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TTI Service Implementation Status Analysis in Europe

Deliverable D5.0

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ATLANTIC WP5 & WP6: Deliverables overview and relation

The deliverables in ATLANTIC workpackage 5 and 6 provide a structured overview of achievements, findings and conclusions. They equally reflect the methodological approach and the strategy for a targeted dissemination of results and recommendations. With respect to the extent of the information ga, analysed and documented, the following overview should facilitate orientation and reference for the reader (Table 0.1).

**Focused
documentation of
results**

Table 1.1: Overview and relation of WP5 & WP6 deliverables

Italics = high-quality printed edition

Rationale	No.	Title	Target Group(s)
Empirical Analysis	D5.0	TTI Implementation Status Analysis in Europe Vol.I: Approach and key findings Vol.II: National reports Vol.III: TTI service descriptions	All stakeholders of TTI service implementation in Europe
	D5.1	TTI service delivery in Europe - Good practice case studies and key actor interviews	European Commission
Stakeholder discussion	D6.2	Focus Group Proceedings on TTI deployment	All stakeholders of TTI service implementation in Europe
	D6.6	Final Conference and proceedings	All stakeholders of TTI service implementation in Europe
Targeted recommendations	D5.2	Recommendations on framework conditions for the deployment of TTI services in Europe	European Commission, decision makers at national level, private sector, European networks and associations
	D6.4	<i>Practitioner's handbook for TTI service implementation</i>	<i>Practitioners of TTI service implementation in European cities and regions (public & private sector)</i>
Dissemination of results	D6.1	Powerpoint presentation on framework for TTI deployment and eEurope Transport objectives and recommendations for use at conferences and outreach events	All stakeholders of TTI service implementation in Europe
	D6.3	<i>Good Practice in TTI service implementation (glossy edition)</i>	<i>All stakeholders of TTI service implementation in Europe</i>
	D6.5	<i>Joint Country reports (glossy edition)</i>	<i>All stakeholders of TTI service implementation in Europe</i>

Austria

1 Institutional framework for TTI development

1.1 Legal and public policy context

The ownership of traffic data as well as the data collection in Austria is separated between different public institutions. ASFINAG (Autobahn- und Schnellstraßen Finanzierungs AG - State motorway development and financing agency) as a company charged by the BMVIT (Österreichisches Bundesministerium für Verkehr, Innovation und Technologie – Austrian Federal Ministry for Transport, Technology and Innovation) finances road constructions and investments, collects and possesses the data they acquire from their motorways. On the other hand companies in the field of the Austria public transport, i.e. the public as well as the private transportation operators and the associations of transportation operators acquire and make use of their own traffic information. This means that the landscape of traffic and traveller systems from the institutional framework contains both publicly owned and privately owned operators.

There is neither an exchange between public and private data nor between private operators, especially under the view of the upcoming liberalisation of the public railways infrastructure and therefore a new competitive environment in Austria. The liberalisation of the infrastructure is an European initiative which tries to effect the separation of the existing State Railways operators into legally completely separated entities for the fields of the services and the railway infrastructure. This initiative is seen to be very important to establish competition for the railways traffic as one prerequisite for any efficient and less cost-intensive transport services. From the administrative and legal point of view there exists no legal compulsion for operators in Austria to exchange generated traffic data.

As mentioned above nowadays exists no regulation concerning the information chain or any data processing. This is expected to be changed by the development of the Austrian Transport Telematic-System TTSA as a technical and regulatory framework for transport telematic up to 2010. This framework will set up definite procedures for traffic and traveller information application development especially under the view of integrated traffic chain, compatibility of telematic systems and the emphasis of the intermodal split.

In Austria the BMVIT is in the position to encourage and promote innovative and useful traffic and travellers systems and applications. For regional goals and projects also the nine Austria federal provinces have this role to promote and support innovations.

1.2 Role of the private sector

In Austria the private and commercial companies already have introduced a number of well accepted TTI development in the market. Owing to a quite competitive environment they are a driver for TTI applications and developments. Examples in this field are the traffic information dissemination via mobiles from the Austrian Radio Broadcasting OE3 and the leading mobile network operator Mobilkom Austria. The system is based on the subscription of users for the value added service who in return for a daily fee get current traffic information in general or for a customers defined route via SMS on their mobile. Some public transportation operators use the same system to spread information to inform public transportation users in real time about possible traffic delays or time schedules.

TTI systems in some examples are enriched by not transport-related services. Two years ago the above mentioned mobile operator Mobilkom Austria started to offer the booking and

simultaneous payment of tickets for the state railways. This service is used by around 6,500 customers per month. This service is currently enlarged by offering this method of reservation and payment to other purposes e.g. tickets for cinema or concerts.

Owing to the existing state system of innovation stimulation by the means of accompanying measures and financial support the TTI development takes place within a co-operative relation and partnerships between the private and the public sector. Since the public sector is not interested and engaged in the market deployment from the supported projects revenue sharing does not exist in this field.

Currently there exists no company in the private sector which provides TTI services in Austria.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Implementation: The TTI application offered by the Austrian Radio Broadcast OE3 is seen as a leading service in this field in Austria. The system is based on real time traffic information which is acquired in the form of current information from actual traffic participants e.g. car driver on the roads. In this kind, this service whereas users receive prestructured information is one of the first launched and widely accepted used TTI value added service in Austria. The current traffic information is disseminated additionally to the radio broadcast and is therefore free of charge.

Market prospects: The program CORVETTE (Co-ordination and Validation of the Deployment of Advanced Transport Telematic Systems in the Alpine Area) promotes and enforces the RDS-TMC system (Radio Data System – Traffic Message Channel). This system is based on enhanced car radio receivers and is capable to deliver accurate and country independent traffic information to car drivers. Since car radio are widely spread and traffic information is accepted by car users this program together with the supported system can be regarded to have good market prospects. The RDS-TMC service is free of charge and can be categorised as a kind of TTI dissemination where the final user receives prestructured up-to date information.

TTI for public transport: One of the first TTI applications with direct recognition by the target group is the indication of real-time information for travellers from Wiener Linien (Vienna Public Transportation operator). The system gives accurate information about the arrival time of the public means, i.e. underground and corporation tram not only on the platform but often on the entrance of public stations to inform travellers about the time period till the arrival of the public trains. This service is free of charge and aims to overcome the traffic information deficit which a large proportion of public means user subjectively perceive by disseminating prestructured traffic-time-related information.

2.2 TTI research activities

During End-2000 Trust Consult prepared a benchmark study on the status and the development of information- and communications technology – IKT - for traffic and transportation in Austria as well as for a number of further European countries. The realising institution was the BMVIT.

The study is based on the methodology of expert interviews and dedicated field research. The results revealed the current developments of traffic information systems in Austria in comparison to developments in other countries.

The key findings were that in comparison to the European countries under review, Great Britain, Germany, The Netherlands and Sweden so far Austria has not yet realised much concerning projects, applications and services for TTI.

The general recommendation out of the findings therefore was the implementation of a comprehensive Austrian telematics plan with co-ordinated and co-operated development and implementation of TTI applications and services. For this purpose the project Austrian Transport Telematic System TTSA is currently being developed.

The TTSA is derived from the project KAREN. Its goal is to create a future proof comprehensive telematic system for any kind of traffic. This currently developed framework integrates all kinds of interest groups in Austria for ITS (Intelligent Transportation System) and will finally result into a co-ordinated and objective oriented basis for current and future telematic systems. The development of the TTSA is co-ordinated by the BMVIT via its operating subsidiaries. For the TTSA the operating subsidiaries are the viaDonau (Donau Transport Entwicklungsgesellschaft mbH - River Danube Transport Development Agency) which was founded in 1999 by the BMVIT and the Austrian research institution Arsenal Research. Here the actors involved in establishing and definition of the Austria ITS architecture TTSA cover a wide spectrum, comprising:

- Private Consumers - Travellers: Commuters, travellers on business or at leisure,
- Domestic travellers, tourists, etc. who will make use of ITS, Commercial Consumers - Freight and Transport Industry: Companies that transport commercial goods, or provide public passenger transport, and who will make use of ITS,
- Companies providing/using ITS: Information Providers, Airports, etc. that will provide their customers with information produced by ITS as part of their overall service,
- Local Authorities: city or district authorities that plan and manage the transport need in their area, and that issue regulations concerning ITS on the local, district or state level,
- High Level Ministries: National or Federal Authorities that plan and manage the transport needs for the nation or state, and that issue regulations concerning ITS at that level.
- Exploitation Level - Operators applying the ITS: Companies that will provide services, normally chargeable, based on the use of ITS.
- Industry Level - Companies developing and producing ITS: All industrial companies concerned with the development, production and sale of ITS.

The TTSA is based on the Project KAREN (Keystone Architecture Required for European Networks). This project has created a minimum stable framework necessary for the deployment of working and workable ITS within the European Union until at least 2010. It is the European ITS system architecture effort, requested by the High Level Group on road transport telematics, approved by the European Council of Ministers and funded by DGXIII as part of the 4th Framework Programme. The project began on 1st April 1998, and aimed to deliver an agreed, and promoted, Transport Telematics Framework Architecture which will:

- Define the necessary elements for an open market of ITS products throughout Europe, and the rest of the world, for European ITS industry,
- Be the basis for building consensus on issues that still prevent wide-spread deployment of ITS in Europe, and hence permit all categories of user to purchase cost effective ITS products that will work in the same way throughout Europe,
- Provide a bridge between the ITS community and those creating the current and future technologies that may be used by ITS,
- Be a guide for public investments on the basic infrastructure necessary for the deployment of the ITS services,
- Support the identification of areas where new research and demonstrations are needed.

An other initiative for research activities and promoting of telematic innovations comes from the public frame program TAKE ÖV (Telematik Anwendungen für den Kunden entwickeln im Öffentlichen Verkehr – Developing Telematic Applications for Public Transport Passengers) set up by the BMVIT for the period 1999 to 2003. This program is a project platform trying to bring together high tech industry and service sectors, public transport operators as well as universities and research institutions. Its main target is to encourage the development and implementation of intelligent telematic applications for the passenger of public transport.

The main purposes of this supporting frame program are:

- adding customer value in public transport,
- generation of ready-to-market demonstrators and showcases which will,
- result in an overall rise of the technological level of public transport infrastructure and applications and
- creating a positive setting in favour of upcoming telematic innovations and investments.

The BMVIT is on the way to establish a new supporting program in Austria, the so called I2S (Intelligente Verkehrssysteme und Services – Intelligent Traffic systems and services). This program takes the given current Austria situation in the field of information- and communication technologies - IKT - into consideration where Austria, as mentioned above, in comparison to other European countries has a quite weak position in the development and implementation of innovative telematic solutions. The aim of the supporting program is to increase R&D activities of Austrian companies in the branch for transport telematic-applications and developments to reach and get in line with the European average in this field. The following goals are planned to reach:

- Strengthen the competitive situation of Austria companies by supporting further R&D activities,
- Significantly increase of the participation of Austrian companies in research- and technology development activities for traffic telematics,
- Strong enlargement of the range of innovative products and intermodal traffic-services for the transportation of people and cargo,
- Increasing integration of the university sector,
- Implementation of reliable R&D networks for telematics for traffic,
- Increasing participation of Austrian participants into European and international R&D programs,
- Positioning of Austria as a reference market for innovative applications for traffic telematics,
- Support of an optimised use of the Austrian traffic corridors in line with the traffic-, transportation- and environmental goals of the Austrian government.

3 Key issues for TT I implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

According to discussions with experts to the development of the new supporting frame-program I2S and out from the first findings and results from the development of TTSA institutions as drivers and trend-setters are ranked as follows.

1. BMVIT (public) (incl. subsidiaries)
2. Telecommunication supplying companies – private
3. Telecom Operators (private and public)
4. Universities and research centres (public)
5. ORF (Austrian Broadcasting – public)
6. European Union (public)
7. IT Companies

3.1.2 Technological (data acquisition and service delivery) [Please rank]

According to discussions with experts to the development of the new supporting frame-program I2S and out from the first findings and results from the development TTSA, TTI related technologies for future development and implementation are ranked as follows.

1. real time information in public and private transport by appropriate technical means,
2. floating car data in urban areas and infrastructures on mainstream/coupled with road pricing infrastructure,
3. dissemination of TTI with varied media (GSM, GPS, Tetra, WWW, RDS-TMC, VMS, DAB, public displays, on-board units, mobiles, etc .)
4. content provisioning,
5. adaptive traffic systems,
6. navigation systems,

3.2 Key obstacles to overcome

According to discussions with experts to the development of the new supporting frame-program I2S and out from the first findings and results from the development TTSA the prevailing key obstacles to overcome are ranked as follows

1. political framework (business model of public transport – cost redemption)
2. decision makers in public institutions with persuasion of road/rail construction
3. legal obstacles (liability of TI and their consequences)
4. End Users perception and readiness to use

5. Political perception for urgent need of TTI solutions
6. Appropriate business models for private TTI dissemination
7. Users cost-price consciousness
8. Operators consciousness for need of TTI accuracy and users needs

3.3 Major potentials to use

According to discussions with experts to the development of the new supporting frame-program I2S and out from the first findings and results from the development of TTSA major potentials to use are ranked as follows.

1. intermodal timetable in public transport (supplemented with real-time data)
2. real-time TTI independent from the transport mode with the alternatives of public and private transport
3. real-time TTI via all kinds of dissemination means
4. navigation system under adaptive consideration of traffic situation for private and public traffic
5. adaptive traffic controlling via traffic lights and VMS based on real-time data
6. Integration of travel information with enhanced regional data

4 Annex

4.1 Key actors in TTI development

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Belgium

1 Institutional framework for TTI development

1.1 Legal and public policy context

1.1.1 Enabling framework

Since the Regionalisation of Belgium in 1988, Transportation has become a “Regional” responsibility (Brussels, Flemish and Walloon Region). Therefore, no overall National reference legal framework plan for the development of TTI exists. However, the three Regional governments agree on a co-operative approach.

Taking into account the availability of a very dense motorway network all over the country, for the improvement of traffic conditions, and improving the capacity (and safety) of the road network priority is given to applying ITS solutions rather than extending the network with environment unfriendly and land consuming infrastructure works.

Particular attention is given to improvement of traffic information centres (TICs) and traffic control centres (TCCs), with respect to ensuring European interoperability and homogeneity (specifically cross-border relations). The overall objective of this activity is to allow Regional TCCs and TICs to communicate with each other and also with their foreign correspondents for traffic management and information purposes.

Particular attention is being put on:

- Extension of traffic monitoring
- Improvement of weather monitoring
- International traffic data exchange (DATEX)
- Assisted motorway emergencies operation
- Dissemination of traffic and mobility information.

One of the initial accomplishments was the decision to run the exchange of traffic information between operators using the DATEX standard. Although this standard was originally adopted for the exchange of cross-border data, it was extended to traffic within the country.

Except for the operation of rail infrastructure and services (NMBS/SNCB), the responsibility for public transport has also been devolved to the regions. The policy emphasis of the different public transport organisations is on publishing (static and in some cases dynamic) information related to their operations.

Though the regional Ministries and different public transport organisations generally support the Commission Recommendation, no specification initiatives have been undertaken to implement it as there are currently no private-sector initiatives in this area.

1.1.2 Information Chain

The information chain for TTI service deployment in Belgium is generally characterized in the following way, with differences primarily based upon mode:

Road Traffic information services use the following information chain:

- Data acquisition and data fusion are generally handled by the infrastructure owner, i.e. the Regional Administrations depending on the Regional Ministries of Transport.
- Information supply and transmission is generally handled by both the infrastructure owner and third party service providers, i.e. Public and Commercial Radio and TV. The National Police (Ministry of the Interior) still operates the National Traffic Information Centre (NTIC), passing on traffic and travel information to the regional radio broadcasters (the Ministries install and maintain the monitoring equipment that feeds the NTIC).
- Marketing & Support is generally handled by the third party service providers. The emphasis on third party service provision has increased over the last few years and this increase is expected to continue over the next years.
- Though contacts with private sector actors exist, there is not yet any official public-private cooperation apart from the reception and broadcasting of private (Touring Mobilis¹) data by the regional broadcasters.

Railway(a national service) information services follow the general information chain described above, with the following division of roles:

- Data acquisition, data fusion, transmission of information, marketing, support and information supply are all handled by SNCB-NMBS² - the national Belgian railways operator, and infrastructure owner.
 - a. Information in the stations is provided through station panels and announcements
 - b. On-trip information is provided at the stations through information points/ticketing offices and announcements on trains
 - c. Pre-trip information from call centres, and internet, providing a full journey planner: based on origin and destination stops and the time of departure and/or arrival. Website: ³

Urban and Inter-urban Public transportation information services generally tend to be managed singly by the transportation provider. Furthermore, only rarely is dynamic information on public transportation made available to final users

1.2 Role of Public Authorities

Four levels can be distinguished in the Belgian (road) administration:

- the federal level, (essentially responsible for traffic regulations)
- the three regions Brussels, Flanders and Wallonia,
- the ten provinces, and

¹ Touring Mobilis is a service of the Royal Automobile Club Belgium “ www.touring.be/trafic/default.asp ”

² Société Nationale des Chemins de fer Belge – Nationale Maatschappij voor Belgische Spoorwegen

³ www.b-rail.be

- groups of municipalities at the local level (called “regies” by the regional Ministries of Transport, and “districts” by the Police).

For ITS-related services, the all-important level is the regional level. All three regions take initiatives regarding TTI and consider it as their (i.e. a public) responsibility

The responsibility for inter-urban roads in Belgium lies at the regional level⁴, and is handled by:

- For the Brussels Region: the Ministry of the Brussels Region (MRBC⁵),
- For the Flemish Region: the Ministry of the Flemish Community (MVG⁶)
- For the Walloon Region: the Walloon Ministry of Equipment and Transport (MET⁷).

The regional Ministries are also the key players in ITS. Both the MVG and MET also operate regional traffic centres, respectively in Antwerp and Namur.

1.3 Role of the private sector

Till now, the private sector plays only a minor role in the deployment of TTI services in Belgium. Only the Brussels Public Transport Company STIB-MIVB⁸, a Private Company owned for 100% by the Brussels Region, has now started to implement real-time information at bus stops on waiting times for the next coming buses. The intention is to cover all *important* bus stops within the next five years. A private company uses the real time position information available at the control centre and calculates the estimated arrival times of the buses at the different stops.

Currently real time information on the position of the vehicles AND waiting times at ALL stops is available on the STIB-MIVB web-site⁹.

Telecom providers are currently also preparing partnerships with Public transport providers (railways, metro, tram and bus companies) in order to allow them to deliver customised information to their clients using SMS and/or WAP. In Particular, STIB-MIVB is preparing such a solution in co-operation with WEBRASKA.?

Such a service is already available concerning arrival and departure times for flights. See Belgian ADVALVAS web site¹⁰.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Please revise the first service description sheet (national road TTI) accordingly; The services 2-5 are actually “interactive” (information can be adapted to user requirement e.g. timetables)

Funding of TTI (and in general all ITS systems) is mainly financed by public money.

⁴ since 8 August 1988 (change by law)

⁵ Ministerie van het Brussels Hoofdstedelijk Gewest - Ministère de la Région Bruxelles-Capitale

⁶ Ministerie van de Vlaamse Gemeenschap (MVG)

⁷ Ministère Wallon de l'Équipement et des Transports (MET)

⁸ STIB – MIVB: Société de Transports Intercommunaux de Bruxelles – Maatschappij voor Intercommunaal Vervoer te Brussel

⁹ www.stib.irisnet.be

¹⁰ <http://flightinfo.advalvas.be/av2/>

2.1.1 Public Transport

Public transport operators are fully aware of the rising interest in the use of telematic systems, in particular for improved management of the system and for the diffusion of traffic and traveller information.

Available information on public transport (essentially static timetable and tariff information) is disseminated by the majority of transport operators via the following methods (ranked in order of importance)

- Internet
- Telephone Call Centres
- Mobile telephone (SMS and WAP)

Brussels

Currently, only the Brussels public transport operator has since many year a full real-time continuous fleet monitoring and management system based on dead reckoning and fixed beacons along the line. High accuracy is achieved by using the door opening recognition at stops.

The real-time position information available in the system is also used as a basis for the priority request at intersection traffic lights for delayed buses and trams at almost 50% of the traffic lights at intersections in the city.

Real-time arrival time announcements of buses/trams at stops are currently under implementation. This service, also using the real-time positioning information available in the fleet monitoring system, provides a stop-based overview of the actual times that all buses and trams will arrive. At present approximately 30% of the stops is equipped and operational. It is the intention to extend the service to all significant stops.

There is also an Internet-based multi-modal (bus, tram, metro, rail) service, that consists of:

- bus/tram service tables: this service provides an overview of all lines and number of passages per hour
- bus/tram/rail journey planner: based on origin and destination stops and the time of departure, this service provides a detailed journey plan covering bus/tram and rail (sent to the user by e-mail) (result of a co-operation between the rail company and the main regional bus/tram operators)
- focused on Brussels region – journey planner coordinated to cover regional (Brussels, Flemish and Walloon Region) bus/tram information as well as national rail information¹¹.

Wallonia

The regional public transport providers are brought together under one umbrella organization the public Walloon regional bus/tram organization called “TEC (société de Transport En Commun)”.

Static time table information is given for free on paper leaflets and at the stops.

Pre-trip and on-trip information is also available on different regional web-sites¹².

¹¹ www.stib.irisnet.be

¹² www.tec-liege-verviers.be - www.tecbw.be - www.tec-charleroi.be

This is an Internet-based service, that consists of bus/tram service tables: based on either the line or one or two stops, this service provides an overview of all lines and times that service these stops.

Currently there are limited real-time fleet management capabilities, but concrete plans to implement such systems in the short term are existing.

Flanders

Similarly to the Walloon situation, the regional public transport providers are brought together under one umbrella organization the public Walloon regional bus/tram organization called “DE LIJN”

Static time table information is given for free on paper leaflets and at the stops.

Pre-trip and on-trip information is also available on one regional web-site¹³.

This is an Internet-based service, that consists of:

- bus/tram service tables: based on origin and destination stops, this service provides an overview of all lines and times that service these stops
- bus/tram/rail journey planner: based on origin and destination stops and the time of departure, this service provides a detailed journey plan covering bus/tram and rail (result of a cooperation between the rail company and the main regional bus/tram operators)
- arrival times of buses/trams at stops: this service provides a stop-based overview of the times that all buses and trams will arrive.

Currently there are limited real-time fleet management capabilities, but concrete plans exist to implement such systems in the short term.

2.1.2 Road Transport

General information is broadcast to the public free of charge.

There are no initiatives to make public information available to private sector initiatives.

Automatic data collection is based on the following data sources:

- loops: overall, there are about 400 measurement points, corresponding to every 10 to 15 kilometres of the main roads (mostly motorways); the system is essentially based on single loops and was installed in the 60's and 70's for statistical purposes; it records average speeds, densities and numbers of different categories of vehicles on a two-minute basis;
- cameras: more recently, about 20 camera-based video detection systems have been installed on motorways in the vicinity of Antwerp and Ghent; the infrastructure is maintained by the regional road authorities and the data are used by the National Police (and its control centre that is connected to the regional broadcasters)
- SOS telephones: are installed every 2 kilometres on virtually all motorways; their importance as a source of information on accidents and breakdowns has reduced a lot since most emergency calls are now made through GSM
- a network of 47 roadside weather detection stations are installed in mainly Wallonia (14 of these are also use for forecasting purposes such as thermal mapping);
- More than 5 000 GSM-users also regularly report to a service called “Touring Mobilis”, that is run by Touring Club, one of Belgium's automobile clubs.
- On busy days, the Police and Touring Club also do air surveillance of traffic by plane and helicopter.

The data distribution for pre-trip and on-trip dynamic information uses different channels:

¹³ www.delijn.be/frame_reisinformatie.html

- live broadcasts
- RDS-TMC messages (using FM) – in Wallonia,
- DAB services are planned but no fixed starting dates have been defined yet
- Internet based services using maps showing real-time traffic situation. See web-site¹⁴

These services are coordinated at national level in order to show at least all national motorways.

2.2 TTI research and demonstration activities

Belgium has no national research activity. However it has been involved on a number of EU research Projects. The most important of which are:

- Brussels region has been involved in the CAPITALS project, providing real time travel information on the major Urban roads in the city.
- It has also been involved in the CAPITALS PLUS project providing real time travel time information on the most important roads in the Capital.
- Flanders Region was also involved in the CENTRICO project on the cross-border data exchange between regional Traffic Information Centres using DATEX.
- TRIDENT EU demonstration project integrated the approaches and methodologies of existing traveller information system solutions to minimise both duplication of development effort and disruption to user organisations. The implementation in Flanders was based upon integration between public transport and urban road traffic

Other projects of interest include:

- EDEN: Directory of European Traffic Centres

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

The main institutional drivers and trends in Belgium are:

1. Development of a common architecture
2. Development of communication protocols, DATEX
3. EU emphasis on need to develop trip time estimates (not just event information) and to ensure that the TERN (Trans-European-Road-Network) is equipped with the necessary instruments to provide the relevant input data
4. The main driver for all these developments is the Euro-regional project CENTRICO in which all regional Ministries participate.

¹⁴ www.vlaanderen.be ; www.routes.wallonie.be ; www.touring.be/traffic

3.1.2 Technological (data acquisition and service delivery)

The main technological drivers and trends in Belgium are:

1. Common implementation of DATEX nodes for the exchange of traffic data
2. Definition of standards for the publication of data for service providers
3. Creation of cross-industry portals providing personalised services
4. Availability of GSM
5. Release of new generation of wireless communication.

3.2 Key obstacles to overcome

The main obstacles to overcome in Belgium are:

- Legal questions regarding data ownership, responsibility, liability for users. The roles and responsibilities of the different actors are not defined in a systematic way
- Liberalization of market so that information is available to service providers based upon “just compensation” not on exclusive supplier relationships
- Management of information to ensure that only valid and current information is presented to the users. If individuals receive incorrect information, there is a great risk of disenfranchising them permanently.
- Gap of intermodal information (car/rail/ship/public transport)
- Non existence of a EU protocol for intermodal information
- Presentation of information in a user-friendly way so as to communicate the message most effectively

3.3 Major potentials to use

Possibility to concentrate on personalised services, as basic national roadway information is widely available, in particular:

- providing seamless integration between as information sources
- information services which communicate effectively in “user friendly” way, based upon the type of instrument (WAP, SMS, Palm, on-board computers, etc.)TTI research activities

4 Annex

4.1 Key actors in TTI development

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	involvement	<i>Head of the department in charge of transport infrastructure</i>
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2	institution	Ministerie van Vlaamse Gemeenschap
...	name / position	Reginald Keygnaert / Directeur Mobiliteitscel
	involvement	<i>Head of the department in charge of transport infrastructure</i>
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3	institution	DE LIJN
	name / position	Hugo van Wezemaal / General Manager
	involvement	Defines general strategy for regional Public Transport
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4.2 Sources and references

Interviews with above mentioned key actors

EDEN project final deliverable

CENTRICO project final deliverable

www.vlaanderen.be

www.wallonie.be

www.bruxelles.irisnet.be

www.belgie.gov.be

www.belgium.fgov.be

www.cordis.lu

Bulgaria

2 Institutional framework for TTI development

2.1 Legal and public policy context

In the Bulgarian transport policy [1,2,3] the ITS is not yet considered as priority topic at least as far as TTI is concerned. This fact is due to various reasons, but the most important one is the financial factor. During the last 12 years the transport sector is permanently suffering from lack of funds and therefore the very limited financial resources are used to cover the most urgent needs: maintenance of rail and road infrastructure, finishing some projects whose realisation has been frozen, providing subsidies for the passenger public transport etc. Moreover, there are no indications that this policy will change in the nearest future. The government's priority tasks for the next 4-5 years are: construction of a bridge over the Danube river on Vidin-Kalafat, finishing the last sequence of the motorway Sofia-Bourgas (Svilengrad), reconstruction and modernisation of the Sofia airport, construction of the missing link between the Bulgarian State Railways (BDZ) and the rail network of neighbouring FYROM etc.

It has to be pointed out that during the 80s the idea of ITS has been launched and some practical steps have been made towards its realisation. For example a data transfer network has been created in the BDZ. It was largely oversized and meant as a basis for a future integrated travel information system including not only the railways, but the other transport branches as well. "Centres for Complex Travel Services" were established in Sofia and in the other large cities and a number of information services could be obtained by telephone.

With the beginning of the reforms in the transport sector in the early 90s the attempts to create centrally managed TTI system have been abandoned. On one hand this development was a logical consequence of the on-going institutional reform and of the difficulties, which the national economy and transport sector were facing, but on the other it was due to the misunderstanding of the philosophy of a modern transport system in the market-economy context. It seems now the awareness is reappearing that the central and local authorities have to lead a long-term policy in support of the development of an ITS. This evolution of the general concept interpretation has been reflected in the national strategy for the transport sector [1] where "the creation of information-management systems for the railway and road networks" is foreseen (p.3.2).

As a whole the legislative framework could be characterised as neutral to a future development of TTI systems. No special privileges exist for investments in this field, but in the same time no significant restrictions are imposed to this kind of activities. Moreover, some difficulties could arise not because of too stringent laws but as consequence of the lack of regulations on some important matters. In addition, the relatively frequent changes in the state administration structures and the related lack of distinctness in some functions could appear as obstacles as well. For example, the road administration has been recently separated from the Ministry of Transport and integrated to the Ministry of Regional Development and Construction. As a result in some cases the coordination between the Road Executive Agency and the Ministry of Transport seems to loose in terms of promptness and efficiency. The same problems appear between the Traffic Police, on one hand, and the institutions dealing with the national road network - the Road Executive Agency and the municipalities - on the other hand.

Public Transport

There is a trend central and local authorities to support development of TTI services through financing activities related to provision of information about the PT. Several examples are

illustrating this tendency. The oldest information system for road travellers in Bulgaria based on the national radio network is managed by the road administration and the Traffic Police. The BDZ recently joined an international consortium (with participation of railway administrations from other countries), which plans to create a large information system for travellers. The municipality owned Public Transport Company in Sofia has put in operation a modern system for trams and buses monitoring whose functions could be enlarged so that useful information could be transmitted to the passengers as well.

The budget restrictions imposed to both central and local authorities by the economic crisis strongly affect the financing of TTI system development and implementation. When some funds are allocated to such activities, they are aiming to collection and processing of data used in the first place for traffic management and safety increase. The created information systems could however be up-graded and adapted to generate also appropriate passenger information.

Road transport

As it was already mentioned, the responsibilities for management and development of the Bulgarian road network are shared by the municipalities (for the part of it situated within towns and villages) and the government institutions (for the rest of the network). This circumstance together with the financial difficulties plays an unfavourable role by planning the development of TTI systems. The latter obviously needs purposeful and good coordinated actions of both central and local authorities, which have not been undertaken yet.

2.2 Role of the private sector

It is important to note that the road transport in Bulgaria is completely privatised since the beginning of the 90s. A large number of freight carriers as well as more than 3500 passenger lines are privately owned and managed. Some of these private operators are using modern TTI systems, but these systems are intended to fulfil operation management tasks and not to provide travel information. For example the largest Bulgarian freight carrier SOMAT owned by Willy Betz operates a GPS based system to link all vehicles of its fleet with the dispatching centre in Sofia. However there are not yet enough collective actions towards elaboration of a common policy for development and implementation of TTI systems. There are good prospects that the organisation of the Bulgarian freight carriers AEBTRI will play a leading role in this process in the future.

On the other hand the private sector is very active by developing and providing TTI systems for all transport branches. Various types of specialised software are offered (mainly - data base creation and support systems), as well as μ C and/or radio-link based on-board devices (for the taxi cars, for example). Since the information and communications technologies are one of the few progressing sectors in the country during the last decade, there are considerable capacities for development as far as creation and production of TTI systems is concerned.

3 TTI Service implementation and research

3.1 State-of-the-art for TTI services

A very limited number of TTI services are provided actually in Bulgaria and their scope and quality is far from meeting the EU standards yet. As a matter of fact, only the first modest steps have been made in some areas and the following examples are almost exhausting the Bulgarian experience in the field.

