (AVL), supplied by German RTPI supplier INIT, utilises the TNDS solution, which means that the transmission of vehicle location, timetable and other related data between buses, control rooms and information displays at bus stops can now be achieved. The speed and accuracy of the data being delivered will result in passengers having access to an information system that will provide real-time arrival and departure details.

Through this innovative data capability added to the system, the solution will not only improve the efficiency of vehicle management but will also deliver operational and cost reduction benefits. Plus the flexibility and scalability of the TNDS system and its ability to integrate with INIT's bus hardware and control software will enable Dublin Bus to develop additional functionality such as traffic signal priority and automated passenger counting.

Operating within a city where traffic congestion has been reaching critical levels for some years, Dublin Bus' overall objectives are to increase the speed, reliability and convenience of its service for its customers. By introducing a reliable and flexible communications system, this is already encouraging more people to use the service. This will not only help to lower overall traffic volumes in Dublin, but will provide environmental as well as socio-economic benefits.

Towards sustainable mobility with transportation intelligence

For sustainable transport solutions, you need to plan for the future. Multi-modal transportation is part of our transport landscape and as demand on transport forms, capacity and efficiency increases, so too do the number of solutions being implemented. The intelligent solution is one that is integrated and future proofed. By Anne English

"You need to look deeper than ITS at sustainable transport systems and optimising the entire state of traffic as well as the entire planning cycle of transportation"
Thomas Friderich

A holistic approach to intelligent transport, that encompasses all modes of transport as well as all transport providers and stakeholders is at the core of optimising any given transportation system. Success lies not just in the integration of the stakeholders, providers, solutions and systems currently available, but in the application of tools in the planning process that enable you to future-proof your strategy.

The intelligent solution is one which can cope with unexpected changes in real-time demand as well as be scalable enough to adapt to future changes and increase in demand.

Future proofing intelligent traffic solutions

According to Thomas Friderich, Vice President at PTV Vision Sales & Marketing with PTV AG, based in Karlsruhe, "You need to look deeper than ITS at sustainable transport systems and optimising the entire state of traffic as well as the entire planning cycle of transportation." This is long term approach with strategic planning at the forefront that can be operationalised and executed in day-to-day traffic management.

"Making private transport more expensive is an option but not always a realistic option…"
Thomas Friderich

PTV AG is an independent company that's been delivering cutting-edge software technology and consulting to both private and public travel, traffic and transportation mobility customers from some 25 years.

Friderich explains that they use a three pronged approach to integration: strategic planning, operational planning and traffic management. Coming from an affiliation with academia, namely the University of Karlsruhe, PTV is well versed in analysis of current and historic traffic flows. But it takes this analysis a step forward to include their understanding of human behaviour in various different traffic eventualities – how people react in congestion, at large crowd events such as football matches or rock concerts. Or indeed how they react to unexpected eventualities such as crashes and so on. It is this added forward-looking data that they add to the mix in strategic planning, which brings scalability and sustainability to their offering.

"Transportation Intelligence is getting what you plan to get"
Thomas Haupt

First simulate then build

According to Thomas Haupt, who is a Member of the PTV's Board of Directors, "Sustainable planning means that what you plan is what you get." This is why PTV is a strong proponent of using simulation to future-proof and stress-tested solutions before anything is set in concrete. "There are so many options to be appraised in any strategy but not all offer the substantiality or scalability that an area will need over the next 10 or even five years. We use advanced simulation software to present to our customers exactly how each option will perform in the face of stress, based on our understanding of human behaviours in given circumstances."

Friderich points to South Korea as an example of a city where the use of fly-overs as a method to alleviate congestion has been taken to the extreme and now dominates the South Korean landscape. He also points to Dubai as an example of a city requiring large-scale infrastructural change to cope with its all-day rush-hour and chronic congestion. This would have not been necessary, if a multi-modal planning approach had been used earlier.

Intelligent transport: getting what you want

Friderich also explains that the obvious options are not always the best, "Making private transport more expensive is an option by not always a realistic option as it brings with it social exclusion and affects the social capital of our urban centres." He adds that we need to keep in mind that increasing fuel prices have not completely kept us off the roads so we still need to build on the fact that it is more environmentally friendly to have traffic flowing instead of in gridlock.

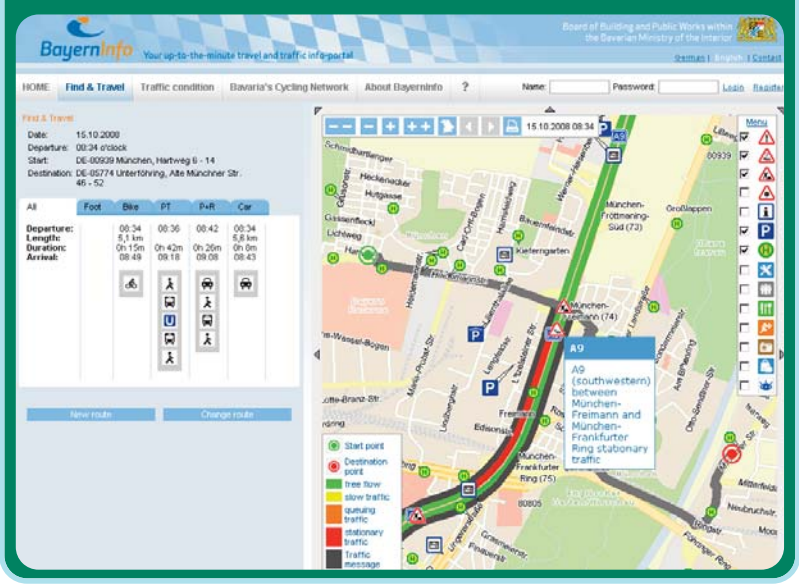
So it seems that the key to sustainability is intelligent and multi-modal transport. That means better integration of all modes. A multi-modal mix based on a proven understanding of the behaviour that drives the destination and mode choices behind our traffic flow.

Ruhrpilot and BayernInfo

Ruhrpilot and BayernInfo are two state traffic info portals powered by PTV in cooperation with Siemens amongst others, where PTV's knowledge and methodologies are used to deliver comprehensive traveller and traffic content. The strength is they use strategic behavioural data as opposed to just current data and historic data to formulate forecasts and offer for example, highly sophisticated intermodal door-to-door routing. (See www.bayerninfo.de)

VISUM

VISUM is PTV's software system for transportation planning, travel demand modelling and network data management. It's being used across the world for metropolitan, regional, state-wide and national planning applications. Designed for multimodal analysis, VISUM integrates all modes of transportation (i.e. car, car passenger, truck, bus, train, pedestrians and cyclists) into one consistent network model. VISUM provides a variety of assignment procedures and 4-stage modelling components which include trip-end based as well as activity based approaches.



Drive-through

Increasing congestion on the roads combined with constant pressure on our time means travel planning has become an essential business skill. By Joanna Bawa

How's the traffic looking? After headline news and weather, the information we seek most frequently concerns the traffic – road, rail and air – and the likelihood of traffic problems disrupting our day. Like any business activity, the key to getting it right is access to good, accurate and timely information. Sources of travel information are typically radio, television and internet, with in-car navigation systems increasingly important. "The challenge is consolidating such a mixture of data and transforming it into a meaningful and accessible service for travellers," says Nick Simmons, Business Development Director with travel information provider, ITIS Holdings, and Managing Director of its broadcasting subsidiary, Trafficlink.

"Our purpose is to make valuable traffic information more accessible, and we have the most diverse sources of data and the most effective means of analysing and publishing that information," concludes Nick Simmons. "We see detailed traffic information as a key value-added service in many areas, including fleet management, hotels and personalised travel services."

The science of traffic

"The challenge is consolidating such a mixture of data and transforming it into a meaningful and accessible service for travellers"
Nick Simmons

ITIS achieves this through its own software platform, TrafficScience. TrafficScience uses ITIS' patented Floating Vehicle Data (FVD) technology, which collects movement data from any connected mobile device and GPS enabled fleets. This data can be collected over a wide area – typically nationally – and allows road network operators to monitor real time traffic information over wider geographic areas, and monitor much smaller classes of road than can be done with fixed-sensor systems. ITIS pioneered the use of FVD from cellular networks, which now enables the company to offer traffic information with the greatest geographic coverage. TrafficScience can also combine FVD with data from other sources, such as traditional fixed sensor equipment and journalistic information from eyewitness reports. This data set can be analysed to produce traffic information of great precision and accuracy, with improved timeliness and quality for both road users and road network operators.

"The traffic information which ITIS supplies meets and often exceeds all of our quality criteria"
Carl Sanderson

Outside of the radio and TV broadcast market, ITIS delivers real-time traffic information over RDS-TMC (Radio Data System Traffic Message Channel) to seventeen car manufacturers, including BMW, Mercedes, Toyota and Ford, as well as to Personal Navigation Device (PND) manufacturers such as Navman and Telmap. "The traffic information which ITIS supplies meets and often exceeds all of our quality criteria," says Carl Sanderson, General Manager, Product and Market Planning at BMW, one organisation which integrates the data onto satellite navigation software so that drivers are informed about congestion and can re-route if necessary. ITIS traffic information is available across some mobile phone networks via unique short dial numbers which can identify the traffic problems in a given area. Real time and historic data is also sold to national and local government to create a long-term picture of traffic flow patterns over time.

FVD data collection does not require any fixed roadside equipment and as a result, the cost to install and maintain TrafficScience is significantly reduced as compared to traditional methods. ITIS is building on its UK experience to enter new countries, and through licensing agreements and joint ventures, is now providing traffic information in Belgium, Australia, Ireland, Israel, and South Africa amongst others.

Want to supply traffic information? It'll take DRIVE

The deployment of TrafficScience involves sourcing appropriate data, implementing the platform, and delivering the resultant traffic information to applications. ITIS's experience and knowledge allow the focus to be on providing the platform, rather than developing applications, this methodology ensures that partners are in position to begin their development at an early stage, using reliable simulation data. Using the DRIVE methodology ensures that experience gained in previous deployments of TrafficScience is fed forward into new projects. The five phases of DRIVE are:

1. Define:
- Define the high level project scope.
- Allocate the appropriate resources.
- Identify project risks and define mitigation strategies
- Define requirements for hardware and software.
- Confirmation of the business case.

2. Requisition
- Obtain inbound data from cellular networks and other sources, including geographic mapping data.
- Obtain hardware and software required.

3. Implement
- Localise platform with mapping data.
- Deploy system.

4. Verify
- Calibrate system to road network and local conditions.
- Interface to third party applications.
- Test that reported traffic conditions match ground conditions.
- Monitor operation against proposed service level agreement.

5. Engage
- Handover system to customer or partner.
- Confirmation by the customer or partner that the system fulfils agreed requirements.

Accurate information is key

Despatching emergency vehicles rapidly can make the difference between life and death in many situations. Murdoch Mactaggart **learns from ERTICO of safety developments based on conversations between cars and the road infrastructure.**

"Information can be customised for an individual driver at a particular moment"
Vincent Blervaque

It's said that no driver is really as good as he – and here the male pronoun is more appropriate – thinks he is and, further, that in virtually every accident involving two vehicles the drivers of both have a large degree of responsibility. While a good and experienced driver will constantly be alert to subtle indicators of road conditions and the activities of others and will drive appropriately, modern cars can too often make the judging of ambient conditions difficult. Cocooned in warmth and comfort, the road noise muffled and the feedback from the road surface filtered through complex engineering processes, the driver is less in touch with what goes on between the rubber and the road than in more primitive early vehicles. Perhaps it's time to provide drivers with accurate, even personalised, dynamic information on which they can rely.

"If we have intelligent vehicles that can assess the real risk themselves ... then we can give the driver accurate and reliable information which he can trust and act on"
Maxime Flament

"There are many useful systems which contribute to vehicle safety already available." explains Vincent Blervaque, Director of Development and Deployment, ERTICO – ITS Europe. "Electronic Stability Control (ESC) is a good example. But we are now working with ERTICO partners on a new generation of ITS solutions which we call cooperative systems. These will allow vehicles to communicate with each other and with the road infrastructure."

"This will bring about a much more efficient interaction and, importantly, mean that the information can be customised for an individual driver at a particular moment. Giving the driver accurate and timely information will help him make sensible decisions about how to drive and so improve safety."

Blunt instruments

Dynamic information signs already exist, of course, typically on motorways. Gantry signs may warn of lane closures and may mandate particular speed limits for reasons of safety or traffic flow but these are still blunt instruments, apart from being very expensive. Warnings of sharp bends on secondary roads are necessarily even blunter, being predicated on giving advice with a very generous margin of error. A bend may have a sign advising 40mph, for instance, yet in dry conditions could comfortably be taken at 60mph by a driver in full control of his vehicle. Too often the consequence is that drivers discount the advice given and so may come to grief in unfamiliar circumstances.

Courtesy of Volvo Car Corporation

"There are limitations with existing systems." says Maxime Flament, Head of Sector of Safety, ERTICO – ITS Europe. "A governor may limit a truck's speed to 100kmph on a motorway but that doesn't stop it going at 90kmph in a city! Rather than just blocking speed it's better to remind the driver of appropriate limits according to conditions. With a curve, for example, there may sometimes be black ice there and so a fixed warning sign may be erected giving a low limit suitable for most conditions, say 50kmph. But in good, dry conditions 70kmph may be appropriate while occasionally it should be even lower than 50. If we have intelligent vehicles that can assess the real risk themselves, perhaps even by using sensors to measure the friction coefficient of the road surface, then we can give the driver accurate and reliable information which he can trust and act on and will respect as being helpful, think of even as a kind of personal driving assistant."

What's happening?

In 2007 there were some 1.3 million vehicle accidents in the EU resulting in 1.7 million people –more than the population of some of the smaller states – being hospitalised. Of those accidents some 38,500 resulted in the deaths of around 43,000 people, 118 daily. A 2006 paper from the Commission on the Intelligent Car Initiative suggested that at least 93% of accidents were caused by human error, indicating scope for major improvement. Since at least 2001 the EU has been concerned about reducing dramatically the death and accident toll and ERTICO – ITS Europe is working to bring about a zero accidents result through the use of ITS.

"We have three phases." explains Blervaque. "Firstly there's the research, including a focus on technical issues. This is followed by development, which might also include large scale tests to prove the concept. For instance, a large fleet of vehicles might be fitted with a system and you might analyse the changes in the drivers'

"We need to raise the awareness of users... Is it better to spend money taking care of risks to your life or on selecting a stylish metallic paint job?"
Vincent Blervaque

behaviour using the system under normal driving conditions. There we're looking not at technical issues but at social benefits and perhaps particularly safety benefits. And then, lastly, it's a matter of raising awareness and of promoting widespread deployment, bringing the product to market."

Any development work is done not by ERTICO itself but by the ERTICO partners and this covers both infrastructure and vehicle related concepts.

