



Research/cooperation needs for urban and regional network management and ITS

Position statement

What is this document?

This document provides an overview of the needs of local authorities (cities and regions) for research, cooperation and knowledge transfer in the area of transport network management and ITS. Network management, enabled by ITS, is an important task for local authorities and has spawned a large market for ITS systems and services, which is evolving rapidly. The purpose of this document is to promote understanding and awareness of the directions that local authorities would like to see ITS developments take to ensure they respond to their real and pressing network management needs.

The document comes in two parts: this first part describes the rationale, the approach and the main findings of the exercise; the second part (annexed) shows the many topics, in the form of a matrix, identified by Polis members (city and regional authorities). The document was compiled by the members of the Polis Traffic Efficiency and Mobility Working Group between June and November 2011.

Why was it compiled?

The European Union offers many opportunities for funding projects in the area of ITS. However, much of the funding goes to European projects which do not address the priorities of local authorities. The technology projects have tended to focus on cooperative systems, which will undoubtedly bring a revolution to traffic management in the future. However, the role of local authorities in many of these projects has remained limited. Outside of the cooperative systems projects, there is a great need for projects in the area of urban and regional network management and ITS, especially for non-technological projects which are particularly lacking even if it is widely acknowledged that the main ITS deployment challenges are of a non-technological nature.

The need for research and development in this area, to help local authorities manage their roads and wider transport network more efficiently and sustainably and to make better use of the supporting (ITS) systems, involve both technological development, eg, transport payment systems, real-time multi-modal information, more efficient use of existing ITS, and 'softer' matters, such as ITS impacts assessment, open ITS systems, integration, decision support, financing and legacy, among others.

Who are the target groups?

This document aims to provide an insight to the needs and expectations of local authorities for the development and deployment of ITS and the wider, more complex area of managing

multimodal transport networks. It should therefore appeal to a wide audience; however, it is particularly targeted at:

- European institutions, especially those bodies responsible for defining the priorities of the programmes offering funding opportunities for research, cooperation and knowledge transfer in the area of ITS and network management, notably FP7/FP8 Transport and ICT programmes, Competitiveness and Innovation Programme (ICT PSP and Steer programmes) and Interreg, among others.
- Traffic systems suppliers and ITS providers, with the expectation that future traffic systems and ITS developments will meet the evolving needs of local authorities.
- Local authorities (city and regional) to encourage them to be more vocal about their needs and priorities.

Why network management and ITS?

Network management is a concept far broader than traffic management in that it addresses the management of the full transport network and hence all modes, whereas traffic management is concerned mainly with the management of the (motorised) road network.

The shift from traffic management to wider network management is happening progressively in line with the greater emphasis given to sustainable modes and the environment in urban and regional transport policy. This policy shift has various consequences in terms of traffic management and ITS. Traffic management is no longer solely guided by the principles of maximum throughput at junctions and minimum travel delay. Priority for public transport and measures to protect and facilitate pedestrian and cycling traffic are being built into the traffic control systems. Faced with deteriorating air quality and increasing traffic-generated noise, there is also a growing interest in environment-responsive traffic control.

ITS is a widely-used term often employed and interpreted in a parochial way depending on the user/client group. For the motorway operator/authority, it is a tool to manage traffic, mainly through road-side information services (incident warning, speed limits, weather warnings, etc); for the car manufacturer, it covers on-board systems for the driver (mainly advanced driver assistance systems); and, for the ITS service providers, it often means information services (eg, satellite navigation). The reasonably new concept of cooperative vehicle-infrastructure systems is bringing all these components (infrastructure, on-board unit and nomadic device) together. In most of the above cases, ITS is developed primarily for car drivers and to a lesser extent for freight vehicles. Most action on ITS at European level, be it in terms of innovation, research or policy, tends to address this type of ITS.

For the local authority, however, ITS has a wider reach. It is of course an important tool for managing road traffic, but it also plays a crucial role in delivering multi-modal information services, transport payment systems and other mobility services, often with the aim of contributing towards seamless mobility and sustainable travel. For local authorities, therefore, ITS is a tool to support all transport modes (private car, freight vehicles, public transport, cyclists, pedestrians and new mobility services). A further distinguishing feature is the policy-driven nature of ITS deployment. Indeed, the priority given to sustainable modes in urban and regional transport policies in recent years has meant that most investment has likewise been directed towards ITS-enabled services such as public transport priority at traffic lights, real-time bus/tram departure information, multi-modal journey planners and electronic ticketing.

Why research and cooperation?