Radio information for the road transport

This is one of the oldest transport information systems existing and successfully operated in Bulgaria. The primary information about the current situation of the roads is collected by a network of offices of the Executive Road Agency situated all over the country. The data list contains: weather conditions (especially on some crucial points, like mountain passes for example), detours, temporary speed limitations or capacity restrictions due to road reconstruction or maintenance works, situation on the border crossing points etc. This information is transferred to the Traffic Police Central Office where data about major traffic accidents and congestions are added; then it is submitted to the Bulgarian National Radio and to a number of private radio stations, which are covering the whole territory of the country.

There are no special traffic program stations in Bulgaria for the time being.

Main road network

There is no system for automatic traffic density monitoring on the main road network. On several crucial points inductive sensors are placed so that this parameter can be evaluated, but the data obtained are used by the road administration for assessment of the road load and not for in real-time generation of TTI. In Sofia about 30 sensors are installed, between 100 and 150 are located on the national road network.

On some main road crossings there are light panels informing the drivers whether the next road sequence is passable. These simple devices are very useful in winter season when the weather conditions in the mountains areas can change quickly and transform some passes in insuperable obstacles.

Similar panels are installed on the tunnels entries of the Hemus and Trakia motorways. They are combined with video-cameras sets for traffic monitoring. These systems are used exclusively for safety purposes.

Several private companies are offering electronic maps of the national road network. Some of these maps are used by the Traffic Police and by the road administration for various purposes, for instance for precise distance calculations.

Local road network

In the 80s automatic traffic control green-wave systems were installed in Sofia and in some other big cities (Plovdiv, Varna, Stara Zagora). Now mostly of them are out of operation because of lack of financial means for maintenance.

Inductive detectors are used on several big crossings in the capital city Sofia and in other big cities for assessment of the traffic parameters and appropriate setting of the signal lights frequency.

Two position-monitoring systems are implemented by the Public Transport Company in Sofia. The first one is radio-relay based and is used since almost two decades for dispatching and control of the Company buses fleet. (Similar systems are operated in other large cities as well). The second is a modern GPS based system for trams monitoring and control. In both cases the systems are not used for generating and/or transmitting passenger information.

National and local PT networks

Regularly transmitted traveller information is provided by the Centre of Telematic Services. The latter is a member company of the Bulgarian Telecommunication Ass. Ltd. and has as main task the operation of the national videotext system INFOTEL. INFOTEL has more than 10000

customers connected either via telephone or through PSDN BULPAK. Unfortunately the transport related issues are underdeveloped so far. The list of the items available contains: the schedules and ticket prices of several private operated inter-city bus lines, changes in the trains schedules of the national rail company BDZ, flights information etc.

The largest national bus companies have their schedules, prices and office coordinates on Internet. There are other services available on some addresses (for example on www.bus.bg.com) as well: booking, obtaining various traveller information (especially about trips abroad), contacting travel agencies etc.

The majority of the bus operators offer adequate information about their services by telephone.

A EU PHARE project is actually started by the Ministry of Transport aiming to develop a local subsystem of the international Number 112 information system. It will allow all foreign (and domestic) drivers dialling the internationally accepted telephone number 112 to obtain the most important information and to contact police, medical services, fire-brigade etc. in emergency cases.

Several private companies are offering GPS services for private cars (vehicle location for emergencies). For some car insurance companies the GPS control of the vehicle is a compulsory pre-requisite for insurance contract.

3.2 TTI research activities

A laboratory in the Technical University of Sofia is developing modern position monitoring systems including GPS based ones. Both systems operated by the Public Transport Company in Sofia are produced by this laboratory.

The same research unit is actually developing light information panel (for tram stations) displaying the arrival time of the next coming trams.

A small research unit of the Executive Road Agency is involved in development and implementation of systems for traffic monitoring and control, but its activities are significantly reduced in the last years because of lack of financing.

4 Key issues for TTI implementation

4.1 Drivers and trends

4.1.1 Institutional (public and private)

1. The on-going integration of the Bulgarian legislative system to this of the EU-15 is a pre-requisite for a more accelerated adoption of EU standards, including transport sector related ones.
2. The Bulgarian transport system is an important part of the European network because of its geographic position. Significant freight and passenger flows are crossing the country and the need of TTI services provision will increase in the future.
3. There is a trend of permanent increase of the foreign tourists number in Bulgaria, especially from EU countries. Furthermore, there are good prospects for a sustainable development of the international tourism in the country. This factor is taken in consideration in the government transport policy (priority of finishing the motorway branches from Plovdiv to Bourgas and to Svilengrade and preparation to start together with Serbia the construction of the

Sofia-Nish motorway). It will stimulate the implementation of TTI services for both international and domestic travellers.

4. The commitment of some state institutions in TTI related projects planned for the immediate future (joining the Number 112 Network, integrating the BDZ information system to an international network etc.) is a positive sign for the government readiness to support development and implementation of TTI services.

4.1.2 Technological (data acquisition and service delivery)

1. The boom of telecommunication services in the country in the last years and the creation of related infrastructure could play a stimulating role in the development of TTI systems in Bulgaria. The availability of electronic maps and GPS services is an example that even for the most state-of-the-art TTI systems, like auto navigation for instance, some pre-requisites already exist.

4.2 Key obstacles to overcome

1. Lack of adequate financing continues to be the main obstacle by developing and implementing TTI systems and services. The only way to overcome it is to attract foreign investors or to benefit of EU funded projects.
2. The low level of coordination between public and private transport sectors in the field of TTI services needs measures aiming to create better and more efficient cooperation. The state institutions have to play leading role in this process.
3. Although at this stage the underdevelopment of the legislative framework is not yet obvious, there is necessity to set up clear regulations concerning the data ownership and access rights which would facilitate data exchange among the main actors in the TTI development process in the future.

4.3 Major potentials to use

1. The mentioned in 3.1.2 technological potential is important and can be used for TTI developments.
2. Bulgaria - like several other EEC - is a country with a very high level of education of its population. Even in the years of deep economic crisis the number of private companies dealing with CIT is unusually large. A lot of them are successfully working in partnership with foreign firms and are gaining positive experience in new products development and implementation.
3. The accession of the country to many EU funded programs open the doors for more efficient cooperation with partners from EU-15 and for participation in international consortiums involved in TTI related activities.

5 Annex

5.1 Key actors in TTI development

- | | | |
|---|-------------|---|
| 1 | name | Dimitar Zhev |
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| | phone | ++359 2 932 4397 |

- | | | |
|--|-------------|---|
| | fax | ++359 2 988 5094 |
| | e-mail | |
| | involvement | Very competent on general transport policy of the Bulgarian government, follows since years all international projects in the transport sector. |
-
- | | | |
|---|-------------|--|
| 2 | name | Dr. Dejan Donkov |
| | position | Director of the Centre for Telematic Services |
| | institution | Centre for Telematic Services – Bulgarian Telecommunication Company Ltd. |
| | address | 7-mi km, Tzarigradsko shosse Bld. 1784 Sofia, Bulgaria |
| | phone | ++359 2 768 748; ++359 2 971 8025; ++359 48 992 733 |
| | fax | ++359 2 971 8291 |
| | e-mail | Donkovd.ctu@btc.bg |
| | involvement | Has a large experience in internet - and teletext - based services. Competent both in transport planning and management and IT issues. |
-
- | | | |
|---|-------------|--|
| 3 | name | Dr. Dimitar Radomiriev |
| | position | Head of Department |
| | institution | Traffic Police Central Office |
| | address | Maria Luisa Bld., Sofia, Bulgaria |
| | phone | ++359 2 982 4792; ++359 2 982 3486 |
| | fax | |
| | e-mail | |
| | involvement | More than 30 years experience in traffic control and planning. |
-
- | | | |
|---|-------------|--|
| 4 | Name | Ass. Prof. Tzetzko Lukarski |
| | position | Head of the company <i>Microprocessor-Based Control Systems for Transport Automation</i> at the Technical University of Sofia |
| | Institution | Technical University of Sofia |
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| | involvement | Main expert by the development and implementation of two vehicle position control systems successfully operated by the Public Transport Company in Sofia, including the GPS based one. |

5.2 Sources and references

- 1 National Strategy for Preparation of the Republic of Bulgaria for Accession in the European Union. Sofia, 1997.
- 2 Bulgarian Transport Sector Memorandum (Chapter I - The Transport and the Economy). Ministry of Transport. Sofia, 1997.
- 3 Zhev D., National Investment Priorities in the Transport Sector of Bulgaria. Conference: Bulgaria Today - Commercial and Investment Opportunities. Rome, 14-16 October 1998.
- 4 www.busBG.com

Czech Republic

1 institutional framework for TTI development

1.1 Legal and public policy context

The Czech National Transport Policy (1998) and other strategic documents which derive from the policy only partially explicitly endorse ITS as an integral part of the transport system, mainly in the area of road safety and public transport integrated information. The policy strongly endorses PT and sustainable development. Information for road users is not, however, addressed directly at all. Research and Development projects in ITS are however given priority.

This state probably rightly reflects the more general feeling that ITS is something for (short-term) tomorrow and not today's immediate priority. No attention is paid in policy to business models supporting financing of investment and operations of TTI systems. A change might be expected in response to the new EU Transport Policy White Paper, placing more emphasis on the user and the information society in transport.

The current Czech research project "ITS in the conditions of CR" is addressing policy issues of TTI implementation (not yet defined, but may include PPP set-up) and is effectively the basis of an ITS strategy and architecture for CZ. This project will address issues of cost-benefits and financial /business models even for ITS including TTI.

There are 2 associations for transport telematics, SDT and ITS Czech Republic. SDT has so far been a very strong dissemination voice for the ITS cause by organising a number of well-attended events as well as advising the Transport Ministry on a number of issues. The membership of over 50 firms is a mix of industry, administrations, academia and the odd consultancy firm.

There is, however, a general lack of knowledge on TTI systems and enabling requirements in state and local level administration, which will form a strong barrier to development. The right technical and legal skills are much more prevalent in the better paid private sector. This fact creates a need for PPPs but at the same time provides a warning for caution and the need for expert independent support before developing such schemes.

The new law on protection of personal data is quite strong in favour of personal security and may prove a problem for maintaining personal travel preference profiles for example.

The recent birth of autonomous regions (with responsibility for regulation of regional PT and the concept of road networks), will, however, lead to a more localised but perhaps less homogenous policy approach to TTI, although this should not affect the national PT schedule database.

The only real positive legal barrier to provision of TTI services is that no road-side equipment can belong to or be managed by a private provider (by law such equipment must be property of the state, and equipment must be under the control of the national police if it is part of a traffic management system, although this law will change with the introduction of PPP legislation).

A further barrier is that there is no legal requirement for the state sector to collect much relevant TTI data (with the exception of PT schedule data), which in CZ conditions may be a barrier to development. In addition, traffic management execution is entirely the domain of the police and the dividing line between informing and management on the road network is not clear.

There is also no specific legal / regulatory framework setting out the rules for public tenders and then supervision of different types of PPPs, although local public procurement laws are quite flexible in definition of selection criteria.

Public Transport

Practical policy initiative support at state level has been kept so far mainly to public transport, through financing a national Internet database of PT schedules (defined and guaranteed by law but privately managed) for all national and regional services and also many local services in larger cities.

Larger local PT companies are generally municipality owned and decisions and funding for TTI come from the city. There is rarely room in tightly managed PT company budgets (except Prague) and no mechanisms for releasing capital funds through cost-reduction incentive schemes.

Regional PT companies are privately owned but heavily cost regulated, leaving little room for any “superfluous” investment beyond replenishment of rolling stock. Financing and co-ordination of TTI in regional PT may become an issue for the newly formed regions.

Road Transport

The Czech Motorway and Roads Directorate (RSD) is currently developing a concept of ITS development on the CZ main road network including plans for strategically placed VMS warning of weather and exceptional road conditions (road quality and incidents).

For TTI road user services, there is so far regulation of data processing and provision, either as regards quality or commercial use of it. This problem has been acknowledged by the RSD and they are working on a proposal to address these questions. Non-personal data that is in state sector hands might in theory be available to any organisation that wishes to use it, although probably not for commercial use. In fact there is much legal uncertainty and RSD is thus reluctant to even “give away” data to non-state sector subjects.

Fixed technical infrastructure placed on the road network must be owned by the state according to current laws, although this is changing with the evolution of PPP laws.

Funding for road TTI should come from the national level, regions or local municipalities, none of which have so far made it an investment priority.

5.3 1.2 Role of the private sector

The role of the Private Sector is currently mostly restricted to the role of systems developer and technology maintainer (with some exceptions such as the vehicle recovery company web systems described in the state of the art section). There are a number of strong locally based developers while basic technology is generally imported. Most of these companies are ready to provide TTI services at all levels of the chain, given the right market entry conditions.

Important systems developers include ELTODO (affiliated with Siemens), which is developing a number of mainly road systems in Prague and Cross Zlin which supplies much ITS equipment outside of Prague. Others include AZD which works in the rail, road and PT sectors (parking systems for example).

Two important TTI services run by the private sector are the National Database Timetable (run by private CHAPS, officially sanctioned by state) and the unofficial national TIC run by the motorist club ABA. Both are fully privately financed, CHAPS lives directly off product and advertising sale and ABA mainly the centre as a marketing tool for its services. See next section

Specialist independent consultants are rarely used in the conceptual phase of projects at the local level, business partnerships are often been made directly between systems developer and local authority, with the obvious risks associated with this.

TTI services are described in the state of the art section.

2 TTI service implementation and research

2.1 State-of-the-art for TTI services

TTI services generally cannot compare in scope and quality with the state of the art found across the EU. There are no traffic and travel information centres and as yet little remote collection and real-time monitoring. The following examples express almost the complete state-of the art.

General information on road network

Information on the road traffic and travel situation nationally and locally is collated centrally by ABA, a motorist group which privately runs an unofficial national TTI centre, from collecting various road and traffic manager and road user sources (in addition to two own surveillance aircraft) and is provided commercially to various 3rd party information providers such as radio, TV and newspapers. Information includes incident news, driving conditions, congestion, traffic levels in Prague, places with limited passing, routes of overloaded cargo, detours, road works, border waiting times, petrol prices.

There is a local and publicly recognized standard system of traffic density level (scale of 1 = free-flow to 5 = congestion) which is broadcast for congested sections particularly for Prague. Sections are unfortunately not localized precisely and rating is based on expert estimate (usually by police) so interpretation is for orientation only without giving the chance to accurately estimate travelling time on routes.

Mobile phone operators offer SMS and WAP services utilising ABA information.

Czech Radio offers a green wave TTI service using ABA info-centre information, which sends RDS messages.

The motorist recovery groups UAMK and ABA both provide on-line internet road information services (www.aba.cz, www.uamk.cz) which combine information on road-works and weather as well as restrictions in traffic movement and incidents. ABA bases its own information on its own information centre. They gather information from the police, other sources and their own sources (including helicopters). ABA offers a full free service and UAMK offers a full service to members and other selected partners and the most important information to non-members.

Little of this information currently comes directly from automatic detectors or detection systems, even though many traffic light loop detectors are available in certain cities such as Prague (harnessing of this information is being developed for example by ELTODO).

Currently Skoda is developing the first Czech in-car navigator with Tele-Atlas and is developing it into a transport portal including traffic information. This is a fully private initiative which should be fully ready in 2006 , but will soon be partially available. The map database is ready but localisation is on-going, a challenge also for RDS-TMC preparation which is on-going

Main road network

On the motorway and trunk road network, traffic detection using loops is made at 90 detector points on the motorways. This data is not used for real-time information provision. There are a

number of temperature measurement points, which show the current road and air temperature on road-side information tables. All new motorways are get loop detector equipment at 6km intervals.

All new motorways now automatically have loop detectors placed at approx. 6 km intervals. Given the planned doubling of the network in the next 10-20 years, this will mean good coverage and a strong base for management and information applications, but does not solve the problem of retro-fitting existing infrastructure which has a low priority

The Roads and Motorway Directorate (RSD) is currently completing a precise digital map of all motorways, first and second class roads in the country, which will be used as a base for all further geographical applications.

On the motorway section before Rozvadov on the Western Czech border, included as part of the motorway construction of the D5 motorway to Germany, there is an information system using VMS which warns of border queues, unfavourable climatic conditions and is used to regulate speed. This was installed at the time of completion of the D5 motorway.

The RSD has a detailed and distributed local weather forecast database, which is not made available publicly but is for internal use in the RSD.

An internet database of lane closures has been developed and is being trialled in the RSD.

Local road network

Prague is currently planning a TIC which will pool inter-modal data from the whole Prague network and solve issues of technical inter-organisational cooperation and compatibility as well as commercial relations to the private sector TTI providers.

In Prague, the most congested city in CZ, which has already installed a number of variable message signs in a trial section of the city - the Prague 5 ATRACIT project (so far only displaying temperature, time and information on tunnel closures). Information signs are also up giving real-time information on parking availability in the P5 centre. The project will include real-time accident and congestion information, using data from cameras and loop detectors. Information will be passed to signs, already placed in the city. This is a project of the City and no public-private partnerships in the information chain are anticipated.

Prague is committed to using TTI as an aid to traffic management all over the city, which has naturally limited capacity in its historical street network.

Other cities so far do not consider road TTI to be a strong enough priority to invest in real-time (or other) systems.

National and Local PT networks

For national and regional bus-services and many cities, timetable information can usually be gained over the telephone.

The national database (CIS) of PT schedules - www.idos.cz - (defined by law but public-privately managed) is publicly provided for all national and regional services and also many local services in larger cities. Schedule data is provided by operators (by law at least 15 days before a change in the schedule to the local regional administration). The regional administration collects and verifies all data and passes it to the private company CHAPS, which provides a free web-service and sells the data in other forms (CD, intranet).

CHAPs is developing a GSM based regional bus locator, which would give real-time advice on the location of buses up to 40m accuracy

Eurotel offers a door-to-door PT navigator (using CIS information), which guides a traveller to destination by using SMS instructions based on inputting origin and destination address or location.

T-Mobile in association with DATIS, the Czech Rail, the mobile phone operator offers PT rail schedules on its mobile phones as a paid service.

TTI development in PT is occurring in a number of cities. Many cities have their PT schedules searchable on the internet

At the local level, the outstanding real-time PT information initiative is in Zlin, which has a beacon based location monitoring system for its bus and trolley bus fleet and has information signs displaying real-time information placed at strategic stops. A local company developed the system.

A number of cities have in place a locally developed communication system between the visually impaired and incoming buses, giving information on bus identity, route etc. to a receiver that the blind persons carries in the stick.

Prague has recently developed a trial information system for its tram network. They have had position monitoring for a number of years, but have recently introduced a number of information signs displaying next arrival times.

Prague is planning a mobility centre as part of the EU MOST project integrating multi-modal transport information to one phone number, one internet address etc.

At the moment there are no multi-modal information services and it is impossible to reserve or pay for any transport services over the phone

The City of Olomouc is planning to develop a real-time information system at its main terminal and then gradually expand it. Most larger cities are aware of the potential of TTI even if it is not generally expressed in their local transport policy.

2.2 TTI research activities

ITS in conditions of Czech Republic, National Research Project

from 1.1.2001 to 2005:

- develop outline strategy, architecture, cost-benefit evaluation framework for ITS in CZ, supervision and evaluation of 5 ITS pilot projects, the precise nature of which has not yet been decided on. Recommendations will be made on ways to deliver TTI, possibly on pilot will be focused on TTI.
- main partners CVUT (Czech Technical University) and CDV (Transport Research Institute)

DIZAS – Method for influencing behaviour of road users through media

- Main element of work is concept for national TIC
- Main partner Autoklub Bohemia Assistance - ABA

from 2001-2003:

TTI RDS-TMC in the Czech Republic, National Research Project

from 1.1.2001 to 2003:

- explore feasibility and implementation conditions and propose concept for system of RDS-TMC in CZ
- main partner CVUT (Czech Technical University)

Telematic system for water ways and water transport

- solving information system on Czech waterways (including use of RDS-TMC for example)
- main partner CityPlan, s.r.o

3 Key Issues for TTI implementation

3.1 Drivers

3.1.1 Institutional (public and private)

- The developing ITS community in the Czech Republic is doing much to promote the profile of ITS solutions (including information systems) and introduce standards and an integrated approach to systems development
- The commitment of RSD to develop a clear and coordinated ITS policy in the following months
- The development of a concept for an official national TIC is key to development of TTI in CZ. This is being developed through the national DIZAS project.
- The formal commitment of Prague to develop its own TIC, probably linked to a national TIC
- The official transport policy support of sustainable development and the new investment in research into ITS and TTI has been and will continue to be an important driver of development in TTI. However more clear policy commitment is needed towards real-time information systems
- The gradually increasing realisation at local and national level (much has been achieved by the exposure of EU projects and “mainstreaming” of such systems worldwide) of the traveler and system benefits of quality information systems is and will continue to be a strong driver for implementation of such systems

3.1.2 Technological (data acquisition and service delivery)

- The formal commitment of Prague to expand and **exploit for information** its telematic sources of data.
- The implementation of fixed loop detector equipment at 6km intervals on all new motorways and the interest in adding additional equipment (infrared detectors etc) is a major step to realising management and information on the motorway network.
- The examples of Zlin and the developing model in Prague are important models for further development of real-time information systems in public transport across the country. They are being studied in detail by other cities.

3.2 Key obstacles to overcome

- General lack of data collection technology in place

- ...and then linked up to central database in real-time
- The lack of an official national TIC makes co-ordinated data collection difficult
- The lack of coordinated real-time traffic management on the national network means that real-time data exploitation for traveller information is not naturally facilitated
- Clarifying questions of data ownership and commercial access to publicly owned data and obligations of road and public transport and traffic managers to provide information to information service providers or to a TIC
- Lack of business case for heavy private investment in TTI (mainly willingness to pay for available information, income opportunities mainly in marketing motivation, phone connection income and associated advertising income, which often precludes heavy investment into data collection and processing) even less convincing than in EU given information quality and infrastructure needs
- Overcoming the lower knowledge level and resistance to spending on TTI in the public sector must be dealt with effectively
- Getting finances at all in the face of competition from road construction and maintenance demands is still a big problem, especially for retro-fit of existing infrastructure.
- Making finances available for PT information systems within the regulated PT budget structure is a major obstacle
- There is no institutional bridge that can help promote and develop inter-modal TTI
- There is little tradition of comparing costs and benefits of investment options. Until this becomes an accepted habit at the conceptual stage for all projects, it makes technology projects hard to sell against more traditional solutions.
- Defining the types, volume and quality of data the state sector must collect and process;

3.3 Major potentials to use

- There is much scope for co-operation with the private sector for developing whole road systems including commitments of the state to buy services from a privately developed information service or to subcontract management and development of the detector network and other traffic or information management tasks for example a TIC. These opportunities should be exploited to the full to fill gaps in the state sector.
- The current unofficial TIC run by ABA is a major contributor to TTI in the country. It can form a springboard to develop a national TIC and apart from being a prime source of “free” TTI, can produce a very useful data source for validation of telematics based sources as they are developed to provide more precise and customised information and as a primary feeder to newer dissemination media (EMS, MMS, on-board navigation etc.)
- The Roads Directorate ITS strategy and position on data provision being developed will be an important document for the development of basic infrastructure and databases that can be used for road information systems as well as for enabling private sector participation. In recent times, the directorate has become much more pro-active in creating such conditions. This though is still in the planning phase.
- The legislative precedent of the national PT schedule database may be very useful for the further fixing of responsibilities in the information chain for all modes and specifically for the

development of real-time PT and multi-modal information services with the right level of government support.

- In the medium term to long-term, the development (or not) of floating car detection systems i.e. the penetration and harnessing of GPS or 3G (even GSM for some uses) for locating vehicles for travel information may prove key for collecting high quality real time travel information at marketable costs given the unsure public commitment to telematics infrastructure investment and the lack of a clear private business case.
- Quality communication at an affordable cost is often a major headache for ITS systems. Administrations can take maximum advantage of their power in approving and granting infrastructure access to communication networks. Optic cable for example is often laid alongside road infrastructure and guaranteed capacity can be gained for telematics applications.

4 Annex

4.1 Key actors in TTI development

- 1

name	Dr Miroslav Svítek
position	Researcher in ITS, Vice-chairman of SDT(Czech ITS association)
institution	Transport Faculty, CVUT Praha, Systems Department
address	Na Florenci 25, 110 00 Praha 1, Czech Republic
phone	+44 602376081
fax	
e-mail	svitek@fd.cvut.cz
why	Leader of Project "ITS in conditions of Czech Republic", leading academic in field and a
suitable	main Ministry advisor, very active in Czech ITS association
- 2

name	Dr Pavel Pribyl
position	Technical Director of ELTODO, President of SDT and Lecturer at CVUT Systems Department on ITS
institution	ELTODO
address	Eltodo a.s. Novodvorská 1010/4, 14201, Praha 4
phone	+4202 6134 3704
fax	+4202 6171 0669
e-mail	Pribylp@eltodo.cz
why	Active in all areas of ITS development, as private developer (ELTODO), academic
suitable	researcher and head of ITS society. Best known Czech ITS expert internationally.
- 3

name	Roman Nekula
position	Technical Director of Road and Motorway Directorate of the Czech Republic
institution	RSD
address	Čimická 809/53, Praha 8, 181 21
phone	+420 2 8550069
fax	+420 2 8552001
e-mail	roman.nekula@brno.rsd.cz
why	Position dictates influence in development of telematics in main road sector. Main
suitable	decision maker.
- 4

name	Ivan Fencí
position	Head of Telematics Department of CDV and secretary of telematics society SDT
institution	CDV (transport research centre, CZ)
address	Lisenska 33a, 636 00 Brno
phone	0420 5 48423740
fax	0420 5 48423712
e-mail	fencí@cdv.cz

- | | | |
|---|--------------|---|
| | why suitable | CDV is partially state funded and is relied on heavily by the Ministry for policy advice. Ivan FencI runs the telematics department and therefore is a key-player (especially in PT) as well as being very active in the ITS association. Has organised a number of ITS conferences and events. |
| 5 | name | Thomas Jurik |
| | position | Managing Director |
| | institution | CROSS Zlin |
| | address | Louky 397, 760 01, Zlin |
| | phone | +420 67 711 02 11 |
| | fax | +420 67 711 02 22 |
| | e-mail | jurik@cross.cz |
| | why suitable | Visionary and other main player in developer market after ELTODO. Excellent understanding of technical and commercial issues. |
| 6 | Name | Evzen Prediger |
| | position | |
| | institution | Ministry of Transport, CZ |
| | address | |
| | phone | +420 51431325 |
| | fax | |
| | e-mail | |
| | why suitable | Influential at Ministry and very well versed on legal, technical and institutional aspects for ITS |
| 7 | Name | Jiri Machovec |
| | position | Manager of ABA info-center |
| | institution | Autoklub Bohemia Assistance |
| | address | Strelnicna 1680/8, 182 000 Praha 8 |
| | phone | +420 2 66 193 255 |
| | fax | +420 2 66 193 600 |
| | e-mail | machovec@aba.cz |
| | why suitable | Driving force of unofficial national TIC run by ABA, lead in DIZAS project to develop national TIC concept |

4.2 Sources and references

- 1 ABA travel information service, www.aba.cz
- 2 UAMK travel information service, www.uamk.cz
- 3 Czech National PT database, www.idos.cz
- 4 Vorel, Valdimir, 2001, ITS on the Motorways and Roads of the Czech Republic, Conference ITS '01 Prague, May 31-June 1, 2001.
- 5 Czech Transport Policy, 1998, Ministry of Transport
- 6 Mirek Svitek and Frantisek Kopecky, 2001, Intelligent transport systems in CZ, ITS on the Motorways and Roads of the Czech Republic, Conference ITS '01 Prague, May 31-June 1, 2001

Denmark

1 Institutional framework for TTI development

Deployments of TTI services are not co-ordinated at national, regional or local level, as there is no enabling framework established or any national policy aiming specifically at area of traffic information. An action plan "Traffic 2005" was issued by the government in 1993 highlighting the area of traffic management as a key mean in order to cope with traffic problems. There has not been reported any formal follow up of this action plan.

1.1 Legal and public policy context

The road owners are also the owners of the traffic data collection equipment and the resulting traffic data. There is presently no organised exchange of these data to the private sector, private partners or private companies. For road transport the exchange of data is between the public TIC and TCC's. The involved public authorities maintain their own databases containing traffic and travel data. For rail, airline and surface transport modes the traffic information is mode specific and supplied directly to the public by Internet and telephone services. All legal responsibility is wavered.

The regulation related to the information chain is based on public ownership of roads and road infrastructures, public transportation and privacy act legislation.

The following main actors are involved in the area of TTI:

Trafikministeriet (MoT) (responsible for strategy and regulatory framework)

Vejdirektoratet (Road Directorate) (responsible for state roads)

Counties (responsible for county roads)

Municipalities/cities (responsible for municipality/city roads)

DSB (Danish State Railways) (responsible for rail, ferries)

HUR- Hovedstadens Udviklingsråd (Copenhagen Public Transport Company) (HUR, responsible for public bus transport in the greater Copenhagen area)

BUS/Tog samarbejdet (Bus/train Co-operation) (coordinating national information related to TTI)

There are no dedicated information chains.

There is no doubt that there is very limited political drive to implement a national Traffic Information master plan. Regarding the implementation of EU Recommendation on the development of a legal and business framework for the participation of the private sector in deploying TTI services, it must be admitted that no visual results have arisen. The Danish Ministry of Transportation has based on our on inquiry regarding such efforts not responded. The key issue must above all be to define a master plan and secondly an action plan to facilitate the legal and attractiveness use of TTI. => place the assessment regarding the implementation of the Com.Recommendation at the end of 1.1

1.2 Role of the private sector

In order to attract commercial companies a positive business case must exist based on services stemming from added value to data - whether public or private. The very limited involvement from the private sector is hampered by the absence of an agreed political TTI framework. No major PPP has been formally established in the area of TTI in Denmark.

The private sector has no established base for traffic information distribution in Denmark.

There are no current plans for motivation of the private sector to establish TTI, hence no planned availability of mobile services.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

The following main TTI services are available. None of the referenced services distribute costs to other parties and no trade of particular benefits exists:

2.1.1 T.I.C.s Globus System

The system offers a 24-hour information service about the traffic situation in Denmark and abroad. The information available relates to accidents/incidents, slippery roads, road works, heavy traffic, delayed or cancelled ferries etc. Available data are gathered from the police, rescue services, local road authorities, road travellers and Danish Meteorological Institute. Information is disseminated pre trip via the Internet and Text TV and on trip via RDS-TMC and VMS. The DRD claims no price for the information and it is solely up to the users to access the information through radio and TV or active telephone calls. The radio and TV stations access the information through the Internet.

Future extensions will include information access via e-mail, telefax, telephone etc.

2.1.2 TRAFIKINFO co-operation

Copenhagen Public Transport Company, Danish State Railways, Danish State Subway, Copenhagen Police, Danish Railroad Association, Copenhagen Municipality and Frederiksberg Municipality co-operate on information pooling and dissemination.

Intermodal information service regarding public transport and road traffic in the Greater Copenhagen area only can be found on the Internet site www.trafikinfo.dk. Site includes links to bike routes, car-pooling database, taxi services, Air traffic, bus traffic, train services, subway services, and ferry traffic. It is the intention to open a telephone service and communication by other electronic means to the public in the near future. The information is interactive but no customisation is currently implemented. This may be offered in the future.

2.1.3 National Travel Planner

The Internet has proven to be a suitable way of disseminating dynamic TTI directly to the end user or between authorities, traffic operators, transport companies, local radio channels etc. Internet based Public travel-planner initiative is conducted by the Bus & Train co-operation. This is an organisation formed by the major transport public companies in Denmark. Major Contributors are Copenhagen Public Transport Company, Danish State Rails and the largest local public transport companies in Denmark. Electronic time schedules from most regional public and private transport companies are available. The co-operation has a common website www.rejseplanen.dk. The website is interactive but currently no customisation is possible.