"On the infrastructure side we're mostly concerned with traffic management, including traffic flow" says Flament "and any safety benefits which result are incidental. It's not possible to install safety ITS solutions on every road in Europe and so installing them in vehicles makes much more sense. By providing vehicle to vehicle and vehicle to infrastructure interaction we can develop the framework so that we can really inform the driver about the conditions."

eCall

"Reducing the time between an accident and the arrival of assistance can significantly reduce fatalities."
Maxime Flament

Potentially one of the most important of these initiatives is the eCall project, part of the European Commission's wider eSafety initiative. eSafety seeks to improve road safety throughout the EU by fitting road vehicles with 'intelligent' safety systems based on advanced electronic technologies. eCall is intended to pass information instantly in the event of a vehicle accident so that appropriate assistance can be brought rapidly to affected motorists anywhere in the EU. It does this by using vehicle sensors to trigger an automatic call to the nearest emergency centre duly passing location and other information and automatically opening a voice channel which vehicle occupants can use to give more information.

"There are comparable systems already on the market" says Flament "but these are proprietary solutions and eCall is intended to offer a system which is fully interoperable irrespective of vehicle or location in the EU. Reducing the time between an accident and the arrival of assistance can significantly reduce fatalities. eCall will do this by contacting the centre as soon as an accident occurs and also by sending accurate information about the location of the accident and its severity."

"The challenge now" adds Blervaque "is to make the system compatible with the public emergency answering point network. Different member states have different emergency phone numbers, 999 in the UK for instance, but the Europe-wide 112 emergency service is an alternative route to the same facilities and is becoming more widely known and used. At present some emergency services can't take electronic messages from vehicles and so the authorities need to adapt the public answering points so that they do. Further, each member state has its own organisation structure around how to organise this service and this makes matters very complex when trying to deploy a single, harmonised system. It's moving forward and it's more complex than we initially expected but I have no doubt that it will happen."

It's not just in saving lives that eCall can bring benefits. There are major economic costs associated with accidents – treament costs, loss of earnings or trade, unnecessary energy use costs and more. The overall figure in the EU is estimated at some €160 billion annually and it's thought that if all cars were equipped with the eCall system this figure could be cut by €26 billion and that in addition around 2,500 lives would be saved and tens of thousand of injuries avoided.

So far just over half the EU's 27 members, the UK not included, have signed a formal commitment to the programme although there are over seventy other formal commitments from the automotive industry and from private and other organisations with road traffic interests. The European Commission has recently launched a new implementation platform to support and accelerate the deployment of eCall throughout Europe. The aim is to develop a clear and agreed programme to provide the momentum to make eCall a reality in the near future.

The future

"The main problem today is not the availability of technology but the business model." says Blervaque. "We need to raise the awareness of users, the people who actually buy cars, so that they understand the benefits of spending money to buy these systems. Is it better to spend money taking care of risks to your life or on selecting a stylish metallic paint job?"

"But it's also something where the authorities perhaps have a responsibility" he adds. "Sometimes they offer incentives to buy an energy efficient car, a green car. That's a great idea but why not extend this concept to offering incentives to buy a safer car. And there could be a system to rate cars for safety improvement so that you knew better what you were getting. It's easier with a green car – you know that maybe you'll save 20% of your fuel bill but unless you've actually experienced an accident you don't really know in the same way how important safety feature might be. One of the most important issues we have to deal with today is to accelerate market penetration."

And what of the recession? With car manufacturers in trouble worldwide this is a difficult time to persuade buyers to spend more on refinements.

"That's a difficult one." concedes Flament. "But I believe that if people learn of the benefits which these systems can bring then they will start to buy them. The penetration rate is getting much faster now for ITS systems. And if you look at navigation systems, that's one of the success stories of the last five years. I think as people learn what real benefits safety systems can bring they'll start to judge them as essential and take-up will increase."

Opening up machine-to-machine communication

Cars that talk to us, to each other and to central information centres? It must be the new generation of automotive telematics. By Joanna Bawa

"With the rapid growth of telecommunications networks and the demand for more sophisticated information about traffic operations and movements, we have seen an explosive growth in the capabilities of automotive telematics."
Herbert Scheitler

Intelligent transportation means many things, but at its core is the use of technology to enhance information flows between vehicles and within the transportation infrastructure. This improved information flow raises awareness of automotive operation among drivers, passengers and other transportation users, improving safety, efficiency and traffic flow. Central to that technology is the CPU (central processing unit) which enables machine-to-machine communication and forms a crucial part of all vehicle telematics, integrating data processing power, robust electronics and the wider telecommunication network.

The manufacturers of these CPUs are an essential link in the process of building every product and technology within the broad field of machine-to-machine (M2M) communication. Typically they work in partnership with the tier of companies known as OEMs (own equipment manufacturers) to develop specific products which have CPU chips embedded within them. These are then sold on to the automotive manufacturers, including General Motors, Toyota, Ford, Volkswagen and similar. Current estimates put the market for automotive telematics at around 18 million vehicles within Europe and 70 million globally, with interest in the capabilities of these devices growing all the time.

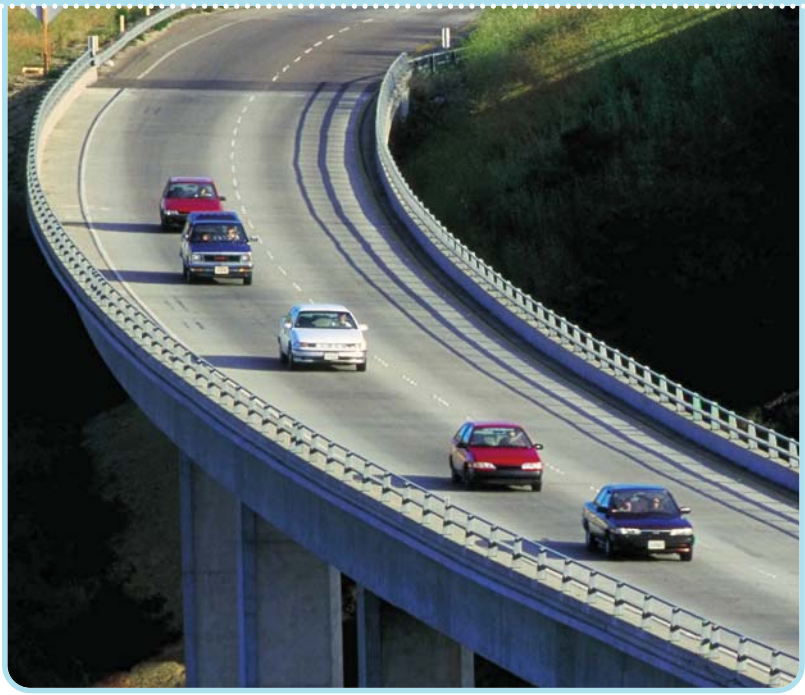
The growth of automotive telematics

"Vehicle telematics once extended no further than the in-car radio and music system," comments Herbert Scheitler, Vice President, Automotive, at Paris-based embedded wireless technology provider, Wavecom. "With the rapid growth of telecommunications networks and the demand for more sophisticated information about traffic operations and movements, we have seen an explosive growth in the capabilities of automotive telematics."

Wavecom technologies for automotive telematics comprise families of programmable processors designed for wireless machine-to-machine communication, which also act as wireless modules or wireless modems complete with software and operating system. The most recent solutions can even include an embedded SIM card. Its Q26 family of Wireless CPUs is used for tracking goods as well as vehicles, and is designed for rapid mounting on printed circuit boards during the production assembly process. It comprises both GSM/GPRS, EDGE and 3G products as well as CDMA solutions.

The Q52 Omni combines cellular, satellite and GPS technology in a single device. Capable of enduring even the harshest environmental conditions, the Q52 Omni was created to enable cost-effective remote monitoring and control of assets absolutely anywhere in the world. Increasingly widely used in the automotive industry, it is particularly suited for tracking high-value equipment, and for the control of transportation and logistics. Along with automotive telematics and tracking, these Wireless CPUs appear in smart metering, fleet management, wireless alarms, wireless POS (point of sales), WLL (fixed voice), remote monitoring and many other M2M applications.

"The important aspect of Wavecom's technology is its ability to exploit the mobile phone networks, providing data transmission routes between individual vehicles, between vehicles and road safety management centres, and between automotive organisations and civil authorities," continues Scheitler. The potential to connect vehicles with each other as well as with stationary information centres makes a variety of products and services possible. Currently awaiting final standardisation is an emergency call service which will ultimately be fitted as standard in all vehicles. "The eCall is something like an aeroplane black box, holding sensitive monitoring technology within a rugged exterior," Scheitler explains. "If a sudden impact occurs – such as a crash – the eCall box automatically begins to transmit alerts to local emergency services requesting an immediate response."



Advanced Driver Solutions

"Pay-as-you-drive solutions have the potential to influence driver behaviour for the better, reduce individual insurance premiums and increase general road safety levels,"
- Herbert Scheitler

Herbert Scheitler

The ability to monitor a vehicle and respond to status changes internally and externally underpins many of the trends in automotive telematics, often grouped beneath the umbrella term, Advanced Driver Solutions. Extensive connectivity can provide notification of external events such as accidents, road blockages or traffic queues, and also scan for alternative routes. Connections with other information services provide longer range route preparation services as well as weather warnings. Within the vehicle, the same technology enables passenger entertainment as well as internet access and full telephony, and will also monitor the vehicle's engine and electricals to warn of potential problems and communicate with external services to organise repair and maintenance.

Across the globe, traffic management increasingly means traffic reduction, and intelligent transportation systems are at the heart of this endeavour. "A critical application which we'll see more of is motorway tolling," says Herbert Scheitler, "and we can expect it to extend beyond motorways into local roads, town centres and even parking facilities." Connectivity between vehicle and banking service makes automatic tolling straightforward – and once this becomes widely used, the scope for related services increases. "Pay-as-you-drive solutions have the potential to influence driver behaviour for the better, reduce individual insurance premiums and increase general road safety levels," Scheitler explains.

Remote tracking and management

Essentially, pay-as-you drive is a form of Vehicle Remote Management (VRM), whereby tracking technology monitors the location of the vehicle and maintains a communication channel with various external service providers. Tolls are deducted from the driver's bank account as the vehicle approaches automatic tolling booths, and the amount can be determined depending on whether the vehicle is a car, van or lorry. At the same time, internal sensors monitor vehicle speed and driver behaviour – such as acceleration and braking – to construct a picture of the driver's safety with regard to other road users. It is not in use yet, but entirely feasible that driver insurance premiums will be partly determined by this kind of data in the future, with consistently safe drivers paying lower premiums than those with bad or unsafe driving habits.

Even vehicle tracking alone is a key service, enabling navigation and automatic alert services but also providing a means to track stolen vehicles. "Tracking technology is popular in different countries for different reasons," says Scheitler. "For some it represents a way of getting relevant local information; for others it is an essential tool for preventing theft. In Brazil, for example, all cars are equipped with a tracking system for this reason."

The uses to which automotive telematics can be put are many, and increasingly varied as new capabilities emerge. Even so, other factors are at play. "Technology is not the only factor in the uptake of automotive communications," says Herbert Scheitler. "The breadth of service which is possible and the sophistication of the technology mean that social, cultural and political factors have a bearing on which devices are preferred, which are viewed with suspicion and which are eventually deployed."

Political and environmental pressures mean that greater fuel efficiency is a high priority within most governments and local authorities, so road tolling receives high levels of support. Security and theft prevention receive more attention elsewhere, while information services are more important in urban areas. "There's also growing interest in commercial applications, such as fleet management, which lets fleet managers maintain dynamic information about the status, service history and mileage, as well as the location, of every vehicle," adds Scheitler. Further on, there is likely to be an increase in the use of Intelligent Device Services (IDS), whereby in-car devices communicate regularly with service centres. When upgrades are available these are downloaded automatically, much as computers update themselves over the internet.

eCall: coming soon to a vehicle near you

eCall is the pan-European in-vehicle emergency Call project, part of a European Union initiative to establish a Europe-wide location-enhanced emergency-response network based on the emergency phone number 112. eCall contributes to a 2003 EU directive, whose goal is to reduce the number of highway fatalities in the European Union by a half, by the year 2010. The 112 number is accessible from virtually all wired and mobile phones in Europe, and in most places is accessible even from GSM phones without a SIM card.

Emergency calls arrive at a "Public Safety Answering Point" or PSAP; and emergency response units are dispatched from the PSAP. One conclusion is that 'several thousands of lives could be saved in the EU by improving the response times of the emergency services and post-impact care in the event of road traffic accidents.' The eCall system proposes to include location information with the emergency call. This information is to be gathered by an in-car device and transmitted with the call. A study has concluded that 'an eCall system which relays the accurate location of the accident to the PSAP and the emergency services will allow a reduction of response time to the accident of about 50% in rural areas and up to 40% in urban areas.'

The European Commission aims for adoption of eCall by all European member states, but the process is slower than initially expected. In parallel, the automotive industry and the public emergency services are working towards a standardisation of the treatment of eCalls. An introduction of eCall as an option in new car models is expected within a timeframe of 2-3 years from now.

Over the longer term, the eCall project is expected to drive the introduction of GSM-enabled equipment in all cars, making possible new services ranging from simple hands-free car kits to telematic services including remote diagnostics, fleet management, Pay-as-You-Drive insurance options, stolen vehicle tracking (SVT) and electronic fee /toll collection (EFC) to name a few. The eCall in-vehicle system (IVS) is the first phase of vehicles with embedded

Delivering transport that works for everyone

According to the UK Government's 'Future of Transport' White Paper, 'an individual using the UK transport system has the right to expect a safe, seamless, efficient, comfortable, accessible and reliable journey'.
Susan Venables **looks at the role innovITS is playing in the development of Intelligent Transport Systems to help deliver against these objectives.**

"…ITS brings significant economic, environmental and social benefits and is widely seen as the key to ensuring a safe, efficient, environmentally sustainable and affordable road transport system for the future."
Phil Pettitt

Intelligent Transport Systems (ITS) are already bringing new levels of safety, reliability, convenience, accessibility and choice to users of transport systems. Because of this Governments around the world are including ITS as an important part of their delivery plans for future transport. This is reflected in the fact that the global market for ITS and Services (ITSS) is expected to grow from $19billion in 2005 to $65billion by 2020.

In the UK the Government is committed to delivering a seamless, efficient transport system, especially on the roads, and again ITS is a key component in its strategy. The ITS policy framework for the roads sector, announced in 2005, introduced a number of new targets and objectives and in particular outlined the importance of promoting innovation in information technology and telecommunications (IT&T) and bringing business, research and government organisations closer together to help develop future ITS solutions. Also as part of the Government's programme the ITS Centre for Excellence for Transport Telematics and Sustainable Mobility was created called innovITS.

Accelerating the pace of change

Established in 2005 in response to recommendations from the Automotive Innovation & Growth Team (AIGT), innovITS was set up as a non-profit organisation by the Department for Business Enterprise and Regulatory Reform (BERR). Its fundamental objective is to help the UK become a leading centre of excellence, delivering world-class ITS solutions, and has set out to achieve this by fostering innovation and providing a platform to build collaborative partnerships between the Automotive, Highways and IT&T industries.

