WAYS TO CREATE A GREENER TRAFFIC USING TRAFFIC MANAGEMENT SYSTEMS and RTTI

Marius MINEA[*], Răzvan Andrei GHEORGHIU[*], Samson TSEGAY[**], Gino FRANCO[**]

[*]*Universitatea Politehnica din Bucureşti – Fac. Transporturi, Cat. Telecomenzi şi Electronică în Transporturi – 313, Splaiul Independenţei, Sect. 6 Bucureşti – sala JE008, www.pub.ro; emails: marius.minea@upb.ro; andrei.gheorghiu@upb.ro*

[**]*Mizar Automazione S.p.A., Italia, www.miz.it - a company of Swarco Traffic Management Division, www.swarco.com*

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1. INTRODUCTION

The continuous increase of traffic in major cities led to the mandatory usage of traffic management systems in order to have an organized traffic. There are many levels such systems may be implemented, depending on the traffic volume, starting from the static signaling systems up to management systems based on complex algorithms that consider a series of key factors. But in the recent years two new factors were considered in the process of finding solutions for traffic management: control of the pollution level and energy efficiency. There were some studies that concluded that the two measures which have the greatest impact in pollution reduction are the change in drivers' behavior and the mobility management (in this order) and many European projects tried to integrate the environmental component in the traffic management problem.

2. THE IN-TIME PROJECT

The In-Time (Intelligent and Efficient Travel management for European Cities) project is developing a traffic management system that includes the two measures specified before. The project focuses on Multimodal Real Time Traffic and Travel Information (RTTI) services with the goal to reduce drastically energy consumption in urban areas across the different modes of transport by changing the mobility behavior (modal shift) of the single traveler.
In-Time provides mainly 3 services:

- Business-to-business (B2B) services that will enable European-wide Traffic Information Service Providers (TISPs) to get access to regional traffic and travel data and services of the single pilot cities via a harmonized standardized open interface. This will enable the TISP
- to provide interoperable and multimodal RTTI services (e-services) to their end-users. E-services will influence the on-trip travel behavior by optimizing journeys taking the energy consumption into account. The community will be the users of mobile devices or navigational devices.
- Web based interoperable and intermodal pre-trip information will be provided by the pilot operators and has the potential to influence the travel behavior in the trip planning stage by taking environmental aspects into account. The typical users are persons that are planning an urban trip on short term.

The fundamental concept and goal of the In-Time project is to pilot and validate – in terms of transport benefits, user acceptance and market potentials – an innovative pan-European approach to RTTI service provision based on an open, standardized service oriented infrastructure and B2B services that will

[1] Real Time Traffic/Travel Information

facilitate access to urban traffic related data, RTTI service provision and interoperability by TISPs. Setting up and running 6 different pilot applications in Europe, the goal of In-Time is to demonstrate how using the same interoperable service infrastructure

1. Europe-wide TISPs can provide, and European travelers can use, the same RTTI service in different countries and
2. how specific services can be deployed and operated in different European cities, responding to specific stakeholders and citizens needs in the different sites.