Technology development is far outpacing deployment, meaning that the gap between research and implementation is widening and local authorities are left wondering how to manage legacy systems, which solutions (technological and otherwise) are best suited to their needs and how to future proof the investments they do make. Research is needed to answer these questions and many others. In some cases, research in its strictest sense is not needed to address these issues. Learning from existing good (and bad) practice through structured knowledge transfer can also be effective. As they share common goals, are not competing with each other and do not have vested interests, local authorities tend to value opportunities to share experience in a peer-to-peer setting. There is clearly a strong need for projects on a wide-range of non-technological matters and these projects could play a role in bridging the gap between research and deployment.

While technology is not the main problem, this does not mean that local authorities do not have needs in the area of technological development. Indeed, there are many areas where development is needed in the transport sector and in other sectors which can be tapped into for the benefit of transport (eg, social media). In the current economic and financial climate, it is clear that cost-effective solutions or solutions making clear inroads towards policy goals are a prerequisite. In many cases, this means better utilisation and development of existing systems, as will be explained later.

Compilation of document

This position statement was produced between June and November 2011 by the Polis Traffic Efficiency & Mobility working Group, which is made up of representatives of city and regional authorities across Europe primarily, as well as some transport experts/researchers.

The topics presented in the matrix (in annex) have all been proposed by Polis members. A questionnaire was used as a basis for gathering the input. Polis members were invited to provide topics according to the categories proposed along the vertical axis.

The vertical axis is divided into the three tiers of network management: strategy is self-explanatory; the tactical level is the level at which choices are made on the measures to deliver the strategy (eg, bus priority at traffic lights, real-time passenger information, etc) and operations is concerned with the implementation of measures (through the traffic control centre for instance). The three tiers have been sub-divided into further categories, which broadly reflect the main tasks of each tier.

The headings in the horizontal axis emerged from an analysis of the submitted topics; they reflect the overarching themes guiding the (desired) future development of ITS and network management from the local authority perspective, namely, user devices, interfaces and applications (including mobile phones); increased value and further development of existing assets; integrated network management; and, open systems and data. It should be noted that some topics may fit under more than one heading.

The matrix enables the research and cooperation needs to be read by management task (eg, decision support) or by thematic heading (eg, integrated network management).

Interpreting the matrix

On the basis of density and spread of topics, the heading 'increased value and further development of existing assets' can be read as being the most popular. The substantial cuts

in public spending, induced by the dire economic and financial situation in Europe, is undoubtedly forcing local authorities to look at how to get more out of their existing systems. Today's public finance pressures have reinforced and accelerated a trend which had in fact already started some years ago. Even in times of growth, local authorities had started to look at how to use their existing systems more effectively.

Regarding the network management task, 'multimodality', 'decision support' and 'planning, legal and organisational aspects' are unsurprisingly the most populated with topics for research and cooperation.

- Transport networks are multi-modal by nature and multi-modal travel is an important aspiration of most public authorities. Indeed, multi-modality is central to the need for improved decision support.
- The concept of decision support has been gaining ground for many years, reflecting the shift in transport policy and the growing complexity of urban and regional transport networks. Decision support tools do exist, mostly in the form of transport and traffic models and simulation software. However, these are mostly offline tools and were developed primarily for motorised transport. Cities and regions today are interested in understanding more about other modes (pedestrians, public transport users and cyclists) and the interaction between them and motorised transport. Decision-support tools are also needed to improve traffic control in real-time, especially in the event of an incident.
- The third task 'planning, legal and organisational aspects' essentially reflects the changing role in service provision whereby commercial services are taking a stronger role and the public sector is becoming a data provider rather than a service provider.

The ITS Action Plan and Directive

The ITS Action Plan and Directive will impact on local and regional authorities, mainly in terms of publishing data about roads, regulations and traffic. One part of the Directive is concerned with creating a legal framework for publishing data in order to accelerate the development and deployment of commercial information services. This legal framework provides an opportunity for local authorities to review and streamline the systems and processes they have in place. However, it is important that the framework makes a distinction between data for information services and strategic data related to network priorities. Research leading to the development of guidelines and tools is needed to help local authorities fulfil the obligations emerging from the Directive, including:

- Cost-effective (IT) tools for the publication of new/amended road regulations and similar updates.
- Define set of minimum information (in relation to ITS Directive) that should not be required to be shared, eg, related to network priorities
- Certification (or guaranteed quality level) of data from external sources (GSM, navigation systems) for use in traffic management
- Development of European standards for traffic communications, building on UTMC and OCIT among other existing traffic protocols and user communities as well as accepted industrial protocols. Benefits would be to expand the supplier base for all member states and avoid single supplier lock-in.



Some selected projects

The matrix shows many topics for research and cooperation. In addition to these topics, several Polis members submitted concrete ideas for research projects, which are listed below.