"Our aim is to accelerate the exploitation of innovative technologies that are realistic and can be validated to ensure that they deliver value to road users and transport operators alike."
Phil Pettitt

"There is no doubt that ITS brings significant economic, environmental and social benefits and is widely seen as the key to ensuring a safe, efficient, environmentally sustainable and affordable road transport system for the future," explains Phil Pettitt, innovITS CEO. "Our aim therefore is to accelerate the exploitation of innovative technologies that are realistic and can be validated to ensure that they deliver value to road users and transport operators alike. But also important is ensuring that solutions developed can not only be used to solve transport problems, but are commercially viable enabling UK businesses to take advantage of the growing global market opportunities in ITS."

As well as this innovITS supports the achievement of the Government's national transport policy objectives and targets. These aim to tackle the challenges in terms of reducing congestion and pollution; improving road safety; providing better travel and traveller information; improving public transport on the roads and supporting the efficiency of the road freight industry. "There is no doubt that innovITS is now playing a crucial role in helping to find solutions to these challenges," adds Pettitt, "and by driving a more joined-up approach we can realise the potential of ITS to solve these complex problems."

Innovation and collaboration

In essence innovITS is about co-operation and facilitating an environment that brings a range of organisations together to work collaboratively that might not necessarily have done so in the past. "The development and implementation of products and systems based on ITS technologies cuts across many long-standing industrial, business and governmental boundaries," states Pettitt. "But by creating a range of programmes, research and development (R&D) projects and facilities for sharing information, innovITS is beginning to bridge the gap between these groups, meaning that organisations – such as government policy makers, businesses from the telecommunications, automotive and electronics industries, highways authorities and academia - can together focus on particular challenges to create more innovative solutions."

A core part of innovITS' activity is the 'ITS Knowledge Transfer Network', which links people with expertise in a broad range of technologies through workshops, events, collaborative groups and networking. This supports the work of the 'ITSS Innovation Platform', the Technology Strategy Board Programme which aims to pull together policy, business, government procurement and research perspectives as well as funding and resources to support innovation projects. Recently innovITS also started facITS, a programme that aims to establish a framework architecture and classification for co-operative in-vehicle ITS that industry organisations can use to help build confidence and trust between independent yet co-operating systems.

Other important projects sponsored by innovITS include the 'Sentience Project', a unique collaborative consortium of industry stakeholders which aims to assess and demonstrate the fuel efficiency improvements and resultant cost savings that can be achieved through the use of Telematics data; and CoDriver Alert which provides real time traffic data to improve the safety of a journey. Plus planning is underway for 'innovITS – Advance' which is a futuristic R&D centre that will enable customers from all the relevant industries, authorities and road operators, to develop, test and validate future transport telematics technologies in a safe highly controlled environment.

Driving future transport technologies

"Providing the opportunity for very different organisations to bring their specialities together is the way to help develop a truly efficient transport system for the future," concludes Pettitt. "Facilitating a more rapid introduction of ITS can only be a good thing, not only in terms of benefits for society as a whole, but also for UK industry to position itself as a global leader."

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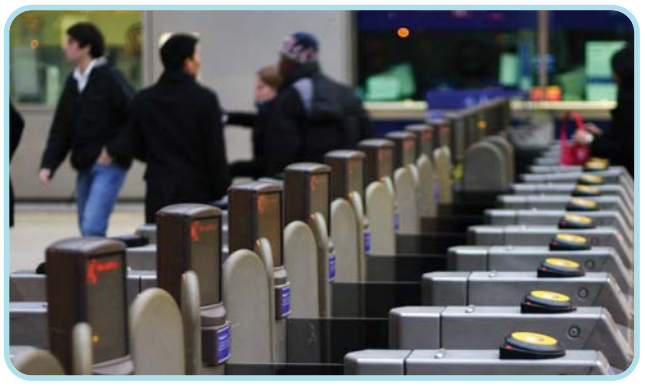
Fares fair: making intermodal smart ticketing work



Beneath the simplicity of the Oyster card lies a complex architecture which other cities are keen to emulate. Technology is the least of their worries, says CTS.

By Joanna Bawa

In a survey which asked: "which objects should be preserved to show people what life was like in 2007?" the Oyster card scored 13%, second only to the iPod at 36%. Oyster is a blue, contactless smartcard which may be 'recharged' from numerous sales points, and which is passed over electronic readers when entering and leaving the transport system to validate it or deduct funds. The ability of the Oyster card to make life easier for travellers within the UK's capital city is significant – and has not been lost on other local authorities and transportation services.

"While such a project may appear daunting, the technology exists, it's proven, and we've already delivered it."
Marcus Platts

With London now amongst the most advanced European city in terms of transportation and ticketing, many cities nationally and across the world aspire to emulate the success of Oyster card. "One of the most distinctive features of Oyster is that it is intermodal, meaning it works across multiple forms of transport – such as trains, buses and trams," explains Marcus Platts, Managing Director for Continental Europe at Cubic Transportation Systems (CTS), one of the main architects of the Oyster card system. "No other large European city has this facility, so even though travellers have the convenience of a smart card on, say, the trains, they need a different card, or even cash, if their journey involves a bus or tram as well."

Operators pulling together

An individual city may have multiple bus companies, train lines and tram operators, each offering a slightly different fare structure. To work, a single smart ticket must accommodate all of these, enabling individuals to move from one form of transport to another without needing to pay again. There must also be some mechanism for calculating the proportion for each leg of a multi-modal journey due to each operator and ensuring payments are made accordingly. But a greater choice of modalities means that each mode may lose revenue as travellers take advantage of such flexibility, meaning that operators will need incentives to provide the level of co-operation and information sharing needed to make such a system work. "Smart ticketing is relatively easy to deploy across a single train line or a bus network, but politically and operationally it is far, far harder to roll out across multiple networks," says Marcus Platts.

"We all want the same thing – fewer people in cars, more people on good, affordable public transport."
Marcus Platts

Which is why the success of Oyster is so notable, and so powerful an example for other cities. On the basis of a long-standing relationship with the then London Transport, CTS developed and built a smart card reader in the early 1990s. In 1998 this became the central technology of the Oyster card system, in a PFI project run jointly with EDS. Co-ordinated since 2000 by what is now Transport for London (TfL), Oyster integrates intermodal fares, which are set by TfLin a way which makes revenue simpler to manage and charge passengers fairly, with, for instance, daily capping.

"Utilising an agreed smart card standard is important to a Transport Authority," says Marcus Platts. "Even so, deploying something as powerful as Oyster across a city the size of London requires political leadership – and an experienced technology partner. And while such a project may appear daunting, the technology exists, it's proven, and we've already delivered it. Ultimately, I'm optimistic because we all want the same thing – fewer people in cars, more people on good, affordable public transport."

ITSO aims for interoperability

Connecting up intermodal smart ticketing solutions within cities is one thing; interconnecting them between cities, nations and continents is quite another. The management challenges are significant, but as the variation between distances, currencies, and fare hierarchies increases, no amount of agreement can work without adherence to robust and widely accepted technological standards. As the first intermodal system, elements of Oyster's technology was developed specifically for London and remains essentially single city specific. In order to succeed, future systems will need to consider a wider geographic environment - and operate accordingly.

Much of the work necessary to achieve this is being undertaken by ITSO Limited, a non-for-profit membership organisation supported by the UK Department for Transport. ITSO was founded in 1998 as a result of discussions between various UK Passenger Transport Authorities concerning the lack of suitable standards for inter-operable smartcard ticketing. The result is a common specification at both the card and application level, to facilitate the use of interoperable smart cards in transport and other areas.

ITSO aims to build and maintain a specification for secure 'end to end' inter-operable ticketing transactions, based on relevant ISO and emerging CEN standards, making it potentially suitable for other applications of smartcards, for example, citizens' applications, car parking, loyalty schemes and similar. It is a member-controlled which includes PTEs, Local Authorities, Passenger Transport Operators and Suppliers of equipment, systems and services.

Ticketing technology by operators for operators

With ticketing systems having a life span of 15 years and more, durability and sustainability are a key concern for transport operators. But longevity does not have to some at the cost of security. By Anne English

Across our cities people commute every day in cars, on buses, trains, trams and subways. They use parking facilities, tolls, public facilities such as swimming pools, libraries and so on. And each mode of transport or facility has its own payment or ticketing system – a plethora of separate cards for the consumer and distribution terminals for the operator. So how do you amalgamate each of these disparate systems without incurring the wrath of compromised security?

"… the best approach is to use security components that are the latest and best on the market as opposed to developing our own …"
Phillipe Vappereau

The answer is 'contactless' technology - secure, contactless transactions between portable objects and terminals with decentralised security. The idea with contactless technology is that you can use a series of different applications from the one single 'smart card' thereby amalgamating payment and access to the many disparate services and facilities that we interact with on a daily basis.

3rd generation technology

After paper tickets and then magnetic technology, the 3rd generation technology nowadays is smart cards using this contactless technology.

Contactless technology is based on inductive transmission, which is used in the transmission between a smart card and a terminal. The smart card holds and processes information while the terminal (validators, vending machines and so on) reads or modifies this information. Used for ticketing, payment and related services, inductive transmission offers several advantages to operators including contactless transactions, speed of transaction, reduced energy consumption, as well as being less expensive than infra-red for example.

Smart cards and security

The concern most often voiced in relation to smart cards is security. According to Phillipe Vappereau, Chairperson of Calypso Networks Association, "Security can be a subjective concept but we found that the best approach is to use security components that are the latest and best on the market as opposed to developing our own security components or being biased towards any one manufacturer."

"…open, independent, highly secure and standards-compliant smart cards are essential for sustainable but more importantly secure ticketing systems for the future"
Phillipe Vappereau

The seed for Calypso Networks Association, was planted by a European Commission co-funded project that ended in 2001. The Association was set up in 2003, to keep the Calypso specification independent of industry and provide a central contact point for all Calypso technology related issues as well as its business development. One of the achievements of this non-profit association was to build a ticketing system that was transport operator-centric and independent of any manufacturer bias. It seeks to help transport operators better manage services and to modify them according to users' needs and in doing so decrease fraud and falsification. Micro processor based contactless technology is extremely difficult to be reproduce or modify. It also helps decrease evasion of fare payment as validation is always compulsory for all on-board users.

Added to the increased security, it helps develop fare integration with all public and private companies, as the profit distribution is carried out on the basis of the on-board validations. And you can get more different services on the same card, such as car-parking and so on.

The Association itself is made up of transport and service partners from Brussels, Lisbon, Konstanz, Paris and Venice and prides itself on solutions built by operators for operators. According to Ralph Gambetta, who is responsible for Promotion and Business Development at Calypso, "It hinges around three working groups, a 'Specifications and Technical Development' group, a 'Compatibility and Interoperability' group and a 'Promotion and Business Development' group."

Micro processors versus memory cards

According to Vappereau, "Microprocessor cards as opposed to simple memory cards are the key to ensuring security of data. We use micro processor cards in all of our solutions to ensure highest se-

"The beauty of these cards lies not only in their security but also in their integration with other systems and compatibility with all main standards"
Etienne Graindor

curity. In fact open, independent, highly secure and standards-compliant smart cards are essential for sustainable but more importantly secure ticketing systems for the future."

Calypso technology's microprocessors use mutual authentication, through random numbers exchanged from a reader and portable object and processed in security algorithms to certify that the reader, the card and the data are genuine. Just as with any micro processor smart card, a set of keys for each application is used. An issuing key is used to set up the application, a reloading key is used to load contracts in the application and a debit key to execute a contract.

Champions of adoption

The early involvement of the five countries Belgium, Portugal, Germany, France and Italy has made them to become champions in the adoption of contactless technology in their own transport systems. The Portuguese capital Lisbon, was one of the first full contactless systems in the world. More than 1000 different ticket types in a paper-based form underpinned the enormous effort in promoting the new technologies. With the set up of OTLIS (the Lisbon transport authority), an entity was created that was responsible for eTicketing system and revenue allocation to the different transport operators in the region on the basis of usage data harvested from the contactless smart card system.

When the Calypso project was brought to fruition, it included scalability for pan- European implementation and it's now gone beyond that having been chosen as the preferred specification outside of Europe too. For example, Israel has chosen it as their national specification. There are also implementations in Riga, Montreal and Caracas. Switzerland, which is in itself a showcase for public transport, has adopted Calypso technology.

Smart card usage in Brussels

The city of Brussels copes with 615,000 commuters every working day and annually some 170,000,000. This travel activity represents 32% of the market of motorised trips and 90% of public transport trips. Brussels Operator System STIB (Société des Transports intercommunaux de Bruxelles) operates three transport modes, underground, tramways and buses. Etienne Graindor who is Secretary of Calypso was in charge of the introduction and development of the Smart Ticketing Systems in Brussels. He explains, "You need to invest your money in principles of durability and highest security. Calypso had the high level of adaptability and flexibility that we needed."

In Brussels, they have MoBIB, a multi-application mobility city card, which provides access to a range of amenities including sporting events, theatre, swimming pools and so on and also complementary mobility cards with which you can even hire city cars and bicycles. Graindor says, "We will be able to use the MoBIB card all over Brussels and its suburbs. This is a large step towards interoperability for us. And indeed it is characterised by real flexibility as the card can be used for public transport for the daily commute to work during the week and then the same person who prefers to use their car for a shopping expedition at the weekend can use the smart card to pay for the parking facilities at their local supermarket." Other Belgian transport operators are also currently undergoing implementation of the system with a launch target date of 2013.

Beauty in integration and compatibility

Graindor adds, "The beauty of these cards lies not only in their security but also in their integration with other systems and compatibility with all main standards. Because the security is compartmentalised under keys, it works somewhat like a bank card that communicates with an ATM using an algorithm and a key. In fact the Calypso solution offers the same level and principles of security as the most secure bank cards. And this use of active micro processors as opposed to passive memory cards sets Calypso apart from its competitors. Many of Calypso's board members are members of national standards bodies so the technology is very closely aligned to international standards bodies and is compliant with all of the main standards. Calypso is also agnostic to technology so its contactless technology federates and integrates other applications or facets of city life. The cards integrate seamlessly with the various elements of the transport ecosystem and other facets of daily city life. And now that it's possible to reload the card via the internet, the end user doesn't even need to go to a vending machine. For the operator, this decreases the cost of distribution and increases profitability substantially."

As a world leader for mircroprocessor contactless technology, Calypso's claim that their smart cards are today's card interfacing with tomorrow's system does not seem far of the mark.

Calypso technology in Paris

RATP (Régie Autonome des Transports Parisien/Autonomous Operator of Parisian Transport) is the major transit operator responsible for public transport in Paris and its surroundings. Its NAVIGO pass has been gradually introduced since 2001 as an answer to ticketing and is set to replace its magnetic stripe cards. NAVIGO can be used in a contact-based or contactless form and meets the specifications required by Calypso. Having access to a technology that could store and process different data securely and swiftly gave RATP clearer insight into passenger needs helped them build a closer and more personalised relationship with them. Teleticketing is also paving the way for other methods of purchasing in Paris such as topping up subscriptions by telephone, internet or vending machines and for other methods of payment, thanks to the 'e-purse'.