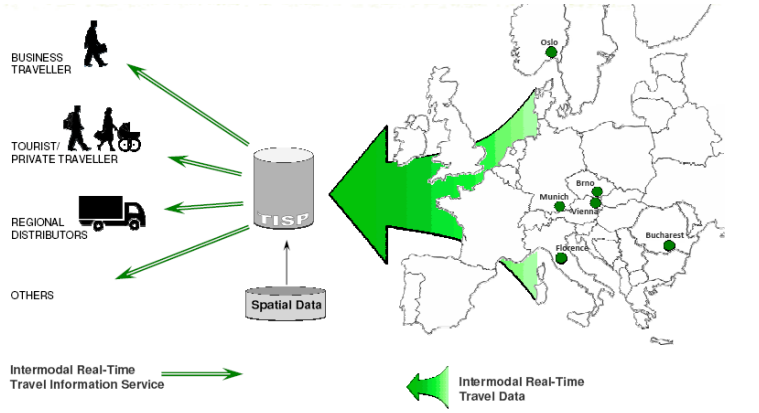

Figure 1. The In-Time concept

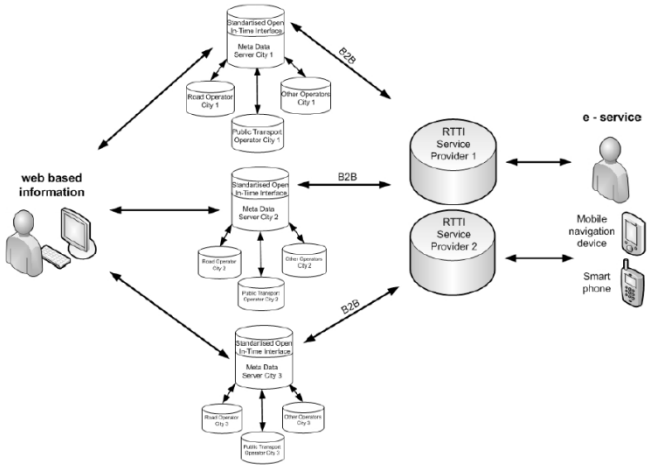

Figure 2. The structure of the system that will be implemented in the In-Time project

The central part of the In-Time concept is the interoperable and multimodal Regional Data/Service Server (RDSS), a service-oriented middleware infrastructure providing a standardized B2B interface and a number of data/services covering individual traffic, public transport, weather, location based services, inter-modal transport planning. Investigated and tested at a prototype level in the EU project eMOTION the In-Time RDSS enables the operation of end-user applications (web based B2C applications and services) as well as the B2B access via the standardized interface and e-service provision by European TISPs. The In-Time RDSS will be set up in all pilot sites to ensure the easy access of real-time multimodal traffic data for external TISPs. This model ensures the easy access to all urban traffic related

data within one region resulting in the distribution to the end-users via several information channels and in parallel enhancing user acceptance.
The RDSS can be seen as a service-oriented middleware infrastructure providing a number of data/services, covering:

- individual traffic,
- public transport,
- weather,
- location based services,
- intermodal transport planning,

and enables the operation of the In-Time services.