1. ITS development for the application of mobile phone tracking for real-time situational awareness delivering improved knowledge of network performance and demand and allowing for intelligent interventions (including RTTI delivery – personalised / location base push technology – use of social media too). This would also have a positive impact on low cost detection technologies and applications for the future.
2. ITS technologies and trials in controlled urban areas based on technologies and applications that use wireless communications to provide connectivity (among vehicles of all types, between vehicles and roadway infrastructure, among vehicles, infrastructure and wireless consumer devices) with a possible link to the public transport operator on the same platform. The outcomes would be in improved safety, mobility and environment.
3. Demonstration of pollution-responsive dynamic traffic control system whereby multiple pollution monitoring sensors are linked with the adaptive control system and generate smooth traffic control strategies automatically.
4. Development of tools to model goods movement: Build up a model for movements of goods (as opposed to goods vehicles); this would include (i) data collection to generate typical demand for goods from specific land use types (schools, retail, pubs, housing etc.) so that the totality of goods can be quantified (ii) baseline monitoring of goods movements (for development types, or central city areas etc..) to understand how goods are shifted in year 1, year 2 etc. as well as the patterns across day, month, season etc. (iii) modelling for various scenarios (intensification of land use, new goods management initiatives etc.) to understand what needs to be done to maintain goods flows.
5. Study, development and deployment of Near Field Communication (NFC) solutions, to improve the passengers' multimodal experience, to make mobile payments possible and to enable enhanced real-time information through the combination of multimodal information.
6. Experimentation of a multimodal traveller information platform centralising public transport/road/bicycle data in a system providing various services: journey planner, traffic and travel information (including real-time) and cartographic representations (accessible through a mobile device).
7. Study, development and deployment of innovative services related to the design of efficient transport interchanges to enhance user accessibility: (i) integration of mobility services at Park & Ride (bike sharing, car sharing, carpooling, bicycles parking); (ii) optimisation of passenger mobility and simplification of trips at Park & Ride sites, improving accessibility and increasing travel information and signage (for disabled people) – notably through new technologies.
8. Experiment/pilot of energy re-use at the metro stops, notably for metro functioning and lighting, to lower CO2 emissions.

Further information

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		User devices, interfaces & applications, including mobile phones	Increased value and further development of existing assets	Integrated network management	Open systems and data
Network management strategy	Interoperability				Development of European standards for traffic communications, building on UTMC and OCIT among other existing traffic protocols and user communities as well as accepted industrial protocols. Benefits would be to expand the supplier base for all member states and avoid single supplier lock in.
	Financial aspects of ITS		<p>Studies on the value of streetspace - economics of parking. It is widely acknowledged that the future of urban transport is demand management; there is therefore a need to understand this better and have tools to help local authorities make demand management decisions.</p> <hr/> <p>Risk assessment and dependency audits: guidelines on how to identify the most important systems (hardware, software, communications and human resources) against what is discretionary in order to prioritise maintenance, upgrades and investments.</p>		Studies to understand the value of information, covering cost-benefit analysis of data, whole life costs, the value of information perceived by users and quality assurances.
	Planning, legal and organisational aspects	<p>Understanding the users' dependence on ITS and what happens in case of failure (ADAS, journey planner, sat. nav).</p> <hr/> <p>Guidance for local authorities on the mutual roles of the public and private sector in the area of travel information services (especially personalised services).</p>	Use of Chipcard data to understand people movement for use in transport planning, notably in planning public transport	Good practice and recommendations on co-operation between planning authorities: integrated urban and regional planning.	Define set of minimum information (in relation to ITS Directive) that should not be required to be shared, eg, related to network priorities.
				Creating a new vision on transportation to make it more efficient - stimulating cooperation between road operators, public transport operators, etc to make multimodality/co-modality easier.	Cost-effective (IT) tools for the publication of new/amended road regulations and similar updates, eg, Dutch platform (to meet the ITS Directive).
	ITS and society	<p>Studies on the safety of mobile phone usage for all modes, not just car drivers.</p> <hr/> <p>Developing the potential of social media to engage with users through, for instance, building up communities around common trip patterns.</p> <p>How effective will it be for a city to promote usage of advanced communication devices (tele-presence) in offices/homes instead of building a new tram line for commuters?</p>	<p>Socially-responsible travel planning: understanding the role of incentives to influence travel behaviour and as a precursor to wider demand management measures.</p> <hr/> <p>New systems and services for an ageing society.</p>		Tools to convert social media information into a data source for traffic management and travel information.