Calypso technology in Capri

Capri's three main transport companies carry over 7.600.000 passengers a year. Calypso was the most developed and therefore tested electronic ticketing system to adopt. In addition, it is based on standard ISO, so it ensured the three local transport companies were able to participate in an integrated fare system applied called "UNICO CAPRI". The use of Calypso technology ensured the best compatibility between different kinds of smart cards and validation machines. In the experience of Capri it was possible to utilise two different types of smart cards, based on GTML and CTS technology, but both based on the same Calypso project protocol. In particular, the CTS smart cards have been introduced since the 16th of July 2002, while the GTML smart cards since the 1st of October 2002.

2009 ITS World Congress: not just boys' toys

The decision to hold the 2009 Intelligent Transport Systems (ITS) World Congress in Stockholm was taken in 2003. Since then the Swedes have treated the event as a key milestone to work towards and one at which they will show the considerable advances they have been making in ITS. Their focus has been on collaborative best practice and the tangible benefits of ITS for both society and the end user. By Anne English

Sweden's main transport players from road, rail, maritime and aviation have embarked on a mission to deploy concrete, integrated solutions that showcase how multi-modality can be deployed in day-to-day life. And in doing so they are showing how ITS can achieve tangible benefits at both a societal and a customer level.

"Volvo set themselves the goal that by 2020 there would be no fatalities in Volvo cars"
Ingemar Skogo

Idealistic aims?

The aim is for these two goals to coincide, that the important social goal of better road safety, for example, also becomes an objective for customers.

Six focus areas, namely traffic guidance, logistics, traveller information, road safety support systems, e-payments and personal safety as well as security are being addressed by the business community, public authorities and the academic world to show validated contributions at both societal and customer level.

"We want to show how intelligent transport systems and services work in daily life, with applications that we tried and tested here in Sweden…"
Ingemar Skogo

The Swedish Road Administration (SRA), a government agency, is responsible for the road safety support systems strand. Speaking about the long term perspective taken by the various authorities who have taken ownership of each of the focus areas, Ingemar Skogo, Director General of the SRA, said, "We view the ITS World Congress in 2009 as a milestone where we can demonstrate the benefit of using ITS in daily life and show what can be achieved to benefit both society and the individual at the same time. Each of the organisations involved in the preparation for the World Congress is now focusing on documenting the benefits of the ITS applications that they have developed, tested and used within each focus area. They are also capturing synergies between the focus areas that are promoting long-term collaboration and mutual benefit."

Forerunners in safety

Sweden is a forerunner in road traffic safety. The SRA has been promoting the use of 'Alcolocks'. They have made use of these alcohol detection units a standard requirement for services such as taxis and school buses, for example, and are trying to make the devices standard in all vehicles. The idea is not to label people as alcoholics but rather to create a demand for this safety device in the market and pave the way for its inclusion in legislation. According to Skogo, "We now have around forty thousand Alcolocks installed in vehicles across Sweden and despite the initial scepticism the device has become widely accepted by the travelling public."

Reducing speed

Also contributing to the lower road traffic accident statistics in Sweden is the Intelligent Speed Adaptation (ISA) Device.This GPS-related device is attached to a database that contains details on all roads and their respective speed limits. It sends the driver alerts stating what the speed limit is on a particular stretch of road and reminds drivers to reduce speed. Skogo explains, "So far this is a standalone device but we are keen for it to be introduced as an integrated part of GPS units. We continue to be a catalytic force by creating the market for it so that the producers will integrate it in their products. The fact is that if such devices are integrated with GPS, for example, and produced on a large scale, they become less expensive and more accessible for the end user and ultimately reduce the number of speed-related fatalities at a greater rate."

Sustainable travel

The SRA is using eco-driving – that is, driving in a manner which is as environmentally friendly as possible - as a way to promote sustainable travel. Drivers use brakes as little as possible, reduce speed when approaching traffic lights, and so on. According to Skogo, "We have found that if you undertake a short training course that only takes an hour, you can already reduce your fuel consumption by 12 or 13 percent. If you are a driver of a large commercial vehicle this also involves a considerable cost reduction. In addition, we are working with oil and transport companies to promote CO2 neutral transport and reduce emissions by 50% by 2020." The SRA also works with those who are procuring transport to develop schemes that enable them to invest in more energy efficient and sustainable methods of transport. So the focus is not only in those who are doing the transporting but also those who are buying and contracting transport itself.

Achieving best practice

Skogo explains how leading names in Swedish industry are setting best practice. "Volvo, for example, set themselves a goal that by 2020 there would be no fatalities in or involving Volvo cars. They recognised that they would have to work closely with those who provide the infrastructure. If you want lane departure control, for example, you need to cooperate with those who provide that lane. So Volvo and the SRA signed an agreement to cooperate on achieving this goal. In concrete terms this means that the lanes, road signage,

"We view the ITS World Congress in 2009 as a milestone where we can demonstrate the benefit of using ITS in daily life"
Ingemar Skogo

roadside communication and so on, all need to work optimally." In fact, the SRA is exemplary in this respect as they are one of the first government agencies in the world to have signed such an agreement with a car manufacturer.

Putting the jigsaw together

In Sweden there is broad recognition that there is a strong symbiotic relationship between all of the players across the sector. Skogo explains, "Our success is dependent on good relationships with the surrounding society and we have long been a proponent of cross-collaboration between all players from the police force, the car manufacturers, the infrastructure providers to the technology providers."

And Skogo brings this partnership full circle. He says, "In fact, especially in times like these, we need good cars and good roads to be able to support our economies even more efficiently and safely than before".

Less boys' toys, more 'ITS in Daily Life'

Traditionally the ITS World Congress has been seen by some as a boys' toys event and it is the aim of the SRA to show that it can be much more than that. According to Skogo, "We want to show how intelligent transport systems and services work in daily life, with applications that we tried and tested here in Sweden and know to benefit the man in the street. The 2009 World Congress has a strong emphasis on co-modality (recognising the advantages of each mode of transport) and ITS solutions for road, rail, shipping, aviation and public transport. We also want to foster interoperability in ITS. ITS should be a natural choice in the development of all transport systems and we'll offer some best practices that can improve everyday mobility as well as show how this can benefit end users and help reduce the negative impact on the environment caused by today's transport."

Volvo cars and the SRA

In September 2008 a letter of intent was signed by Volvo Cars and the SRA. Volvo Cars has a target that no one should be killed or seriously injured in or by a Volvo car by year model 2020. In order to reach the target Volvo Cars cooperates with other key stakeholders and has a common interest with the SRA in reaching this target. In particular Volvo Cars and the SRA, together with the other stakeholders, will promote the safe use of the road transport systems and establish criteria and expectations on driver performance and limitations, as well as driver responsibilities. They will offer techniques and criteria for driver support and collaborate on the safety of infrastructure elements, such as barriers, side areas and intersections. They will also collaborate on urban design, location and quality of road signs and road markings, intelligent car to infrastructure communication and road maintenance standards.

Swedish Networks of Excellence

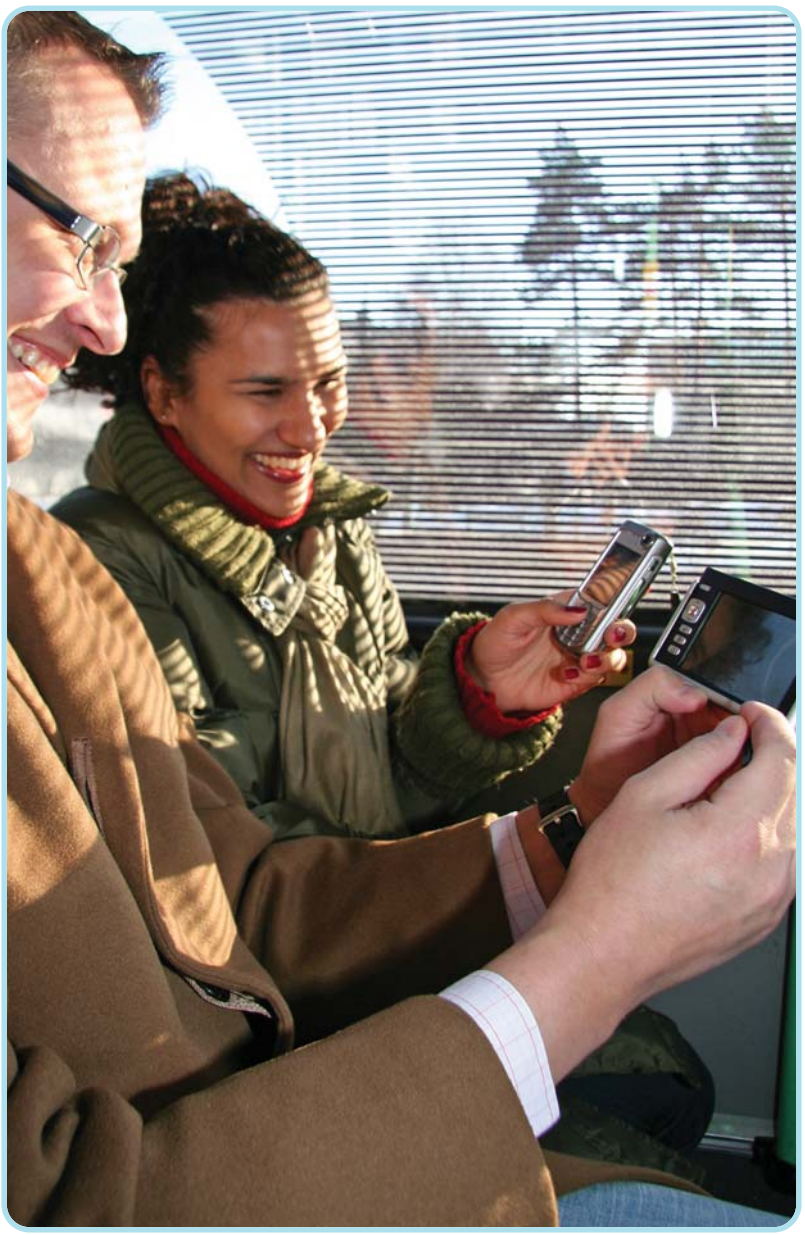
The SRA is investing in Swedish Networks of Excellence to strengthen Swedish research and development on the requirements of the road transport sector in Sweden and Europe. A Swedish Network of Excellence, previously called a 'Virtual R&D Centre', consists of prominent research and development bodies throughout Sweden that co-operate in larger composite projects adapted to the explicit needs of the SRA and other funding agencies. One benefit of coordination and common resources is that they increase the potential for the individual research and development bodies to participate in EU research programmes. Co-operation also means similar bodies complement one another rather than compete and can conduct larger integrated projects instead of limited, similar, overlapping ones.

Vision Zero governs Swedish traffic

Work by the SRA on traffic safety is based on 'Vision Zero', meaning that it is unacceptable for anyone to be killed or injured for life in a traffic accident. Sweden is already among those countries with the lowest number of traffic fatalities in relation to its population. This Vision Zero goal was ratified by the Swedish Parliament in 1997 and is based on the Vision Zero programme. The programme includes a review of mass media campaigns in road safety, recommendations for cost-effective infrastructure measures on rural roads, measures for traffic calming in built-up areas, studies on the influence of chronic illness on crash involvement of motor vehicle drivers and the effects of information campaigns on behaviour and road accidents.

Speed, reliability and real-time information

With a mission to create the preconditions for a well-functioning and vital city whilst providing equal mobility for all, Helsinki City Transport's ambitious project to transform its public transport system is now delivering what it set out to achieve. Susan Venables **explains how.**



More than 220 million journeys are made each year on Helsinki's public transport system, just over one third by bus, one quarter by metro, one quarter by tram and the rest by commuter train, which represents over 50 percent of daily journeys within the city. It is the responsibility of Helsinki City Transport (HKL) to maintain the economy of this transport system which consists of about 550 buses, 130 trams and 54 metro trains.

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Ville Lehmuskoski

"The main benefit of the network connection will be to speed up public transport and shorten travel time."

Juha Malmberg

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Certainly both busses and trams have established their position as the main form of public transport in the inner city and have long had a reputation for being reliable and easy to use. But with increasing use of the transport system and the public's demand for an even better, faster more user friendly service, HKL has developed a solution which set out to not only address these issues but to deliver significant cost savings and other important quality factors for the travelling public.

The need for speed

HELMI is the name of Helsinki's public transport traffic-light priority and real-time information system and covers all tram lines and 15 central bus lines. "HKL has been using this system since 1999 so we were well aware of the benefits it could deliver such as increased speed and reliability of services," states Ville Lehmuskoski, Planning Director HKL. "Despite this Helsinki City Council demanded improvements in the transport services and in 2005 set new targets to increase further the speed of bus traffic by 6 percent and tram traffic by 4 percent by 2012."

"Research had revealed that by increasing the speed, reliability and convenience of the transport system this would encourage more people to use it helping to lower overall traffic volumes. Our challenge was to not only find a solution to achieve this, but one that would also deliver significant cost savings and socio-economic benefits."

Green is for go

"We have found the answer by introducing a new traffic-light priority and real-time information system, which we have called HELMI2," explains Lehmuskoski. "Unlike the original system, HELMI2 uses high precision GPS receivers and each vehicle uses a mobile broadband internet connection to send its position to a central server. The traffic light priority system then uses positioning information from the server to send priority requests directly to intersections via the wireless broadband, meaning busses or trams get a green light when approaching a cross-road so there is no need for them to stop."

HELMI2 equipment is currently installed in approximately 35 buses and 40 trams. The system is still in the pilot phase, with different components and traffic light priorities being tested. "Our current goal is to start installations for the HELMI2 production system in the first half of 2009 and to complete installations for the core system during 2010," adds Lehmuskoski. "The plan is for the core system to cover the 550 buses and 130 trams operating regularly and almost all of Helsinki's 300 signalised intersections."

The solution

The digital mobile broadband network is based on Digita's @450 services and from the passengers' point of view, according to Juha Malmberg, Business Director, Digita: "The main benefit of the net

"The main advantage is that management of the system and collation of all data is now centralised enabling the delivery of versatile passenger information in real-time.."

Mika Varjola

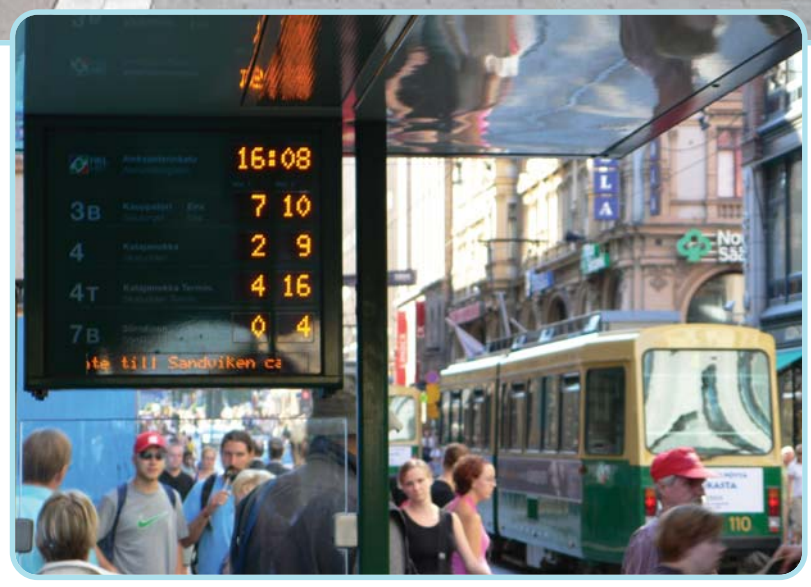
work connection will be to speed up public transport and shorten travel time. And in addition to a smoother journey, passengers will be able to retrieve real-time public transport information as well as obtaining free internet connection. Also passengers can follow their route from their own terminals and check the schedules of their connections. Plus the advantages of the network are high-speed data transfer and shorter delays than in the mobile phone network which, from the viewpoint of the user, means quicker downloading of files."