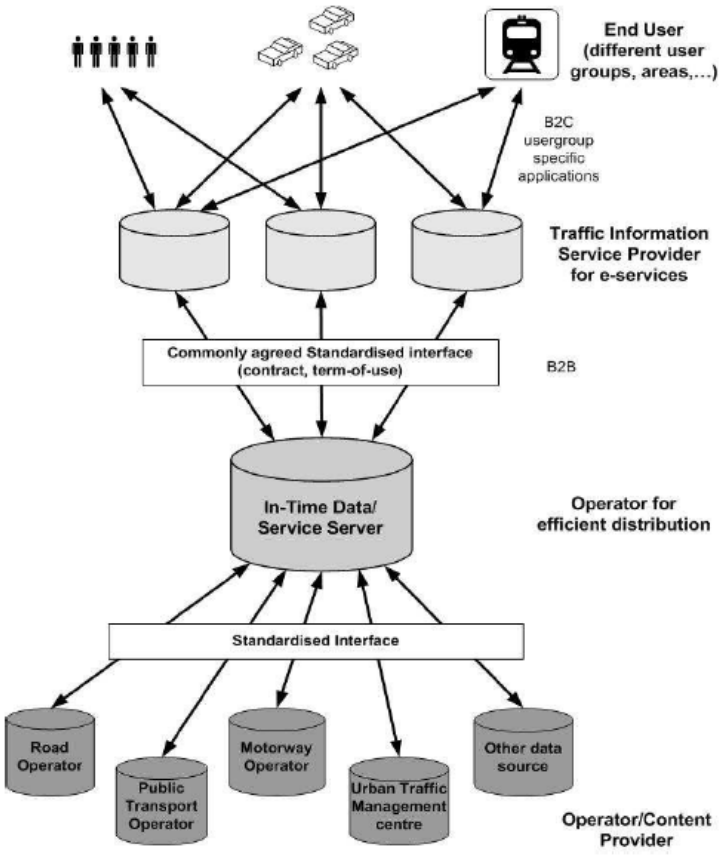

Figure 3. RDSS concept

3. DESCRIPTION OF *IN-TIME* SERVICES

Web based interoperable and intermodal pre-trip and on-trip information are very common interfaces from the single operators to their users. "*Pre-trip information is already an important contribution to sustainable mobility*" (Final Report of the eSafety RTTI WG), but has in many cases the disadvantage that a door-to-door trip planning taking different modes into account, is currently impossible.
The new approach within In-Time will ensure that on the one hand each pilot site will have the complete travel information (public and individual traffic) combined and interpreted at one location - the Interoperable and Multimodal In-Time Regional Data/Service Server (RDSS). This ensures that the user gets accurate and precise door-to-door information on the current travel times within the city, including

alternatives. But as shown in above usage example, the setup of the RDSS will give also the possibility for a seamless transition of data/services between the single regions and to result in interoperable cross-border travel information. It is expected that this service will facilitate inter-modal changes, thus attracting travelers to less energy consuming transport modes.
For the implementation of web based interoperable and intermodal pre-trip and on-trip information the costs will be mainly with the operators, that might be public authorities and ppp-models.
Accurate reliable intermodal real-time on-trip Traffic and Travel information as planned in the In-Time e-services has the potential to avoid congestions and bottlenecks, to select alternative routes and/or alternative transport modes. Hereby one key factor is, that the user needs to be used to the device he uses, therefore within In-Time standard products of Wayfinder will be enhanced by the e-service.
With the assessment of the operating Traffic Management the environmental impact of new traffic management technologies, that have reduced energy efforts, it is possible not only to improve visibility but also to cut the energy consumed to at least one fifth (in terms of CO2 emissions, comparable to the local impact of vehicle control measures!). The pilot of Bucharest is an opportunity to make direct measures of the savings in terms of overall energy efficiency across the city network, as here historical data from before the implementation of modern traffic management technologies are available..
Beside the energy consumption also the efficiency of the Infrastructure Device Product Life Cycle needs to be taken into consideration. A global approach must consider also energy efficiency of the whole life-cycle of products used for traffic control. Again the example comes from the signal heads, specific LED-based products have gone trough the assessment of their Global Warming Potential and demonstrated dramatic improvement if compared with traditional productions. This technology is used in the field in the Bucharest demonstrator and analysis for future “green-certification” rules will be performed.

4. *IN-TIME* PILOT SITES

The In-Time services will be piloted and operated in following European cities (see Figure 4):

- Vienna: 3.5 M inhabitants
- Brno: 0.4 M inhabitants
- Munich: 1.3 M inhabitants
- Bucharest: 2.3 M inhabitants
- Oslo: 0.5 M inhabitants
- Florence: 0.6 M inhabitants

The pilot of Bucharest will be operated by the Politehnica University of Bucharest – Center for Research, Design, Services and Consulting in Transport Electronics and Remote Controls Domain, which has an agreement with the Municipality of Bucharest to have access to all data relating to traffic flows and transport services as well as other traffic management data.
Bucharest is one of the major growing cities within Europe with a potential of approx. 7 million inhabitants until 2015. This will need the installation of an effective Traffic Management System. The installation of the new (UTOPIA) traffic control system started in 2007. The first phase is currently operating. Full implementation will be completed before the end of 2009. This will consist of:

- 140 intersections controlled with the UTOPIA UTC system;
- 300 vehicles monitored and managed by the MIZAR Fleet Management system FLASH
- about 300 probe vehicles equipped with monitoring equipment
- 40 CCTV cameras used for security monitoring purposes.
- 1 Supervisor server already enabled to exchange multimodal data with external TISPs and compliant with the Emotion schema (based on Mizar MISTIC platform)

The following paragraph will give a brief description of the data available in the Bucharest pilot site.