2.1.4 TRIM, Traffic Information on Motorways in the Copenhagen Area

The link www.vd.dk shows the Road Directorate traffic map on road traffic situation. The map covers approximately 100 km of motorway around Copenhagen and is updated every minute based on traffic data from inductive loops in the road. There is a freeway traffic density measurement system with associated near real time Internet dissemination component to visualise average geographical vehicle traffic and speed on graphical map. Travel time estimation is planned but not yet implemented. The system is extended to cover the Øresund link between Denmark and Sweden. The information is disseminated via the TIC, Internet and radio. The service is not interactive and no customisation is possible.

2.1.5 Travel time estimation Frederikssundsvej

Local Copenhagen Municipality (CM) and Danish Road Directorate (DRD) are working in a joint venture to implement a travel time estimation system in a major arterial road. The regional travel time estimation system will be based on averaged actual vehicle travel time measurements. The video based system will be able to calculate actual travel time for users of the Internet on the covered road segments. The system is expected to be operational in May 2002. The service is not interactive and no customisation is possible.

2.1.6 Parking Information Systems

7 cities including Copenhagen, Aalborg, Aarhus, Odense, Kolding, Svendborg and Vejle have implemented various parking information systems. The Municipalities operate those systems but they provide benefits for both the public and private parking-houses and -lots. The local municipalities did not co-ordinate their effort nor did they have any formal corporation the exception being Aalborg that was funded under the EU Jupiter 1 and Jupiter 2 projects. The municipality of Aalborg has implemented a local website www.aalborg-trafikinfo.dk containing dynamic traffic information on available parking spaces, road works, bus locations and bus arrivals at bus stops. The service is not interactive and no customisation is possible.

2.1.7 QUO Vadis in Aalborg

Route guidance system advising road traffic about the waiting time to cross the Limfjords bridge or alternatively the tunnel. The system utilises road detectors and calculates the total travel time based on vehicle speed over these local sensors through the two paths. The two results are displayed as waiting time for the two alternative routes available on 14 strategically located VMS's. Even though Quo Vadis is an elderly system now, it still pretty much represents state of the art regarding VMS based route guidance in Denmark. The service is not interactive as you have to pass the signs in order to obtain the necessary travel information.

2.2 TTI research activities

The main research activity is concentrated at the Technical University of Denmark (DTU) and the University of Aalborg and is mainly sponsored by the Ministry of Transport and the Transport Council. The main research programme is FORTRIN with the main focus on analysis and assessment of road pricing systems. Ref. Jensen, P. og Kildebogaard, J. (1999). *FORTRIN programmet: Beskrivelse af et kørselsafgiftssystem*. Notat 1999-1, DTU. Information on the follow up project of FORTRIN named AKTA is to be found on www.akta-kbh.dk. AKTA is part of the PROGRESS project.

The Road Directorate conducts research and technical development, implementation and evaluation related to the TTI services listed by its own merit and by participating in European Framework projects. These projects are primarily covered under the VIKING initiative. Further a limited number of counties and municipalities are included in these activities. DSB, Bus Tog

Samarbejdet and the County of Copenhagen are participating on a European level in the multimodal project EU SPIRIT on European System for Passenger Services with Intermodal Reservation, Information and Ticketing.

3 Key issues for TTI implementation

3.1 Drivers and trends

Thus there are no agreed nationwide visions for the use of travel and traffic information systems in Denmark. The drivers are organised in Foreningen af Danske Motorejere (FDM). The trend is to decrease the investment of public money in the area of TTI.

3.1.1 Institutional (public and private)

1. MOT
2. Department of Justice
3. Danish Road Directorate
4. Counties traffic offices

It is clear that the general driving institution should be the Ministry of Transportation and juridical obstacles should be dealt with by the Department of Justice. Political drive is essential. The public sector can not at this point identify lucrative business areas by them selves.

3.1.2 Technological (data acquisition and service delivery)

1. Nationwide deployment of the TRIM system based on road loop detectors, as this system is already well propagated..
2. Addition to the TRIM system to comprehend travel-time estimation probably based on license plate recognition.
3. Expansion of the nationwide travelplanner to include city busses outside Copenhagen and ferrys. Secondary upgrade to include real time information.

3.2 Key obstacles to overcome

1. Making the MoT play a proactive role at the strategic level
2. Creation of political awareness
3. Allocation of appropriate funding to research and implementation projects
4. Focus on targeted education

3.3 Major potentials to use

1. Environmental policies
2. Local political parties
3. Conferences
4. News articles

4 Annex

4.1 Key actors in TTI development

1	institution name / position involvement address phone fax e-mail	Danish Road Directorate (DRD) Director General Henning Christiansen Initiator of major parts of the research and implementation Niels Juels Gade 13 1059 Copenhagen K +45 33156335 Vd@vd.dk
2	institution name / position involvement address phone fax e-mail	Municipality of Aalborg Kurt Markworth / Principal Engineer Initiator of major parts of the local TTI projects Vesterbro 14-18 9000 Aalborg + 45 99 31 20 00 None Trafik.veje@aalborg.dk
3	institution name / position involvement address phone fax e-mail	Ministry of Traffic Chief of section Thorkild Eriksen Head of traffic planning office Trafikministeriet Frederiksholms Kanal 27 1220 København K +45 33 92 33 55 +45 33 12 38 93 trm@trm.dk
4	institution name / position involvement address phone fax e-mail	Bus og tog samarbejdet Chief of section Niels Mortensen Cooperation between public train and bus transport Amtsrådsforeningen Trafikkontoret/Bus og Tog Sekretariatet Dampfærgevej 22 2100 København Ø +45 3529 8255 none nm@arf.dk
5	institution name / position involvement address phone fax e-mail	Center for Trafik og Transport (CTT) Professor, dr. techn. Oli B. G. Madsen Head of Centre Bygningstorvet 1, bygn. 115 - DTU DK - 2800 Kgs. Lyngby +45 4525 1524 +45 4593 6412 info@ctt.dtu.dk
6	institution name / position involvement address phone	Københavns Kommune, Vej og Park Ole Bach, Director Njalsgade 13 DK - 2300 København S +45 33 66 35 00

	fax	+45 33 66 71 06
	e-mail	vejpark@btf.kk.dk
7	institution	FDM
	name / position	
	involvement	Representing drivers in road traffic counsels and boards
	address	Firskovvej 32 DK - 2800 Lyngby
	phone	+45 70 13 30 40
	fax	+45 45 27 09 93
	e-mail	fdm@fdm.dk

4.2 Sources and references

http://www.banestyrelsen.dk	- Traffic informationer on the rail network
http://www.billund-airport.dk	- Billund Airport
http://www.daf.dk	- Danish Automobile Association
http://www.dasp.dk	- Danish houlriers
http://www.dmi.dk	- Danish Meteorological Institute (DMI)
http://www.dsb.dk	- Danish State Railways (DSB) train timetables
http://www.dtl.dk	- Danish Transport and Logistics
http://www.faelrdssikkerhed.dk	- The Danish Road Safety Council
http://www.fstyr.dk	- Denmark's Road Safety and Transport Agency
http://www.ht.dk	- Copenhagen Public Transport Company
http://www.rejseguide.dk	- Travelguide
http://www.rejseplanen.dk	- Travelplanner
http://www.ring-djursland.dk	- Ring Djursland
http://www.slv.dk	- Danish State Air Services (SLV)
http://www.toef.dk	- The Transport Economy Association (TØF)
http://www.trafikdage.dk	- Traffic research group at Aalborg University
http://www.trafikinfo.dk	- Traffic informations from Hovedstadsområdet
http://www.trafikministeriet.dk	- Ministry of Traffic
http://www.trafiksjoev.dk	- Traffic side for children
http://www.transit.dk	- International Transport Denmark
http://www.transportraadet.dk	- Danish Transport Council
http://www.tur.dk	- The Transport Training Board of Denmark
http://www.vd.dk	- Road Directorate
http://www.vejregler.dk/vejregler/vr_frame.f_index	- Regulations on infrastrucutur equipment (signs etc.)
http://www.aalborg-trafikinfo.dk	- Traffic information from Aalborg
http://www.aar.dk	- Aarhus Airport
http://www.aarhus.dk/bus	- Aarhus Trams
http://www.danske-havne.dk	- Danish Harbour Association
http://www.sofartsstyrelsen.dk	- Danish Maritime Authority
http://www.europeanshippers.com	- European Shippers Council
http://www.mst.dk	- Ministry of Environment
http://www.vejpark.kk.dk/	- Municipality of Copenhagen
http://fdm.dk	- Organisation of Danish Motorists (FDM)
http://akta-kbh.dk	- The akta project homepage

Finnland

1 Institutional framework for TTI development

1.1 Legal and public policy context

General

The transport sector in Finland is led by the Ministry of Transport and Communications, which guides its public organisation for each of the transport modes: road transport, rail transport, shipping and aviation. The respective organisations are Finnish Road Administration, Finnish Rail Administration, Finnish Maritime Administration and Civil Aviation Administration of Finland. These organisations are responsible maintaining, operating and developing for their respective infrastructures, for example Finnish Road Administration (Finnra) has got obligation to maintain the public road network.

The various administrations are in their own areas also dealing with telematics – some of them having used telematics more than others. This paper is dealing mostly with the various developments actual currently in Finland, thus the focus is on road traffic TTI services for both private motorists and public transport users. The situation for other transport modes is also described briefly. The development phases of TTI services vary from mode to mode, and also the focus how telematics is used can vary substantially.

Road condition data

Finland has got a fairly long road network and is sparsely populated compared to other European countries. Also, the weather situation and road conditions during winter are quite different from other European countries. These factors have naturally influenced the development of telematics in Finland. Due to the relatively small market potential, the public sector has been notably involved in developing the area with its funding for R&D and development of needed basic infrastructure. The need for infrastructure has been seen as one of the key issues so be solved to enable the realisation of various private telematics-based TTI-services.

The information on road conditions seems to be an interesting data for private sector in Finland. There has been indications that this data could be a valuable base for the development of TTI-services for road users. The data on road conditions is primarily collected for winter road maintenance management. The data is also used for controlling the variable message signs according to the road conditions.

The interest of the private sector on this data could be due to its good quality and coverage of the whole country. The information on road condition is also valued high by Finnish car drivers. This data contains information on air temperature, road surface temperature, temperature under surface, precipitation, wind speed, wind direction, road condition (dry, wet, snowy, icy, salted,...) etc.

The Finnra's point of view would be to provide this information without any fee to service providers who would be able to use the data in their own services. This is currently done for piloting new services. However, the Finnish Meteorological Institute's (FMI) point of view differs on this matter, since FMI sells their weather data on commercial basis. The both organisations, Finnra and FMI, are public organisations and also in the area of the Ministry of Transport and Communications. There has been discussions on how the information could be provided to other users and the regulation needed. However, this question is not completely solved yet.

The issue above is presented here to highlight the problematic nature of these issues when there are several actors in the same or closely-related area.

Finnra's aim would be to promote the use of the information on order to promote traffic safety through the information, and also to provide the data without payment to service providers to enable development of new services. The value of the data in monetary terms is estimated to be low, and a fee for this data is seen as an obstacle the possible realisation of services.

The FMI is selling its data that contains information on air temperature, wind speed, precipitation etc in order to finance a share of its budget through this. From FMI's point of view, Finnra's free data would be considered as a market disturbance.

Road traffic data

Finnra is so far the only actor who collects real-time data on traffic conditions. There are efforts to be able to collect this information on one real-time database. The real-time database is supposed to serve as a basis for also the private service providers. Aim is to realise this kind of database within some years.

There has not been so far activity where a private actor would be interested in installing equipment for traffic monitoring. So, there has not been any formal definition on Finnra's policy on this matter. However, it is most likely that this kind of activity from private sector would be considered desirable.

The two above examples are presented in order to describe the stage of the development of TTI-services in Finland. Since there have been only a few services launched into market so far, quite many issues on regulation etc are not yet solved. However, these issues are at the moment starting to come up into discussion. The various services and data ownership questions will have to be dealt within next couple of years if and when the new services are entering the market – especially when data from several different sources are integrated.

The problematic issues will be most likely solved at least for the nearest years in future close to the introduction of the various new services. When this area is being more established, the regulation will be more stable.

Time table information

Provision of time table information is one area which is in particular interesting within telematics. There are several actors, who possess the information for their operation, and this is collected quite widely into respective databases. Some of the information is already available through Internet and mobile communication, a couple of examples of this are Helsinki Metropolitan Area public transport time tables and departures and arrivals in real-time on Helsinki-Vantaa airport.

Role of public authorities

TTI is regarded as one of the main issue on Ministry of Transport and Communications future plans. Ministry is involved in developing telematics areas through it's R&D programmes which are concentrated into creating architecture and basic structures for development of telematic services. Ministry has also allocated "earmarked" funds for the development of a national road and street database (Digiroad) and realising an electronic traveller information system for public transport.

Finnra is responsible for R&D development of telematics in the road sector.

The Helsinki Metropolitan Area Council (YTV) provides the public transport within the Helsinki Metropolitan area. Thus YTV is also responsible for public transport information in the area, and

YTV is one key player when considering the public transport information, and it has been developing services and systems for better use of public transportation information.

Civil Aviation Administration of Finland provides information on flight arrival and departures for public via Internet and teletext. The information is real-time based on actual movements of aircrafts and continuously updated.

The public authorities' are taking actions in Finland to enable the introduction of private TTI-services through their involvement in creating the framework needed for the service provision. The public authorities are widely in favour of open distribution of data, and also acting so that there will be regulation that enables the private sector to operate in the area.

1.2 Role of the private sector

Finnish Road Enterprise, a state-owned-company that operates on commercial basis, that is currently developing it's business within the area of telematics. The company is also searching for possibilities within telematics-based services, and it is Finnish Road Enterprise is currently developing it's information services considering road conditions.

Mobile communication operators are one part of private sector that is also important in realisation of the services. Their role can be anything from operating as a phone operator to developer and provider of the service.

Only a few services that have been dealing with revenue sharing have been realised so far in Finland. These cases involve basically the transport information through mobile communication. The services which have shown to have commercial possibilities have been based on Helsinki Metropolitan Area Council's public transport information and Finnish Road Enterprise's information on road condition via mobile phone.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Some of the most interesting TTI-services are presented here in order to give a description of the stage of implementations in Finland.

Helsinki Metropolitan Area Council has got a service on time tables that gives door-to-door information on all available public transport modes (metro, rail, tram, bus) via mobile phone, "communicator" and palm computers. The users sends a request for information on the points of departure and arrival for given time, and receives the possible door-to-door connections with description of the public transport connections. The information contains detailed description of the travel, and the information can also be personalised. The service is also available without fee on Internet <http://pathfinder3.meridian.fi/ytv/eng/>

Finnish Road Enterprise has recently launched a service that provides information road condition on decided route by mobile phone (SMS). The service commercial, and the fee is collected in the mobile phone invoice. The service can be used both pre-trip and on-trip. This service is based on Finnra's real time monitoring of road conditions, weather forecasts and information on planned and on-going winter road maintenance actions. There is no charge for the use of Finnra's data, and thus the fee is collected for Finnish Road Enterprise's work and for the mobile phone operation.

Finnra's has got an Internet site that provides real-time information on road weather conditions, traffic situation Helsinki area and Tampere. The information is used especially by radios, but also by normal road users. The same kind of information content is provided by Finnra's Points of Information which are located on "high level" service stations. The Internet service is completely owned and operated by Finnra. Several media, especially radios, use the information available on the site in their own programs. www.tiehallinto.fi/alk/english/index.html

Within Finnra, The Uusimaa Road District is implementing travel time information system on the Ring Road I that is most important ring road for Helsinki area. The information on traffic jams etc. will be (probably) provided via Finnra's web site.

The real-time information on flight departures and arrivals on Helsinki-Vantaa airport is available on teletext and Internet: <http://www.ilmailulaitos.com/ilmailulaitos>

Also, Finnair provides a wide range of information on its Internet site, and also via mobile communication. The mobile communication information include among others departures, arrivals and time tables. The mobile information can be obtained for example with Nokia Communicator, WAP, SMS. www.finnair.com

Within rail traffic (outside the Helsinki Metropolitan Area) the current development phase is equipping the stations with new information displays. The information is going to be more based on real-time information when the needed data systems are available.

In shipping the TTI services are not under development. Within shipping the use of telematics is focused on the electronic documents for the cargo, track and tracing and also positioning.

2.2 TTI research activities

The Ministry of Transport and Communications has launched a "Finnish Research and Development Programme on ITS Infrastructures and Services" (FITS) that continues to year 2004.

The FITS programme aims at developing public and private ITS or transport telematics services and the related information infrastructures. Along with the information society and transport policy objectives, FITS covers all transport modes and concentrates on the seamless co-operation between all modes of transport as required by the users. The programme emphasises such R&D actions that lead to user need-oriented services. The program that started 2001 consists of number of R&D projects in the area of transport telematics.

(More information on www.vtt.fi/rte/projects/fits/indexe.htm .)

Finnra is realising a national road and street database (Digiroad) on the behalf of the Ministry of Transport and Communications. Digiroad will contain data to facilitate the following activities:

1. Pre-trip route planning
2. On-trip navigation
3. Route guidance for fire and rescue services
4. Public transport services

The DIGIROAD system will also serve traffic management, driver information and road maintenance needs to a limited extent.

Finnra is developing mobile phone based positioning system for data collection. The data will be used to provide real-time data about traffic fluency (travel time) presumably on trunk road

network. The development is currently in a pilot field study stage. The results of previous study were promising, however it is still impossible to estimate the future of the system.

The electronic traveller information system for public transport –project is currently in a phase where the possible system developers are in competitive bidding. This phase deals with the system definitions and will serve as a base for future development of the system. The service will be available within a few years.

Short-Term Prediction of Travel Time on Main roads is also under research. There has been study to evaluate prediction system based on travel-time measuring. The possible future exploitation of the prediction system is not clear yet.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

1. Ministry of Transport and Communications
2. Finnish Road Administration
3. Helsinki Metropolitan Area Council

The key drivers within TTI-services currently in Finland are Ministry of Transport and Communications, Finnish Road Administration and Helsinki Metropolitan Area Council.

The telematics have been exploited within the road sector so far widely only in gathering of road weather information, and Finnish Road Administration is the owner and primary user of these systems. The road weather information system is primarily used for road maintenance actions especially during the winter time.

The Ministry of Transport and Communications can be recognised as the most important driver of the area due to its role of the owner of transport system and it's guidance of the public administrations for road, water, rail and air transport. The ministry is also the most important actor in R&D funding through it's R&D programs and projects. Ministry has been putting effort into the realisation of the needed basic infrastructure which has been seen crucial to enable the development of the are.

Helsinki Metropolitan Area Council is an important player with it's public transport in the area. Helsinki area is the probably most interesting commercial market area for TTI-services in Finland, and the already available public transport information via different medias could be regarded as a best-practice in the TTI-service area.

3.1.2 Technological (data acquisition and service delivery)

1. Mobile communication – phones, "communicators", palm computers.
2. Development on traffic monitoring
3. Road Weather Information System as a data acquisition system

The development of mobile communication will have an important effect on the possible future TTI-services, since the various possibilities will enable the public to use the information more freely. The development with the data transmission capacity of the mobile communication will enable more effective and cheaper operations, and this in turn will probably lead to a situation where public will be more interested in various TTI-services.

The development of traffic monitoring can be seen as a crucial base for the future possibilities for the provision of TTI-services to car drivers. For the normal road user, a system with traffic information needs to be reliable, extensive and real-time. Within this area there is a special need for effective and non-expensive systems for gathering the information.

The Road Weather Information System will have an effect on the development of various systems, since it can be considered as one base information to be included in the various systems, for example on information to road users.

3.2 Key obstacles to overcome

1. The funding for implementing an extensive traffic monitoring system is limited.
2. The availability of low cost detection tools that are of decent quality for traffic monitoring
3. Missing regulation for data exchange

One key obstacle to overcome is that the implementation of an extensive system for traffic monitoring will not be possible if the funding is too scarce. This issue should also be discussed from the other point of view, i.e. that there are not so far any effective low cost detection tools available on the market. These both two obstacle are strongly connected with each other, and the situation needs development.

An obstacle that also needs addressing is that there is so far very limited regulation for data exchange. For example, in Finland there has been debate on whether the road administration can give it's road weather information to public without payment or not, when the meteorological institute is required to charge for similar type of data. The missing regulation can prohibit the development of services, especially in the situations where the private operators cannot have a clear picture of public sector's standpoint.

3.3 Major potentials to use

1. Public transport time table information in the Helsinki area
2. Data on Road condition on the trunk road network
3. Traffic data on Helsinki area – especially traffic jams and unexpected incidents that influence the traffic flow

Currently, the most interesting potential is in the public transport information in the Helsinki area. The information for time tables is already available in electronic format, and is utilised for creating a database that is used in an existing TTI-service. The area is also most densely populated in Finland. These both factors make this service the probably most attractive at least for a couple of years in the future.

Data on road condition on trunk road network is collected primarily for management on winter road maintenance. The information for possible services is thus available with virtually no cost, and could be seen as one major potential to be used for services.

The Helsinki area can be regarded as the most interesting single area for the information on traffic jams etc. The area is also quite small and the traffic monitoring data could probably be useful for TTI-services – this needs, however, more implementations on traffic monitoring systems.

4 Annex

4.1 Key actors in TTI development

1	...	Ministry of Transport and Communications
...	name / position	Matti Roine, Head of Transport Telematics
	involvement	Ministry is in charge of developments in the area of transport telematics. Mr. Roine is in charge of the use of information and communications technology in transport.
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2	...	Ministry of Transport and Communications
...	name / position	Seppo Öörni, Senior Engineer
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3	...	Helsinki Metropolitan Area Council
...	name / position	Kimmo Sinisalo
	involvement	Planning of public transport information, especially the electronic information and R&D projects.
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	phone	+358 9 1561 496
	fax	
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4	...	Finnish Road Enterprise
...	name / position	Petri Ellmén, Project Manager
	involvement	Mr. Ellmén is responsible for product development and customer relations projects.
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	fax	+358 20 444 2158
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5	institution	Finnish Road Administration
	name / position	Jan Juslén, Project Manager
	involvement	Mr. Juslén is responsible of the national street and database project DIGIROAD.
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	fax	+358 20 422 2512
	e-mail	jan.juslen@tiehallinto.fi
6	institution	Finnish Road Administration
	name / position	Timo Karhumäki, Project Manager
	involvement	Mr. Karhumäki is the project manager for R&D project dealing with mobile phone-based position for travel-time measurement.
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	phone	+358 20 422 2448
	fax	+358 20 422 2418
	e-mail	timo.karhumaki@tiehallinto.fi
7	institution name / position involvement	Finnish Road Administration Sami Luoma, Project Manager Mr. Luoma is (temporary) team leader for traffic monitoring at Finnra.
	address	Opastinsilta 12 A, P.O.Box 33, FIN-00521 Helsinki, FINLAND
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	fax	+358 20 422 2418
	e-mail	sami.luoma@tiehallinto.fi

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Policy documents:

Traffic management policy of the Finnish Road Administration for 2001-20015. Finnish National Road Administration, Traffic Services. Helsinki 2000. ISBN 951-726-735-5.

Internet sites:

Data and service on road conditions and traffic situation:

Finnish Road Administration's web site:

<http://www.tiehallinto.fi/alk/english/>

FITS - Finnish Research and Development Programme on ITS Infrastructures and Services

A research programme by Ministry of Transport and Communications :

<http://www.vtt.fi/rte/projects/fits/indexe.htm>

Public transportation Journey planner by

The Helsinki Metropolitan Area Council:

<http://pathfinder3.meridian.fi/yty/eng/>

Information on flight arrival and departures

by Civil Aviation Administration of Finland:

<http://www.ilmailulaitos.com/ilmailulaitos>

Information on flight arrival, departures and timetables

by Finnair:

www.finnair.com

Development projects:

Finnish national road and street database (Digiroad), see e.g:

Jan Juslén. *System Architecture for a national road and street database*. 8th World Congress on Intelligent Transport Systems. Sydney 2001.

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France

1 Institutional framework for TTI development

Traffic and Traveller information services in France are at a highly developed stage, with wide-scale research and implementation in both the public and private sectors. This section outlines the institutional framework for TTI services and also the framework of transport ownership and operation which, in France as elsewhere, dictates to a large extent the way in which TTI services are implemented, operated and funded.

1.1 Legal and public policy context

In France, most interurban motorways are toll roads owned and operated by concessionary companies (either private or semi-public). All other roads which are part of the national road network (including public toll-free motorways) are the responsibility of the state and are owned and operated as follows:

- For rural main roads: by local highway directorates (DDEs¹⁵) which are themselves departments of the Ministère de l'Équipement¹⁶;
- For urban motorways in major conurbations: either a consortium of several DDEs or a consortium of a DDE, a metropolitan council and a private motorway company.
- Local roads are either owned by the city council or metropolitan authority for roads in major conurbations, or by local authorities (Conseils Généraux) in other areas.

In each case, the road operator is responsible for providing roadside monitoring infrastructure and roadside traffic information (e.g. by Variable Message Signs). Data collected by the road operators is generally public and is made available to traffic management centres of neighbouring regions or motorway operators and to the regional and national traffic information centres (CRICRs¹⁷ and the CNIR¹⁸), which are jointly operated by the Ministère de l'Équipement, the national police and the Gendarmerie¹⁹. The CRICRs and the CNIR supply information to other service providers, e.g. broadcasters. Data is also exchanged with Traffic Control and Information Centres in neighbouring countries, including by DATEX electronic means linking France with Spain and the UK, and also (experimentally) with Italy and Germany.

Road public transport is provided by private bus and coach operators, although the environment is highly regulated with single-operator licences being granted by local public authorities on an area-wide basis for cities (also including metro or tram systems where they exist) and by service or group of services elsewhere. There is no national express coach network, although private operators run international coach services. Traffic data is not normally exchanged between local operators/authorities as its use outside the local area is limited.

¹⁵ DDE: Direction Départementale de l'Équipement

¹⁶ Full name: Ministère de l'Équipement, des Transports, du Logement, du Tourisme et de la Mer (Ministry of Public Works, Transport, Housing, Tourism and the Sea)

¹⁷ CRICR: Centre Régional d'Information et de Coordination Routières

¹⁸ CNIR: Centre National d'Information Routière

¹⁹ Gendarmerie: police under the direction of the Ministry of Defence

Rail transport is almost exclusively provided by the SNCF²⁰, a state owned but commercially oriented business. Regional services are operated by SNCF under contracts from the regional authorities and many international services are operated by partnerships between SNCF and operators from neighbouring countries (e.g. Eurostar, Thalys and Artesia). The national rail infrastructure is owned and operated by the state-owned track infrastructure company, RFF²¹. Exchange of data takes place with other European railway operators, allowing through timetable consultations and ticket booking for cross-border trips.

Waterways are owned and operated by a state-owned company, VNF²². There is no major passenger service on waterways in France. Information concerning navigability (flood warnings, lock restrictions, etc) are collected and made available by DDEs. Sea traffic is generally provided by private operators, although SeaFrance (services to England) and SNCM (to Corsica) are public.

The principal national airlines in France are Air France (state-owned) and Air Lib, Brit-Air and Regional Airlines (private). Information is not normally shared except for flight bookings with airlines which are members of a co-operative alliance.

The roles of the different actors involved in TTI development can be summarised as follows:

- National government: National traffic information.
- Regional government: Funding regional transport services (the TER²³ network), although operation (including TTI) is undertaken by the SNCF and by bus operators. In Ile-de-France (Paris region), co-ordination is developed through the STIF²⁴, an umbrella organisation.
- Local authorities: Funding local public transport services and managing the road infrastructure/traffic management. Public transport TTI is the responsibility of the operators (usually delegated to the principal area-wide franchise holder by the transport authority, which is itself controlled by the relevant local authorities). Local councils can, often with private sector involvement, develop road traffic information services. As regards local and regional public transport in rural areas, where the social need is greatest among non-car owners, TTI provision is in general very weak, as such services are funded by local authorities and in the main, aim to cater for school traffic.
- Infrastructure owners: Motorway companies provide TTI services for their own networks as a customer service and as a marketing tool. In fact, they consider themselves to be in the vanguard of TTI provision because of the customer relationship whereby customers “expect motorways to be the first to provide these (ITS) services – We are expected to lead the way.”²⁵ Information provided includes real time on-trip information (journey time estimation, information on incidents, re-routing, etc) by dedicated motorway radio and VMS, pre-trip information such as leaflets, maps, websites for journey planning and traffic information, as well as information at service areas. The provision of real time traffic in-

²⁰ SNCF: Société Nationale des Chemins de Fer Français

²¹ RFF: Réseau Ferré de France

²² VNF: Voies Navigables de France

²³ TER: Transports Express Régionaux

²⁴ STIF: Syndicat des Transports Ile-de-France

²⁵ J-F Poupinel (chairman of motorway operator Cofiroute) at the 2001 IBBTA Annual Meeting, Boston (quoted in “Enhancing Toll Standing”, ITS International, Nov/Dec 2001, p.50)

formation by private motorway companies in day-to-day operation does not necessarily contribute to traffic management policies as their principal aim is to attract toll-paying users and not to encourage people to divert to other routes or use public transport. Of course, in case of peak traffic or exceptional crisis situations (holiday rushes, very bad weather conditions, etc), co-operation between private motorway companies and authorities is good, thanks to special traffic management plans which transfer management decisions to the prefect of the region (central government representatives in the regions).

- Transport operators: These also provide TTI services for their own networks as a customer service and as a marketing tool, sometimes as a commercial venture (e.g. airlines, SNCF) and sometimes with a public subsidy (e.g. local buses). Informational interfaces with different local transport systems, or between national and local systems, are scarce (no national door-to-door public transport planner by Internet or telephone as in several other European countries). However in the major metropolitan areas such as Paris, co-ordination between public transport operators is developing, thanks to specific umbrella organisations (e.g. STIF²⁶).
- TTI service providers: Private service providers include telecommunications operators (information by Minitel²⁷, mobile phone or WAP), broadcasters (radio, TV) and Internet service providers.

As regards TTI as a transport policy issue, there has been considerable public support at national and local levels for TTI services, in order to promote public transport. Currently this policy is being supported by pilot projects partly supported by public funds.

In addition, as regards traveller information for long distance drivers during holidays the national authorities have since 1976 developed the Bison Fûté ("cunning/crafty/smart bison") campaign, which aims at reducing the traffic peaks by providing advice on best days and hours to travel. This campaign includes pre-trip journey planning maps and calendars, pre-trip information by Internet, TV bulletins and radio, as well as on-trip information by radio, VMS and semi-static (changeable) signs. The key policy objectives are to smooth out road travel demand by encouraging road users, particularly holidaymakers at summer peak holiday periods, to re-time their trip or to re-route to avoid key bottlenecks. Although this is a public campaign, private motorway operators also co-operate and information is exchanged.

For public transport, information is in the hands of either local and regional authorities or operators and there is no overall national structure. There is no national multimodal TTI service or campaign to promote modal shift, however these sometimes do exist at regional and metropolitan levels, particularly in the major cities, e.g. Sytadin/Cité Futée in the Ile de France (Paris) region and Le Pilote in the Bouches du Rhône area (Marseilles).

With respect to the European Commission recommendation on the development of a legal and business framework for the participation of the private sector in deploying TTI services, the position of France is as follows:

- Facilitation of European TTI services: France is involved in three Euro-Regional projects concerning the deployment of road transport telematics and thus actively participates with Spain, Portugal, Italy, Switzerland, Germany, Luxembourg, Belgium, the Netherlands and the UK on matters including seamless cross-border TTI services.

²⁶ STIF: Syndicat des Transports d'Ile de France

²⁷ Minitel: "Audiotext" telephone based keyboard/display unit, connected to the computerised "Teletel" phone network. There are over 10 million Minitel terminals in France (in private homes, businesses, public terminals in post offices, etc).