In order to provide flexibility and scalability for improving and adding new transport services, HELMI2 has been built around standard Internet technologies, using open interfaces and server-based architecture. "The main advantage is that management of the system and collation of all data is now centralised enabling instant system updates and the delivery of versatile passenger information in real-time to in-vehicle displays, terminal displays and the Internet," states Mika Varjola, Head of Unit, Transport Information Systems, WSP Finland – who designed and implemented the pilot system. "As data on the position, speed and direction of all vehicles is updated on the database every second, control and efficiency of the transport system can be maintained with complete accuracy."

Significant time and cost savings

"There is no doubt that the HELMI2 will ensure that HKL will reach its targets and even though still in pilot phase the system has an estimated economic cost-benefit ratio of 3:1 and socio-economic cost-benefit ratio of 7.5:1," claims Lehmuskoski. "And despite investment costs of around €3.4million and annual running costs of €0.8million, HKL has calculated that the full scale implementation of the system will save the city €4.6million per annum and another €6.6milliom in passenger travel time savings per annum. But not only that, we now have the opportunity to open up a whole host of new services to benefit the passenger to speed their journey in a reliable manner."

To see Helsinki City Transport system live go to http://www.hkl.fi/kartta



The 21st century rail network

There are major rail incompatibility problems across Europe and as a result freight usage is low and services generally are poorer than they could be. Murdoch Mactaggart **learns of an initiative to transform the European rail network into the best in the world.**

European rail transport is in a mess, Eurostar and other fast direct services notwithstanding. There are major incompatibilities between national rail services and this directly affects performance. Rail gauges, rolling stock specifications, electricity voltages, coupling and signalling systems, and wireless communication protocols can differ country to country. There are twenty different train control systems across the EU, let alone Europe as a whole, and there are 35 different European radio communication systems. All this leads to delays in cross-border services, unreliable time-keeping, and increased costs for both passenger and freight traffic.

"Rail interoperability simply does not exist in Europe."
Fabio Croccolo

Rail transport is environmentally kinder than road although the exact differences depend on many factors, including which locomotives are used and how energy is generated. Rail is also potentially much faster and cheaper for longer distances and the necessary land use is less. However, rail lacks the destination flexibility of road and so it makes sense to use road transport primarily for local carriage and use rail for longer distances, switching between the two at inter-modal hubs.

Fabio Croccolo is a former chair of the UNECE Working Party on Rail Transport and is a Board Member of the UN Inland Transport Committee (UNITC) and an advisor on railway matters to the Italian government. UNITC looks at regulations on an extremely wide range of transport-related issues including such disparate matters as the colours of traffic lights, the bores of pipes for delivering fuel, road construction conventions, rail or road border crossings, and much more. It's become a de facto worldwide forum on transport regulation.

Old fashioned and conservative

"Rail is the most old-fashioned and conservative of the transport modes." explains Croccolo. "One reason is the substantial legacy infrastructure in each country. Secondly, there's a major emphasis on safety and this leads to a desire not to change anything working correctly. And the third reason is because of the history of European railways."

"Rail is the most old-fashioned and most conservative of the transport modes."
Fabio Croccolo

Croccolo explains than in Italy the first ever railways served the port of Naples in order to provide ready access to naval shipping for military reasons. Countries would typically use their own national development and engineering processes but might also intentionally vary track gauges and other specification from those of their neighbours in order to prevent easy rail access without permission.

No interoperability

"Rail interoperability simply does not exist in Europe" adds Croccolo "although there are attempts to get round that. For example, you could use multi-tension locomotives for different electricity supplies across borders, or have special wheels to cope with different gauges, but the costs of such approaches are high and speed and convenience can be affected. And, unlike in aviation or maritime, there's no tradition of mainly using English and that means that train crews need to understand the local languages."

But surely I can get on a train in London, say, and with no more than a change or two end up in Geneva or Rome or Budapest or perhaps even Moscow?

"Your carriage might arrive in Moscow, certainly," says Croccolo "but your locomotive will have been changed many times and so will the personnel. And there will have been delays at border crossings. Crossing from Poland to Russia, for instance, the wheels on your carriage will have been changed. You cannot consider just the carriage but must think of the train – and the train will have been split and recombined many times in order to allow you to remain in the same carriage."

A new management system

Changing physical infrastructure is a complex and expensive process but progress towards standardisation is being made. Importantly, the EU decided in the early 1990s to support development of a common European-wide signalling and management system to replace existing country systems and to improve on the best of them. This is the European Train Control System (ETCS) which with GSM-R (see sidebar) makes up the European Railway Traffic Management System (ERTMS).

There are three levels of signalling management in ETCS. In level 1 a cab signalling system is superimposed on the existing trackside system, collecting information as the train passes over the Eurobalise transponders (see sidebar) on the track. The first such implementation was on the Zaragoza-Huesca high speed line in December 2004 and many others are now in place, including in China and elsewhere.

Level 2 is a radio-based signal system making visual track signals redundant although they typically remain in place and may still be used in part. Trains automatically report their location and other parameters as they pass over Eurobalises and are constantly monitored by the centre and controlled as necessary, communication being by GSM-R. Several level 2 installations are already in place or planned.

Level 3 is a full radio-based train management system with very comprehensive safety and reliability features. One major benefit is that many more trains will be able to run safely in given periods and at higher speeds – a 40% increase is estimated and speeds up to 500km/hour are supported. Level 3 is currently under development and because of the complex nature of the system will need new rolling stock to be deployed.

"ERTMS will transform rail movement in Europe into perhaps the most efficient in the world." **Fabio Croccolo**

The world's most performant system

"Safety remains paramount" says Croccolo "but commercial considerations are also important and at present relatively little freight goes by rail, certainly compared with the potential. One common complaint is that there's no punctuality in delivery - sometimes you won't even know where your freight has got or when the train might arrive, an incredible situation. Further, there's no compensation framework in place."

Quality of service is an important consideration for transport and its lack, coupled with associated through-ticketing and pricing limitations, may help to explain why only 10% of European freight goes by rail compared with some 40% in the US. ERTMS will gradually replace existing incompatible systems and promises to make dramatic improvements to journey times, punctuality and capacity. There's enthusiastic interest in much of the rest of the world, including in India, Saudi Arabia, China, Taiwan and South Korea, and that, coupled with the essential standardisation elements, augurs well not just for European rail transport but also for the mainly European companies developing and deploying the technology.

"It's a huge step" adds Croccolo "and will transform rail movement in Europe into perhaps the most efficient in the world."

GSM-R

GSM (Global System for Communication) is the standard for cellular telephony developed initially in the late 1980s to provide a common standard for mobile phones across Europe. It's now used by some 80% of the global mobile market and in over two hundred countries.

GSM-R (GSM for Railways) is a specialist variant of GSM which also draws on relevant railway-related communication specifications and is used to communicate between railway control centres and trains moving at up to 500 km/h (just over 300mph). There are currently some 35 different radio systems used throughout Europe and a major benefit of GSM-R is to provide radio interoperability as part of the wider push for interoperability across the whole rail network.

Like any GSM network GSM-R handles both voice and data and so can be used as a conventional mobile phone by the train driver. It also supports conference calling, voice broadcasting and can handle high-priority emergency calls. Its data transmission capabilities are an important part of the train management system and are used to transmit relevant data, obtained from track balises and other sources, to control centres.

Implementation is done using dedicated base stations along the line of the railway and around three to four kilometres apart to provide a very high level of reliability. The train itself maintains contact through a circuit switched connection to the control centre, designed so that if contact is lost the train will be halted automatically.

RFID and transponders

RFID (Radio Frequency IDentification) is now being widely deployed in a variety of sectors, most particularly in enterprise supply chain management, healthcare, animal management and veterinary services, road toll collection, and for a number of safety and security applications. The devices often used to guard against retail theft and car keys used to control engine starting typically use RFID but the technology is used in many other applications, often highly sophisticated.

The process is basically one of automatic identification although devices can often store far more information than merely ID. A system consists of two communicating parts - a tag, also called a transponder, and a reader. Tags can now be minute in size and can even be printed direct on packaging using special inks. A reader interrogates a nearby tag and so identifies the object to which it's attached, perhaps receiving further information from the tag.

Passive tags are cheap and inert, being "woken up" and duly deriving the energy necessary for them to communicate from the radio waves propagated by the reader; active tags have batteries and are much more complex and expensive but can be used for sophisticated applications - for instance, monitoring dynamically and recording the ambient conditions in a container of perishable food.

RFID is now used extensively in automatic train protection systems, the name for the specialist transponder used being balise (from the French for "beacon") or, more specifically, Eurobalise. These are used in pairs and are ordinarily fixed on or between the sleepers on the track. Train computer systems passing overhead continuously interrogate the balises and so receive track, route, speed limit and other location-dependant information, allowing them to monitor and control conditions and, if necessary, stop the train automatically.

More detailed technical information, together with numerous case studies of practical RFID use, can be found in a companion briefing to this one at www.rfidbriefing.com.

Mobility as a driver for economic growth

Sustainable mobility is about moving people and goods in ways that reduce impact on the environment, the economy and society. What new approaches and technological advancements can be applied to help reach this aim?
By Susan Venables.

Transport is the lifeblood of modern economies as it provides mobility and the basis for economic growth. But transport is also the source of many of the problems societies face today. As mobility accelerates worldwide stakeholders are becoming more concerned about congestion, inadequate infrastructures, land use, noise and pollution and the ever increasing reliance on non-renewable resources. The EU's White Paper on Transport Policy highlighted that transport is responsible for 31% of energy consumption and contributes 26% of all CO_2 emissions.

"Road pricing is not only a good idea but inevitable and is almost always the best way to allocate a scarce resource…"
Martial Chevreuil

Current mobility trends are unsustainable and simply building new transport infrastructures is unlikely to solve the problems. National governments agree that transport needs to become more efficient, more equitable and less disruptive, but transport still poses one of the greatest policy challenges for achieving sustainable mobility and economic development. New approaches are required to help balance the positive and negative impacts of transport and indeed, by encouraging technological innovation and promoting behavioural change, this could hold the key to future transformation.

Creating a sustainable environment

There is clear evidence that a comprehensive and high-performing transport system is an important enabler to sustained economic prosperity. "In fact it was the Eddington Transport Study, 2006, that highlighted that in the UK a 5% reduction in travel time for all business and freight travel on the roads could generate around £2.5 billion of cost savings," explains Jeremy McCluskey, UK Managing Director, Egis Mobilité. "But, that being said, the inextricable link between transport and the economy brings with it many challenges and addressing them does require a sophisticated approach."

"…the inextricable link between transport and the economy brings with it many challenges and addressing them does require a sophisticated approach."
Jeremy McCluskey

Getting transport policies right means making a comprehensive assessment of the full range of economic, environmental and social impacts. It requires considerable foresight and an understanding of all the various elements involved in transport systems. "Whether it's pricing, traffic management or road safety - they are all linked. And certainly what can help bring it all together is the application of new information and communication technologies," adds McCluskey. "Not to suggest this is the panacea, but Egis' 20 years experience of design and implementation of advanced intelligent transport solutions demonstrates the value they can deliver in terms of creating sustainable mobility whilst maintaining a sustainable environment."

Road pricing

Improving mobility whilst preserving the environment is about reaching a compromise and this is why many governments have introduced or are considering introducing national 'road pricing policies' – charges for road use. Martial Chevreuil, Executive VP, Strategic Policy and Development, Egis Mobilité, agrees that: "Road pricing is not only a good idea but inevitable and most densely populated high-income countries will have some form of road pricing within the next three decades."

"Pricing is almost always the best way to allocate a scarce resource and it has already been proved that it is the most efficient way to ration road space, consistent with freedom of choice," Chevreuil goes on to say. "Not only does it help to save costs and reduce congestion and transport's environmental impact, but it brings predictability to end-to-end journey times, not only for the individual but for the transportation of freight. Indeed, the Eddington Report calculated that a 'UK national road pricing scheme' could reduce congestion by 50% below what it otherwise would be in 2025 and produce benefits worth £28 billion a year by 2025."

To ensure that road pricing works, putting in place the infrastructure along with the right intelligent transport solutions is critical – such as electronic tolling systems. And certainly Egis have been involved in the successful implementation of many such tolling infrastructure projects across Europe. "But what's key is that this is not just about introducing national road pricing, and other transport infrastructure systems, that work in isolation, as remember transport crosses boundaries," adds Chevreuil. "Systems need to be able to integrate and communicate with each other and this is why our design and project engineering is focussed on developing standards to enhance technological harmonisation and interoperability."

A holistic approach

As governments increasingly recognise sustainability as a core guiding principle, the need for more sustainable transport systems is a priority. McCluskey concludes: "It's about developing transportation that does not jeopardize public health or ecosystems but still meets growing mobility needs. This can be achieved as now there is a realisation that transport can't be considered in isolation due to its inextricable link with the environment, global economies and energy resources."

"This means developing a holistic approach where all these factors can be considered and for me the true integration of technologies is the key. I believe it's already providing the platform for sustainable development and, ultimately, facilitating migration to the inevitable changes which will happen during the next 50 years - for example a change to a 'hydrogen-economy' away from failing to sustain the current 'hydro-carbon' one."

No downturn in demand on infrastructure capacity

About 80% of total transport in Europe is by road. According to current midterm forecasts, road traffic in Europe is expected to increase by about 2% each year for the next 15-20 years. And even during the current economic downturn the demand for mobility is set to continue to grow. So how do we minimise the inevitable consequences of this strain?

By Anne English

The consequences are of course accidents, traffic jams, reduced efficiency and even greater emissions. We rely on injections of cash from national administrations through direct tax revenues to fund the construction and maintenance of transport infrastructure. And at a time when we need to focus on economic growth and bolster national GDP, we face cuts in investments from cash strapped government bodies.

Smarter infrastructure

"Europe could be a world-leader in cooperative transport management…"
Dr Reinhard Pfliegl

Increasing the capacity of current transport systems does need to lie solely in investment in more infrastructure but rather in smarter infrastructure. According to experts this can be realised by using telematics, a relatively young discipline that helps policymakers and operators develop and implement sustainable, compatible transport policies as well as foster new systems and services.

One part of telematics portfolio is information services for road transport. Both the Japanese with the Vehicle Infrastructure Communication System (VICS/SmartDrive) programme and the Americans with the Vehicle Infrastructure Integration (VII/IntelliDrive) programme have already invested heavily in ITS. The European Commission has also been funding ITS via its research and development programmes since the early 1990s. The expected benefits of smart infrastructure are safer, more efficient and more environmentally friendly transport and better use of existing infrastructure capacities. Since 2005, funding has focused on cooperative traffic management which has three main application areas: infrastructure to vehicle communication, autonomous vehicles systems and vehicle-to-vehicle communication. These services have the potential to be the missing link that we need to reap the much anticipated but not yet fully achieved benefits of smart infrastructure.