Network management tactics

		User devices, interfaces & applications, including mobile phones	Increased value and further development of existing assets	Integrated network management	Open systems and data
Decision support			Development of better tools and models to generate the real-time traffic situation on the road network.	Development of multi-modal modelling and simulation tools and methodologies in order to understand the impact of a measure implemented for one mode on all other modes.	
			ITS predictive analytics – Real-time data fusion to realise a common operating picture, visualised through GIS web mapping, which can feed into predictive traffic models to support operational decision making.	Cost-effective technologies enabling the gathering of data on all modes, especially non-car modes such as cycling and walking.	
Performance monitoring, evaluation and impact assessment			Development of online/offline decision support tools utilising modelling and data fusion techniques for both real time and scheduled data. The front end must be GIS based and linked to network dashboard / performance reporting.	Development of tools (technological and methodological) enabling environment response traffic control.	
			Network management tactics menu: Development of a menu of tactics for network management, including (i) Management by Exception – suitable for stabilised networks, where interventions are focussed on abnormal events, and based on Key network locations, junctions, breach of key thresholds, key alerts (security, safety etc.) or key events (ii) Management by Objective – suitable for network re-configuration, where actions are based on Key Performance Indicators, dashboard etc. (iii) Management Tactics for Closed networks – where security, safety, evacuation, information etc. is central.	The development of automated strategies to improve network performance when dealing with (un)planned events.	
		Studies on the impacts of real-time information provided by third party service providers (such as satnavs) on traffic system.	Improved understanding of the performance of ITS in relation to transport policy objectives, notably air quality (In line with 20-20-20 goals of the EC) through, for instance, the development and uptake of CONDUITS key performance indicators for traffic management and ITS.		
		Developing the potential of near-field communication for mobile services, including mobile payment. Need to understand reactions from the market and the user and consider data processing. What are the benefits for local authorities. A pilot between two major cities with substantial people traffic could be useful.			

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Management operations	Legacy		Managing legacy systems: developing guidance to local authorities on (i) how to assess when systems are “end of life” “out of date” etc. , including a database of “current industry-supported systems” etc. (ii) how to migrate from single-contractor/supplier dependency to tendered service provision (iii) when and how to invest in refurbishing old ITS systems.		
	Public transport and new mobility services	Technologies and applications to make passenger transport more attractive through real-time information, mobile payments, use of mobile phone data, etc. Cooperative systems could play a role in the development of improved/new services.	Harnessing social networks to develop innovative mobility services, such as real-time car pooling	The role of ITS to improve the efficiency of interchanges, notably through integrated information and payment systems	
	Individual (motorised) transport	Driver information applications, enhanced interfaces and use of social media to enable effective demand management and modal shift.		Parking and ITS: (i) Integration of metropolitan traffic management with ITS for parking (e.g. parking guidance, using dataflows from on and off street facilities, including sms based parking payments) (ii) Integration of parking information in the cooperative environment and services, including GNSS based systems (iii) Technologies for monitoring and enforcement (iv) Integration of parking payment systems with electronic tolling schemes.	Certification (or guaranteed quality level) of data from external sources (GSM, navigation systems) for use in traffic management.
	Goods transport	Good practice and knowledge transfer on ITS and freight (notably the findings of projects such as Freilot).	The potential of ITS to prioritise goods vehicles depending on cargo or engine type (electric, emissions standard).	Tools and methodologies (i) to manage new types of distribution vehicles in city centres and (ii) for night-time distribution without the need for shop staff New solutions for goods distribution in cities (including parking) especially in historical and/or heavily pedestrianised city centres.	

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Network	Multimodality	<p>Personalised services for the user providing relevant personal, temporal and spatial journey data only. Building up profiles based on personal data will require clarity on institutional and data relationships, ie, how far can a public authority go in using personal data for delivering personal services?</p>	<p>ITS technology development in the field of video analytics (Image Recognition and Incident Detection suite of applications) for additional detection including pedestrians and cyclists, enabling safety considerations to be enhanced and promote modal balancing.</p>	<p>Development of inter-agency communication standards and protocols to enhance inter-urban traffic management cooperation through ITS.</p>	<p>Certification of GNSS data (ie, EGNOS and Galileo) for use in (public sector) transport management</p>
		<p>Guidance for local authorities on the mutual roles of the public and private sector as regards travel information services (especially personalised services).</p>	<p>Development of a common urban transport dashboard to obtain a synthetic overview of the traffic situation for traffic control purposes. This would require commonality across all users, ie, all seeing data in same format, common descriptions, agreed KPIs, etc.</p>	<p>Good practice and knowledge transfer on integrated traffic control and information centres (bringing together traffic operators, public transport operators, transport police and other emergency services) to enable a coordinated approach to traffic management/ information, especially in the event of an incident.</p>	
			<p>Demand management measures and ITS to improve traffic management and crowd management during large events, especially in the event of an incident requiring emergency services.</p>		