- Regulatory framework for TTI services:
 - Requirements and applicable laws on public safety, traffic safety, privacy, etc are published and made available.
 - Although there are no standard contracts for the provision of public data to service providers, public data is generally available to private service providers. However in some cases public authorities prefer to manage all information themselves as it is an essential component in traffic management strategies (this is the case of the SIER²⁸, the inter-departmental road operation service in Ile-de-France).
 - Since the 1980s, public data by law has to be free, or if charged for, only at the cost price of providing it in the required format. The state-operated road traffic information centres provide free information (including information originating from the concessionary motorway companies) to television and radio broadcasters; for all other applications (RDS-TMC, WAP, Internet, etc), the supply of information passes by an Economic Interest Group of the concessionary motorway companies in a commercial context.
 - Public-private partnerships have been promoted to some extent, although the fact that so much information is provided publicly and free to users, there is often little incentive for private service providers to become involved. The new Economic Interest Group of the concessionary motorway companies is an example of the evolving situation – this acts as a platform for distributing information to private operators (information from the State is free or at-cost, whereas information from the motorway companies themselves can be commercialised).
- Proprietary traffic and travel data: so far, there has been no privately operated monitoring equipment installed on public roads. The toll motorway companies, which are commercial operators, install and operate their own equipment and it is up to them rather than any public authority to allow a private operator to do likewise. National standards exist for monitoring equipment. Traffic management plans and data interchange agreements require private road operators to notify the public authorities of incidents.
- Observance of road infrastructure hierarchies and traffic management strategies: Road infrastructure is hierarchical in France and these hierarchies are clearly presented. Several classifications exist, e.g.:
 - The SDER²⁹ (road operations strategic plan) which defines 5 levels of operational categories for motorways and national roads (1. Urban expressways; 2. Major interurban motorways; 3A. Other major interurban routes with high traffic levels; 3B Other major interurban routes with high seasonal traffic levels; and 4. Major roads carrying mainly local traffic);
 - The SDIR³⁰ (road information strategic plan) defines similar levels for quality of road information to be provided;
 - Road signing hierarchies (green directional signs on national and major departmental routes, white signing on other roads).

²⁸ SIER: Service Interdépartemental d'Exploitation de la Route

²⁹ SDER: Schéma Directeur d'Exploitation de la Route

³⁰ SDIR: Schéma Directeur d'Information Routière

- Facilitating TTI services: Private operators are free to offer services on a commercial basis. However, the level of interest is relatively low and the risk is high: past private initiatives such as Mediamobile have failed due to public reluctance to pay for additional traffic information when the current level of (free) information on main roads and motorways is already good.

1.2 Role of the private sector

Although the situation in France is fairly public service oriented (particularly by northern European standards), private sector infrastructure and transport operators have a significant role in developing and providing TTI services. Mobile phone operators and Internet service providers provide value-added services (e.g. the Mappy trip planning service on the Internet, provided by a subsidiary of France Telecom). Commercial public transport operators and toll motorway companies (whether private, public, or semi-public) provide traveller information services.

Examples of information websites including booking facilities include SNCF (rail tickets), almost all airlines and ferry companies, and toll motorway company websites which allow users to purchase electronic toll tags online. The Minitel system also allows rail tickets to be booked and, of course, ticket booking for most major transport operators is available by telephone.

A major transformation is underway within the transport industry in France, as elsewhere, where decision making power increasingly lies with integrators and system developers. Transport businesses and suppliers, on the other hand, need to take account of both technological change and of the changes in the requirements of their clients. The role of the private sector is therefore expected to increase substantially, particularly if one relates TTI provision to the industries closest to it, i.e. IT, telecommunications and the supply of passenger transport services (and to some extent, freight), where the trend in the last decade has been towards a marketplace dominated by a small number of large players, viz. the motorway companies, the French automobile industry and telecom operators (Orange, SFR and Bouygues telecom).

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

In France, a wide range of road traveller information services is publicly provided by the Ministère de l'Équipement, which co-ordinates the Bison Fûté traffic information campaign. Additional information (e.g. the motorway radio service) is provided by the toll motorway companies. Key road traveller information services include:

- Press: pre-trip information leaflets, bulletins, calendars of traffic flow estimates, restriction calendars for lorries, maps of recommended alternative routes to avoid regular congestion bottlenecks, etc, available at various points such as toll stations and motorway service areas.
- Radio and TV: TICs and TCCs provide automatic service bulletins by fax to radio and television broadcasters. Autoroute FM 107.7 covers most of the French toll motorway network.
- RDS-TMC³¹ in operation on the motorway network (using the FM 107.7 radio network) and recently at the national level, operated by Mediamobile, (stakeholders are France

³¹ RDS-TMC: Radio Data System - Traffic Message Channel

Telecom, Renault, Cofiroute and TrafficMaster). This service can provide real time traffic information that can be integrated in navigation systems.

- Extensive installation of Variable Message Signs on the French motorway network, which can be used for re-routing in case of major incidents downstream.
- Telephone: national centre (CNIR), seven regional TICs (CRICRs) and recorded message lines; the motorway companies also provide a common automated telephone service and some of them additionally have their own phone line.
- Mobile telephone operators also offer traffic information services.
- Minitel service (3615 Route and 3615 MeteoRoute).
- Internet (www.bison-fute.equipement.gouv.fr): also Internet services provided by the motorway companies, e.g. www.autoroutes.fr, www.asf.fr, etc. and some private services (e.g. www.visionaute.com) Some websites offer trip calculation services, WAP servers and/or personalised SMS/e-mail messages.

In urban areas, some major cities have websites providing information on traffic conditions, local radio is extensively used, as are real-time displays giving parking information (number of spaces available in each car park).

Of particular note is the Sirius³² system in Paris/Ile-de-France which informs drivers in real time of traffic conditions by means of 175 VMSs, Minitel, Internet (Sytadin website) and in-car systems provided by separate service providers (Visionaute, Influx and Carminat). The Sytadin website is the first European Internet server of its kind, allowing real time traffic information to be downloaded from the combined servers of Sirius and the City of Paris, and receiving about 75000 hits per month. Sirius also improves traffic conditions and road safety by automatic detection of traffic congestion by means of 370 video cameras and 3000 sets of inductive loops. Similar systems are being studied or installed in at least 11 other cities and conurbations in France.

Regarding other transport modes, the SNCF and local public transport websites such as RATP in the Paris area or TCL in Lyon offer trip calculation engines. Over 16 cities in France have an urban public transport website.

Most TTI services are not intermodal, due to the fact that they are generally provided by operators or infrastructure owners, which are almost always mode-specific. The multimodal services which do exist, such as "Mon trajet" and "Cité Fûtée" in the Paris region and "Le Pilote" in the Marseilles area, are as a result of partnerships (e.g. between public transport operators, local road authorities, city and regional councils, the private sector, etc).

Some 27 TTI services are outlined in the tables in annex to this report, covering all modes and encompassing all major national and cross-border services, plus a selection of regional and local services, both publicly, privately and jointly (PPP) developed.

³² Sirius: Service d'Information pour un Réseau Intelligible aux Usagers (Information service for a network intelligible to users)

2.2 TTI research activities

The French inter-ministerial land transport research and innovation programme, known as PREDIT³³, is the main vehicle for state-sponsored research into transport TTI. The current programme (PREDIT 2) includes several thematic groups, of which three are relevant to TTI:

- Intelligent roads;
- New services to users; and
- Management of urban trips.

In 2002, the French Ministry of Transport has launched within this context the PREDIM project: Research and Development Platform for multimodal information. The objective is to foster the development of multimodal information services and subsidise pilot projects initiated by public and private actors.

The new programme starting in 2002 (PREDIT 3) will cover six broad themes, of which three are relevant to TTI:

- Mobility and territory;
- Intelligent vehicles (including communication between vehicles and infrastructure); and
- Safety and new technologies.

In addition, the toll motorway operators carry out a substantial amount of research in the road transport sector. Some of this research is pooled and undertaken under the auspices of ASFA, the Association of French Toll Motorway Operators. In the TTI domain, this includes standardisation, signing for alternative routes, information platforms, etc.

Examples of areas of research in France are:

- New services using GPS/GNSS positioning and satellite communication technologies;
- Improving the urban/interurban interface for TTI;
- The use of PPPs for information services (e.g. Le Pilote); and
- Traffic information exchange (projects by the French motorway companies).

Several demonstration projects have been undertaken or are taking place in France. Two recent examples are:

- The AIDA project³⁴ in the field of vehicle to roadside communications using DSRC³⁵. This involved building an on-board system compliant with European standards and capable of delivering added value information, and then undertaking a demonstration using 500 equipped vehicles on a 100 km section of motorway between Paris and Orléans in which drivers were provided with real-time on-trip information. This was part of the PREDIT programme and involved a motorway operator and three French car manufacturers.

³³ PREDIT: Programme national de Recherche et d'Innovation dans les Transports terrestres (research programme supported by four ministries and two state agencies)

³⁴ AIDA: Applications pour l'Information Des Autoroutes

³⁵ DSRC: Direct Short-Range Communications

- The HANNIBAL³⁶ project, covering the Franco-Italian trans-Alpine road network, in which a range of traffic management and driver information measures were demonstrated. Specifically, this project served as a testbed for electronic traffic information exchange using the DATEX standard, both within France and cross-border to/from Italy (the first successful cross-border demonstration of this technology). Following this project, DATEX is now in operation between the national traffic centres in France and Spain and will shortly be operational with Belgium and Germany.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

TTI services are at a crossroads between universal public services and business or commercially-oriented added value services:

- On the one hand, for safety and security reasons, **public authorities** need to collect basic information. In addition, this information serves to better manage the transport modes, especially in difficult or crisis situations, and dissemination of TTI services is often considered as a key tool for optimisation of their network. In that context TTI should be free.
- On the other hand, several **value added service providers** are trying to extend their services by providing up to date travel information: trip planning, travel time estimation, event warning, etc. TTI is thus considered as a promising new market even if first steps in that direction are rather disappointing (slow development and take-up of commercially-oriented private services).

As the boundary between what should be free and what is able to be sold is not clarified, a certain competition exists between private sector and public sector.

In addition:

- **Improving customer service** is seen as a priority by infrastructure owners, in particular for the toll motorway companies, as toll paying users expect to receive a high level of service in return for their toll and also expect the motorway operators to be at the forefront of the ITS development and service provision.
- The provision of information for the large number of **people who visit or pass through France**, including TTI accessible from other countries (e.g. multilingual web information) and cross-border on-trip information (VMS, RDS-TMC, multilingual radio information flashes) is seen as desirable by both the public and private sectors.

The three key levels of transport research and activity, as seen from the French public sector perspective are as follows:

1. The regional level, which is increasing in importance, and must respond to the needs of business, local authorities and the general public.
2. The national level, which needs to organise itself into centres of excellence and internationally well connected platforms.

³⁶ HANNIBAL: High Altitude Network for the Needs of Integrated Border-crossing Applications and Links

3. The international level, which needs to form a network at the European level.

While this analysis was made by the PREDIT programme for the transport sector as a whole in France, it also reflects the general policy as regards TTI.

Recently, the SDIR (road traffic information master plan) has defined a policy framework with respect to traffic information. Firstly, this defines various levels of traffic information that can be provided by telematic means (specifically the Internet), as follows:

1. Road and traffic information bulletins: news flashes on traffic conditions or information on major incidents.
2. As (1) above, + other incidents and events (list and/or map-based).
3. As (2) above, + traffic indicators (on main strategic road links as defined in the SDIR, linking around 30 major centres in France).
4. As (3) above, + travel time information (on the SDIR-defined links above).
5. As (4) above, + itinerary calculation (between the SDIR-defined nodes above), taking account of events, incidents, travel time and comparison with alternative routes.
6. As (5) above, + personalised itinerary calculation between any two addresses, plus tourist information.
7. As (6) above, + personalised information services (information on a district/locality, an itinerary, relating to a certain date, etc) by e-mail, SMS, fax, etc.

Services to be provided by the State are limited to the 4th level in the above list, allowing the private sector to provide services at levels 5, 6 and 7.

Many initiatives have also been taken at the local, regional and national level to develop TTI, e.g.:

- At the national level, the **ACTIF** project (Architecture Cadre pour les Transports Intelligents en France / Framework Architecture for Intelligent Transport in France) is helping ITS project teams design systems which inter-communicate effectively. The project defines a framework architecture to be used when developing all land transport ITS in France. Further details are at <http://www.its-actif.org>.
- In the **Paris area**, public authorities (City of Paris + regional district of the Ministry of Transport + local authorities) have developed high level services with VMSs on the main network, Internet service, (<http://www.sytadin.tm.fr>) with on line trip calculation. The information is also accessible to private operators through a specific contract with the authorities. This allows these operators to integrate the information emanating from the public authorities in their own value added services, such as navigation, mobile communications, etc. Motorway companies are acting as private operators and provide their own information directly or also by contracting with other private partners.
- Faced with this situation, **private operators** try to find their own way in order to offer better services that can be sold to final users and they often see the public authorities as unfair competitors. In order to differentiate themselves from the service already provided by the public authorities they try to investigate ways of improving the information (especially through the use of floating car data).

Concerning public transport, and besides Paris where the STIF try to promote integrated multimodal information, the provision of information remains mainly under the responsibility of the transport operator.

However, under current French legislation, metropolitan areas of more than 100 000 people are required to implement multimodal information services for transport users.

3.1.2 Technological (data acquisition and service delivery)

1. Lack of low cost solutions to obtain a minimum data collection system on the lighter trafficked parts of networks.
2. Potential use of mobile phone signals to track motorists (anonymously) and thereby deduce average speeds and predict journey times (not yet a proven solution).
3. Increased use of/access to mobile phones and the Internet.

3.2 Key obstacles to overcome

1. Lack of an umbrella organisation, incentive, or “champion” to promote the provision of joint information services between operators in neighbouring areas (the costs of merging several different systems usually outweigh the benefits when often only a small minority wish to make trips covering several networks/operators)
2. No structure to provide real multimodal information (road operators and public transport operators all have their vested interests)
3. Limited level of convergence between different service providers
4. Different data sets for different operators (especially public transport)
5. Insufficient integration of on-trip road information between motorways and other roads (e.g. urban areas or national roads after the motorway has run out)
6. Insufficient pan-European integration of TTI services
7. Little incentive to develop TTI services for rural transport due to low demand: investment is concentrated in urban areas and in key interurban corridors.
8. No continuity of service (particularly for long distance journeys).

3.3 Major potentials to use

1. Toll revenue gives the motorway companies the means to invest in new information systems – motorways are already well equipped with VMS, a dedicated traffic radio service, etc and more innovations are likely to come on line. For the motorways (and airlines and intercity rail) at least, cost is not a major obstacle.
2. Rapidly growing Internet access in France (taking over from the Minitel, which was a 1980s technology and now rather dated, although still available in many homes)
3. High level of mobile phone ownership allows for pre-trip telephone enquiry services to also be used whilst travelling
4. High level of mobile phone ownership also allows service providers to track signals in order to predict journey times and provide estimated travel time information to users.

4 Annex

4.1 Key actors in TTI development

1	institution name / position involvement address phone fax e-mail / website	ITS France Mr Stéphane Péan, Chargé du développement Umbrella organisation for ITS R&D and deployment in France and the French-speaking world. Part of ATEC (see below). 51 bis, avenue de Versailles, F-75016 Paris +33 1 45 24 09 09 +33 1 45 24 09 94 http://www.itsfrance.net
2	institution involvement address phone fax e-mail / website	ATEC (Association pour le développement des techniques de transport, d'environnement et de circulation) Association for the development of transport techniques, environment and traffic flow: a 27 year old organisation aimed at facilitating exchanges between specialists in these areas from central government, local and semi-public organisations and the private sector, in order to fully exploit the competencies, technologies and decision making powers to enable optimum decisions in the future. ATEC set up ITS France in 2000. 51 bis, avenue de Versailles, F-75016 Paris +33 1 45 24 09 09 +33 1 45 24 09 94 atec@wanadoo.fr http://www.atec-tec.net
3	institution name / position involvement address e-mail / website	Predit Key actors and contact details are listed in the French version of the website below, under "Thèmes de recherche", followed by "Groupes opérationnels" Interministerial land transport research and innovation programme. Ministère de l'Équipement, Direction de la Recherche, PREDIT, Tour Pascal B, F-92055 Paris La Défense predit@equipement.gouv.fr www.predit.prdd.fr
4	institution name / position involvement address phone e-mail / website	Ministère de l'Équipement - DSCR Mr Régis Rioufol, Ingénieur en Chef Responsible for TTI implementation in the DSCR (road traffic and safety directorate of the Ministry of Transport) Arche de la Défense, Paroie Sud, F-92055 Paris La Défense Cedex 04 +33 1 34 25 24 04 regis.rioufol@equipement.gouv.fr http://www.securite-routiere.equipement.gouv.fr
5	institution name / position involvement address	Ministère de l'Équipement - DSCR Mr Roger Pagny, Head of European Projects Co-ordination of road ITS deployment projects, including traveller information systems Arche de la Défense, Paroie Sud, F-92055 Paris La Défense Cedex 04

	phone	+33 1 40 81 81 17
	fax	+33 1 40 81 81 99
	e-mail / website	roger.pagny@equipement.gouv.fr http://www.securite-routiere.equipement.gouv.fr
6	institution name / position	ASFA (Association des Sociétés Françaises d'Autoroutes) Mr Jacques Boussuge
	involvement	ITS deployment projects, standardisation
	address	3, rue Edmond Valentin, F-75007 Paris
	phone	+33 1 47 53 39 29
	fax	+33 1 47 53 36 32
	e-mail / website	jacques.bossuge@autoroutes.fr www.autoroutes.fr
7	institution name / position	CETE du Sud-Ouest Mr Bernard Beudou
	involvement	Responsible for developing pre-trip road traveller information services, especially on a cross-border level (e.g. France/Spain)
	address	Rue Pierre Ramond, BP C, F-33165 St Médard-en-Jalles Cedex
	phone	+33 5 56 70 65 53
	fax	+33 5 56 70 66 78
	e-mail	bernard.beudou@equipement.gouv.fr
8	institution name / position	CERTU (Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques) Mr Jacques Nouvier
	involvement	Traffic management and Telematics
	address	9, rue Juliette Récamier, F-69456 Lyon Cedex 06
	phone	+33 4 72 74 58 61
	fax	+33 4 72 74 59 60
	e-mail	jacques.nouvier@equipement.gouv.fr
9	institution name / position	Isis S.A. Mr Martial Chevreuil
	involvement	Technical and Scientific Director of Isis (traffic engineering and ITS consultants) with extensive experience in TTI; was previously employed by the Ministry of Transport where he was responsible for its road traffic information policy and creation and implementation of the Bison Fûté campaign
	address	11, avenue du Centre, F-78286 Guyancourt Cedex
	phone	+33 1 30 48 47 70
	fax	+33 1 30 48 47 10
	e-mail	m.chevreuil@isis.tm.fr
10	institution name / position	Ville de Paris (City of Paris) Mr Bernard James
	involvement	Leader of the Urban Multimodal Information working group in ITS France
	address	Direction de la Voirie et des Déplacements 40, rue du Louvre, F-75001 Paris
	e-mail	bernard.james@mairie-paris.fr

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Germany

1 Institutional framework for TTI development

1.1 Main actors and competencies

Due to the federal structure of Germany, key responsibilities for transport issues are divided between the four main authority levels of national government (Bund), federal states (Länder), counties (Kreise), and local authorities (Städte, Gemeinden). Additionally, specific institutional settings and competencies exist for the different transport modes. This complexity is approached here by first sketching the basic institutional framework in relation to road transport, and then specifying the situation for the other modes.

1.1.1 Road transport and authority levels

The federal government (Bundesregierung) defines the general orientations of national transport policy. In terms of road transport it is directly in charge of the construction, finance, maintenance and control of the federal motorway- (Bundesautobahnen) and highway-network (Bundestraßen). In practice, however, a major part of the day-to-day operative business (including traffic management) is delegated to the 16 federal states i.e. their ministries responsible for transport. They are the key authorities for inter-urban road transport.

Coordination among federal states and with the national government is established through a standing committee composed of representatives from the 16 transport departments with a rotating chairperson (Verkehrsministerkonferenz - VMK), as well as through a number of federal state's committees on the working level.

For purposes of traffic information, the federal states collect traffic data on motorways and highways in their regional Traffic Information Centres (TIC; Landesmeldestellen - LMSt), which are connected to the national TIC (Bundesmeldestelle - BMSt). In addition, the police pass on information on incidents to TIC's, and both national and federal authorities supply their data on scheduled road works.

At the local level, the organisation of transport functions is the domain of the public authorities (Städte, Gemeinden), which have a high level of autonomy in Germany compared to other European countries. Cities and municipalities, which have the constitutionally guaranteed rights of sovereignty and subsidiarity, are in charge of local traffic planning, the construction and maintenance of their own road network, road data collection, and the entire traffic guidance and management within their jurisdiction.

Finally, the counties (Kreise) are supramunicipal bodies responsible for the construction and maintenance of the inter-municipal road network, as well as for public transport services at this level (bus), and are financed by municipalities and federal states. Large cities combine the roles of county and city ("kreisfreie Städte"). Berlin, Hamburg and Bremen even have the status of a federal state (for historical reasons).

1.1.2 Public Transport

The provision of local public transport services is undertaken by companies, which are mostly under full (direct or intermediate) control of the local authorities. Yet, the principal source of funding for local transport infrastructures and services (road, rail and technical systems) is a national subsidy based on federal law (Gemeinde-Verkehrswege-Finanzierungsgesetz - GVFG).

At the national level, all PT operators are represented by the German Federation of Public Transport Operators (VDV³⁷).

In major agglomerations public transport provision between central cities and the surrounding counties needs to be closely co-ordinated. Therefore, in these areas the different public transport operators for rail, subway, tram and busses have formed urban-regional public transport associations (Verkehrsverbünde) cooperating for PT service provision. They are in charge of harmonizing schedules and tariffs and aim to collect traffic or incident information from the various operators.

1.1.3 Railways

For rail transport, the national authority responsible for technical standards, regulation, and control is the Federal Railway Agency.³⁸ The former national railway company (Deutsche Bahn – DB) has been privatized in 1994 and separated into an infrastructure provider (DB Netz) and transport operators (DB Personenverkehr, DB Cargo).

For national passenger travel relations, the DB still remains the only operator. However, the responsibility for regional services has been delegated to the federal states in 1996 and the regional railway network has been opened to competition. The federal states now commission regional rail services after a tender procedure, with the effect that in a number of cases the DB has been replaced by other private operators.

All relevant railway operation data and incident information is collected and processed by the DB Netz AG and made available to operators (currently ca. 200). Apart from that, data exchange is only practiced with PT operators in the context of an urban-regional *Verkehrsverbund* and limited to the use within these associations.

1.1.4 Aviation

For air transport, the national authority responsible for regulation, control and technical standards is the Federal Aviation Agency.³⁹ It supervises operation and development in the sector, but also collects operation data and incident information.

Most airports are managed by public companies owned by the federal states and/or local authorities, while private shareholders still form an exception (e.g. in Frankfurt and Düsseldorf). The airport companies exchange traffic data and incident information with the private airlines. Furthermore, in the case of the rail connections to Frankfurt (largest German airport and hub of the former national airline Lufthansa) and Düsseldorf, the airport companies also exchange data with the DB for coordination of a passenger feeder service (“rail&fly”).

1.1.5 Shipping

For water transport the national authority is the Federal Waterways and Shipping Administration.⁴⁰ Operation in the sector is fully private, and almost all German carriers and operators are members of the Federal Association of Inland Navigation (BDB⁴¹).

³⁷ Verband Deutscher Verkehrsunternehmen – VDV; www.vdv.de

³⁸ Eisenbahn-Bundesamt – EBA; www.eisenbahn-bundesamt.de

³⁹ Luftfahrt-Bundesamt – LBA; www.lba.de

⁴⁰ Wasser- und Schifffahrtsverwaltung des Bundes – WSV; www.wsv.de

⁴¹ Bundesverband der Deutschen Binnenschifffahrt e.V.; www.binnenschiff.de

However, for passenger transport, common databases concerning schedules and tariffs are only available at the regional level. Most operators also supply static data on schedules to the DB for the operation of an inter-modal journey planner.

For freight transport, the larger shipping-companies provide also inter-modal information (road, rail). Furthermore, in 2001 the Federal Ministry of Transport (BmVBT), the relevant federal states, the BDB, and the private parties involved in shipping entered a public-private partnership for the promotion of shipping in inter-modal transport (Short Sea Promotion Center). This platform provides information about inter-modal transport chains on the internet and forms part of a European network.⁴²

1.2 Policy orientations

1.2.1 National level

Mobility oriented TTI services are part of a broader policy strategy for the implementation of intelligent transport systems (ITS) in Germany. This strategy pursues two overall objectives:

- Economic development and promotion of the business location Germany with its strong export orientation (major industrial branches of vehicle-manufacturing, electronic equipment and ICT) and spin-off effects including attractiveness and image.
- Sustainable transport development, favouring the integration of transport networks (inter-modality), a modal shift towards public transport, and the efficient use of existing infrastructures.

In this, a clear division of roles between private and public activities is envisaged. While basic infrastructures and services of control and information are considered the responsibility of the public sector, new value-added and personalised services should be provided by the private sector. It is seen as the key task of the public sector to create a liberalised regulatory framework and to play an enabling and moderating role for ITS implementation within the complex institutional context in Germany. For this purpose, working relationships with interest groups from industry, the public transport operators' association, and the associations of Länder, cities and municipalities exist at different levels.

Already in 1995 the Minister for Transport initiated the "Federal Economic Forum for Intelligent Transport Systems" (Wirtschaftsforum Verkehrstelematik). Members of the Economic Forum are top-level representatives from public and private agencies involved in ITS.⁴³ In addition to the Forum members who meet once or twice a year, there is a „Steering Group“ composed of ca. 50 representatives from the same institutions, yet on the level of managing directors, which prepares the Forum's formal decisions.

⁴² www.shortsea.info

⁴³ Members are:

- Federal Minister of Transport (chairman)
- board directors of Ford, Opel, Volkswagen, Mercedes-Benz
- board directors of Siemens, Vodafone, Bosch
- the President of the major German motorists association ADAC⁴³
- the representative of the current acting chairperson of the federal states transport ministers working group (VMK),
- the President of the major organisation of German cities (Deutscher Städtetag)
- the President of the association of German public transport companies (VDV) and
- a member of the board of the German Railways (DB)

The Economic Forum is considered a „strategic public-private partnership“ in the sense of an enabling institution. Its objective is to promote the implementation of ITS within an integrative transport concept, based on the understanding that:⁴⁴

- The introduction of new ITS services is the task of the private sector, while the state should create an enabling framework.
- Services which have an effect on the overall transport system should have priority for deployment.
- Services should be inter-operable and based on common European standards.

The Economic Forum has discussed and gradually reached consensus on a new (legal) framework for TTI services, concerning private data collection on roads, human-machine interface (HMI) design, privacy and data security, delivery and selling of public traffic data, as well as public-private-partnerships. It also had an important „catalytic“ function in the actual emergence of such services by establishing the relevant contacts.

Also the need for a further definition of formalised and de-facto standards has been sustained by the Economic Forum, and all major suppliers are committed to their adoption. For instance, the introduction of the Global Automotive Telematics Standard (GATS) by Tegarom and Mannesmann⁴⁵ has been supported by the German car-manufacturer's association (VDA) and subsequently taken up by various OEM's. Today GATS is considered to be too rigid and open interface standards are on the move.

In November 2001 the Ministry of Transport published a study on the „effects of information and communication technologies (ICT) on transport volumes and innovative employment“.⁴⁶ It reflects the integrated approach to the overall objectives, linking ITS, transport- and economic development. The final recommendations address different authority levels, demanding in particular to:

- support the standardisation of ICT interfaces at EU-level
- support the full coverage of broadcasting media (RDS/TMC, DAB) at EU-level and enhance implementation in Germany
- provide traffic data to private service providers at regional and local level
- establish inter-modal mobility centers at the local level (traffic management/ information centers - TMC/TIC)
- nominate a delegate for ITS in big cities
- modernize the ICT infrastructure for emergency calls (police and rescue services)

Also in autumn 2001, the federal government initiated the so called „Mobility Initiative“ (Mobilitätsoffensive) in cooperation with high-level representatives from transport and related industry, which led to the publication of a common „Recommendation for future actions“ in May 2002. Against the backdrop of transport growth and changing demand structures the initiative aims to ensure mobility in order to strengthen the competitiveness of the business location

⁴⁴ BmVBW 2000

⁴⁵ see section 1.4.3

⁴⁶ BmVBW 2001b

Germany. It strongly underlines the positive implications of transport for economy and society and suggests a number of common priority tasks:

- invest in infrastructure and enhance planning procedures
- improve the use of infrastructures through establishing inter-modal transport chains
- realize transport market liberalisation and competition, including air, rail and local public transport
- reduce public subsidy and harmonise conditions of EU-wide competition
- improve social and ecological standards
- create logistic competence
- stimulate a “technology thrust” in transport

The development of ITS thus figures as a horizontal task that requires investment and innovation to improve transport efficiency, safety and environmental protection, to create a framework for new technology use in transport and communication, to enhance public and private services, and to increase budgets for public implementation.⁴⁷

Apart from these initiatives, especially the national research programmes are an important trigger for the implementation of TTI services and the development of the market. For this purpose the federal government seeks to combine efforts in the areas of transport and ICT research and demonstration projects.⁴⁸

1.2.2 Regional and local level

Based on the described coordination with national policies, all federal states assume a proactive approach to ITS deployment and support national and local initiatives. Some federal states have been particularly active in the backing of research and demonstration projects for the implementation of TMC's and TIC's (traffic management/ information centers) at the regional and urban level (Bayern, Baden-Württemberg, Hessen, Nordrhein-Westfalen, Berlin, Sachsen).

At the local level, ITS applications are generally considered an important transport policy tool. Many authorities actively aim to achieve greater efficiency in organisational and economic terms regarding their difficult budgetary condition, and to improve the efficiency of the transport system in view of daily congestion problems. Especially the larger cities are interested in actively deploying ITS, namely in the areas of parking management, traffic management, traffic and traveller information and public transport priority at intersections.

There is a clear tendency to move away from (public) proprietary systems towards open standards and system architectures, and the political context is mostly favourable as regards public-private partnerships. Furthermore, there is a broad consensus about encouraging a shift from the private car to public transport modes, for which ITS-based traffic management and TTI service provision are seen as supportive measures. The public transport operators' association (VDV) strongly recommends the provision of inter-modal timetable and tariff information by its members to TTI service providers, but demands that this information should be made available free of charge for end users.

⁴⁷ BmVBW 2002

⁴⁸ See section 2.2

Nevertheless, local transport policies always depend to a considerable degree on the specific political power constellations and coalitions between parties in place. The more advanced examples of TTI service implementation in Germany illustrate, that the particular local conditions, development strategies, actor networks, and also individuals in charge have been key for the resulting design of a TTI service provision model. In this, next to transport related goals the promotion of the respective business location and its competitiveness appears to be the most important strategic issue and justification for public investment. As a result, there is a variety of substantially different local approaches and solutions for TTI service provision, in particular concerning the tasks and responsibilities of public and private actors. This spectrum comprises:

- exclusively public establishment and operation of a TMC/TIC (traffic management/ information center) as a platform for the delivery of data (including future private services) and provision of public TTI services (e.g. Bayerninfo/ Mobinet)
- public establishment and finance of a TMC, public-private partnership set-up of an operating company for a TIC, public and private TTI service provision (e.g. as aimed by Stadinfo Köln)
- public finance of infrastructure, but exclusively private operation of a TMC/TIC and TTI service provision (e.g. VMZ Berlin)

1.3 Laws and regulations concerning TTI services

Seven regulatory “cornerstones” for TTI service development have been prepared between 1996 and 2000. Instead of official laws, these are mostly agreements between public and private parties that outline a common “code of practice”. Apparently, the Economic Forum has played a key role here, either through direct elaboration or through coordination and assessment. All agreements and regulations have been published by the Ministry of Transport in a single document in June 2000.⁴⁹

1. In December 1995 an “Agreement on the rapid introduction of ITS services in Germany” was reached in the Economic Forum. It has the character of a voluntary Memorandum of Understanding (MoU) between the main stakeholders and formed the basic reference for the following steps.⁵⁰ It essentially requires:
 - the private sector to develop modular and flexible end-user devices
 - the public sector to provide its traffic data
 - both sectors to develop business models for inter-modal traffic data management
 - the private sector to take the initiative to market ITS-based services
 - the private sector to enhance normalisation and standardisation
2. In 1996 the Economic Forum approved the “Guidelines for the Design and Installation of Information and Communications Systems in Motor Vehicles” with a view to safety implications of in-car traffic information systems, equally in form of a MoU.⁵¹ The guidelines demand

⁴⁹ BmVBW 2000

⁵⁰ Vereinbarung des Wirtschaftsforums Verkehrstelematik zur zügigen Einführung von Telematikdiensten am Standort Deutschland – 12.12.1995

⁵¹ Vereinbarung zu Leitlinien für die Gestaltung und Installation von Informations- und Kommunikationssystemen in Kraftfahrzeugen – Wirtschaftsforum Verkehrstelematik 11/1996

e.g. that these systems should not have negative effects on vehicle functions or driver attention, and should be easy to use.