The European Commission ITS action plan

"Harmonisation is paramount for Europe to address its own capacity issues…"
Dr Reinhard Pfliegl

Seamless, cross-border solutions play a major role for a pan-European transport management. On 16 December 2008, the European Commission took a major step towards the deployment and use of ITS in road transport by launching a concrete action plan. The plan suggests a number of targeted measures for ITS and a proposal for a Directive to lay down the framework for their implementation. The goal is to create the momentum needed to speed up market penetration of quite mature ITS applications and services in Europe.

Austrian showcase

"The Telematics Master Plan Austria … sets a strategy and recommendations for the best application of telematics…"
Dr Reinhard Pfliegl

Austria has become a showcase for intelligent transport initiatives in Europe with its national master plan for telematics and services deployment as well as its involvement in pan-European initiatives. AustriaTech, which itself was set up in 2005 by the Austrian Ministry for Transport, Innovation and Technology, initiated ITS Austria, a platform to support the sharing of knowledge and strengthening of links between key players across Austria's transport arena.

Dr Reinhard Pfliegl, Managing Director of AustriaTech, Federal Agency for Technological Measures Ltd, in Austria explains, "The Telematics Master Plan Austria provides guidelines for future telematics applications in transport and traffic in Austria addressing cost/benefit perspectives from public government point of view. It ensures a bottom-up deployment of the latest in ITS and sets a strategy and recommendations for the best application of telematics in Austria. The plan spans not only road, but also rail, air and inland waterway transport. And Austria contributes significantly to each mode especially since the accession of East European states to the EU made Austria a more fulcrum point in European transport."

Harmonisation as a European goal

According to Pfliegl, "Europe could be a world-leader in cooperative transport management in all modes of transport and the European Commission is making significant steps towards this." Major efforts have already been made to consolidate transport, innovation and technology as key enabler for stimulating ITS. And international cooperation in the development of new telematics applications is the prerequisite for the implementation of standardised solutions across the European market.

According to Pfliegl, "Harmonisation is paramount for Europe to address its own capacity issues and an integral part of our path to becoming world leaders in ITS. The current economic crisis should be seen as an opportunity to stimulate innovation and foster the implementation of smart infrastructure. Harmonisation is crucial on a technical, legal and logistical level across each of the member states. European partners need to cooperate so that our systems are integrated, compliant with European standards and aligned with European policy."

Telematics

Telematics is a combination of telecommunication, automation and informatics and combines a wide area of ICT applications and components to monitor, control and manage traffic in a safe, efficient and sustainable manner.

Coopers

AustriaTech is the coordinator of the pan European research project Coopers – Cooperative Systems for Intelligent Road Safety. Pfliegl explains, "Coopers is looking at ways to enhance both vehicle and infrastructure telematics to enable better use of the available infrastructure capacity. Some 120 researchers across Europe are looking at new processes for the early avoidance of traffics jams and establishing fast, safe and reliable real-time information about congestion and accidents and so on."

This is your consignment calling ...

Freight transport is a vitally important component of trade yet suffers from serious inefficiencies. Murdoch Mactaggart **learns of moves to develop intelligent cargo.**

Freight transport faces serious problems. During the last half-century air freight grew dramatically, increasing at approximately 12% annually, but since autumn 2008 has gone into serious decline. Some commentators suggest that air freight will never recover to former levels, partly for environmental and cost reasons but also because supply chains are shortening.

"Step by step you're making things easier even for the skilled driver or the fleet manager with many years of logistics experience" **Zeljko Jeftic**

Air freight is less important within Europe but the potential of a relevant alternative, rail, is seriously compromised by lack of cross-border interoperability. This is being addressed by the introduction of a highly sophisticated ITS approach, the European Railway Traffic Management System, but it will be some years before that helps turn Europe's rail network into arguably the most efficient in the world. In the meantime, a mere 10% of freight traffic goes by rail compared with four times that proportion in the US.

Road freight has its own problems while the increasingly preferred approach of co-modality – combining different forms of transport for optimal movement of freight – suffers from inefficiencies, particularly around exchanging information and handling schedules and processes, perhaps particularly at border crossings.

Complex routing and procedures

"Even within Europe a shipment may be handled by many different organisations, cross a number of borders and be carried on several different vehicles or forms of transport." says Zeljko Jeftic, Project Manager for Freight Services, ERTICO – ITS Europe. "There's a lot of inefficiencies there. In many cases electronic documentation isn't available and most of the work is still done manually. Customs can't then prepare for the passage of shipments and if a shipment's delayed then often the only way you'll know is if someone responsible in an office somewhere rings up to tell the shipper or the consignee starts chasing a missing delivery."

"At ERTICO we're considering the future world of intelligent mobility where everything is connected – travellers, connected vehicles and infrastructure, and now, connected goods" **Zeljko Jeftic**

"The technologies are already there in many cases" he adds "but there are too many barriers in the way of those systems being used. Interoperability is a major problem. You don't have agreed standards between major stakeholders as to how messages should be communicated. XML is important in logistics but there's lack of agreement on its use and there aren't common sets of standards for communications protocols. And some companies are making money out of dealing with this non-optimised handling of goods and so they don't want change."

A further problem is that the road freight industry is very fragmented ranging from substantial logistics companies like DHL, now part of Deutsche Post, right down to tiny operators with only one or two trucks mainly used for local freight.

"A lot of freight operators are family businesses with very few trucks," says Jeftic "perhaps just father and son driving together. Often the only ICT component they'll have in their trucks is a mobile phone – that's what they use for business most of the time. It might be difficult to persuade them to invest in equipment to share a common platform with the larger fleet operators."

Cost will always be a factor but the important point is to show the value which ITS solutions for freight transport might bring to freight companies and their customers, large and small.

Overcoming delays

"ITS can certainly help you in your work." explains Jeftic. "Today, if you're delayed, stuck in a traffic jam perhaps, then you need to notify your fleet management centre and get them to reschedule your deliveries, reschedule your ferry crossing, whatever it happens to be. You might run out of permitted driving time or the ferry might be full and so there might need to be many telephone calls before everything is sorted. That's distracting work for you or a further load on your back office. And then you might be delayed yet again!"

With freight ITS all this could be done automatically, perhaps triggered following an analysis based on your truck's location at a given time coupled with knowledge of your planned schedule. Your truck management system would simply talk with the other systems involved to renegotiate a viable new schedule. It would then present this to you for confirmation before accepting it and perhaps informing your customer or destination warehouse of the new timings.

Nice idea, but would it work? Computer systems are excellent for fast and accurate number-crunching and for managing straightforward logical services but they tend to fall down when presented with complex or messy requirements outside their immediate domain of expertise. Too often also, perhaps, what seem to be useful support systems are really solutions looking for problems which an experienced worker could easily overcome.

"Of course it's the case that the driver or the logistics clerk will be much more intelligent than the system" agrees Jeftic "but if the sys-

tem can help with certain functionalities you give more time for the humans to focus on the more important tasks, the ones they can do better. There's perhaps a link here with safety systems such as collision avoidance systems, adaptive cruise control, electronic stability control systems, all of which make driving much safer without reducing the importance of good driving."

"EURIDICE is an important project built on an ambitious vision and when it's fully implemented will make a huge difference to European freight transport."
Zeljko Jeftic

"We're not going all the way to totally autonomous driving" he adds "but step by step you're enhancing the intelligence of the system, not just on the road but also in areas like fleet management systems. Step by step we're making things easier even for the skilled driver or for the fleet manager with many years of logistics experience. And we're trying very much to stay focussed from the user point of view."

Communicating vehicles, communicating freight

Jeftic is particularly involved with an ERTICO-led initiative, co-ordinated by colleague Paul Kompfner, seeking to develop a system facilitating vehicle to vehicle and vehicle to infrastructure communication, a project known as CVIS (the Cooperative Vehicle Infrastructure System). Related to the wider vision of the internet of things – the approach towards turning everyday objects such as cars or roads or fridges or packets of soup into individually-addressable intelligent components capable of responding to the ambient environment and to relevant instructions, irrespective of location – this foresees cars becoming active communicators within dynamic networks to the benefit both of individual drivers and those around them.

"At ERTICO we're considering the future world of intelligent mobility where everything is connected – connected and informed travellers, connected vehicles and infrastructure, and now connected goods." explains Jeftic. "For example, a packet on a truck could communicate through the truck's systems with anything anywhere in the world because the truck is now part of the IPv6 global network. That's the only viable solution I see in the future because using point-to-point GSM or 3G routing will be too expensive and it's important to consider costs here."

This view makes sense, given the steady development of backhaul broadband technologies and packet switching technologies, the growth of metropolitan area networks and the growing deployment of IPv6. However the important point, as Jeftic acknowledges, is to ensure that no single communications approach is mandated and that a range of alternatives is supported so that different approaches can be used according to circumstances.

EURIDICE has an optimistic timescale - it claims that in five years time most of the goods flowing through the European freight corridors will be intelligent - but this may meet the harsh practical realities and almost inevitable delays around implementing complex technologies in sectors with established routines and many different stakeholders, as has indeed happened with the deployment of RFID in the wider retail supply chain.

Saying this doesn't diminish the very real importance of the initiative, of course. "EURIDICE is an important project built on an ambitious vision" says Jeftic "and when it's fully implemented will make a huge difference to European freight transport."

No looking back

Somewhat more prosaic than the mythical wife of Orpheus EURIDICE (European Inter-Disciplinary Research on Intelligent Cargo for Efficient, Safe and Environment-friendly Logistics) is a project seeking to develop an advanced European logistics system around the concept of 'intelligent cargo' which here means self-identifying freight, which is easy to interact and communicate with, so providing information services en route as required.

EURIDICE began in February 2008, runs for three years and is funded by the EU's Seventh Framework Programme ICT for Transport Area. It's led by INSIEL spa of Italy and has 22 partners. ERTICO is not itself involved in the project but ERTICO partners such as Oracle, Logica and the Technical Research Centre of Finland – VTT are.

The project's focus is to build an information services platform centred on the individual cargo item and its interaction with the surrounding environment and the user. This will consist of a fixed and mobile web services infrastructure supporting dynamic services combinations to address required user-cargo-context interactions. The three levels of services are identified as immediate proximity services, supply chain services and freight corridor services. Examples of the first include RFID-based cargo identification services as well as warehouse, intermodal, vehicle and similar services.

Interoperability is a major design focus so that those with relevant need and authority can access the services they need on a given cargo item at any point on its travels throughout Europe, duly connecting the cargo item with back-office users and consumers as appropriate. Back-office systems integration appears to be the biggest barrier to adoption of cargo information services, ignoring for the moment the large number of small or medium companies with limited or even non-existent ICT resources.

EURIDICE aims at a paradigm shift leading to mass adoption by the largest community of potential users, namely small logistics operators. These will be able to use plug-and-play tags and smart devices supported by an ubiquitous infrastructure providing basic information services such as identification, track and trace or proof of delivery, at virtually no integration cost. This shared services platform, named ORPHEUS (Object Recognition and Positioning Hosted European Service), can be used by companies and providers to integrate their own advanced services, an approach which removes the need to reinvent the wheel, a common failing of proprietary platforms and a consequent risk to interoperability.

Simulating reality to realise the future

While early traffic models were quite aggregate and could neither capture nor extrapolate much of the detail on what was happening on our roads, technology has gradually caught up with the ambitions of early exponents.

By Anne English

"The simulations provide an impartial platform to decision makers and engineers alike and assurance that they are making the right decisions as they can quantify the impact of each potential decision"
Jaime Ferrer

The day is gone when traffic engineers could do little more than model the movement of vehicles along main corridors and across intersections using the behaviour of fluids as their best analogy. Technology and computer hardware has now made possible a far more detailed study of traffic. And something that was developed in the late 80s and early 90s has became commercial software and is widely accepted, namely, traffic micro simulation.

Traffic micro simulation

Traffic micro simulation makes it possible to understand how traffic is distributed or congestion develops and spreads though a city or highway network. This is achieved by focussing on the movement and choices of each particular vehicle. People have, for example, different preferences in relation to speed, the aggression with which they change lane or indeed the way in which they plan their route. All of these decisions by each driver collectively affect traffic. So why has this category of software become so popular over the last ten years or so?

From obscure to ubiquitous

"A hybrid simulator means an optimal blend of power, speed and scalability on the one hand, and accuracy on the other"
Dr Jordi Casas

According to Jaime Ferrer, Managing Director at TSS - Transport Simulation Systems, which produces one such widely used traffic simulation product called Aimsun, "It began as interesting if slightly obscure software within academia, but traffic micro simulation is now a must in any serious assessment: intersection design, dedicated bus lanes, toll booths, congestion charging - in essence anything that changes the configuration of the city or highway network. It's an environment for conducting fast, safe, accurate and above all inexpensive virtual experiments."

Data availability

So how does it work? Micro simulation can tap into the vast array of data sources available now such as mapping technology, GPS, CCTV, detectors at intersections and probe data. It produces numerical outputs and animated videos which show what the real road network would look like - the same effect as if you had the luxury of being able to make changes to the road network or the way it was managed and then film from a helicopter for several hours whilst collecting information from every vehicle, second-by-second.

Planning

Traffic engineering is about trying to understand what will happen if you make certain infrastructure or operational changes. With traffic micro simulation products you can create a virtual testing environment. A good model will be life-like in its detail including advanced traffic management, public and private transport, pedestrians and adaptive signal control leading to a very realistic depiction of a city's traffic operations. You can navigate around the model in 3D or, indeed hide the model completely and build complex measures of effectiveness. According to Ferrer, "The simulations provide an impartial platform to decision makers and engineers alike and assurance that they are making the right decisions as they can quantify the impact of each potential decision".

Operations

A novel application of micro simulation software is its use to enhance day-to-day traffic operations. In a traffic control centre, experience coupled with simple models helps to deal with local, repeatable congestion. However, nonrecurring and network-wide events are a tough nut to crack. The use of traffic simulation ensures that future traffic predictions are more accurate; and that response to incidents, routing of emergency vehicles, advice to citizens, reduction of emissions all become more efficient.

Power, speed and scalability

To make meaningful decisions in real time, simulation software needs to generate a concrete, feasible recommendation in seconds. Products such as Aimsun are by design take advantage of the prevailing multi-core hardware architecture. It is now possible to micro-simulate the entire city of Singapore faster than real time on an ordinary laptop computer. On a large model like this, calibration, that is adjusting the parameters of the model such that its outputs agree with field data from a given city network, can be an arduous task. Cue mesoscopic and hybrid simulation.

Dr Jordi Casas, Director of Research and Development at TSS explains, "Mesoscopic simulation, which is detailed enough to deal with traffic control plans and changing demand, yet rapid enough to deal with huge networks and easier to calibrate, used in tandem with micro simulation, ensures even shorter times to build and run a simulation model."

So combining the two simulation models at the same time into a hybrid simulator means an optimal blend of power, speed and scalability on the one hand, and accuracy on the other.