The dynamic traffic control is implemented in order to measure the impact of the adaptive traffic control system configured to reduce fuel consumption (i.e. implement the eco-flow concept) with selective bus priority function the data collected used as a basis will include:

- travel time both private cars and public transport vehicles (300) on selected fixed routes within the area where the UTC system is active (these are referred to in the following as fixed route trials);
- measurement of number of stops made at traffic lights and overall time vehicle is stationary (based on probe vehicle data);
- average speed of private vehicles when in motion;
- estimated and predicted travel time for the whole network as calculated through supervisor modeling and historical data;
- real time and dynamic multimodal routing engines accessible by external users and/or Infomobility portal.

Figure 4. In-Time pilot sites

The impact of automated vehicle (bus) management on energy consumption will be assessed my means of:

- average speed of Public Transport Vehicles while in motion;
- total stopping time and number of stops.

To assess the impact of pre-trip and on-trip traveller information and guidance on traveler route and modal choices, it is planned to collect the following data:

- travel time broken down into component areas (e.g. on board, waiting time at bus stop etc.) for selected OD relations within the area where the Bucharest city systems are available. This will be done where users have free path selection and will be carried out with the Bucharest systems ON and OFF. These trials will be referred to as OD trials. The survey will be designed mainly to assess the differences in total distances travelled and, where possible, vehicle speed. The “Politehnica” University participated in 2007 as subcontractor in the project “Bucharest Transport Masterplan”, with the Municipality of Bucharest as beneficiary. Part of the project involved collecting of OD data and also Household Surveys (questionnaires about public travel by private cars and public transport: time of departure, time of arrival, mode of transport, waiting time and so on). This data can be updated and completed with other necessary information.

- Energy consumption estimates: it is intended to apply energy consumption models and algorithms (sing a methodology to be developed during the first phase of the project) to the above data in order to produce estimates of energy consumption in the different ITS areas. In addition, overall fuel consumption and motorisation statistics for Bucharest will be used to calculate:
- the change in energy consumption (volume of fuel consumed per million inhabitants/year for vehicles within the controlled system).

The efficiency of technology choices with regard to energy consumption of the infrastructure and especially the adoption of LED technology for signal heads will be assessed by means of:

- an estimate of the amount of energy needed to operate the traffic control system in the area concerned; Here, in addition, it is also planned to make
- a product life cycle analysis, with information from the manufacturer to permit an estimate of total costs over full lifespan of the LED technology;
- an estimate of CO_2 emissions is also possible.

The pilot project is an opportunity to make direct measures of the savings in terms of overall energy efficiency across the city network.

As a part of the pilot, it is planned to use data collected from probe vehicles to constantly monitor the operational effectiveness in terms of energy efficiency of the measures described above. The continuous measurement of actual average fuel consumption of vehicles driving through the network will provide evidence of the overall trend and quantify the impact of any new strategies. As for other network parameters already commonly measured (e.g. travel time), this approach will guarantee constant improvement in the policies adopted.

5. CONCLUSIONS

This project intends to give a simultaneous solution both for traffic problems and environmental ones. Considering that the level of pollution caused by traffic is continuously increasing, implementing this issue in traffic management systems have become a necessity of the present time.

This project expect impacts in the following fields: traffic impacts, environmental impacts, business impacts and socioeconomic impacts on the society as a whole. The result will comply with the EC recommendations in each of the mentioned domains: the improvement of traffic management will lead to a safer and more secure traffic, complying to the requirement of EU to reduce road fatalities by 50% by 2010; a greener orientation (for traffic) – in terms of emissions and energy consumption – is a requirement in every field of activity and furthermore, studies carried out for EC Directorate General V have shown that difficult journeys to work create stress, absenteeism and reduce productivity at work, and have a harmful impact on family life and social interaction. Again, improvements in the travel conditions and travel comfort for commuters will help to reduce such negative effects.

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