These orientations have also been considered later in the 1999 Commission Recommendation on a European statement of principles on human machine interface.⁵² In a communication of 7.3.2002, the federal government has informed the Commission about the fulfilment of this recommendation in Germany. It states that this process is gradually being achieved with the industry following in its own interest. A need for a directive defining “hard” characteristics of HMI is currently not seen.⁵³

3. A “Model contract for the installation and operation of traffic information systems on federal highways and bridges” by private parties (Straßenbenutzungsvertrag) was first approved in coordination with the federal states in 1996, then updated in 2000.⁵⁴ It provides a common regulation for the right of use, traffic safety and liability issues, as well as derived duties and costs for private parties. Most importantly, private agencies are obliged to pay a fee for the use of the public infrastructure, gradually increasing during the first three years of operation.
4. The “Information and Communication Services Act” of 22. July 1997 then set the legal framework for the provision of advanced *private* traffic information services.⁵⁵ This law regulates the provision of any ITS-based services, their related data privacy issues and for digital signatures, and modifies other existing laws (criminal law, offences, protection of minors, intellectual property rights, pricing).

Its key element is, that tele-services including traffic-related information and services can be provided without special licensing or registration. There is no specific liability for the contents of tele-services other than for any other commercial product or service provided. It is standing practice to disclaim liability between data suppliers and intermediaries, as well as towards end users.

Regulations for privacy issues, which are an area of substantial public interest in Germany, restrict the use of personal data to the technically and commercially required minimum. In particular any data on service usage needs to be erased upon completion of the transaction at the latest (except for items which are relevant for billing) and may not be passed on to third parties.

5. In April 1998 the national and federal transport ministers agreed on a “Model contract for the delivery and selling of traffic data from federal traffic control centers” to private parties. This model contract recommended for application by the *Länder* regulates e.g. the interface supply, permissions, right of use, and payment. It excludes any form of liability of the public data providers, does not guarantee the continuity of data provision and data quality (depending on availability), and allows private companies to match, combine and transmit the received data freely.

In terms of costs, the model contract allows for free data exchange during the implementation phase of new services and provides flexibility on the amount of payment, which is to be fixed in relation to the commercial interest of the data receiving company. Private parties also have to assume the costs for installation and the development of interfaces.

⁵² C(1999) 4786 - 21.12.1999

⁵³ Mitteilung der Bundesregierung and die Kommission der Europäischen Gemeinschaften vom 7.3.2002

⁵⁴ Muster eines Straßenbenutzungsvertrages – BmVBW 15.4.2000

⁵⁵ Gesetz zur Regelung der Rahmenbedingungen für Informations- und Kommunikationsdienste - IuKDG

6. In November 1998 the largest associations of local authorities (Deutscher Städtetag) and ITS industry (ZEEI)⁵⁶ elaborated a “Model contract for the delivery of traffic data between local authorities and private service providers”.⁵⁷ It regulates the data delivery, right of data use, attribution of resulting costs and liability in case of inaccurate or neglected data delivery, and is recommended for application by local authorities.
7. Finally, in February 1999 the “Guidelines for public-private partnership in ITS services” were approved by the Economic Forum. They refer to information and routing services for individual transport based on dynamic real-time traffic data, defining a set of common overall goals: Increase of traffic safety, maintain traffic fluidity, avoid destination/parking-search traffic, and comfort for the user. In particular, the guidelines demand that:
 - route recommendations be based on the road network hierarchy, official detour definitions, and traffic management concepts of public authorities
 - information and recommendation must not contradict public authority requirements

Therefore, the requirements stated in the Commission recommendation on the “development of a legal and business framework for the participation of the private sector in deploying TTI services” appear to be largely fulfilled in Germany. Due to the consensual approach, the present framework is also fairly stable and unlikely to be changed. However, the chosen path can be considered as partly diverging from the recommendation, for instance as private agencies are required to pay for the use of public infrastructures to install their roadside equipment. Also the delivery of public data is in principle enabled through unified model contracts, but again private parties have to pay, even though the data quality may not suffice to establish a business case. Apparently, the private sector has assumed these conditions, last not least with a view to the large transport market in Germany and subsequent export perspectives.

1.4 Role of the private sector

As a result of the described approach and policy framework in Germany, there are examples for private sector involvement in all tasks along the information chain for TTI service delivery. Private actors also partake in services at all spatial levels (national, regional, local), for the different transport networks, modes and customer profiles. While an interconnection of the different TTI services between regions and urban centers at a national level is difficult to achieve, it is the participation of a small number of private key actors that has actually established a network of relationships and (knowledge) exchange. These key actors are playing an important role regarding the future development of TTI services in Germany.

1.4.1 Data providers

For road traffic data collection and processing, the only company that has made use of the model contract on the national level so far is the DDG (Gesellschaft für Verkehrsdaten GmbH), founded in 1997 as a joint venture of T-Mobil (the mobile network subsidiary of Deutsche Telekom) and Vodafone (formerly Mannesmann). The DDG has installed roadside equipment (passive infrared sensors) along the motorway and on the federal road network (mostly on bridges), while it uses public data only marginally for validation purposes.

DDG offers traffic status and incident information, travel time calculations and prognosis, and other traffic relevant information (weather, planned incidents, etc.). Its data quality appears to be

⁵⁶ Zentralverband Elektrotechnik- und Elektronikindustrie

⁵⁷ Mustervertrag über die Überlassung verkehrsrelevanter Daten zwischen Kommunen und privaten Diensteanbietern – Deutscher Städtetag/ ZEEI 8.12.1998

the highest for the German road network. In the long term it is expected that floating car data (FCD) will be used increasingly. It appears to be unclear whether this will also be supplied via DDG or whether the two companies would rely on own data acquisition.

Apart from the DDG, the only large-scale private data acquisition is undertaken by the major motorists association ADAC.⁵⁸ The ADAC collects information on major traffic incidents through staff patrolling the road network by car, motorcycle or helicopter as well as by members reporting incidents (“Staumelder”). Approximately 15.000 “Staumelder” are contacted by the ADAC that pays for their mobile-phone air-time. Most (private and public) radio stations rely for their traffic information on public authority data and the ADAC (fig.1).

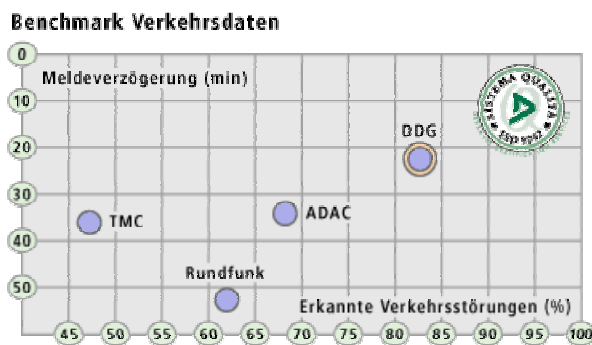


fig.1: Data quality comparison between public TMC, radio stations (Rundfunk), ADAC and DDG [reporting delay (up) vs. share of reported incidents (across)]; source: DDG 2002

Private data collection is also carried out for the railways (DB Netz AG), and partly for aviation (airport companies). For the other modes (bus, light rail, ship), the respective operators are collecting their own data.

Regarding the provision of non-transport data, private providers are becoming increasingly important as private TTI service providers tend to develop personalised and integrated contents that require information repackaging (location-based services, infotainment, etc.). Thus, specialised publishers (e.g. Falk), providers of databases for geo-information (e.g. Tele-Atlas, Tele-Info, Map&Guide), address data (e.g. Gelbe Seiten) or other travel-related information (e.g. ADAC, Michelin) identify good business prospects regarding private TTI service provision.

1.4.2 System and solution provider

As a key branch in ITS applications, there is a strong interest in the development of ITS and the related markets. The main players in Germany have therefore been actively pursuing their participation in TTI demonstration projects, even though business cases are not clear yet. This concerns in particular Siemens AG as the major know-how and technology supplier in this sector (project involvement in Berlin, Stuttgart, Cologne, Dresden, Hannover), but also “new-comers” such as Gedas (a subsidiary of VW) promoting FCD technology (to be demonstrated at the Athens Olympics 2004),⁵⁹ or DaimlerChrysler mobility management services, who have developed modular solution packages (e.g. for toll collection, fleet management, traffic management). Other companies active in TTI delivery such as PTV AG, IVU Traffic Technologies AG, TransTec GmbH or Heusch Boesefeldt GmbH, focus on providing hard- and software solutions as well as consulting services.

⁵⁸ Allgemeiner Deutscher Automobilclub

⁵⁹ The Intelligent Highway. no.8. 15.4.2002

1.4.3 Equipment manufacturers

At present, the most advanced telematics⁶⁰ equipments available to vehicle manufacturers and end-users are integrated radio & navigation systems based on traffic message channel (TMC) information (e.g. by Bosch/ Blaupunkt, Siemens/ VDO). This situation reflects, that most OEM's have been in a waiting position as the development of new technologies and devices strongly depends on coordination with several branches, and TTI market development remains uncertain. However, alliances with car-manufacturers seeking an integration of in-car electronics and telematics equipment are now emerging (e.g. Bosch/Blaupunkt and PSA Peugeot/Citroën will jointly develop applications in the areas of safety, comfort, pollution control and fuel consumption). Furthermore, all major equipment suppliers have also joined the Open Mobile Alliance (OMA) for the promotion of mobile internet applications, which provides a common platform for the development of multi-standard interoperability.⁶¹ These new alliances will probably enhance the realisation of more open in-car telematics platforms, as well as TTI applications for other transport modes available on mobile devices.

1.4.4 Service providers

For road transport there are two major providers on the German market: Passo, a service founded in 1995 by Mannesmann Autokom and taken over by Vodafone in 2000, and Tegarón, a joint venture of T-Mobil and DaimlerChrysler services AG founded in 1997 and taken over by T-mobil recently. Both services are now exclusively using motorway data from the DDG. There is no indication that either of them is interested in signing a model contract for obtaining data from the federal states. Their operation is still estimated not to have reached the break-even point, but a consolidation is expected within 2-3 years.

Aside from its participation in Tegarón, especially DaimlerChrysler has developed a number of TTI and mobility management services, both for end-users and business clients, including personal travel assistance (CityCompanion⁶²) or traffic-sensitive routing (TrafficDialog System with PTV, Harman/Becker, Tegarón, ADAC).

Furthermore, some system and content providers also operate road TTI services, partly as free demonstration sites for potential (B2B) clients (e.g. Reiseplanung by PTV), but also on a commercial basis (e.g. Tele-Info). Apart from road-related TTI, private providers for other transport modes currently only exist for airline information services (e.g. Amadeus, Galileo) and the railways (DB).

1.4.5 Car and automotive industry

After the initially high expectations regarding TTI services as a "subsidiary branch", the car manufacturers seem to have realized that the demand remained insufficient to sustain the business efforts made in this direction. All major brands have developed and offered their own TTI services, partly in cooperation with TEGARON or Vodafone-Passo (Audi „Telematics“, BMW „Telematik“⁶³, „Mercedes-Benz Portal“, Opel „OnStar“, VW „Mobilservice“, etc.), yet without any commercial success.

At present there appears to be a trend back to the core business of car selling. New concepts for the integration of TTI services aim to purchase solutions available on the market from TTI

⁶⁰ "Telematics" is understood here as technology for the communication between infrastructures and vehicles, in accordance with the use of this term in the US.

⁶¹ The Intelligent Highway. no.14. 15.7.2002

⁶² See Annex: Service no.7

⁶³ See Annex: Service no.5

service providers and mobile network operators, and for this purpose develop vehicles with telematics platforms that allow to adopt the services to the particular image of the brand. Direct alliances between manufacturers for a joint development of in-car telematics services (such as PSA, Ford, Renault/Nissan: Signant)⁶⁴ have not yet emerged among German firms.

1.4.6 Mobile network operators

The only operators actively involved in TTI service delivery are currently T-Mobil and Vodafone (see above). This situation will supposedly change with the deployment of UMTS. Apart from these two operators, for Germany UMTS licences have been granted to

- O2 Germany (subsidiary of mmO2)
- E-Plus/Hutchison
- MobilCom (France Télécom)
- Quam (Telefónica/Sonera)

In 2001, network alliances have been signed between T-Mobil & mmO2, and E-Plus & Quam, thus leaving D2-Vodafone and MobilCom as only “single” operators. E-Plus has already launched the “i-mode” service for Germany, offering a wide range of mobile infotainment, but also TTI through partners such as ADAC, DB, ViaMichelin or YellowMap.⁶⁵

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 Inter-urban road networks

The automatic data collection system (public) currently covers one quarter of the motorway network in Germany, especially at major nodes and urban intersections. The federal highways (Bundesstraßen) are being further equipped with detection equipment. Moreover, an on-line information system for weather conditions has been completed for the West-German motorway network and is now being implemented also in the East (SWIS).⁶⁶ This road data acquisition is complemented by reports from the police and road authorities. Based on these sources, public traffic information on road and weather conditions, traffic status, incidents, route recommendations, road works and special events is made freely available on-trip (VMS, radio, RDS/TMC, partly DAB, videotext) and pre-trip (internet).⁶⁷

The private TTI services available add to this by providing better quality on-trip information in terms of speed based on DDG data, and without modification for traffic management purpose (Tegaron⁶⁸, Passo). Furthermore, traffic information is combined with navigation and/or options for personalised services (location based, reservation, emergency messaging, maintenance, theft protection) provided through GSM. Especially for pre-trip information through the internet,

⁶⁴ Joint press release 14.3.2002

⁶⁵ <http://www.teltarif.de/i/umts> 13.8.2002

⁶⁶ Straßenzustands- und Wetterinformationssystem

⁶⁷ BmVBW 2001a

⁶⁸ See Annex: Service no.4

contents such as route planning or detailed city maps are offered (Reiseplanung⁶⁹, ADAC, Tele-Info).

2.1.2 Urban networks

Urban TTI service provision refers to both, public and private transport. For urban TTI services the initiatives and programmes of the federal states concerning the establishment of regional traffic management centers and schemes, as well as the national RTD demonstration projects have become particularly important. All advanced examples of urban TTI service implementation are linked to some form of national or regional policy initiatives. Together, all levels show a common tendency towards implementing *inter-modal* and *real-time* TTI services for the purpose of traffic management, increasingly addressing the interrelation between *public and private* transport.

Public transport

The public transport companies operating bus, tram and subway services have implemented a common interface standard (TRANSMODEL), and automatic vehicle monitoring and control systems (AVL) are widely used for fleet management purposes.

Recently, all public transport associations, the DB and 80 operators have signed a declaration of intent for the implementation of a country-wide e-ticketing system that ensures the autonomy of operators but facilitates the use by travellers. Until autumn 2002 the details for this system should be elaborated, in particular regarding framework agreements, certification, accounting, central clearing, blacklist administration and the operation of a call-centre, urged by the preparation of a call for tender for implementation in the Berlin region. Main partners for the set-up are T-systems, Deutsche Bank, Siemens and Infineon.⁷⁰

To the traveller, operators provide mostly static pre-trip information on timetables and fares (internet), and on-trip information at stops/ stations and in vehicles, which in some cases is also dynamic. Phone enquiry lines exist for practically all operators. In the large agglomerations the information provided covers all associated operators (inter-modal) including the regional rail (DB and others). Furthermore, with the change to the common European currency several companies have also introduced advanced electronic ticketing systems, thus enabling new possibilities for TTI.

Private road transport

In terms of private road transport, the density of monitoring equipment (mostly inductive loops) is comparatively high, although with local differences. Especially the larger cities have implemented traffic and parking management systems delivering real-time traffic and parking information (route recommendations). By contrast, for rural areas little road transport monitoring is undertaken and static public transport data still represents the principal traffic information source available.

Initiatives and programmes of the Länder

In **Bavaria**, the „Bayern-Info“ project, which is part of the programme “Bayern Online”, has set up together with private parties a state-wide inter-modal traffic information centre with forecast

⁶⁹ See Annex: Service no.6

⁷⁰ Presentation of A. Müller-Hellmann (VDV) at Mobiball conference Berlin, 18.5.2002

and route planning functions (road, PT, bike), regional TMC/TIC's in the major Bavarian cities of Munich and Nuremberg, and an electronic public transport timetable information system.⁷¹

Similar "framework" programmes are being implemented e.g. in **Baden-Württemberg**, where "MOBIN" (Mobilitätsinformationsnetzwerk) is currently subject to a call for tender,⁷² or in **Hessen** with the implementation of a regional TMC/TIC (MoTIC) as part of the „Hessen Media“ initiative, promoting multi-media applications in all sectors.⁷³ The focus is equally on integrated traffic management (public and private), the provision of dynamic PT information and reliable, secure interconnections, as well as inter-modal traffic information provided through "mobility centers" (centrally located service offices), internet and WAP/GSM.

In **North-Rhine Westphalia** a particularly ambitious regional TTI and traffic management project titled "Ruhrpilot" has been launched in January 2002.⁷⁴ It aims to establish an interface between the TIC of the Land (Verkehrsinfo.NRW) and the multiple local TIC's for both private and public transport, providing real-time information coverage of the entire transport network in the Ruhr area. This fully integrated intermodal service will be established in partnership with private actors and should be operative by 2004.

Implementations in cities and agglomerations

Comparing urban TTI service provision in cities and agglomerations, however, relevant differences exist regarding the distribution of roles between the public and the private sector. Specific models have been designed in each case, depending on multiple local parameters such as (ITS) development status, economic conditions, political constellations, or strategic orientations of key actors aiming to shape, for instance, a "European model region for modern transport management."⁷⁵

In **Berlin**, especially the ambitions of the city (new capital, "center of competence" for transport, "digital city"), and the strategic interests of the major German system and service providers Siemens and DaimlerChrysler have led to design a „bold plan“ for traffic management and TTI service provision. The Land Berlin has covered all initial investments for the infrastructure (additional detection equipment, VMS, traffic message channel systems) and signed in 1999 an agreement with the private parties for a 10 year operation and service provision on a fully commercial basis.

To this end, a private operating company has been founded in 2001, and public transport companies are expected to join (DB Regio, BVG). The new company (Verkehrsmanagementzentrale Berlin – VMZ) is responsible for public and private transport data collection and processing, traffic management, and TTI service provision. At present, all services are free of charge, but this may change in the near future with the introduction of on-trip delivery of personalised content.⁷⁶ Recently also B2B applications have been launched.⁷⁷

By contrast, in **Cologne** the chosen approach can rather be described as „step-by-step“, starting with the (public) implementation of a real-time parking information system in 1986.

⁷¹ See Annex: Service no.3

⁷² Mobilist News Letter. no.3. May 2002

⁷³ <http://www.hessen-media.de>

⁷⁴ http://www.projektruhr.de/de/ruhr_pilot

⁷⁵ <http://www.hessen-media.de/inhalt/telematik/verkehr.htm> - 20.8.2002

⁷⁶ <http://www.vMZberlin.de> - See Annex: Service no.1

⁷⁷ With local hotels offering intermodal routing ("Concièrge"), and with parking houses placing their logos on the VMZ web-site to offer real-time parking status information.

Through a combination of European (e.g. SCOPE, Euroscope), national, regional and local funding, Cologne has improved its TTI infrastructure effectively over the last 15 years. TTI services are co-ordinated through a TMC/TIC that delivers real-time traffic information to the end-user.

Mutual agreements have been signed with a local network operator in 1996 for the provision of TTI services through mobile phones (traffic status, parking reservation and payment). For the Stadtinfo Köln project, national research funding has been achieved in 1998. The aim is to effectively improve the traffic management functions, and at the same time deliver traffic information B2B (e.g. to hotels, retailers) and traffic data to private providers of personalised services.⁷⁸

Similar implementations of advanced traffic management and TTI service provision exist also in other German cities, each presenting particular features. Common denominators are the integration of real-time inter-modal information for public and private transport in order to enable corresponding route planning and recommendations, e.g. in the “Mobinet” project in **Munich**.⁷⁹ Also the city of **Nuremberg** is currently deploying a traffic management system with a particular focus on traffic control during major events (trade fair, sports).⁸⁰

“Mobilist” in **Stuttgart/Ulm** has implemented an inter-modal journey planner for public and private transport, that allows to adjust the preferred shares of the modes. The initiative also addresses car-sharing systems, e-commerce and e-government as elements of an integrated traffic management.⁸¹

In the **Frankfurt** region (Rhein-Main), the “WayFlow” project has demonstrated complementary data collection through FCD, mobile information access (PDA, GPRS), a car-pooling service and a smart-card for personalised applications.⁸² Also “Intermobil” in Dresden, is implementing a smart-card system. Furthermore, a demand-responsive operation of the regional railway lines is envisaged.⁸³

In **Bremen**, the first broad implementation of an e-commerce standard (GeldKarte) has been achieved, offering innovative mobility services through integrating PT services, car-sharing, taxi rides and the use of various public facilities. Moreover, real-time PT information is made available on-trip via VMS in vehicles and at stops, info-kiosks, as well as through a call-center.

In **Hannover**, a private operating company for the TMC/TIC has been founded by authorities and transport operators (MOVE GmbH). An exclusively private operation of this TMC/TIC through outsourcing is currently under discussion.⁸⁴

All these initiatives are based on public-private cooperations, without commercial risk-taking of the public sector. At present there are also no significant established revenue-generating private business cases, although all actors aim to create the required technological and institutional conditions for this to be realised.

⁷⁸ <http://www.stadtinfoekoeln.de> - See Annex: Service no.2

⁷⁹ <http://www.mobinet.de>

⁸⁰ Internationales Verkehrswesen no.7/8. 2002

⁸¹ <http://www.mobilist.de>

⁸² <http://www.wayflow.de>

⁸³ <http://www.intermobil-dresden.de>

⁸⁴ <http://www.move-info.de>

2.1.3 Railway network

For rail passenger transport, building on the results of the DELFI project the DB offers on-line timetable information and booking through the internet and call centers (including ticket print-out). A system for the provision of real-time information about the traffic status especially at stations (VMS) is currently in development, including options for on-trip delivery via WAP/UMTS. So far, all railway information has been freely available. However, the DB has now decided to charge for its phone-enquiry and booking service from September 2002, while basic schedule information through automatic announcement will remain free. Mobile information about real-time traffic status can therefore be expected to be a pay service as well.

The DB internet services have been further developed towards more interactive use and inter-modal contents. The journey planner allows to select preferences in terms of mode (train types, subway, tram, bus, ferry, taxi) and access to start/destination (walking, cycling, taxi), check bicycle carriage options, and compare routes, costs, travel times and emissions with the private car (and partly the airplane).⁸⁵

The DB is also actively involved in the EU-SPIRIT project that aims to develop an interface that allows to retrieve information across various journey planners and networks for different modes, especially long and short distance.

2.1.4 Aviation

For air travellers, real-time information is made available by the airport companies pre-trip (internet) and on-trip (VMS, phone enquiry). For trip planning, static information on schedules and fares is also provided by travel agencies or the airlines themselves through the internet. Via its "i-mode" portal, the DB delivers this type of information also on-trip.

2.1.5 Navigation

All relevant information for safe and economic water transport operation can be received through a central on-line system (ELWIS),⁸⁶ run by the WSV. Operators provide static information about schedules and fares for shipping passengers mostly through the internet, for small lines only by phone. Integrated information with other modes is offered by the DB that includes ferry operators in its journey planner, or for freight transport by the large carrier companies.

2.2 TTI research activities

In national transport and ITS research, responsibilities are divided between the Ministry for transport (currently: Bundesministerium für Verkehr, Bau- und Wohnungswesen - BmVBW, for road transport supported by the Bundesanstalt für Straßenwesen - BASt), and Ministry for research, science and education (Bundesministerium für Bildung und Forschung - BmBF). However, while programmes are being coordinated, most funding is actually provided by the BmBF. The co-ordination of horizontal tasks (e.g. project management and evaluation) is carried out by thematically focused large research institutions (Projektträger), i.e. for mobility, transport, construction and housing the TÜV Rheinland.⁸⁷

ITS represent a key issue in current research programmes, covering all transport modes. Research funding and demonstration projects are clearly conceived of as instruments of market

⁸⁵ <http://www.db.de> - See Annex: Service no.8

⁸⁶ <http://www.elwis.bafg.de>

⁸⁷ <http://www.tuvpt.de>

development, and their results will have a major influence on the further implementation of TTI services in Germany.

The overall research programme “Mobility and Traffic”, approved in 2000, promotes a number of projects related to TTI. A research priority is the “Intelligent Transport Network”, making use of ITS solutions to improve transport efficiency and safety, integrate modes, optimize mode choices and reduce resource consumption.⁸⁸ Four major initiatives should be highlighted:

- INVENT (2001-05) is the continuation of the MoTiV programme and addresses the two areas of driver assistance systems for increased traffic safety, and “traffic management 2010”, aiming at an efficient use of infrastructures and improved attractiveness of PT.⁸⁹
- The initiative „Mobility in Conurbations“⁹⁰ was launched in 1997. Five projects were chosen to demonstrate cooperative approaches to integrated traffic management strategies in urban agglomerations (“CashCar” Berlin, “Intermobil” Dresden, “Stadtinfo” Köln, “Mobinet” München, “Wayflow” Rhein-Main, and “Mobilist” Stuttgart). For each project the formation of large private-public consortia was required that had to sign legally binding agreements before submission of the full proposal (1997-2003/04).

An important link between some of these projects establishes DIRECT.⁹¹ It aims to connect local and regional information services⁹² with providers of inter-urban information services in a cooperative network covering both, public and private transport. Based on results from the DELFI and EU-SPIRIT projects, the independence of the different providers is preserved through dialogue interfaces that allow the exchange of real-time data (duration 7/00-6/04).

- The research focus area „Mobility-Information Services“⁹³ is promoting the development and implementation of TTI services (2000-03). 5 projects have been chosen to demonstrate new solutions (DOM, PIEPSER, Tele-Travel Service, Grenzzulaufsteuerung, InterTransBoard).
- The research focus area “Better Understanding Mobility”⁹⁴ seeks to improve knowledge about the interrelation of causes and effects in contemporary mobility patterns as a basis for transport planning and management. The programme includes the project „Tele-Travel-System“ (TTS), aiming at improving the quality and availability of data for transport planning, information and management. TTS focuses on developing a system for reliable acquisition of data on traveler and vehicle specific passenger transport behaviour, e.g. through GPS and PTA. Demonstration sites are the Hannover/Braunschweig and Berlin/Brandenburg regions.
- Independent from national research funding, PT Operators, the DB and various private partners are currently developing the framework and standards for the introduction of a country-wide e-ticketing system by the end of 2002 (see 2.1.2).

⁸⁸ http://www.bmbf.de/621_1783.html

⁸⁹ BmV/BW 2001, 13

⁹⁰ Mobilität in Ballungsräumen - <http://www.mobiball.de>

⁹¹ Durchgängige Intermodale Reiseplanung mit Echtzeitinformation - <http://www1.faw.uni-ulm.de/fawweb/index.shtml>

⁹² Mobinet, Mobilist, Stadtinfo Köln, Intermobil Dresden

⁹³ Mobilitäts-Informations-Dienstleistungen - <http://www.mobidienste.de>

⁹⁴ Mobilität besser verstehen - <http://www.mobev.de/projekte/tts.htm>

3 Key issues for TTI implementation

3.1 Drivers and trends

- *Government* has decided to introduce a distance-based toll collecting system for heavy vehicles (trucks) until 2003. A contract for installation and operation has been signed with a private consortium recently.⁹⁵
- *Car-manufacturers* are starting to equip their vehicles with proprietary and non interoperable telematics platforms. The technical integration and standardized availability of this equipment enables multiple applications.
- *Mobile network operators* are looking for possibilities to recover the enormous investments made for UMTS licenses. TTI still seems to represent an important market here, but requires new cooperation forms for the sector.
- *National research and demonstration projects* are creating know-how and enhancing cooperation between (trans-)local actors, thereby facilitating “good practice” transfer.
- *FCD collection based on GSM* becomes an important complementary data source for TTI services on inter-urban roads, closing gaps in the detection network. First trials at the urban level are under way.
- *GSM deployment* and broad availability of mobile devices (smartphones, PDA) enhances the service demand and in turn opens up new possibilities for contents (location-based services) and applications (tracking).

3.2 Key obstacles to overcome

- *Demand paradox*: High user expectations in terms of service contents (competing with other media) contrast with a very low willingness to pay (competing with free public service provision).
- *Business models*: To cover the enormous costs for data acquisition and service operation, private providers need to develop user oriented service contents and billing models that can be marketed successfully.
- *User awareness*: Politically desirable TTI services (inter-modal public/private transport) are not requested, as mode choices are fairly rigid.
- *Information reliability*: High quality standards need to be met in order to ensure TTI services do not provide “outdated” or “wrong” information, as this would have very negative repercussions on the demand.
- *Data availability*: Few data are currently available at the urban level. Important gaps exist also at the intersection between the urban- and the inter-urban networks, as well as in respect of the restricted access to railway and public transport data.

3.3 Major potentials to use

- The different *local actor networks* could become interconnected at the national level by establishing an independent common Forum, supported by national subsidy.

⁹⁵ ETC, consisting of Daimler Chrysler Services AG, Deutsche Telekom AG, Cofiroute S.A.

- *The Economic Forum* has already made a major contribution to TTI deployment and also lost its initial impetus, but could still help to establish links between branches (esp. telecoms, car-manufacturer, SME's)
- *Public-private partnerships* needs to find a better balance between public and private interests. The gaps between limited resources and high political interest in TTI service provision (for the public sector), and between low demand and a business case (for the private sector) need to be bridged.
- *B2B business cases* based on TTI service "packages" sold to car-manufacturers, hotel-chains, important travel destinations e.g. leisure parks, retail centers, etc.

4 Annex

4.1 Key actors in TTI development

1	institution name / position involvement address phone fax e-mail	BmVBW – Referat Telematik Rainer Wunsch / Head of division ITS policy issues; Representative of Germany in EU Committees Invalidenstraße 44, 10115 Berlin +49.30.2008.2551 +49.30.2008. reiner.wunsch@bmvbw.bund.de
2	institution name / position involvement address phone fax e-mail	BmVBW - Referat Grundsatzfragen Wolfgang Hahn / Head of division transport policy issues; former head of ITS division Invalidenstraße 44, 10115 Berlin +49.30.2008.2410 +49.30.2008.1955 wolfgang.hahn@bmvbw.bund.de
3	institution name / position involvement address phone fax e-mail	TÜV-Akademie Rheinland GmbH – Projektträger Mobilität und Verkehr, Bauen und Wohnen Peter Rüenaufner / Director monitoring and evaluation of national research projects Am Grauen Stein, 51101 Köln +49.221.65035.111 +49.221.65035.115 ruee@de.tuv.com
4	institution name / position involvement address phone fax e-mail	Hessisches Landesamt für Straßen- u. Verkehrswesen Jürg M. Sparmann / President ITS policy and implementation Wilhelmstr. 10, 65185 Wiesbaden +49.611.366.33.11 +49.611.366.33. j.sparmann@hsvv.hessen.de
5	institution name / position involvement address phone fax e-mail	Land Berlin - Senatsverwaltung für Stadtentwicklung, Abt. Verkehr Ural Kalender / Head of division establishment of urban-regional TMC/TIC and TTI services An der Urania 4-10, 10787 Berlin +49.30.9016.2463 +49.30.9016.3305 ural.kalender@senstadt.verwalt.-berlin.de

6	institution name / position involvement address phone fax e-mail	Stadt Köln – Amt für Straßen- und Verkehrstechnik Peter Hasberg / Head of traffic management division establishment of urban-regional TMC/TIC and TTI services c/o DLR, Linderhöhe, 51170 Köln +49.2203.18.34.27 +49.2203.18.34.29 peter.hasberg@stadt-koeln.de
7	institution name / position involvement address phone fax e-mail	Mobilist Stuttgart Christian Günther / Project coordinator establishment of urban-regional TMC/TIC and TTI services c/o WRS, Friedrichstr. 10, 70174 Stuttgart +49.607.31.323 +49.711.228.35.55 Christian.Guenther@daimlerchrysler.com
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11	institution name / position involvement address phone fax e-mail	Siemens AG Heinz Sodeikat / Director communication and standardization, member of Economic Forum, honorary chairman ERTICO, president ITS Munich Siemens AG, Intelligent Traffic Systems Hofmannstrasse 51, 81359 München +49.89.722.252.36 +49.89.722.418.42 heinz.sodeikat@siemens.com
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Greece

1 Institutional framework for TTI development

Greece is introducing TTI services at a slower pace than the rest of Europe, although there exist already some very innovative applications. These services need, nevertheless, further expansion and integration. One of the reasons for the delay is that the public sector is slow at implementing systematic data collection practices and, secondly, the private sector shows a serious lack of incentive. The small size of the market plays a significant negative role.