Aimsun in action

The integrated transport modelling software has nearly 1,300 users worldwide, or around 530 organisations using the product. Aimsun has been used for applications of many scales and complexity: from optimising a toll gate in Tokyo's Cargo Terminal to helping control, in real time, the traffic lights around the entire ring-road of Madrid and simulating the traffic of the entire city centre of Barcelona at morning peak time up to 60 times faster than real time.

Electric vehicles set to go mainstream?

With surging oil prices and growing environmental pressures on manufacturers and motorists to adopt greener vehicles the market for electric cars, with green credentials, could not be better. But what is stalling the wholesale defection from conventional internal combustion engines? Susan Venables **reports.**

According to the Stern Report, a 2006 study commissioned by the UK Government, transport is the world's third biggest source of greenhouse gas emissions, accounting for 14% of the total. The number of vehicles in use around the world, moreover, is expected to grow rapidly as emerging economies develop. It is no wonder that most national governments now view transport policy as playing a vital part in tackling climate change and reducing carbon dioxide (CO^2) levels.

"Achieving a low-carbon electricity infrastructure is going to be difficult but if greenhouse gas emissions from road transport are to be cut substantially electric vehicles must play a large part."
Simon Wood

Certainly tighter environmental regulations are focusing carmakers' minds as never before, arguably giving electric models a new lease of life as witnessed through carmakers' fast-tracking an unprecedented number of these vehicles through their product pipelines.

There is no doubt that there is a tremendous momentum building for demand of electric vehicles (EVs) and, according to Roland Berger Strategy Consultants, over the next decade they could count for more than 25% of the European market and 10% globally. If so, it would mark one of the biggest technological shifts in a century of automotive history.

The surge in electrification

"EVs offer the best chance of creating zero-emission cars," states Simon Wood, Technical Director Lotus Engineering. "Several hundred million dollars is being invested in developing EVs by all the major car manufacturers and many of the international motor shows clearly demonstrate that this is a fad on the brink of becoming a trend."

"Only as recently as a year ago carmakers' green-car announcements often had overtones of worthy science projects or corporate window-dressing, and were not to be taken seriously. But recent actions point to electric propulsion becoming a core business. The reason for this is that despite alternatives – such as biofuels and hydrogen - the car industry sees electrification as the simplest way to deliver the big increases in miles per gallon and reductions in CO2 that regulators are demanding. That combined with incentives being offered to consumers - like lower road tax and congestion charge discounts - means we are going to see more changes in powertrain technology over the next five years than we've seen in the last fifty. Being an international automotive engineering consultancy, Lotus certainly plans to be part of that revolution."

"…to build a mass market manufacturers have to develop vehicles that ask drivers to sacrifice little or nothing in comfort, convenience or performance."
Simon Wood

Reality or Panacea

"However like most revolutions this one has complex causes and there are issues that still need to be addressed," continues Wood. "Even though EVs are often regarded as the ideal non-polluters it is not quite that simple. They're obviously good for lack of tailpipe emissions, but they need to carry rechargeable batteries which can be heavy and bulky with very low energy densities, meaning their range is limited to about 40-60 miles on a single charge.

Also topping up batteries involves plugging in for several hours and recharge points are still scarce. Plus there are issues around the recharging infrastructure - how is it going to work and where is it going to come from?"

Several conditions need to be met before the technology can be classed as truly carbon-free, the most important of which is outside car manufacturers' control – where the electricity comes from. "As to whether an EV is greener than a conventional one is largely a function of how the electricity is generated," explains Wood. "If it comes from burning fossil fuels then the car will have a high carbon footprint but if power comes solely from renewable sources the car will be zero-emission."

"Achieving a low-carbon electricity infrastructure is going to be difficult but if greenhouse gas emissions from road transport are to be cut substantially EVs must play a large part. According to the King Review of transport emissions, 'fully electric, battery-powered vehicles, if using zero or low-carbon electricity, offer the most direct opportunity to decarbonise road transport over the longer term', and we must work to achieve this."

Making inroads

"Despite the challenges the automotive world is ever adapting to achieve a greener future," states Wood. "Certainly at Lotus we are developing green technology to make EVs become a reality and are working on several EV projects with carmakers. But we realise that to build a mass market manufacturers have to develop vehicles that ask drivers to sacrifice little or nothing in comfort, convenience or performance. The development of the Tesla Roadster, a battery-powered sports car built by Lotus, is just one example of how this can be achieved."

EVs are making inroads, but they are only likely to become the cars of choice once the infrastructure around recharging points is improved. "But this will come," claims Wood. "Already power utilities - seeing EVs as a future source of demand for their off-peak capacity - are forging bonds with carmakers to work together on building the infrastructure to recharge and service EVs. Plus with advancements in the development of lithium-ion batteries these can store enough energy to propel vehicles over meaningful distances."

"Finally and even more importantly, there are signs that growing production scale and rising carbon taxes are easing the main deterrent to drivers buying EVs: price. In 10 years time driving an EV will be something no longer to be snubbed but something to be desired."

Taking a strategic view of transport worldwide

Transport and economic well-being are intimately connected yet many lessons need still to be learned. Murdoch Mactaggart **hears of an international organisation looking strategically at worldwide transport issues.**

Transport often has a bad press. A quarter of all CO_2 emissions are transport related, three quarters of that overall figure from road transport. Well over a million people are killed annually on the world's roads and anything up to a further fifty million are injured. Maritime transport has the dubious distinction of providing one of the world's worst ecological disasters when the Exxon Valdez ran into a reef and spilt some 41 million litres of crude oil into the sea off Alaska. Protestors are becoming increasingly incensed by what they see as wholly unnecessary airport expansion blighting their lives

"Until recently there's been no single organisation providing the opportunity to think more strategically, more holistically, about the whole transport sector internationally."
Jack Short

Transport activity is also an essential concomitant of trade, especially global trade. As Joseph Stiglitz, Nobel laureate economist, and others have pointed out, the callous approach of too many international corporations and the emphasis of governments on constant economic growth have led to serious social damage and justified unrest and so it's important also to look in detail at issues other than purely economic ones. With transport, the need is to decouple the energy use and negative impact of transport from its place as an essential function of long-term economic growth and social wellbeing.

"The impacts of climate change are potentially so catastrophic that the need for action is overwhelming. Business as usual is not an option."
Jack Short

Thinking strategically about worldwide transport

"Until recently there was no single body looking at all the modes of transport worldwide." explains Jack Short, Secretary-General of the International Transport Forum (ITF). "You have the likes of the International Civil Aviation Organisation or the International Maritime Organisation but there's been no single organisation providing the opportunity to think more strategically, more holistically, about the whole transport sector internationally."

The ITF is an independent body of the OECD, the Paris-based forum and research institute which brings together governments committed to democracy and the market economy to examine common problems around economic, social and environmental issues. Like the OECD itself, the ITF is a member-driven organisation with no formal legal authority and which relies on peer pressure to help bring about member government policy changes.

"We were called the European Conference of Ministers of Transport" adds Short "and a couple of years ago we changed into a body with a more global focus. There are 51 member countries but although all the OECD countries are members – including of course Canada and the US - we're broader than that. We have a raft of members from central and eastern Europe, Russia included. India is now a member and we're looking to have both China and Brazil join. We're a forum for transport ministers to consider economic and policy issues and we're a think tank which provides the opportunity for discussion, analysis and thinking about all transport sectors globally."

Like the OECD, the ITF has a justified reputation for the quality of its research. Its publications list is relatively small but covers a wide range around challenges which the transport sector faces. A recent publication titled Towards Zero, for instance, considers developments and initiatives to meet increasingly ambitious road safety targets, emphasising a strong focus on results and looking at the economic case around the issue. Other titles look at the economic contribution of transport, funding transport infrastructure, approaches to reducing transport emissions and the dependence on oil, or information on long-life road surfaces.

Important themes

"We have one big event a year to draw attention to a specific theme." explains Short. "We looked at Congestion issues in 2007 and at climate change in 2008, that event attended by the German Chancellor, Angela Merkel. Our next major event is in May 2009 in Leipzig, considering there the global economy and the challenges and opportunities arising as a result of the financial downturn. And then next year, 2010, we'll be looking at innovation in transport and particularly at Intelligent Transport Systems and the impact ITS can have on the challenges facing global transport."

The 2008 event was the first held by the ITF in its wider global role and had as the keynote speaker Rajendra K Pachauri, Chair of the Intergovernmental Panel on Climate Change (IPCC). This is the scientific intergovernmental body established in 1988 by two organisations within the UN to evaluate the risks of climate change brought about through human activity. Dr Pachauri's speech included some trenchant criticisms of the transport industry, pointing out that over the previous decade that sector's global greenhouse gas emissions had risen faster than in any other energy using sector, adding that if the transport sector were truly concerned about such issues it had to make a start by itself.

"The challenge is to foster economic and social development, requiring a well-functioning transport system, while at the same time reducing emissions."
Jack Short

"The declines we've seen recently in travel and transport have been quite dramatic."
Jack Short

This perhaps underlines that the ITF is concerned about undertaking proper analyses of how transport can be used as a driver of economic growth while controlling and reducing the harmful effects traditionally associated with the sector, and is not acting merely as an unthinking cheerleader for the transport industry.

Taking responsibility around climate change

"Climate change is different from other problems, for two reasons." says Short. "First, its impacts are potentially so catastrophic that the need for action is overwhelming. Business as usual is not an option. But, secondly, we don't yet know what to do. There simply isn't a toolbox of policies and measures or technology to limit emissions to anywhere near the extent needed. Moreover, the dynamics of the transport sector are such that emissions are likely to increase 50% by 2050, not decrease by the same amount as is being proposed."

"Economic development is highly correlated with transport levels and so the challenge is to foster economic and social development, requiring a well-functioning transport system, while at the same time reducing emissions.
This is undoubtedly the greatest challenge the sector has ever faced."

Short points out that 97% of transport activities depend on oil, a far higher proportion than in any other sector, and that this dependency is an enormous strategic mistake. What's needed now is urgent action to develop viable alternatives to oil and to the internal combustion engine. Electric motors are the most likely candidate but there needs to be intensive work on battery systems, on recharging processes and on developing new models of ownership and use. Further, he adds, oil subsidies should cease and fuel prices need to reflect their real costs.

Transport in crisis

The May 2009 event theme - global transport during a financial downturn - is both topical and critical, with worldwide relevance. Over the past half-century transport has mushroomed, in step with world trade values over the same period. Air cargo has grown approximately 12% annually while ocean shipping has quadrupled in the shorter period since the 1970s. Things are now very different.

"The short term concern is definitely with the financial crisis." says Short. "The declines we've seen recently in travel and transport - sales of transport equipment, of cars and trucks and container ships and the like, have been quite dramatic. Renting a Panamax-type ship – that is, one built to the maximum dimensions capable of using the Panama Canal and typically used to transport bulk materials such as grain – might have cost $100,000 daily until recently and now you can get one for $3,000 a day. This shows just how sensitive these markets are to the changing patterns of demand."

Among the questions to be considered by the eight hundred or so delegates to the ITF event is whether there will now be some fundamental rethinking about certain aspects of mobility and transport and trade. Given the close link between trade and transport, will transport once more roar ahead if the economy recovers in a year or two or does the current recession herald a paradigm shift in world transport policies and practice?

"We have echoes that some things might change." says Short. "Air freight grew rapidly but started declining when fuel prices rose. It's been in decline since even before the recession started because it's more expensive than other forms. Some people are now saying that it doesn't have a long term future, that if we can find and use other delivery systems that are reliable but don't just depend on speed, then maybe we'll need less air freight."

"Another question is around supply chains." he adds. "Are they going to get shorter? And, yes, there's some anecdotal evidence that that's happening. A number of factories and manufacturers are moving back to Europe from China. The reasons are complicated – sometimes linked to labour costs, sometimes other things like fuel price rises. And is there any evidence that people are rejecting cheaper goods in favour of others which are more sustainable but also more expensive? Some people may be doing this, particularly with food, but that's not the evidence coming from the supermarkets and it doesn't seem to be what people have done up to now. But it's very uncertain, very difficult to analyse."

Agreeing policy

Difficult it may be but it's precisely in such areas that the ITF is working, considering in detail issues around the transport sector. Specialist research groups within the ITF look at such issues and make recommendations. After discussion by member countries these recommendations may be endorsed by ministers, thereby eventually leading to policy shifts in the member states concerned.

"We absolutely fill an important gap by looking strategically at the whole transport sector, world wide, as I mentioned earlier." insists Short. "However, there's also another important strand to our work. Transport is intimately linked with economic wellbeing but it's also blamed for many of the problems we're currently experiencing. It too often gets a very negative press. Transport ministers and politicians and specialists all know how important transport is but very often the general public doesn't understand this fully and that's something we're working hard to change."

Taking it slowly

Enforcing speed limits may not be the most popular aspect of intelligent transport, but it's the one that saves the most lives. By Joanna Bawa

Despite speed limits in many countries being generally well defined and recognised, excessive speed remains a controversial and emotive topic. Drivers generally, and men in particular, maintain an excessively high regard for their own driving ability, frequently driving faster than they believe they do. And while women are generally in favour of speed controls, men are far more likely to be hostile to technology which enforces speed limits, and actively choose to defy or ignore such devices.

"Speed enforcement reduces average speed in a given area by around 6km/h, which translates into a reduction in the annual death rate of around 30%"
Johan Frilund

All of which is surprising, given the statistics. "Over one and a half million people die in traffic accidents across the world every year," says Johan Frilund, CEO of Swedish speed enforcement technology company, Sensys Traffic AB. "That is the equivalent of eight jumbo jets crashing every day." And while excessive speed is not the only cause of this alarming death rate, it is a significant factor. "Alcohol, driving without a seat belt, and tiredness are the main causes of traffic accident," Frilund continues. "When speeding is involved as well, there is a higher likelihood of an accident, and far worse consequences." Measures such as education programmes, in-car warning systems, legal sanctions and police enforcement make a major contribution to reducing the accident rate, but speeding remains a stubborn problem across the world. In some countries, particularly the Middle East, a macho culture of 'red light running', whereby young male drivers deliberately cross red lights at high speed, increases the death rate enormously. "In Sweden, the death rate in traffic accidents is around 450 per year, out of 9 million people," says Frilund. "Compare that with Iran, which has a comparable road network in terms of size and quality. Even though the population is six times larger at 70 million, the death rate is nearly 70 times higher, averaging 30,000 per year – many of these being pedestrians."

Long term behavioural change

"Speed enforcement is not about revenue, or about punishment, it is about ensuring what most people want, which is fewer deaths, and improved public safety."
Johan Frilund

Sensys Traffic AB is developing speed enforcement technology which will address this critical issue – but the emphasis is less on enforcement and more about accuracy and integrity. "Speed enforcement reduces average speed in a given area by around 6km/h, which translates into a reduction in the annual death rate of around 30%," continues Frilund. "While this is positive, it can be hard to overcome driver resistance. A lot of what Sensys does is about encouraging long term behavioural change through technology which can be shown to be accurate, fair and incorruptible."

Camera-based enforcement of speed limits, whereby average speed is measured in a given zone, is not a new idea, but constant challenges to its accuracy and fairness limit its acceptance. Sensys technology uses a unique multi-tracking capability in which the radar measures speed and distance to the vehicle 21 times per second, providing a tracking of all vehicles from 150m up to 10m in front of the camera. "The result is very high quality data, with any reflection, ambiguity or inconsistency removed, in which we can show repeatedly that the vehicle was exceeding a speed limit," says Frilund. "Our data is independently verifiable, legally acceptable and absolutely fair."

It is also cost effective. The cost of ownership is minimal, and because of the high data integrity, court procedures are straightforward and fast.

Ultimately, of course, the biggest saving is the reduced cost of hospital treatment and the huge cost to individuals, families and the economy following traffic fatalities.

"In Sweden speed enforcement is not about revenue, or about punishment," concludes Frilund. "It is about ensuring what most people want, which is fewer deaths, and improved public safety."

Putting our faith in multi-tracking radar

Safer roads require many things; one of these being long-term changes in driver behaviour. This cannot be achieved quickly or easily and often requires pressure on drivers through speed enforcement. If technology is to be relied upon in this context, it needs to be irreproachable: accurate, reliable, fair and legally verifiable.

The Sensys Speed Safety System is based on Sensys' multi-tracking radar. This wide-beam radar unit, capable of tracking multiple vehicles simultaneously, uses a lobe that oversees several lanes up to 150 meters deep. Vehicles moving within that cone are tracked and their movements analysed. The technology is non-intrusive, and tracks and measures each vehicle more than 20 times per second. Speed is determined through Doppler and checked by distance over time.

The system provides continuous speed verification by applying two independent methods, and generates secure, high-resolution digital images including information about time, date, location, vehicle speed, and speed limit. The data generated by Sensys technology provides intelligent reporting about speed hot spots, enabling other measures to be introduced in these areas, and is also sensitive to individual vehicles.

The connected vehicle

Cooperative Vehicle Highway Systems are the next big challenge in automotive electronics and ITS. But what are they and what can they do? How might they work in practice, what are the benefits and who needs to play a part in their operation? Susan Venables **reports.**

For all those that drive vehicles congestions, diversions and other traffic problems are an integral part of life. And even though much has been done to improve traffic information messaging and navigation solutions traffic flow is still not as fluent as drivers and road network operators would like it to be. This not only makes driving tiresome but also results in increased fuel consumption and more hazardous traffic behaviour.

"There is no doubt that CVHS represents a revolution in both the way transport systems could work in the future and in the scale of benefits available..."
Richard Harris

For example, throughout Europe the number of casualties due to road traffic is still unacceptably high. Plus as car ownership and use have continued to grow steadily the resulting congestion in built-up areas and on main highways has become a significant overhead and burden for travellers, the economy and for the environment.

It is no wonder that globally governments want to find solutions to solve these traffic challenges so that driving can be made safer, easier, quicker, more productive and more efficient. And it is for this reason that time and resource is being invested in initiatives involving the development of Cooperative Vehicle Highway Systems (CVHS) that in theory claim to solve these problems.

Vision for the future of highways

"Imagine driving your car, always having up-to-date information about everything from local driving conditions to congestion and alternative routes and just think of the benefits this could deliver," states Richard Harris, Technical Director, WSP Group. "The reality of this lies in the concept of CVHS. These systems provide technologies that enable cars to communicate with each other and with the roadside infrastructure and which can truly offer the most exciting new services for all stakeholders involved in road transport."

"For cooperative systems to work they must be able to give, take and share information with each other."
Richard Harris

"There is no doubt that CVHS represents a revolution in both the way transport systems could work in the future and in the scale of benefits available to infrastructure owners and operators and to individual road users," adds Harris. "Not only do they hold the potential to transform mobility for travellers and goods, they also promise great improvements in terms of efficiency, safety and reliability for all those that use the road networks. For instance, it is estimated that CVHS could easily lead to savings of around 10% in harmful emissions, casualties and congestion costs."

So what are cooperative systems?

"There is a vision and many individuals and organisations are joining forces to make CVHS become a reality."
Richard Harris

For the road operators and roadside infrastructure CVHS offers increased information about vehicles, their location and the road conditions. For the driver they effectively increase the quality and reliability of information about the immediate environment, other vehicles and road users, enabling them to make informed decisions about their journey.

"For cooperative systems to work they must be able to give, take and share information with each other. While systems individually may hold vast amounts of information stored in the vehicle, in roadside equipment, in control and management centres and in mobile devices, these must then be controlled through the entire chain from data collection and processing to data delivery," explains Harris.

"This information can then be shared with other cooperative services and applications, meaning that all members of the cooperative mobility community – the driver, passenger, traffic operator - can benefit from it so that real synergy can occur."

"It's really about modifying behaviour in light of having knowledge of others' actions and intentions and CVHS facilitating such interaction can bring widespread benefits -such as improved management and traffic control of the road network; shorter and more predictable journey times; better and more efficient response to hazards, incidents and accidents – that is provided drivers obey the rules and follow the advice!"

Making it work

So, if cooperative systems are so effective and produce such benefits, why are there none today? "The answer clearly lies in the fact that the technologies required to create applications where vehicles and roadside infrastructure can talk to each other directly are not yet fully developed and validated," states Harris. "Just think, in order to accomplish cooperative systems, all cars, roads and traffic management centres must be connected in a wireless and road-wide computer network, a feat that is not entirely trivial. What needs to be created is a 'universal communications module' and the complexities around achieving this are considerable."

"Probably the greatest uncertainty surrounds the question as to which organisations and decision makers need to be involved and how they can also work cooperatively. And with all the various technologies involved CVHS will only be feasible if they speak the same language and if there is full interoperability in the communication between the collaborative services."

"But there is a vision and many individuals and organisations are joining forces to make CVHS become a reality. Today there are initiatives being driven by, for example, PIARC (World Road Association) and FISITA (International Federation of Automotive Engineer Societies), in which WSP Group actively participates, to promote more active collaboration between automotive engineers, the public sector, road infrastructure builders and operators. Already projects in Japan across the US and in the European Union are progressing, demonstrating the drive and commitment to make CVHS happen because the benefits for drivers, the environment and society in general are too significant to be ignored."

Our friend electric

Marlon Wolff **finds out how the Sentience intelligent advanced hybrid vehicle demonstrates a huge potential for fuel savings with a minimal investment.**

The Sentience research vehicle was unveiled in March 2009 to an invited media audience at TRL (Transport Research Laboratory), who were provided the opportunity of driving the vehicle on the TRL test track in conditions representative of public roads.

The event marked the conclusion of the 15 month Sentience research collaboration between Ricardo, Jaguar-Land Rover, TRL, Ordnance Survey and Orange Business Services, with part-funding provided by innovITS, the UK centre of excellence for intelligent transport systems and sustainable mobility. The project has been based on extending the electronic horizon of the vehicle using internet-enabled mobile communications, GPS, advanced mapping and other sophisticated real-time navigational technologies, aimed at reducing the exhaust emissions and CO_2 output of future vehicles in a cost-effective manner. "Sentience has been a unique collaboration between three industries who would not normally work together", explains project director, Tom Robinson, of Ricardo. "The results speak for themselves in demonstrating the potential synergy to be realised by connecting the existing on-board systems of vehicles with mobile communications and advanced mapping technologies."

Three particular areas of focus for Sentience have been on Enhanced Acceleration/Deceleration (EAD) in which the vehicle speed is controlled to meet actual and virtual speed limits; Optimized Engine Load (OEL) in which the hybrid power-train systems are managed using advanced route knowledge in such a way as to make optimal use of recharging opportunities; and Enhanced Air-Conditioning (EAC) control in which temperature set-points are adjusted prior to and following temporary stops. Much of the work of the project team has concentrated on the first of these strategies as Robinson explains: "IWe wanted to demonstrate the potential benefits of implementing EAD as we felt this held the prospect of the most substantial fuel savings and hence CO_2 reductions. With fuel savings demonstrated on the test track of up to 24% and at least 5% in evening based on road tests, this was a sensible primary focus for our work, but there remains further clear potential in the implementation of OEL and EAC strategies, as well as in the integration with navigation technologies such as intelligent route guidance."

EAD: An advanced form of adaptive cruise control

EAD is implemented on the Sentience demonstrator vehicle through an advanced form of adaptive cruise control linked to the hybrid powertrain system of the vehicle. Based on route information - which could in a production setting be integrated with a commercial navigation system - the Sentience vehicle will calculate and follow an optimal driving strategy. Its control system adjusts vehicle speed, acceleration and deceleration via its adaptive cruise control. Using GPS and mapping data it takes into account the speed limits, traffic conditions, the road's gradient and features including bends and even speed bumps, as well as less predictable road features including roundabouts and traffic lights. At any time, of course, the system can be manually over-ridden by the driver.

Moreover, the data provided by the mapping and navigational systems is also used to optimize the recharging strategy of the hybrid's batteries, thus increasing the potential availability of electric-only mode in urban environments.

Although not implemented on the project vehicle, the EAD implementation has the necessary in-built links to work with real-time traffic information in order to update its strategy according to prevailing conditions and areas of congestion. In track based tests, the EAD strategy alone has demonstrated fuel savings of between 5 and 24% depending upon traffic conditions and route topology. In evening tests on public roads in "real-world" conditions in the vicinity of TRL, achieved mean savings at all times in excess of 5%.

Enhanced mapping data

A crucial enabler of Sentience technology is the availability of enhanced mapping data based on the OS MasterMap Integrated Transport Network layer - Ordnance survey's national transport dataset. This extends beyond basic route topology to include details such as gradients, curves, speed limits and probabilistic speed limiting features such as junctions, crossings, schools, traffic calming measures and traffic lights. Specific routes have been captured for the TRL test track as well as a number of predefined routes on public roads close to Ricardo, TRL and Orange development facilities. As such the vehicle control system has advanced and actionable knowledge

of the road ahead and can use this to optimise its approach. Mapping including this level of enhanced data is available on a large scale by mapping suppliers such as Ordnance Survey.

The human-machine interface

A key visual element of the implementation of Sentience within the demonstrator vehicle is a human-machine interface (HMI) developed by Orange and based on a Nokia N95 mobile phone. This device also provides the communications link that delivers route data for the vehicle's control system. The HMI provides appropriate feedback to the driver - for example, of the prevailing speed limit at the vehicle's current location - as well as input configuration information.

To provide an integration infrastructure for the demonstration vehicle a telecoms protocol was defined and implemented by Ricardo and Orange for communication between the HMI and the Ricardo rCube rapid prototyping controller used to supervise the Sentience EAD functions. The design of the HMI architecture was deliberately intended to accommodate the integration of real-time traffic data in a future implementation.

National implications of Sentience technology

The Sentience project has been careful to represent all principal types of UK road - including motorway, urban and rural A roads, and minor roads - both within the simulation and modelling work that preceded the design of the vehicle control systems, and also within the testing carried out at TRL.

Using the results of fuel savings achieved on the TRL test track, the routes driven were scaled using Department for Transport data for vehicle-kilometres driven on different road types in the UK. This analysis demonstrated a potential total UK fuel saving of 14%, equating to between 1.2 and 2.9 million barrels of oil per year.

A low cost of implementation

Despite its considerable fuel saving and CO_2 reduction advantages, Sentience represents a potentially very low cost of implementation. In a vehicle already equipped with a phone and GPS (eg for a navigation system) then no additional hardware would be needed for a production implementation. If these systems were not pre-installed, then the project team estimates that these functions could be provided for a unit cost of around €20 in high volumes. Extra control and integration software would be needed but the processing and storage needs would be modest and likely to be readily integrated into almost any existing vehicle architecture. The availability of high resolution mapping would be a prerequisite for implementation but given the increased availability of such data, the project team estimate that a Sentience based system could be put into production in approximately 3-4 years based on technology availability for model year development programmes in around 18 months.

Longer term potential of Sentience

While Sentience has focused on its EAD strategy and also demonstrated the potential of OEL and EAC, the control architecture demonstrated is clearly expandable to other potential intelligent transport system applications. These include vehicle to infrastructure and vehicle to vehicle cooperative driver assistance systems, enhanced positioning systems such as lane detection. EAD in particular could be enhanced through integration with vision based systems for road sign detection and junction/topology recognition.

Most immediately the architecture lends itself to integration with dynamic traffic routing to further improve the consistency of traffic flow and individual journey times, and hence deliver yet further fuel and CO_2 savings.

ERTICO

ITS EUROPE

Bringing intelligence into mobility...

ERTICO ITS Europe is a public-private, multi-sector partnership promoting the development and deployment of Intelligent Transport Systems and Services across Europe.

Our vision is to bring intelligence into mobility.
We strive towards a European transport network

- with zero accidents
- with reduced impact on the environment
- with fully informed people

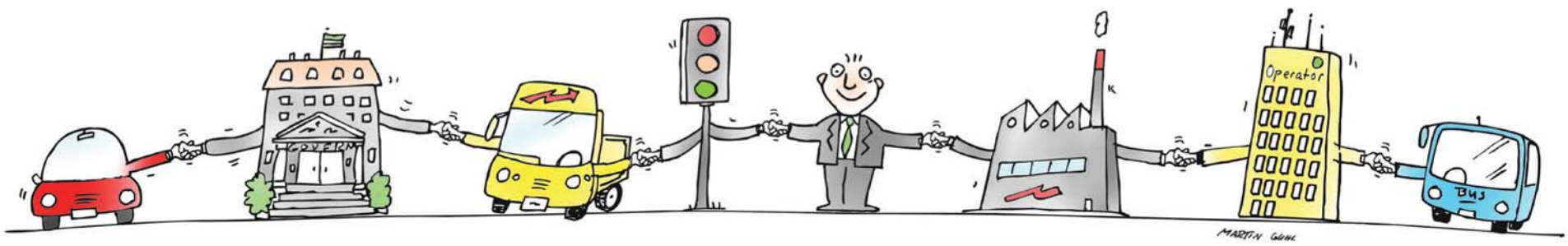
Intelligent mobility enables all modes of transport to communicate with one another and the infrastructure, and gives the traveller easy access to all relevant information needed to make his or her travel choices.

More than 100 Partners working together...

ERTICO represents the interests and expertise of over 100 active Partners involved in a wide range of funded projects and other cooperative efforts to come up with sustainable solutions for safer, smarter and more efficient mobility.

Our current activities focus on strategic areas, such as:

- Safety & Security: Accelerating the development and deployment of life-saving transport technologies and applying ITS technologies to make mobility more secure.
- Efficiency & Environment: Enhancing the efficiency of the transport network and making it more environmentally friendly.
- International Cooperation: Stimulating and strengthening the exchange of knowledge between Europe and other regions of the world, in particular emerging markets.



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The 2009 ITS World Congress & Exhibition will bring the vision of intelligent mobility closer to reality. Taking place from 21-25 September 2009 in Stockholm, Sweden, the event will gather more than 5,000 participants from around the world to share ITS experiences, innovations and network together. Demonstrations of existing ITS solutions will be a key feature of this Congress that will place a strong emphasis on co-modality. Stockholm 2009 will be a great opportunity for all ITS stakeholders to learn from each other as well as show the general public how ITS can help them in their daily lives.

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