1.1 Legal and public policy context

The market of TTI services in Greece is currently lagging behind what one should have hoped for. Although there were a lot of initiatives in the mid-90s, primarily in the form of city or country demonstrators or pilot implementations of EU-sponsored projects, very few withstood the test of time and fewer developed thereof.

One of the problems for this delay is attributed to the lack of identification of the proper entity that will undertake the implementation. The public sector has not done much in this respect, probably as a result of lack of a demand from potential users.

It is perhaps indicative of the current state of affairs that the most publicized TTI service is that of the dynamic real-time traffic map of Athens (www.transport.ntua.gr/map) which has been developed by an independent research organization, the Department of Transportation Planning and Engineering, of the National Technical University of Athens (NTUA).

It is noted that this academic research initiative had been motivated to play the role of an (early) *enabler* of emerging advanced telematics applications, which didn't find imitators until now. There were a few proposals for cooperation but no new stakeholders or innovators have evolved.

The public sector has not initiated yet a well defined and coherent policy regarding the provision of information. Public agencies would have to initiate, as a first step, a process of (inter-agency) information sharing before reaching the mature stage of giving away information to third parties. Therefore their responsibility is to release the resource of information to the general public (and to the competition), something which is attempted-recently- with the introduction of the e-government initiative.

It is noted here that Greece has not yet actively implemented any of the European Commission Recommendations (2001/551/EC), neither has been known to have opposed any request for facilitating TTI services.

1.2 Role of the private sector

The private sector has a definite role to play in the collection and dissemination of information. It is expected that private operators will set up partnerships with public authorities to support traffic operations centres and contribute to the field of traffic data gathering as well as data distribution and fusion. This trend will most probably expand as major transportation projects are given out to private BOT (Build-Operate-Transfer) concessions (see for example www.attiki-odos.gr). The current rollout schedule is not complete at this time.

It appears that the private sector does not see (for the time being) a promising (self-sustained) market developing for such services. Whatever is offered, is part of a broader service. For

instance COSMOTE (www.cosmote.gr), one of the three mobile providers in Greece has launched an SMS service to track incoming/outgoing flights to the new Athens International Airport: e.g by sending a message "AEPO OA270 04/03/02" to a service center (1651) one can track incoming Olympic Airways flight 270 from London Heathrow on the 4th of March 2002.

COSMOTE has also developed a voice recognition service (voice portal) where the same information is provided by calling 1656 and talking-in to the service. It also provides short-sea shipping information (timetable information from any port to any other port).

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Dynamic traffic map

One of the most publicized outcomes of the previous research activities is the development of the Athens Real Time Traffic Map. Raw data capturing traffic volumes and occupancies are selected sensors (inductive loops) and arrive to the NTUA's CSST (Control Strategy Selection Tool) communication handler every 90 seconds. All data are batch processed, by a combination of custom-made tools and algorithms. The process produces, among others, aggregate as well as statistical data concerning the overall traffic situation in Athens (e.g. 15-minute traffic volumes and occupancies).

The magnitude of a traffic volume and congestion of each link is represented by a number, which is then translated to a color according to a severity table (green for lightest, red for heaviest)

Combining all the information contained in the data files, ten GIF (Graphics Image Format) images are generated. Two of GIF images (one for traffic volumes and one for congestion levels) depict the whole central area. The remaining eight GIF's are blown-up parts of the network., which are generated along with the main image, every quarter of an hour via a UNIX script. These images are generated once during the shell process in order to lower loading time. The ANSI-C language was used for the development of the application and known graphic libraries were used to read and write the GIF images.

The final result is accessible to any Internet user at the address:

<http://www.transport.ntua.gr/map>

An implementation of a lighter version of this site suitable for use with cellular phone is also available at:

<http://www.transport.ntua.gr/map/en/mobile.html>

The site offers a variety of related services, one of which, is the concurrent display of the messages, which are also displayed by six VMS panels owned and installed at various locations by the municipality of Athens. These messages are also developed in real-time by the same suite of programs that develop the dynamic map.

Data are collected by the Urban Traffic Control Center of the Ministry of the Environment, Physical Planning and Public Works (M-EPPPW) and transferred by leased (dedicated) telecom lines to NTUA for algorithmic processing.

An interesting extension to the VMS service is an application by the IT department of the municipality of Athens (www.cityofathens.gr) which displays the content of VMS messages in its WAP site (www.cityofathens.gr/index.wml). As a consequence VMS messages can also be seen from WAP mobile phones. No evaluation of this service has been conducted up to now..

The Travel Time Traffic Map

Providing users with information regarding *travel time* was considered to be an important element for travelers' route choice decisions, one that can lead to the improvement of the network efficiency.

To do this 6 origin points have been defined at the major city entrances from which a total of 17 possible (commonly used) routes have been considered.

Speeds and travel times along these 17 routes are being estimated by developing a reliable algorithm, which is fed by the available flow and occupancy data transmitted from the UTC controllers.

The estimated times are represented in a graphical way that adapts better to the user comprehension rather than by simply giving numerical results.

All travel time GIF images are generated in a similar way as those of the Athens real-time traffic map. The first image is a visual representation of the Athens road network with 6 traffic lights representing the selected entrances. By clicking on a traffic light the traveler is informed about how far can he/she travel in 15 minutes.

The EPPPW Ministry launched in the year 2000 a new service, which complements the dynamic map (which forms part of the display) as it extends outside the city center along the main arterial streets leading into the city and vice versa (www.pdk.minenv.gr/map.html). This site will eventually develop to a full incident map reporting all traffic disturbances, their exact location and expected duration. It is developed as part of a project awarded to a consortium of industrial partners, which gradually implements the functionality of what is called an 'integrated system for environmental traffic control'. Currently only incidents of traffic congestion are displayed. An innovative part of this application is the concurrent display of estimates of travel time posted on three newly erected VMS panels as dynamic text overlaid on VMS pictograms on a web map. The processing of the information and the provision of travel estimated is undertaken by the dynamic traffic map facility of the NTUA.

Traffic Alert Messaging (In Greek Language)

A newly developed service is that of Traffic Alert Messaging. This service sends an email in the form of an SMS message to mobile phones alerting network users to incidents of congestion. There are two types of messages available: *time-based*, which are sent out twice a day as a percentage of token travel time increase/decrease compared to the traffic of a typical day; and *event-based* messages, which are generated whenever an incident is detected along the major approaches to the city (or, respectively, leaving the city). This service needs registration and it is offered free-of charge. Costs may incur, though, to users as a result of phone company charges for SMS services.

The service is available at:

http://frida.transport.civil.ntua.gr/map/el/terms_sms_gr.html

PT information

The Urban Transportation Organization of Athens launched recently a new site (www.oasa.gr) offering static information about the bus network in Athens. This effort is intended to contribute to the endeavor of the public sector to promote e-government rather than to launch a distinct TTI service.

Port information

Other municipal applications include a system of VMS panels installed in Piraeus matching port gates (entrances) to island destination as well as a similar VMS system in Thessaloniki displaying parking availability and other related information.

2.2 TTI research activities

One of the research initiatives that introduced TTI applications to Greece was the EU-sponsored QUARTET PLUS pilot application in Athens. It attempted to combine the responsibilities and assets of various public and municipal organizations into a synergetic, co-operative organizational setup that would promote an Integrated Road Transport Environment (IRTE). A centerpiece of the IRTE application in Athens was the concept of the "Mobility Regulator" whose main objective is to suppress the excessive use of private cars by means of traffic control (gating) techniques. These techniques are supplemented by the provision of timely information (*pre-trip* as well as *on-trip*) in order to:

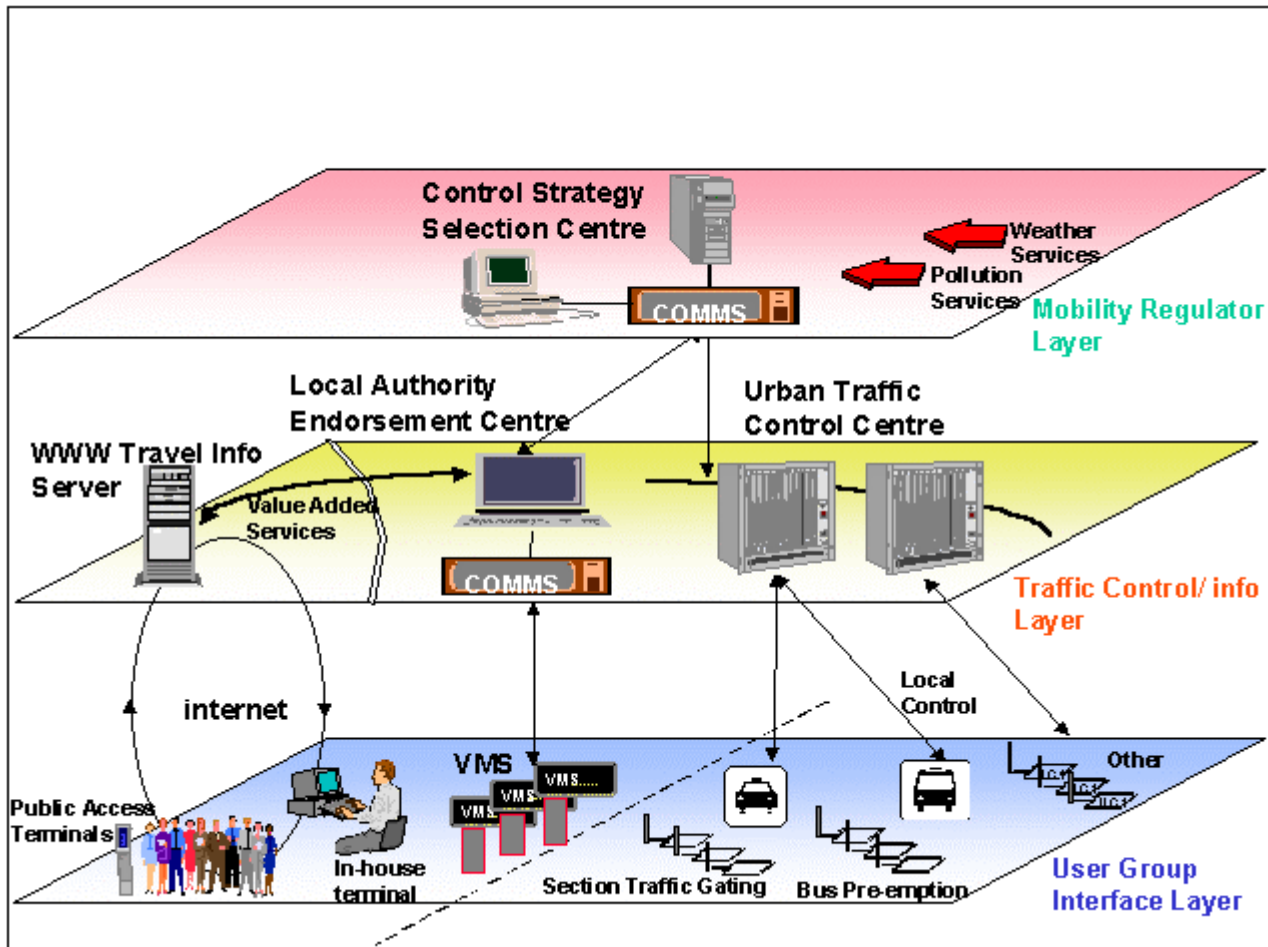
- (i) redirect (where applicable) extensive vehicular traffic using re-routing advisories;
- (ii) to optimize, at the local level, public transport operation (bus preemption); and
- (iii) to disseminate traffic or travel information using electronic dissemination techniques such as the internet.

The accomplishment of the above objectives would contribute towards an equilibrium between the user's demand for mobility and an acceptable (sustainable) level of provision of transportation system services (private and public). This would contribute to the long-term target of improving the adverse effects that traffic has on the urban environment of Athens.

The list of stakeholders include:

- Individual Users: Private vehicle drivers, Travelers, Netizens;
- Collective Users: City Authorities, Traffic control operators, Public transport operators;
- Information Providers: Administration and public providers.

This effort leads to the development of a hierarchical urban travel information and traffic control system based upon IRTE principles where System Supervisor responsibilities would eventually be granted to the Mobility Regulator. The Mobility Regulator will be the only entity responsible for harmonizing the selection of control strategies in order to improve the effects that traffic has on the urban environment (see figure below).



‘Eye in the Sky’

This project is currently executed by a consortium of German and Greek partners headed by the Berlin-based gedas group. It is co-financed by the EU and it is expected to assist traffic management and enhance information provision. It involves airships, fitted with navigation and GPS (Global Positioning System) technology, aerial photography and integrated traffic flow data. The application would combine Floating Car Data (FCD) sensors fitted into vehicles on the ground, with traffic control, via satellite and Zeppelin airships using special cameras.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

- New services will emerge primarily from mobile telephony companies that will offer transport-related information on a national/regional basis and ultimately on a local/neighbourhood level
- A competition might emerge among service providers to increase the content and scope of information provision in terms of its time frame (from medium term to short term)
- Total mobility packages will emerge by the time of the Athens Olympics (2004)

3.1.2 Technological (data acquisition and service delivery)

- The internet technology (IP) will play a major role in the transfer of data (raw and processed) as well as final products (information content) over the wireline network
- WAP services will probably not catch up. On the contrary SMS services (either PULL or PUSH driven) will expand as they are already very popular
- Location-based services will emerge by 2004
- Web-based services/operations will emerge by 2003

3.2 Key obstacles to overcome

- The key obstacle is the relative small market size
- The public sector should get first motivated itself before motivating wide ranging private sector initiatives that are needed for a build up of momentum
- Lack of data (there exist very few data sources collecting and storing traffic and travel related data in a systematic/permanent way)

3.3 Major potentials to use

- The new generation (G3) mobile telephony will be the major TTI enabler to a host of new applications, all of which are expected to be available on the next generation handsets.
- Location-based services will enhance the sense of mobility and will soon catch up.

4 Annex

4.1 Key actors in TTI development

1	Institution name / position involvement address phone fax e-mail	Ministry of Environment, Physical Planning and Public Works DMEO- Division of Signalisation <i>Kostas Skiadopoulos, Head of Division</i> <i>Responsible for Traffic Control and ITS applications</i> 205, Ippocratous Str. Athens GR- 114 72 +30-10-640 0553 +30-10-640-0559 Kskiadopoulos@hotmail.com
2	Institution name / position involvement address phone fax e-mail	Urban Transport Organisation of Athens <i>Dr. Stratos Papadimitriou, Managing Director</i> <i>Has introduced first telematics applications</i> 15, Metsovou Str. Athens GR_ 106 82 +30-10-884 2716 30-10-821 1226 Stratos@ath.forthnet.gr
3	institution name / position involvement address	Municipality of Athens – IT Company <i>Constantinos Lambrinopoulos, Director</i> <i>Has introduced and maintains ITS applications</i> 22, Liossion Str., Athens

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4.2 Sources and references

- 1 <http://www.transport.ntua.gr/map>
- 2 <http://www.cityofathens.gr>
- 3 <http://www.oasa.gr>
- 4 <http://www.cosmote.gr>
- 5 <http://www.greekferries.gr>
- 6 <http://www.ose.gr> (Hellenic Railways Organization)
- 7 QUARTET PLUS Final Deliverables
D03.1 'Comparative Impact Assessment of IRTE Strategies in Six Sites', Issue 2, Feb. 1998
D04.1 'Validation of User Behavioural Changes due to Multimodal Traffic Information and Related Impacts on the Transport System', Issue 2, Feb. 1998

Hungary

1 Institutional framework for TTI development

1.1 Main actors and competencies

1.1.1 Road transport and authority levels

The main actors in field of transportation and information at government level are two ministries: the Ministry of Economy and Transport and the Ministry of Informatics and Communications.

Building on the close relationship between the economy and transport and by unifying these two sectors, the Hungarian National Assembly established the Ministry of Economy and Transport in 2002.

The fundamental task of the Ministry of Informatics and Communications (established in 2002) is to create the framework for the widespread use of information technology, and in connection with that to prepare the formation of the information society. This task is outlined in the form of a cohesive, unified and comprehensive government strategy.

The motorway network is operated by two companies: the State Highway Management Company operates the highway M0, M1, M3, M7, the AKA Rt. operates the concession highway M5.

Other interurban roads and national roads crossing towns are managed by the 19 county road administrations. The Technical and Information Services on National Roads (ÁKMI) is responsible for the general organisational and co-ordination tasks related to the operation and maintenance of the about 30,000 km long national public road network and the information on news influencing the traffic safety and undisturbed transport for the road users and other participants in the traffic. The county road administrations provide data for temporary road restrictions, road works etc. to ÁKMI which counts road traffic through count stations and on site manual counts, maintain and publish traffic data. Operates ÚTFORG, ÚTMET, the national road databank, which contains details of the 30,000 km national road network. ÁKMI is also active in the field of research and develop road information systems.

Urban roads are operated by the local authority. The Budapest Urban Traffic Control Centre operates 860 signal control junctions, 60% is centrally controlled. The Traffic Control Centre operates a closed circuit television system. 70 cameras provide visual control of the traffic situation. Special cameras have been installed to monitor unauthorized use of bus lanes.

The Budapest Mayor's Office has started the development of an Integrated Transport Information System. As the first step, a sub-system has been created for the electronic announcement of the maintenance/repair works of public utility companies. The various organisations (district municipalities, road planners, operators of road network) send data of road works into the unique system. A map-based web interface informs the users about road works and details on the desired area of Budapest.

The UTMC is being upgraded with regional traffic management centre functionality. The traffic control centre of the motorway ring road M0 (MARABU) and motorway M3 (MAESTRO) is being connected to the UTMC.

1.1.2 Public Transport

The local public transport services in greater cities are undertaken by companies owned by the local authorities. In smaller cities the local public transport is operated by the regional bus company.

1.1.3 Railways

The State Railway Company (MÁV Rt.) operates both passenger and cargo rail transport. Although the track infrastructure is financially accounted separately, it is managed by MÁV Rt. the operator of the infrastructure is

Between Austria and North-West Hungary an Austrian-Hungarian regional railway, GYSEV (Győr-Sopron-Ebenfurti Vasút Rt.) operates the railway traffic.

The railway operation data and incident information is collected and processed by the companies.

1.1.4 Aviation

For the air transport the Civil Aviation Authority is responsible for regulation, control and technical standards.

Hungary has 3 airports opened for international civil air traffic. The main airport Budapest Ferihegy is owned by the state. The local authorities own the former soviet military airports in Debrecen and Sármellék.

1.2 Policy orientations

1.2.1 Hungarian Information Society Strategy, Plan of Action

The Hungarian Information Society Strategy (HISS) can only be successful as the strategy of the Government of the Republic of Hungary and, in a wider sense, as that of Hungarian society. The Ministry of Informatics and Telecommunication merely creates the basis for the strategy and coordinates and partially executes the government's plans of action to be implemented on the basis of the strategy, while the various ministries and the Prime Minister's Office, too, have a role in planning and execution.

The individual sectors are able to play this role by preparing their own informatics strategy and fulfilling the connected responsibilities. In this sense, we also regard governmental informatics (service provider state) and other areas functioning under the supervision of the Prime Minister's Office (e.g. regional and area development, national security, etc.) as "sectors". The Ministry of Informatics and Telecommunication and HISS offer to the sectors the additional opportunities that are generated through cooperation. As a result of the integration of the sectors' own strategies into the Hungarian Information Society Strategy, we shall be able to solve any common, non-sector-specific problems as well. We must therefore formulate the Hungarian Information Society Strategy concerning the tasks related to the construction of the information society and incorporating the necessary part-strategies, and must present it to the Government together with the medium-term plan of action.

Ongoing planning

The rapid changes in information communication technology require the re-writing of our long-term strategy from time to time. This necessitates basic and applied research, the results of which enable us to define new niches, opportunities and visions. Planning and the renewal and maintenance of the strategy may be guaranteed by a continuously updated and developed monitoring system, through the interpretation of the indicators and feedback offered by the system. Plans prepared for medium-term periods also require updating from time to time, and

the annual plans of action must be drawn up on the basis of the updated strategy, in harmony with the planning of the annual budget.

This task can only be resolved through ongoing, “rolling”, planning, the procedural, organizational and legal framework for which must be created. It is necessary to continuously monitor and update the Hungarian Information Society Strategy which will enable us to keep track of the progress achieved by the information society in Hungary.

Institutional supervision

The tasks related to the building of the information society require agreement from many sides. On the one hand, this stems from the fact that almost all these tasks concern all the ministries, in many cases, with a great deal of overlap (distance education, distance employment, distance administration, etc.). The other cause is that the resources of the implementation of the tasks set in the interest of the attainment of the strategic objectives are complex. While in 2003 we may rely primarily on funds provided by the central budget and private capital, as of 2004, we shall have to make good use of the available EU funds as well. This, too, requires HISS to be in full harmony with the National Development Plan.

In the interest of the coordinated performance of these tasks and cooperation between the state administration agencies, the Government has set up the Inter-Departmental Coordination Committee for the Information Society pursuant to the provisions set forth in Clauses 93 and 95 of Government Resolution No. 1088/1994. (IX.20.) on the Procedural Order of the Government and in Section 1, subsection (2), paragraph b) of Government Decree No. 141/2002. (VI.28.) on the Responsibilities and Competence of the Minister of Informatics and Telecommunication.

The Inter-Departmental Coordination Committee for the Information Society is an advisory, consulting and coordinating body which coordinates the government’s measures necessary in the interest of the creation of the information society and takes part in the making of the related government decisions. We wish to stress that the Committee serves the Government’s work in issues emerging in general in connection with the whole of the development of the information society, in cooperation with and by helping, through the mutual sharing of information, the work of the Government’s Inter-Departmental Conciliation Committee on Informatics whose responsibility it is to tackle any governmental and state administration problems in the field of informatics.

eTransport

Our objective is to attain sustainable mobility, to achieve higher standards in the services provided and to create economical and environmentally friendly transport systems. The intelligent transport systems of the future are integrated systems which provide accessible traffic and transport information everywhere and at all times for both road operators and road users with the aid of user-friendly devices and information equipment.

We attribute particular importance to a comprehensive service in the area of travel information which contains dynamic and static data, traffic data and map information and is able to transmit the required information to drivers via various media (such as, for instance, radio, telephone, fax, SMS, Internet), in addition to network access. It is necessary to improve inter-modality and to encourage the public’s preference for public transport in the area of city transport/communal transport. A further strategically important field in transport is the introduction of smart cards which is primarily necessary in the formulation of a standard ticket system in public transport.

1.2.2 Hungarian Transport Policy

The objective of the governmental transport policy is in accordance with the economic policy of the government, the modernization program of the Hungarian economy, taking into account the principles of the EU transport policy as well. The main strategic guidelines of the Hungarian transport policy (Transport Policy of the Hungarian Republic, 1996) that was put into effect are the followings:

- promoting the integration-process to the European Union;
- improve terms of regional relations with the neighbouring countries;
- supporting a more balanced regional development of the country;
- protecting human life and environment;
- effective, market-based transport management.

The *need for a new national transport policy with a new approach* has emerged due to the following changes of the past years:

- new tendencies of the world economy:
 - globalisation and regionalisation,
 - new forms of ownerships, reduction of state ownership, possibility of competition in transport;
 - modified state involvement, strengthening of market-regulation role of the state;
 - increase of liberalisation processes, constitution of an integrated EU transport market;
- enhanced priorities of transport safety, protection of human life, health and environment; acceleration of technological development.

In accordance with the above-mentioned factors, the main task of the elaborated new transport policy is to ensure the sustainable mobility, which means to ensure the harmonization between the demand side and the supply side. The characteristics of the transport policy ensuring sustainable mobility are their complexity, the longer planning horizon (up to 2015) and the practice of “subsidiarity”.

The new “*Development plan of the motorways and motor road network*” until 2015 reflects the main goals and objectives of the new Hungarian Transport Policy.

Pan-European Transport Corridor IV, V, VII and X/A cross Hungary intersecting at Budapest. International transit traffic results in significant load on the network. Due to the missing links in of the Hungarian motorway network and the lack of the complete bypass of the M0, international transit haulage loads Budapest’s main arterials on orbital, increasing the congestion problems.

Intelligent Transport Systems are referred in the draft of the Hungarian Transport Policy as important tools for better utilisation of the existing infrastructure capacity.

1.3 Laws and regulation concerning TTI services

In June 2001, Hungary’s Parliament passed Act XL of 2001 on Telecommunication which came into force on 23 December 2001. The new regulation, in theory, opened the telecommunication market to competition. Nonetheless, progress remains slow in the fixed cable retail sector. Regardless of the legislation, competition has started in speech transmission (between the fixed and mobile networks) and on the mobile, Internet and data transmission markets.

Due to similar unfavourable experiences, the European Union has required its member countries to re-regulate this sphere; this will be inevitable in Hungary as well.

In harmony with the contents of the chapter entitled “Information Society” of the National Programme of the Adoption of “Acquis Communautaire”, the legislation concerning electronic signature was a major step forward in the field of information technologies in 2001.

Act CVIII of 2001 on Certain Issues Relating to Electronic Commercial Services and Services Concerning the Information Society, which was passed by Parliament in December 2001, is another milestone in the IT-centred legislative process which started with the Act on Electronic Signature. A government resolution provided for the execution of the Act. At the same time, the creation of the legal conditions of the e-economy has not been followed by the development and considerable extension of the choice of market and administrative e-services.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 Inter-urban network

Collective Traffic Control and Information Systems Using Variable Message Signs

MARABU

In the early 1990's a system study for an integrated traffic control and information system was prepared for the strategically important motorway ring road around Budapest (MARABU – Management of Road Traffic Around Budapest). The completed project comprises several subsystems as follows: data collection system, MARABU control centre, fog and black ice warning system, roadside traffic information system, parking guidance system, and section control system. The main tasks of the MARABU system are the permanent monitoring of the traffic, improved utilisation of the capacity of the M0 ring road, optimum use of the distributor function of the motorway ring road as well as the improvement of road safety.

MAESTRO

The *MAESTRO* system was implemented in 1999 on a North-East M3 motorway, it aimed first of all a higher level of quality of road operation. Further tasks are the support of a better traffic flow, and the improvement of road safety. The information provided is also related to the traffic conditions on the surrounding roads. The traffic data collection system using inductive loop detector is completed by a video camera monitoring system.

ITS Systems for a Better Road Operation

ÚTMET – Road and Weather Information System

ÚTMET is a road and weather information system, as a part of IRIS (Intelligent Road Information System), with the aim to support the winter road maintenance work, by using the most advanced technology. The system was launched in 2000, it contains about 200 meteoric data collection stations on the whole road network. Another 20 external meteoric stations are cooperating with the ÚTMET. ÚTMET includes roadside meteoric stations (with solar cell or wired power supply roadside data collection units, weather and traffic sensors), the ÚTMET centre (collection and process of data, data store, data exchange with the meteoric centre) and terminals at the maintenance centres and, in a later phase, VMS for the road users.

ÚTFORG – Traffic Data Collection System

Also being planned is a traffic data collection system, using the very same infrastructure (power supply, data transfer) of the above-mentioned road weather information system. This system will include 50 traffic data collection stations, and it would provide traffic and speed data (by vehicle categories) from the critical sections of the national road network, 24 hours a day. It will give us an opportunity to detect congestions on the road network, and the real-time data from this system would be very useful for ÚTINFORM (traffic information-centre of the Ministry of Economy and Transport) in its everyday work.

Individual Traffic and Travel Information Systems

Regarding the individual traffic information systems, the main technical conditions for the operation of such systems already exist in Hungary and certain systems are functioning

(primarily with experimental aims). However, one cannot speak about the existence of comprehensive and integrated systems.

GPS is available and functioning in several systems. GSM provides a data transferring possibility, and the number of mobile phones is rapidly increasing, with a steadily expanding sphere of connected services. Other systems in operation include GPS-based fleet management, mobile-phone related information systems, and GPS-based navigation systems (in experimental phase).

Other information systems

The information service of the Ministry of Economy and Transport, UTINFORM provides information about the road traffic conditions for the Hungarian national road network. The information is collected from the road administration of counties, through system provided by ÁKMI's central database.

The bus schedule covers the timetable of all regional bus companies (VOLÁN). The bus timetable is available on the Internet, the WAP interface is under testing.

Multi-modal trip planning is not yet available because of the separate systems. Join of the system depends on the agreement of the developers.

2.1.2 Urban network

Private road traffic

In Budapest one of the three street parking association provide electronic payment system for his own zone. The users indicate the start and end time of the parking via mobile phone call, the system deducts the parking fee from a prepaid deposit.

Public Transport

BKV Rt. operates an automatic vehicle monitoring systems (AVM) for the main bus lines. The system uses marker beacons with odometer and radio data transmit. Although it has been running since 1996 this is not linked to the UTC, thus it doesn't provide real-time information.

Operators provide mostly static pre-trip information on timetables and fares (internet), and static on-trip information about departure at stops/stations and about stops/changeovers in vehicles, which is also static. Phone enquiry lines exist for practically all operators.

Key players of the public transport (BKV, railway and bus companies) signed an agreement to promote a traffic union and electronic ticketing system for Budapest and its surroundings area.

On the Internet interactive electronic schedule is available for bus transport. The system contains the timetables of all regional bus companies (VOLÁN). The information is soon available through WAP. The system not connected with the railway timetable so multi-modal trip planning is not available.

Systems connected to the Budapest traffic control centre

FŐVINFORM is a service of the Budapest Public Transport Operator (BKV Rt.) and provides the same data as UTINFORM but for Budapest and informs also about the local public transport.

Individual information systems used in urban environment

Info-Touch (for Budapest)

Info-Touch system is a pre-route travel information system/service ensuring easy handling and immediate information-giving by the touch-screen of the info-touch terminals. The terminals had been placed at public transport interchanges (underground stations, railway stations, airport), and in famous places visited by tourists. The information can be displayed on a map, in text or with pictures. The route-guidance between two points can relate to both public transport vehicles and private cars, thus the users of the system could be not only the drivers, but also other road users. The system uses map data basis, traffic engineering data basis, public transport vehicles data basis, and the data basis of the tourism establishments (static data) for the route-guidance and for the information services. The possibilities of further developments: connecting of the terminals into network, continuous update of data/information stored in the system, extending the system by integrating new data basis into the system, and completion of the static data with actual, dynamic data/information.

PannonWap Navigator (in Budapest and agglomeration, as well as in the county towns)

The PannonWap Navigator is a travel information service (via mobile phone). The aim of the services is to ensure route-guidance to the owner of the mobile phone (in the case of private and public transport), and inform him/her about different institutions/buildings (bank, post office, pharmacy etc.). The PannonWap Navigator is an automatic positioning based object-searching service. After the registration of the set the cell are automatically identified, thus during the WAP navigation the position of the mobile phone is automatically determined. The system lists the affected road sections, takes into account the rules of the Highway Code, and estimates the travel time. The users of the system are the Pannon GSM Telecommunication Co (as system-provider), the subscribers (as end users). The possibilities of further developments: the improvement of the actual accuracy by GPS, extending the data basis for other application areas, multimodal extending the data basis, integrating actual online information into the system, using two-way communication for gathering additional information.

2.1.3 Railway network

Interactive timetable is available on the internet for rail transport.

ELVIRA is the electronic timetable of the Hungarian Railways, it provides information about schedules, tariffs, changeover, bicycle carriage. The system is available via Internet, WAP, touch-info terminals at main railway stations and by phone enquiry. Booking for intercity trains is available by phone.

MÁVINFORM is the information service of the state railway about changes in the railway travel.

The information of the services is available via main radio broadcasting, Internet, videotext and phone inquiry.

The informatics systems of the Hungarian State Railways (MÁV Rt.) based on experiences of decades. The two biggest systems are the Oracle Financials with 1500 users and the Transport Information and Management System with 1000 users in the national IP network. The MÁV uses about 10,000 personal computers for supporting its work. The earlier systems are continuously updated by using WEB-technology.

The most important developments of the near future: the Hungarian State Railways intends to initiate the ticketing system with chip-card application. The MÁV INFORMATIKA Ltd. (own company in 100%) possesses qualified electronic signature service (Trust and Sign), which will be integrated into the interactive systems. Integration of the IT solution of the satellite tracking into the conventional data-supply based systems is in development phase. Important works have begun for the establishment of the electronic purchase and the logistic market, and for the

building up the data storehouse based driver information system. It is also planned the introduction of the ERTMS on the main rail-sections.

2.1.4 Navigation

At present, digital maps for the Hungarian road network are not yet available in the used international standard.

GPS based inland ship navigation maps are available in electronic format for the river Danube and for Lake Balaton.

NavCity/RoadGuide

NavCity/RoadGuide is an on-board navigation system, which enables real-time navigation for the drivers by satellite positioning (GPS), by map data base stored in the on-board computer, and by the processing software. The system handles the detailed digital map of the Hungarian settlements, gives the optimal route, and displays the movement continuously. The navigation can occur also by speech sound. The GPS automatically determines the actual position of the vehicle, thus the driver can type only the destination, than the software automatically calculates the optimal route. In every intersection a sound supports the driver to choose the right direction, which is displayed on map and in text form. The users of the system are the drivers, both the private transport and the freight transport can use the system. The possibilities of further developments: more complex connecting to the West-European system (from the point of view of maps and route-guidance), further development by dynamic data based on actual measuring.

Spedinform

The *Spedinform* system was developed for optimising the transport tasks. It can be seen as a pre-route information system for freight transport, which supports the fleet management. The control program of the project gives optimal route for every truck, which can be used for the whole country. The background data base contains the traffic rules, and the users can also adjust the road sections to be avoided. The program determines the optimal route - lining up the address list. The users are small companies, who can achieve significant time- and fuel-savings by using the *Spedinform* system.

2.2 TTI research activities

Earlier, in national transport and ITS research the Ministry of Transport and Water Management was responsible (coordination work: "Technical and Information Services on National Roads"). After the reorganisation of the authorities on governmental level (June 2002), the responsibilities for ITS related research issues are divided between the Ministry for Economics and Transport (ITS deployment/development, transport policy) and the Ministry for Informatics and Telecommunications (establishment of the Information Society).

2.2.1 Some projects of the past years

"Preparation of the realisation of intelligent transport systems"

The project makes a proposal for telematic tools/systems, which can be used in some very important application areas of the road network. These stressed application areas are the actual bottlenecks of the road network (regions of Danube bridges, areas of border crossings), and the information systems of the motorway network. The actual situation analysis will be completed by technical suggestion/solution, and by effect analysis.

(Project: on behalf of the Ministry of Transport and Water Management, 2002)

“ITS tools for a better road operation”

The usage of the telematic tools in the field of road operating/road maintenance is of great importance, since the new technologies can considerably facilitate the operator's work by providing actual information both for the road operator and for the road users, and thus by providing a higher level of service on the network.

The study surveys the possible application areas of the telematic systems in the field of road operating/road maintenance by making a proposal for the appropriate application within the important sub-areas.

(Project: on behalf of the Ministry of Transport and Water Management, 2002)

2.2.2 Actual projects (in elaboration)

“ITS strategy for the national road-network”

The research theme represents the general European tendencies and requirements, which can act as a base for the comprehensive road sector telematic strategy (which will be later part of the overall transport policy).

The proposed national strategy will enable the co-ordinated development and deployment of the telematic systems/services in the future, outlining the main development tendencies and giving a framework both for the long-term development tasks and for the short-term arrangements.

In the future a comprehensive strategy is essential, which can be the base of a common approach in the field of the national telematic applications.

Identified priorities: elimination of bottlenecks, traffic information and control systems on the motorway network, DRRC (distance related road pricing), traffic information centres, ITS tools for the better road operation, as well as system architecture.

(Project: on behalf of the Ministry of Economy and Transport, 2003)

“ITS system architecture for the national road-network”

System Architecture Concept has been elaborated for a Regional Traffic Control and Information Centre for Budapest and Debrecen. The organisations concerned promote the project. The concept of the system has been completed. In Budapest the first hardware procurement has finished, the system is ready for connecting to the regional information systems.

In Debrecen the first phase is the installation of the UTMCI/TIC, which is expected until end of the year.

(Project: on behalf of the Ministry of Economy and Transport, 2003)

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public/private)

1. The Ministry of Informatics and Communications handles the area of the “Information Society” as of overriding importance.
2. The interest of the private sector/capital in the system-development is significant (fleet management, navigation systems, information systems).
3. The EU funds will be available for Hungary as a new EU member state (regional and cohesion fund).
4. In the road transport the institutional background connected to the area of intelligent transport systems is available.
5. The need for deploying these systems exists from both the side of road operators and from the side of users, and the drivers/travellers.

3.1.2 Technological

1. The availability and the use of the information technologies (GSM, GPS, Internet, etc.).
2. Several intelligent transport systems/services are in operating, and the further development of these is planned.
3. The establishment of common, comprehensive data basis is in progress.

3.2 Key obstacles to overcome

1. The general absence of the financial funds (on governmental, regional, and local levels).
2. In the case of the European “R+D” programmes, because of the lack of the political supports, adding of the own (private) part (50%) can be ensured with difficulty.
3. In the regional and urban transport the institutional condition of the deployment is still missing.
4. The legal regulation background of the information-use is missing (competence, accessibilities, etc.).
5. Many systems are operating in the country, which are not compatible/interoperable, and the lack of the “open systems” is also typical.
6. The lack of the user-related infrastructure (e.g. electronic purse, RDS).
7. The lack of the unification and standardization efforts (because of lobby interests and because of the lack of interests), e.g. in the case of data collection systems, and digital maps.

3.3 Major potentials to use

1. Establishment and consistent execution of a comprehensive “ITS strategy” in the field of transport.
2. Comprehensive government strategy in the field of “Information Society”.
3. Establishment of a „system architecture“ for the national systems, integration of the future systems, for interoperable and open systems, which could co-operate.

4. In the “6. Framework Program” in the field of “Information Society” the active participation ensures new possibilities for the researcher background.
5. Active governmental support for the researcher base and for the entrepreneurs.
6. Acceleration of the standardization process (data collection, data exchange).
7. In the case of such systems, which have not yet been deployed, pilot systems and pilot projects are supported.
8. Possibilities of the using up of EU funds (ISPA, cohesion fund, regional fund).
9. The rapid spreading of the existing ITS systems, and the improvement of the system coverage.
10. Effective “Public Private Partnership” in the possible fields (planning, financing, operating, etc.).

4 Annex

4.1 Key actors in TTI development

- | | | |
|---|-----------------|--|
| 1 | institution | Ministry of Informatics and Communications |
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- 4 www.gkm.hu (web-site of the Hungarian Ministry of Economy and Transport)
- 5 www.ihm.hu (web-site of the Hungarian Ministry of Informatics and Communications)

Ireland

1 Institutional framework for TTI development

Proposals for Intelligent Transport Systems (ITS) and Traffic and Traveller Information (TTI) services in particular are in its infancy in the Republic of Ireland. The public sector in Ireland is providing the momentum to introduce TTI initiatives, such as real time passenger information systems, and to date the involvement of the private sector has been limited.

1.1 Legal and public policy context

A range of bodies currently have responsibility with regard to transport in Ireland.

- In June 2002, a new Department of Transport was established in Ireland. This department has responsibility for policy, legislation and financing related for public transport, road transport (except non-national roads and motor taxation) and aviation matters.
- The Department of the Environment and Local Government retains the responsibility for non-national roads and traffic.
- The National Roads Authority (NRA) has a planning, co-ordination and funding role in relation to roads with project implementation through local authorities.
- Local Authorities have responsibilities in relation to roads and traffic.
- Córas Iompair Éireann (CIE) and its three operating subsidiaries – Dublin Bus, Iarnród Éireann and Bus Éireann - are responsible for the provision of the bulk of public transport services. There are a small number of private bus operators but these provide a very limited service. The Railway Procurement Agency is responsible for the development of light rail and metro information proposals.
- The Dublin Transportation Office co-ordinates and monitors the implementation of a Land Use and Transportation Strategy in Dublin. It reviews the activities of implementing agencies to ensure that works are consistent with the Strategy.
- The Garda Síochána (Police) is responsible for the enforcement of traffic law with some of these functions shared with some local authorities.

The basis for infrastructural developments in the Republic of Ireland is the National Development Plan (NDP) 2000-2006. The NDP outlines the objectives established by Government for the improvement of a number of areas including transportation. Whilst there is no specific reference to TTI services in the NDP, it includes the objectives of improving reliability, reducing journey times, improving road infrastructure and contributing to sustainable transport policies. The sources for capital funding include financial assistance from the European Union – Cohesion Fund and European Regional Development Fund as well as exchequer and private sector investment.

Central to the NDP's implementation is the provision of €22.4 billion over the period 2000-2006 for public infrastructure developments including roads and public transport projects. The current remit for developing TTI services in the Republic of Ireland is limited given the deficiencies of infrastructure which it is felt need to be rectified before TTI projects on widespread scale are introduced (see Section 2).

1.2 Role of the private sector

The input of the private sector into strategic and policy development in transportation in Ireland is limited. To date, only a small number of projects have been advanced by the private sector. Whilst private sector funding has not been a feature of investment in transportation projects over the last ten years, the situation has changed with the adoption of the Public Private Partnership (PPP) approach for some projects.

PPPs are partnerships between public sector organisations and private sector investors and businesses for the purposes of designing, planning, financing, constructing and operating infrastructure projects, in particular those which are normally provided through traditional procurement mechanisms by government bodies. There are no PPP projects for TTI service provision in the Republic of Ireland at present.

The key driver for PPP in Ireland is the need to accelerate the pace of infrastructure development followed by the need to source private finance. The PPP approach has been adopted on a case by case basis to meet specific requirements and a minimum target of €2.35 billion of PPP funding has been set down in the NDP with €1.65 billion for roads and public transport projects. The key area of involvement by the private sector in TTI services in the Republic of Ireland is expected to be in the provision of traffic/passenger information on the internet or via mobile phone technology. No specific private sector firms have so far been identified to provide TTI services under PPP contracts.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

National Roads Authority – The INSTANT Project

The INSTANT project (Information and Management System for Multimodal Transport in the Republic of Ireland and Northern Ireland) is currently at Feasibility Study stage. The clients for the study are the National Roads Authority, Republic of Ireland and the Roads Service, Northern Ireland.

This is a European funded project which is based on a multimodal traffic management and information system for cross-border traffic between Dublin and Belfast. The project is examining three principal components -

- A pre-trip planning tool
- Creation and dissemination of real-time traveller information
- Traffic control and management

The study also examines the following issues - technical feasibility, system costs, impact assessment, system finance, and implementation.

National Roads Authority – The STREETWISE Project

Another initiative is a project called **STREETWISE**. This project aims to provide seamless and effective travel information on the TEN-T between the Republic of Ireland, Northern Ireland, Scotland, Wales and England. It therefore acts as a bridge to form part of a pan- European network of services.

Such widespread information is needed as drivers passing from Ireland to France, for example, may suffer from delays in Scotland or Wales as well as in England. This delay can add to the problems of trade with mainland Europe. Because of such problems, Roads Authorities are investing in ITS systems and services that meet the specific needs of each country.

This project is a multi-annual programme commencing in 2001 and concluding in 2006. The programme of works has been confined to studies in the following areas - monitoring studies (user needs), journey time estimation, and data exchange between the national authorities and studies aimed at identifying user needs and also at ensuring a consistent and assured level of basic information quality.

National Roads Authority – Motorway Management System for M50

The National Roads Authority is implementing the use of ITS technology on the orbital M50 motorway which runs to the west of Dublin City. As a first measure all grade-separated junctions on the M50 are being converted to automatic controllers under the management of the Dublin Corporation Traffic Control Centre (SCATS operation). This will mean that the traffic signals on the roundabouts will be controlled dynamically reflecting the changes in traffic volumes. Plans are being developed to expand the project to include the introduction of an automated incident detection system on the route and variable message signs (VMS) to inform drivers of incidents and current traffic conditions.

Dublin Bus - Real Time Passenger Information System

A pilot scheme of electronic information displays at bus stops has been in operation by Dublin Bus for over a year. This system called Q-Time gives customers an estimate of the waiting time for the next bus. It uses a variety of technologies (GPS and central computer) to track the location of buses in real time and use this information to generate predictions of the bus arrivals at stops along the route.

The customer benefits from the elimination of the uncertainty regarding the waiting time for the next bus. The bus stop is equipped with an electronic display unit. The information displayed indicates the route number, the destination and the predicted number of minutes for the bus to arrive at that stop. This information is updated every thirty seconds.

Dublin Area Rapid Transit (DART) - Real Time Passenger Information System

Similar to the Q-Time system above, Iarnród Éireann has introduced a real time information system at all stations on the DART line in Dublin. The DART is an electrified suburban rail service which carries over 80,000 passengers per day.

Various Agencies – Traffic Management Systems

A number of authorities have developed traffic management systems on a localised basis. Features of these include closed circuit television pictures (CCTV) coverage, VMS signage primarily for car parking (e.g. Dublin City Council and Cork City Council) but also for route choice (e.g. National Roads Authority) and automatic traffic counting information (e.g. National Roads Authority) which is posted on the internet for informational purposes.

2.2 TTI research activities

The amount of transportation research is not significant in the Republic of Ireland. The primary source is from the Transport Study and Research Group (TSRG) in the Department of Civil, Structural and Environmental Engineering in Trinity College Dublin.

The TSRG was set up to conduct research on transportation, planning and related areas. Current research activities include several EU funded projects under DGXII, DGVII, DGXXII and DGXVII.

A further source of research is the Traffic Research Unit (TRU) in the Department of Civil and Environmental Engineering in University College Cork. This unit has expertise in transportation modelling and planning, urban traffic management and the use of intelligent transport systems.

2 Key issues for TTI implementation

2.1 Drivers and trends

2.1.1 Institutional (public and private)

The current focus of attention in the Republic of Ireland is the development of sustainable transportation systems. This in turn will result in the expansion of TTI projects in the country and given the Government's policy of encouraging Public Private Partnerships (PPPs), private sector involvement will be encouraged.

3.1.1 Technological (data acquisition and service delivery)

There are three mobile phone system providers in the Republic of Ireland, all of which are keen to develop data systems using GSM, SMS and WAP based on 2.5 and 3G technology. There are moves to develop remote monitoring systems for public transport vehicles using the Global Positioning System (GPS).

3.2 Key obstacles to overcome

The main obstacle to TTI service development in the Republic of Ireland is the lack of a comprehensive transport infrastructure in the country. Other problems include inconsistency of proposals between authorities, lack of funding for projects, lack of resources to design, manage and implement projects and the lack of private sector involvement.

3.3 Major potentials to use

Traffic is increasing rapidly in the major cities of the Republic of Ireland (e.g. Dublin and Cork). TTI services will be required to effect travel changes particularly through increased use of public transport, avoidance of congested road conditions and availability of parking.

3 Annex

3.1 Key actors in TTI development

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Italy

Introduction

The need for the development of Traffic and Traveller Information (TTI) services was explicitly recognised by the Italian legislation in the second half of the 1990s. The initial goal of improving traffic management at the European level through the use of the new technologies was increasingly complemented by the acknowledgment that the dissemination of traffic and mobility-related information to the general public was key to achieving transport safety and operability. In 2001, such vision was officially sealed by the public tendering for the development of a national architecture whose ambition would be the establishment of a reference legal and technical framework for telematics in transport. Among the main elements of intelligent transport systems to be addressed, TTI services will expectedly play a central role.

The implementation of TTI services has been widespread in Italy for both collective and private transport modes. Nonetheless, most services remain predominantly monomodal with information integration limited to same-mode transportation. The majority of services are most commonly provided for the public through a combination of traditional and innovative dissemination methods, such as call centres and internet portals. The newest developments are focused on the delivery of user-tailored information services.

1 Institutional framework for TTI development

1.1 Legal and public policy context

1.1.1 Enabling framework and relevance of TTI as policy issues

In May 1996, the “Ispettorato Generale per la Circolazione e la Sicurezza Stradale”⁹⁶ presented the document “Telematica e Sistemi di Comunicazione Avanzata Applicati ai Sistemi Stradali – Primo Piano Nazionale (1996-2002)”⁹⁷. This document proved to be the necessary prerequisite for building of the national base infrastructure of the new technologies.

Particular attention was given to improvement of traffic information centres (TICs) and traffic control centres (TCCs), with respect to ensuring European interoperability and homogeneity (specifically cross-border relations). The overall objective of this activity was to allow TCCs and TICs on the Italian side to communicate with their foreign correspondents for traffic management and information purposes. This was accomplished through:

- Extension of traffic monitoring
- Improvement of weather monitoring
- International traffic data exchange (DATEX)
- Assisted motorway emergencies operation
- Dissemination of traffic and mobility information⁹⁸

One of the initial accomplishments was the decision to run the exchange of traffic information between operators thorough the DATEX standard. Although this standard was originally adopted for the exchange of cross-border data, it was extended to traffic within Italy.⁹⁹

⁹⁶ The Ministry of Public Works

⁹⁷ Telematics and Advanced Communication Systems Applied to Road Networks - First National Plan (1996-2002)

⁹⁸ Source: Phone Interview with Roberto Nenzi: 08/03/02

The “Secondo Piano Nazionale dei Sistemi Telematici applicati alla Circolazione e ai Trasporti su Stradali”¹⁰⁰ was presented at the end of 1998. The plan was based on the following concepts: 1) moving from ATT (Advanced Transport Telematics) to ITS (Intelligent Transport Systems); and 2) improvement and qualification of service levels along roads thorough information and services to drivers. Information was seen as one of the factors contributing to road safety and as an improvement to transport conditions. This second plan extended its objectives into 2004.¹⁰¹

In 2001, the “Piano Generale dei Trasporti e della Logistica (PGTL)”¹⁰² provided an appraisal of the structural conditions of transport in Italy and outlined the objectives and strategies pursued by the national transport policy. The prospective of an optimised transport system was among the stated goals of the PGT and was specifically addressed in the “Technological Innovation” section: here the use of new technologies was explicitly indicated as the principal means for achieving the strategic objective of improving services to transport.

In this context, TTI applications became a priority development area towards the promotion of integration and intermodality in transport systems.¹⁰³ In particular, the PGTL pointed at a fast and comprehensive development of TTI services by calling upon the establishment of a reference legal and technical framework. The immediate result was the 2001 public tendering for the development of a “Architettura Nazionale per la Telematica nei Trasporti”¹⁰⁴. The goal was to structure functions, features, and relationships among all the elements constituting the backbone of intelligent transport systems: thus services, technologies, actors, and norms. The National Architecture is currently being accompanied with the development of a set of 3 pilot projects for:

- the realisation of a distribution support system for hazardous freight
- the realisation of a national support system for freight and passenger transport safety
- the study of e-commerce potential for the system of urban freight delivery.¹⁰⁵

Finally, the PGTL committed to supporting and financing technological innovation through the promotion of integrated research programmes, program agreements with the industry, and training. In practical terms, this evolved into:

- the organisation of public tendering for advanced technological solutions for transport services
- the introduction of additional adjudication criteria (other than costs) for said tendering, such as technological contents, quality, and efficiency.¹⁰⁶

⁹⁹ Source: Phone Interview with Roberto Nenzi: 08/03/02

¹⁰⁰ Second National Plan of Telematics Systems Applied to Road Circulation and Transport

¹⁰¹ Source: Phone Interview with Roberto Nenzi: 08/03/02

¹⁰² National General Plan for Transport and Logistics

¹⁰³ Source: Ministero dei Trasporti e della Navigazione, Ministero dei lavori Pubblici, e Ministero dell'Ambiente. 2001. *Piano Generale dei Trasporti e della Logistica*.

¹⁰⁴ National Architecture for Telematics in Transport

¹⁰⁵ Source: Ministero dei Trasporti e della Navigazione, Ministero dei lavori Pubblici, e Ministero dell'Ambiente. 2001. *Piano Generale dei Trasporti e della Logistica*.

¹⁰⁶ Source: Ministero dei Trasporti e della Navigazione, Ministero dei lavori Pubblici, e Ministero dell'Ambiente. 2001. *Piano Generale dei Trasporti e della Logistica*.

At the European Level, the Ministero delle Infrastrutture e dei Trasporti¹⁰⁷ has been working towards the development of a legal and business framework for the participation of the private sector in deploying TTI services, in accordance with the European Commission's Recommendation C(2001) 1102 final.

Prior to this recommendations, Italy had already defined a frame of co-operation through the creation of the national traffic information centre, the CCISS. In this centre, both public and private operators co-operate in collecting and validating data. The national road police has a special validation function in the centre. They are directly involved in the road traffic operations both at the national and local level, in order to ensure that emergency situations are handled promptly and they have the necessary authority for issuing obligations. In addition, through the development of DATEX and RDS-TMC applications, Italy has already established conditions for exchange and dissemination of traffic information. After national connections, international data exchange have been set up, at the CCISS level for dissemination of information relative to bordering countries, at a more detailed level road operators exchange data for road and traffic management operations. The Ministero delle Infrastrutture e Trasporti is in the process of identifying the most appropriate way to facilitate TTI services, in particular with respect to identifying formally the distinction between services of the public sector with those of the private sector. The distinction is critical in order to that the public understands the parameters in which services are offered and to simplify the inter-institution interface in the management/operation of these services. Furthermore, the Ministry wants to ensure that commercial service developments are offering value-added services either with public data or with data collected autonomously.¹⁰⁸

1.1.2 Information Chain

The information chain for TTI service deployment in Italy is generally characterized in the following way, with differences primarily based upon mode:

- Data acquisition and data fusion are generally handled by the infrastructure owner
- Information supply and transmission is generally handled by both the infrastructure owner and the third party service providers
- Marketing & Support is generally handled by both the infrastructure owner and the third party service providers. The emphasis on third party service provision has increased dramatically over the last few years and this increase is expected to continue over the next years.

Collective Transport Information Services, generally follow the information chain described above, with the following specificities by mode type:

- Airline information services are provided by both the relevant airport, along with the specific services developed by airlines.
- Railway information services (national and regional) follow the general information chain described above, with the following division of roles: Data acquisition, data fusion, and information supply are all handled by Rete Ferroviaria Italiana (RFI)¹⁰⁹. The transmis-

¹⁰⁷ The Ministry of public works and the Ministry of Transport merged in 2001 to become the Ministry of Infrastructure and Transport. The organisational changes of this merge are still ongoing.

¹⁰⁸ Source: Phone Interview with Roberto Nenzi: 29/03/02

¹⁰⁹ Rete Ferroviaria Italiana is the infrastructure owner of the Italian national railways

sion of information, marketing and support are handled jointly by RFI and the service providers.

- Local and regional public transportation information services generally tend to be managed singly by the transportation provider. Furthermore, only rarely is dynamic information on public transportation made available to final users or is it integrated across modes (ex.Turin). (See sections 2.1.1 and 2.1.2)

Private traffic information services are provided based upon the geographical scope:

- Interurban traffic and road information follows the general information chain with a variety of third party service companies. The infrastructure providers/managers primarily include: Autostrade, ANAS, regions. Examples of third party service providers include: RAI, Quattroruote, Mizar Mediaservice, ACI, etc. (see section 2.1.3)
- For the primary and secondary urban roads, the information chain is dominated by the single management of a mono-modal information chain (see section 2.1.3)

1.2 Role of public authorities

The four public levels in Italy are:

- National level
- 20 regioni (regions)
- 87 provincie (provinces)
- Approximately 8000 comuni (municipalities) and local transport authorities.¹¹⁰

However, the most relevant TTI related responsibilities lie within the national and municipal level.

1.2.1 National level

The national level is responsible for policy making (i.e. the PGT) and for the management of important sources of traffic information through an array of national ministries:

- Ministero delle Infrastrutture e dei Trasporti¹¹¹ has control over the “free” highways (some 1000 km) and all national roads via the national Road Directorate (ANAS). The latter operates and maintains traffic management installations;
- “Ministero degli Interni”¹¹², through the “Polizia di Pubblica Sicurezza”¹¹³, patrols the entire transport network and provides crucial traffic information which is transmitted via a variety of means (RAI, CCISS, and private television and radio networks, see below); and
- “Ministero della Difesa”¹¹⁴, through the “Carabinieri”¹¹⁵, also supplies network-wide traffic information.¹¹⁶

¹¹⁰ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-5.

¹¹¹ The Ministry of public works and the Ministry of Transport merged in 2001 to become the Ministry of Infrastructure and Transport.

¹¹² Ministry of Domestic Affairs

¹¹³ National Police

¹¹⁴ Ministry of Defence

Other public actors active at the national level and providing network-wide traffic information are:

- CCISS (Centro Coordinamento Informazione e Sicurezza Stradale), ¹¹⁷ which is the national traffic information centre. The CCISS is co-ordinated by the Ministry of Infrastructure and Transport (formerly the Ministry of Public Works) and the Ministry of Interior. It is composed of several partners, among which: AISCAT, Autostrade, ENAS, National Road Police, Carabinieri (Military Police), RAI, and ACI. The centre, via different means including DATEX, gathers all the different data supplied by each member. ¹¹⁸ Through DATEX the CCISS has activated a link with France and Bavaria. ¹¹⁹
- “CCISS: Centro Controllo Informazione e Sicurezza Traffico”, which is the national traffic information centre. The CCISS is run by several partners, among which: AISCAT, Autostrade, ANAS, National Police, Military Police, RAI, and ACI. The centre, via different means including DATEX, gathers all the different data supplied by each member. Through DATEX the CCISS is experimenting links with France.
- ANAS, which manages the national highways (approximately 45.000 KM) and “free” motorways (approximately 1000 km) ¹²⁰
- Rete Ferroviaria Italiana¹²¹ (the Italian rail infrastructure owner) operates a central traffic control centre which it then provides to the rail operators for divulgation to the general public

1.2.2 Urban level

The municipal level plays an important role in that it collects (in co-operation with the national entities described above) and delivers traffic information on the urban network. Main involved actors are:

- Local transport authorities, responsible for transport planning and monitoring. For the purpose of demand management, these bodies generally have a variety of information available for dissemination to the general public: traffic circulation status, road works and impacts on road availability, public events and manifestations, closure of roads to circulation (for environmental or large events management), access control information, and parking information and status. (See 2.1.1 for further information)
- Local transport operators, responsible for managing services are beginning the collection of disaggregated dynamic data on performance. (See 2.1.1 for further information)

1.3 Role of the private sector

The private sector tends to be organised into the following 3 categories for TTI services:

¹¹⁵ Military Police

¹¹⁶ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-5-13-6.

¹¹⁷ Centre for Traffic Control, Information, and Safety

¹¹⁸ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-6.

¹¹⁹ Source: Phone interview with Roberto Nenzi 10/03/02.

¹²⁰ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-5.

¹²¹ Italian Railways Network

- Infrastructure providers:
 - a. At the national level, 26 private toll motorway operators, grouped into an organisation called AISCAT, operate approximately 6000 kilometers of toll roads in Italy. Of this group, the largest member is Autostrade SpA, which operates 55% of the AISCAT network¹²².
 - b. These companies collect data on service levels, traffic conditions, delays, etc. Furthermore, they provide individual information services and/or collaborate in integrated services. See section 2.1.3 for a description of the services currently available
- Service providers
 - a. Specialized providers of transportation related information; examples include Quattroruote (a primary Italian auto magazine), Mizar Mediaservice (an infomobility service provider and a technology enabler), and ACI, Automobile Club Italia¹²³. See section 2.1.3 for a description of the services currently available
 - b. Cross-industry service providers: telecommunication companies (Telecom, Omnitel/Vodafone, BLU etc.) and others (Targasys, VIASAT, etc.). These providers tend to integrate traveller information services (developed and managed) with other information services (such as the location and opening hours of restaurants, pharmacies, gyms, etc.). These providers seek to provide “one stop shopping” for information services both pre-trip and on-trip. See section 2.1.3 for further information.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 Collective Transport

Airline Information

Airline traveller information services are public mono-modal with pre-trip and real-time trip information:

- Pre-trip static information is available primarily through call centres and company web sites operated by the airlines directly.
- Real-time information is provided by both airports and airlines through call centres, televideo¹²⁴ and internet. The Società Esercizi Aeroportuali (SEA)¹²⁵ and the Aeroporti di Roma¹²⁶ have two excellent examples of portals providing integrated real-time information on departures and arrivals for all airline operators at the airport (international and domestic). SEA also provides a free personalized email service for updates on the arrival and departures of those flights pre-selected by the user as being of interest.

¹²² Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-4.

¹²³ Italian Automobile Club

¹²⁴ Televideo is a teletext service supplied by numerous television networks and some highway rest areas.

¹²⁵ A publicly owned company which manages both the Linate e Malpensa airports outside of Milan.

¹²⁶ A company which manages the two airports in the Rome area: Fiumicino and Ciampino.

Railway Information

The traveller information services, available for the national passenger railways, tend to be mono-modal with on-trip information regarding trip performance:

- pre-trip static information from call centres, televideo¹²⁷ and internet (the Trenitalia portal). The call centre services are created ad hoc to handle emergency/strike situations so passengers can obtain real-time information on their travelling options (managed by Trenitalia¹²⁸)
- on-trip information from:
 - a. Messaging information in the stations through station panels and announcements (managed by Rete Ferroviaria Italiana¹²⁹)
 - b. Information points/ticketing offices and announcements on trains (managed by Trenitalia¹³⁰)

Local and Regional Public Transport Information

A recent survey of public transport operators shows a rising interest in the use of telematic systems, in particular for improved management of the system and for the diffusion of traffic and traveller information.¹³¹

Currently, public transport operators have limited real-time fleet management capabilities (7%), continuous user monitoring (14%), and priority traffic lighting systems (69%).¹³² This situation, forecasted by TTS Italia to change dramatically by 2005, limits the amount of dynamic information services for public transport currently deployed nationally. Available information on public transport is disseminated by the majority of transport operators via (expressed in percentage of public transport operators surveyed which currently use the dissemination methods)¹³³:

- Internet (74%)
- Call centres (48%)
- Kiosks (11%)
- Televideo¹³⁴ (8%)
- Mobile telephone (4%)¹³⁵

¹²⁷ Televideo is a teletext service supplied by numerous television networks and some highway rest areas.

¹²⁸ Trenitalia is the primary national railway operator.

¹²⁹ Rete Ferroviaria Italiana is the national railway infrastructure owner.

¹³⁰ Trenitalia is the primary national railway operator.

¹³¹ Source: TTS Italia. 30 November 2001. Presentation at the 1st Annual Conference: *Survey sullo stato di sviluppo e diffusione dei sistemi ITS in ambito urbano.*, pg 4.

¹³² Expressed percentages represent the public transport operators surveyed which currently use the ITS systems specified. The survey included 53 public transport operators, with a 55% response rate.

Source: TTS Italia. 30 November 2001. Presentation at the 1st Annual Conference: *Survey sullo stato di sviluppo e diffusione dei sistemi ITS in ambito urbano.*, pg 7.

¹³³ The survey included 53 public transport operators, with a 55% response rate.

¹³⁴ Televideo is a teletext service supplied by numerous television networks and some highway rest areas.

¹³⁵ Source: TTS Italia. 30 November 2001. Presentation at the 1st Annual Conference: *Survey sullo stato di sviluppo e diffusione dei sistemi ITS in ambito urbano.*, pg 6.

Static information services are plentiful throughout Italy with the ability to plan and estimate standard travel times. Some examples of dynamic public transportation information exist:

- on-trip information: forecasted arrival times posted on panels in metro stations (ex. ATAC Rome), bus stop information on express buses (ex. ATAC Rome), and SMS event information (ex. 5T Turin).¹³⁶ In addition, intelligent bus stop displays were implemented in Rome for the jubilee bus lines but the traveller information service provision was never completed.
- pre-trip information: dynamic trip planning and estimated travel times (ex. 5T Turin)¹³⁷

2.1.2 Intermodal Transport

The information chain management traditionally has led to mono-modal information services. Furthermore, these services tend to be limited to a few cases of information integration with public transport and never truly “seamless” integrations. Recently activities have focused on limited intermodal applications:

- 5 T Consortium in Turin has developed a public portal, which provides intermodal journey planning, intermodal journey times, vehicle locations, waiting times and incident information. In addition, the site offers a beta testing version for parking availability via SMS and email.¹³⁸
- Walkie portal, a commercial portal developed by Mizar Mediaservice, provides pre-trip dynamic trip planning and travel time estimation for “intermodal trips” (i.e. trip by car, identification of nearest parking location, and indication of pedestrian component in order to reach final destination)¹³⁹.

In addition, personalized services are available for selected highway sections: the user can opt to receive information on these sections for specific days and times. The portal is under construction for the inclusion of urban traffic information¹⁴⁰. The portal provides on-trip information through SMS and WAP navigation.

Current services are free of charge for email with a fee for SMS messaging, based upon the type of service requested. WAP services require payment for the navigation time.

In addition to direct user services, the Walkie portal has taken advantage of B2B opportunities, such as becoming the provider of traffic information to Webraska¹⁴¹.

¹³⁶Source: <http://www.5t-torino.it/home.html>

¹³⁷Source: <http://www.5t-torino.it/home.html>

¹³⁸Source: <http://www.5t-torino.it/home.html>

¹³⁹Source: Phone interview with Fabio Pressi, Mizar Mediaservice 08/03/02

¹⁴⁰ The base information is obtained from public sources (including CCISS) and then verified and updated by an operational centre. In addition, in automatic, systems are verifying other sources to ensure that the data published is valid.

¹⁴¹ A new portal is under development (Walkie 2) with an expected launch date of May 2002. This updated portal will offer an expansion on current services, in particular more detail and possibly some urban traffic information. The data sources will also increased with bilateral agreements for the exchange of information (also the inclusion of some floating car data by specific providers). Payment for services is based upon deducting fees from a prepaid card (with the lowest denomination of 5 Euros). Fee services include individual transactions as well as the ability to subscribe to systematic information services delivered to your SMS.

- ATAC in Rome has developed a public portal, which provides non-static intermodal journey planning (bus, metro, tram, and pedestrian)¹⁴² and event information.

2.1.3 Private transport

A variety of traffic and traveller information systems have been developed for private transport, based upon the geographic level of information:

National Level

The private highway operators, AISCAT members, run local traffic centres for support and assistance. These centres usually employ traffic coils, video cameras, and weather monitoring installations. Three examples include:

- Autostrade's local traffic control centre in Florence, jointly operated by Autostrade and the national police. In 1998, this TCC supported: emergency telephone, video monitoring (50 cameras), VMS providing Italian text and standard signs (30 signs), weather monitoring (10 stations). The information provided includes both forecasts and real-time data for roadworks, meteorology, road closures, social events (demonstrations) serious accidents, extensive migration difficulties, traffic jams, re-routing, circulation limitations (snow/ice equipment required, light vehicles/HGV restrictions, etc.).¹⁴³
- ASTM, the Turin-Milan motorway, a central toll highway network operator, delivers traffic condition information through VMS, iso-frequency radio, and Internet. ASTM will start a connection with France during 2002.¹⁴⁴
- Autostrada dei Fiori provides real-time traffic and situation information, published on the web (with a visual of sections of the road via live cameras) and on a WAP site (experimental).

Some of these groups are exchanging information with the adjacent operators in order to offer more integrated information. This exchange is generally done through the DATEX protocol. The general information on the viability of the national highways is disseminated locally by VMS.¹⁴⁵

One example of this integration is Autostrade's Centro di Produzione Multimediale di Informazione sull'traffico¹⁴⁶). This centre integrates information, data and images on the traffic and weather conditions from the 9 Autostrade local traffic control centres (such as the Autostrade local traffic control centre in Florence mentioned above). This input is used to disseminate integrated information to users and to support the daily and weekly forecasting activities of Autostrade. The information is distributed via radio, television, televideo, fixed and mobile telephones, GPS and Internet.¹⁴⁷

Source: Phone Interview with Alfredo Bolelli, Mizar Mediaservice 10/03/02

¹⁴² The dynamic nature of the trip planning for ATAC involves altering the forecasted travel times based upon the time of day, applying a standard modeling distribution for the selected time period. It is not based upon near-real time information on road conditions or fleet management.

¹⁴³ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-8

¹⁴⁴ Source: Phone interview with Roberto Nenzi 10/03/02.

¹⁴⁵ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-8

¹⁴⁶ The Centro di Produzione Multimediale di Informazione sull'traffico is Autostrade's central traffic control centre in Rome.

¹⁴⁷ Source: Autostrade. *Autostrade Il Centro di Produzione Multimediale*.(depliant)

Furthermore, all the information collected by these local providers is then provided to the CCISS (by telephone, fax, email, DATEX) and passed on to service providers. The police validate this information. The primary service providers include: RAI, Autostrade and Telecom Italia, which offer services such as Onda verde¹⁴⁸, Iso-radio¹⁴⁹, Televideo¹⁵⁰ ¹⁵¹

RDS-TMC, developed by RAI, has been used experimentally in Northern Italy for the divulgation of traffic conditions and event information. Recent developments have included FIAT's production of the thousands of Fiat Stilo cars with RDS-TMC receivers¹⁵²

In addition to the above dissemination methods, a variety of portals have been developed, including ones, which offer personalised services via SMS, WAP, and email. Some examples include:

- Infoviabilita Portal, a commercial developed by Autostrade, provides personalised services for users – identifying real-time traffic conditions, events, and weather for user-selected itineraries, along with static information on service station availability. An SMS service for registered individuals is under development to communicate those events, which impact the previously defined user-selected itinerary.
- Infotrafic portal, a commercial portal developed by Quattroruote (a primary Italian auto magazine), provides real-time traffic condition information for the highways and urban ring-roads, live video camera images and maps. The site also provides demand responsive route planning. Portal services are also available via WAP (only traffic condition/event information). Personalised services are available through a call-centre for a fee.
- Telecom (a primary telecommunications operator in Italy) provides traffic information via internet (pre-trip), SMS (pre-trip and on-trip), and WAP (pre-trip and on-trip) for a fee. The information sources include Webraska and ANAS.
- Movitrack portal, developed for the Italian Automobile Club (ACI) clients, provides real-time traffic information services to registered users. This commercial portal can be accessed by internet and WAP.
- Targasys, a service provider of the FIAT group, provides on-trip traffic information for user-selected itineraries for those clients with the on-board navigator (CONNECT system). The user requests information from a call-centre (multilingual) which then transmits the response to their on-board navigator via a data-SMS. The annual service fee is approximately 220 Euro. The system also allows for a “follow me” service, in which addi-

¹⁴⁸ Onda Verde is a national FM radio service with traffic bulletins every 30 minutes.

¹⁴⁹ Iso-radio is (FM 103.3) is an iso-frequency service covering most of the highways operated by Autostrade SpA

¹⁵⁰ Televideo is a teletext service supplied by numerous television networks and some highway rest areas.

¹⁵¹ Source: 1998. *EDEN Final Report. Directory of European Traffic Centres*.pg 13-8

¹⁵² Source: Phone interview with Alfredo Bolelli on 11/03/02

tional updates on traffic conditions are provided for the entire length of the trip, based upon the itinerary previously declared¹⁵³.

Urban Level

Based upon a survey conducted by TTS Italia in 2001, the following types of information are provided to end users by municipalities in Italy (expressed in percentage of municipalities surveyed which currently provide the type of information):¹⁵⁴

- Real-time information on traffic conditions (28%)
- Real-time information regarding circulation problems (28%)
- Information on parking localization (20%)
- Information on road characteristics (24%)¹⁵⁵

The type of real-time traffic information services available for urban areas is divided into two categories:

- Urban ring roads: information regarding the traffic conditions for the majority of the ring roads is incorporated into the national information services, as it is collected into the national CCIS.
- Primary and secondary urban/regional roads: this data is collected and divulged by the respective municipalities. Much work has been done in this area over the last five years with Rome and Turin at the forefront.

Based upon a survey conducted by TTS Italia in 2001, the principal means of information dissemination used by the municipalities include (expressed in percentage of municipalities surveyed which currently use the dissemination means):¹⁵⁶

- radio broadcasts (60%)
- VMS (44%)
- Internet (20%)
- televideo¹⁵⁷ (16%)
- on-board systems (12%)
- radio (8%)
- mobile phone (8%)
- information kiosks (4%).¹⁵⁸

Two examples of urban traffic and traveller information systems for primary/secondary roads include Rome and Turin:

¹⁵³ Sources: FAQ's section of <http://www.targaconnect.com/> and Nascimbene. "Arese, Tutti Gli Uomini del Connect" La Repubblica Auto. 15 December 2001. from <http://www.repubblica.it/auto/supplemento/20011215/34arese.html>

¹⁵⁴ The survey included 70 municipal administrations in Italy, with a 42% response rate.

¹⁵⁵ Source: TTS Italia. 30 November 2001. Presentation at the 1st Annual Conference: *Survey sullo stato di sviluppo e diffusione dei sistemi ITS in ambito urbano.*, pg 15.

¹⁵⁶ The survey included 70 municipal administrations in Italy, with a 42% response rate.

¹⁵⁷ Televideo is a teletext service supplied by numerous television networks and some highway rest areas.

¹⁵⁸ Source: TTS Italia. 30 November 2001. Presentation at the 1st Annual Conference: *Survey sullo stato di sviluppo e diffusione dei sistemi ITS in ambito urbano.*, pg 14.

Rome: The city of Rome, through STA SpA, has implemented a traffic control centre, which feeds information into a traffic information centre for disseminating information to the general public. The centre is equipped with a DATEX node and links with motorways leading to Rome are being experimented. Information available for a selection of the urban network includes:

- Traffic circulation status
- Event information (regarding road works, impacts on road availability, public events, demonstrations, closure of roads to circulation, access control information)
- Parking information and status

Information on traffic circulation status and event bulletins is accessible pre-trip on the STA public web site. In addition, urban VMS are used to provide on-trip information along several principal itineraries. In 2000, STA conducted an experiment with the telecommunications operator BLU for the provision of SMS and WAP services, as part of the CAPITALS PLUS project.

Turin: The City of Turin, through the 5T consortium, has implemented a traffic control centre, which feeds information into a traffic information centre for dissemination to the general public. The site provides real-time information on expected travel times for public transport and private car, arrival times for public transport stops (updated in real-time for accumulated delays), real-time information on availability for city parking centres. Furthermore, the site allows for personalised services for registered users. These personalised services include traffic condition updates (by email or SMS) for user-indicated commute trips during a specific time interval.¹⁵⁹ The impact of the portal has been measured in terms of reduction travel times: surveying results indicated a reduction in travel times for private traffic of 17% and for public transport of 13% along the axes of the trials.¹⁶⁰

2.2 TTI research and demonstration activities

- The National Telematics Architecture project, being developed by the Ministry of Transport, for the creation of said architecture, based upon the EU Frame guidelines. This project is also connected to a series of pilot projects (see 1.1.2), which explore the use of different telematics architecture for specific applications within Italy.
- The 5T project, through the development of the 5T consortium (a consortium of seven participating companies: 5 private, the City of Turin, and AEM), has resulted in one of the first “intermodal” travel and traffic information services. The project began in cooperation with the QUARTET and QUARTET PLUS EU research and demonstration projects. In 2000, a private company was formed with both public and private partners.¹⁶¹
- The Rome-specific jubilee projects, which provided national funds for the preparation of the year 2000 jubilee in Italy, facilitated the realization of the Rome traffic control centre and traffic information centre.
- The Rome implementation of the CAPITALS PLUS EU research and demonstration project was focused on providing traffic and traveler information services, including improved intermodal trip planning.

¹⁵⁹Source: <http://www.5t-torino.it/home.html>

¹⁶⁰Source: http://www.5t-titos.it/consorzio_en.html

¹⁶¹Sources: Phone interview with Fabio Pressi, Mizar Mediaservices 11/03/02 and http://www.5t-titos.it/consorzio_en.html

- TRIDENT EU demonstration project integrated the approaches and methodologies of existing traveller information system solutions to minimise both duplication of development effort and disruption to user organisations. The implementation in Rome was based upon integration between public transport and urban road traffic.¹⁶²
- SERTI: As part of this EU project, SERTI has an implementation in the North-west of Italy for the development of traffic information services and trip times.
- CORVETTE: As part of this EU project, CORVETTE has an implementation in the North-east of Italy for the development of traffic information services and trip times.

Other projects of interest include:

- EDEN: Directory of European Traffic Centres
- ROSETTA: Real Opportunities for Exploitation of Transport Telematics Applications
- INFOTEN research and demonstration project focused on traffic information exchange and the provision of traveller information services

3 Key issues for TTI implementation

3.1 Drivers and trends

Institutional (public and private)

- The 2001 plan general plan for transport and logistics has tendered the development of a common architecture, which is currently being undertaken by a panel of experts.
- Although initially purely a cross-border standard, DATEX is presently used as one of the principal communication protocol to run the exchange of traffic information between operators at the national level.
- The EU emphasis on need to develop trip time estimates (not just event information) and to ensure that the TERN (Trans-European-Road-Network) is equipped with the necessary instruments to provide the relevant input data,

Technological (data acquisition and service delivery)

- The increase in implementation of DATEX nodes has facilitated the exchange of traffic data among a variety of institutions.
- The definition and refinement of standards for the publication of data for service providers has facilitated the development of information services by third party service providers.
- The implementation of cross-industry portals, providing personalised services, has been an important trend in Italy.
- The widespread availability of GSM is being taken advantage of for the provision of real-time traffic and mobility information.
- The release of new generation wireless presents important new opportunities to deliver TTI services.

¹⁶² Source: Phone interview with Roberto Nenzi, consultant 10/03/02

3.2 Key obstacles to overcome

- Legal questions regarding data ownership, responsibility, and liability for users are currently being addressed. The roles and responsibilities of the different actors are not defined in a systematic way.
- There exists a need to liberalise the market so that information is available to service providers based upon “just compensation”, as opposed to information being disseminated upon exclusive supplier relationships.
- A key concern relates to the correct management of information to ensure that only valid and current information is presented to the users. If individuals receive incorrect information, there is a great risk of disenfranchising them permanently.
- There still persists a gap of integrated intermodal information (car/rail/ship/airline/public transport).
- The lack of an EU protocol for intermodal information helps perpetuate the scarcity of intermodal information.
- Efforts are being devoted to improving the presentation of information in a user-friendly way so as to communicate the message most effectively.

3.3 Major potentials to use

- Considerable opportunities lie in the possibility to concentrate on personalised services, as basic national roadway information is widely available, in particular:
 - a. providing seamless integration between as information sources;
 - b. information services which communicate effectively in “user friendly” way, based upon the type of instrument (WAP, SMS, Palm, on-board computers, etc.).

4 Annex

4.1 Key actors in TTI development

	institution	Ministry of Transport and Public Works ¹⁶³
	name / position	Carla Messina
	involvement	Responsible for EU projects
	Phone	+39-06-44123279
	institution	RAI ¹⁶⁴
	name / position	Amedeo Massimo Minisini
	involvement	Responsible for CCISS
	e-mail	am.minisini@rai.it
	institution	AISCAT ¹⁶⁵
	name / position	Massimo Schintu
	involvement	Involved in the exchange of traffic information
	Phone	+39-06-4827163
	institution	Autostrade

¹⁶³ This individual was not contacted during the research for this paper.

¹⁶⁴ This individual was not contacted during the research for this paper.

¹⁶⁵ This individual was not contacted during the research for this paper.

	name / position	Giuliano Trenta
	involvement	Responsible for EU projects-- DATEX expert
	Phone	+39-06-43632038
	e-mail	gtrenta@autostrade.it
	institution	Rete Ferroviaria Italiana (Gruppo Ferrovie dello Stato)
	name / position	Nicola Manderino
	involvement	Responsible for Process and Systems Innovations
	Phone	+39-06-4410-2806
	email	n.manderino@rfi.it
	institution	Società Trasporti Automobilistici SpA (STA SpA)
	name / position	Maurizio Tomassini
	involvement	Director of Systems and Innovations, involved in the realisation of the STA traffic control centre and traffic information centre
	Phone	+39-06-57118206
	e-mail	m.tomassini@sta.roma.it
	institution	N/A
	name / position	Roberto Nenzi
	involvement	Freelance consultant with experience in the sector
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	institution	TTS Italia
	name / position	Olga Landolfi
	involvement	General Secretary, involved in the work done with CORVETTE
	phone	+39-06-80973240
	e-mail	tts.italia@inwind.it
	institution	Mizar Mediaservice
	name / position	Alfredo Bolelli
	involvement	Managing Director of Mizar Mediaservice
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	institution	Mizar Mediaservice
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	involvement	Responsible for WALKIE development
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	e-mail	fabio.pressi@roma.miz.it
	institution	ATAC
	name / position	Stefania Di Serio ¹⁶⁶
	involvement	Involved in the demonstration activities for intermodal traveller information systems in the Capitals Plus project
	phone	+39-06-46954923
	e-mail	sdiserio@atac.roma.it
	institution	5T
	name / position	Rosella Panero ¹⁶⁷
	involvement	Involved in the demonstration activities of traveller information services, in particular the public transport side
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	e-mail	panero.r@atm.torino.it

¹⁶⁶ Although not interviewed for this document, this person was informed directly of the project and the possibility of being asked to participate in focus groups.

¹⁶⁷ Although not interviewed for this document, this person was informed directly of the project and the possibility of being asked to participate in focus groups.

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Aeroporti di Roma	http://www.adr.it/it/default.html
Autostrada dei Fiori web and wap site (experimentation) with real-time traffic condition information	http://www.autofiori.it/
Autostrade's integrated traffic information centre brochure	Autostrade. <i>Autostrade Il Centro di Produzione Multimediale</i> . (depliant)
Autostrade web site and traffic information services	http://www.autostrade.it/pagine_1/homep.html http://www.infoviabilita.it/infotraff/guestlogin.jsp
CCISS web site (only realtime bulletins available on site)	www.radio.rai.it/isoradio/
5T Portal (Turin intermodal portal)	http://www.5t-torino.it/home.html
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CORVETTE web site	http://www.eu-corvette.com/Project/project.html
EDEN -- Directory of European Traffic Centres	1998. <i>EDEN Final Report. Directory of European Traffic Centres</i>
General Transportation and Logistic Plan	Ministero dei Trasporti e della Navigazione, Ministero dei lavori Pubblici, e Ministero dell'Ambiente. 2001. <i>Piano Generale dei Trasporti e della Logistica</i> .
INFOTEN web site	http://www.infoten.com/
ITS Master Plan for Rome	Master Plane delle Applicazioni ITS di Roma: Sintesi (from STA web site)
Ministry of Transport and Navigation web site (old site being phased out)	http://www.trasportinavigazione.it/
Ministry of Infrastructure and Transport web site (new site under development)	http://www.infrastrutturetrasporti.it/
Other misc. transportation web sites of interest	http://www.viasatonline.it/ http://www.enteanas.it/ http://www.aci.it/
Passenger Bill of Rights for the national rail operator (Gruppo Ferrovie dello Stato)	Ferrovie dello Stato. 2001. <i>La Carta dei Servizi 2001 del Gruppo Ferrovie dello Stato</i>
Quattroruote Portal	http://www.edidomus.it/auto/servizi/infotrafic/avvio.cfm
Rosetta Project -- Executive Summary of Personal Travel Services	2001. Executive Summary. Rosetta: Real Opportunities for Exploitation of Transport Telematics Applications
SERTI web site	http://safari.irobot.uv.es/serti4/
STA Portal (Rome urban traffic portal)	http://www.sta.roma.it/
Targasys Portal (explanation of connect services)	http://www.targaconnect.com/
Telecom Italia Portal	http://www.i-tim.it
Telematica & Trasporti (supplier of traveller information systems in Rome for the Jubilee lines)	http://www.t-t.it/indexE.html
Telephone Interviews with:	Nicola Mandarino, Rete Ferroviaria Italiana (07/03) Raffaella Natili, Trenitalia (08/03)

	Giuliano Trenta, Autostrade (08/03; 11/03) Olga Landolfi, TTS Italia (08/03) Maurizio Tomassini, STA SpA (11/03) Alfredo Bolelli, Mizar Mediaservice, (08/03; 10/03; 11/03) Fabio Pressi, Mizar Mediaservice (08/03) Gino Franco, Mizar Automation (08/03; 10/03) Roberto Nenzi, consultant (08/03; 10/03; 11/03)
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Walkie Portal	http://www.walkie.it/

Lithuania

1 Institutional framework for TTI development

1.1 Legal and public policy context

National Transport Strategy

The Lithuanian transport system has been developed in accordance with the Transport and Transit Development Strategy. The Strategy is especially focused on safeguarding sustainable mobility of the public and renders all information-related services to the traffic actors, taking into consideration the strategic aims of European general transport policy.

The main long-term strategic goals of Lithuanian transport policy are:

- Modernization of transport infrastructure by integrating the main trunk-roads into the TINA networks, and – via them – into the trans-European networks;
- Improvement of transport mode interaction – expansion of multimodal transportation processes;
- Speedier integration of Lithuanian carriers into European transport service network;
- Increase of transit volumes;
- Creation of logistic centres in Lithuanian towns and their integration into the continental European network of transport logistic centres;
- Formation of informative, safe, and environmentally friendly transport system;
- Satisfaction of the needs and possibilities of local and foreign traffic actors with regards to mobility.

The Lithuanian geographical situation is favourable for transit as it is traversed by transport corridor I and transport corridor IX both of which are of European significance. The country has well developed network of overland routes with high quality road maintenance and repairs system.

However the TTI developments in this sector are more a declaration of strategy than any significant implementation. Historically, responsibility for TTI is divided between two main actors: Lithuanian Road Administration (Ministry of Communications) is responsible for road traffic maintenance and reconstruction and the Department of Tourism is more or less responsible for the Traveller information supply.

In the near future, the transport system will be upgraded and reorganised so that the technical status of its infrastructure and the legal basis regulating its activity will maximally satisfy transport service users and travellers, and especially the needs of the delivering transit services. For that it is important to improve the infrastructure of international transport corridor I and IX, to create the best conditions for the formation of the integrated transport service system, as well as for establishment of multimodal logistic centres. The TTI technologies in the future will be more and more requisite to achieve these goals.

Information services rendered to traffic actors must expand significantly. However there are no clear strategies for integrated TTI services development but specialist are considering the idea of a TTI portal which will comprise assistance services, weather information, traffic counting, traffic control, fee collection, information on traffic conditions, tourism information etc.

Public Transport

In Lithuanian towns, people are transported by buses, trolley buses, specified route mini-buses, taxi, and private cars. Trolley buses are available in Vilnius and Kaunas.

Public transport stations and operators are responsible for traveller information and time schedules. Most of them inform travellers by phone and information boards in stations. Some have websites, where general information about schedules is available. The public transport stations and carriers operated on the public routes are responsible for passenger information at stops. For national and regional bus-services and some cities, timetable information can usually be gained over the phone.

The Municipal Enterprise “Communication Services” (CS) established in Vilnius, performs the function of passenger informer in Vilnius. Vilnius municipality funds an information system for passengers: www.vilniustransport.lt. In other Lithuanian towns, information to passengers is presented in traffic schedules in bus stations, inscriptions on vehicles, etc.

Interurban and international bus routes in Lithuania are served by the private firms TOKS, Kautra and others, which give information on their services in bus stations, press, informative publications, or their own web pages. However, only booking by phone is available at this moment.

Besides the Lithuanian Road Administration, other organizations and firms related to transport also render information services to traffic actors. Such other organizations and forms are municipalities, traffic police, tourism information centres, city parking companies, and Lithuanian National Road Carriers’ Association Linava.

Road Transport

Today, Lithuania has a rather well developed road network: at present 21271 km of state roads, of which are 52% asphalted, including 1722 km of trunk-roads, 4816 km of national roads, and 14733 km of regional roads.

The Information System Department of Transport and Road Research Institute performs creation, development, and supervision of information systems, and develops data accumulation methods and measures. A strategy of LRA information technology and the Lithuanian Automobile Road Data Bank has been developed, which is the base for the “LAKIS” road information system described in the best practice section.

As regards the traffic detection base, the Transport and Road Research Institute calculates traffic intensity on roads (mainly static data) according to the data collected from fixed continuous traffic intensity calculators – classifiers, fixed periodical traffic intensity calculators - classifiers, and mobile traffic intensity calculators – classifiers.

Fixed continuous posts with automatic calculators – „MARKSMAN 660“ function continuously all year round at 14 posts: 12 on trunk-roads and 2 on regional roads. Fixed periodical posts function at 120 installed sites. Traffic there is calculated on 69 posts for 1 week per year and on 51 posts for 1 week four times per year, i.e. once per quarter. On both types of post, calculators summarize vehicles every hour and save information on such vehicles in their memory. Vehicles are divided into 6 classes according to the international classification chart EUR6. Mobile posts function on 89 road sections. Traffic on mobile posts is calculated one day 3 times per year. The data are summarized every 15 minutes. Calculators classify vehicles into 13 classes according to the international classification chart EUR13.

Municipalities or cities do not consider TTI systems for traffic management to be a strong priority.

1.2 Role of the private sector

The private initiative in TTI development is quite limited to specific fields of activity. The private sector usually acts in the field of advertising and provides information on signs about services near roads, i.e. motels, radio stations, tourism information, etc. Such signs are financed by private sector and must be agreed with authorities.

It has to be mentioned that some private carriers have implemented GPS systems in trucks. They can track the cargo and control itinerary in real time. The dispatcher or client can contact the driver if necessary. This system is very expensive and additional investments are needed, which increase expenditures, so GPS is not very common.

Most private carriers are members of the LINAVAL (Lithuanian National Road Carriers' Association). Truck drivers get information from Linava and "Linava – services". Part of the information is available for free on site www.linava.lt. This part of site provides information about fuel prices in EU countries, custom conditions, traffic news etc. Linava also prepares various information publications for the members. Other parts of the information are secure and provided to the members (which pay membership fees). Operators receive information from the traffic police and Lithuanian Automobile Union www.las.lt.

One of the new websites is www.maps.lt. The web page created by private enterprise "HNIT-BALTIC Geoinfoservisas" and provides Lithuanian and Vilnius, Panevėžys interactive maps for the locality or address search. The site is based on a private initiative; information is available for free and periodically updated.

Passengers taking railway, air, or sea transport may receive information independently from these carriers (also see TTI implementation).

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Lithuanian TTI services are under development and not comparable with EU state of the art. There are some private organizations, such as LINAVAL providing information for the carriers and "HNIT-BALTIC Geoinfoservisas". However LINAVAL collects information and news from various sources (such as ministries, customs, veterinary services, etc). Private initiative is mostly limited to certain sectors (mostly advertising of the activity) and nearly doesn't deal with real time TTI. The remote data collection is not very common and only one real time system LAKIS is functioning. Further information shortly describes the state of the art in the appropriate fields.

Media Information

In Lithuania, television companies have weekly issues for traffic actors: LTV „Keliai, mašinos, žmonės“ (Roads, Cars, People), LNK „Keturi ratai“ (Four Wheels), BTV „Ekipažas“ (Crew), VTV „Autofanai“ (Auto Fans), presenting the most up-to-date information to the traffic actors. Everyday information on road meteorological conditions, road sections under repairs, complicated traffic conditions are given in TV and radio news issues.

Besides, there are a lot of different periodical publications – newspapers and magazines intended for drivers and passengers, which give urgent information on traffic on roads and streets.

Road transport

The Lithuanian Road Administration (Financed by road developing programme) has developed the road information system „LAKIS“, http://www.lra.lt/index_en.html, aimed at storage and timely presentation of necessary data to traffic actors on roads, their structures, traffic loading, road accident rate, meteorological conditions etc. Meteorological conditions (Precipitation, Visibility, Air Temperature, Surface Temperature, Surface Condition, Wind Speed, Wind Direction) are presented almost in real time, i.e. the data collected with 0.5-2 hours periods. The main Lithuanian highway from Vilnius to Kaunas has a few (4) electronic signs showing real time information on speed limitation and surface conditions.

Classifiers and calculators calculate traffic intensity on roads, but data is not dynamic. Road information systems are prepared and digital road maps are easy available in Lithuania. Road classification according to categories and road pavements are available. This web page provides references to other sites including the Baltic road information system <http://www.balticroads.net/lt/>.

As mentioned earlier, municipalities do not consider TTI systems for traffic management to be a strong priority. However such ideas as payment for parking by mobile phone and alternate routes are recently functioning in Kaunas.

Public transport

Only Vilnius - capital of Lithuania has PT information on the Internet. City is considering real-time PT information, based on GPS.

The Municipal Enterprise “Communication Services” (CS) in Vilnius, provides a city information system for passengers: www.vilniustransport.lt. Information is given in three languages: the history of Vilnius passenger transport in photos, short information on carriers and city routes, the Rules of Passenger Transportation approved by Vilnius City Council, privileges, ticket prices, comprehensive references, extracts from laws granting privileges, news column, and, of course, full traffic schedules for each bus stop and each route, as well as route transport map of Vilnius. Data related with route planning mainly collected by CS from site research. Actually there are no automatic tools for automatic data collection except some buses with passenger counters. CS is working in the public transport field very actively: a new ticketing and GPS system is under consideration. Afterwards the TTI system for the passengers working on a real-time basis could be implemented.

Information given to passengers at stops:

- Bus traffic schedules
- Trolley-bus traffic schedules
- Private route bus traffic schedules
- Route taxi traffic schedules.

“Vilniaus autobusų parkas“ has a web page giving information on the services rendered by buses. „Vilniaus troleibusai“ does not have a web page. Private carriers by buses and mini-bus give only minimal information about themselves.

There are no other urban transport systems like in Vilnius. Information for passengers on suburban transport is generally presented in bus stations and stops.

Railways

JSV "Lithuanian railways" created own web site <http://www.litrail.lt>. The Internet page of "Lithuanian railways" contains general information about enterprise, stock, infrastructure, passenger (schedules, prices, information, instructions) and cargo transportation. Presently the

web site operates in the Lithuanian language, but English and Russian languages are pending. The passenger can plan his trip easily with help of interactive maps and text information. Lithuanian Railways has a quite well developed telecommunication system, which is under elaboration.

Airports

Vilnius International Airport (<http://www.vilnius-airport.lt/#>) and Kaunas International Airport (<http://www.kaunasair.lt/>) have web sites. Internet resources orientated to private and business consumers, and general information (references to operators) are available, which is necessary for the trip planning. Languages: Lithuanian, English.

Palanga International Airport and Siauliai international Airport do not provide information in the internet.

Air Operators

Lithuanian Airlines (<http://www.lal.lt/>) is the national air carrier of the Republic of Lithuania, is a full member of ERA and IATA. The web page quite attractive for the users. Full information about timetables, bookings on line, services, discounts, aircrafts, cargo etc are available. Languages: Lithuanian, English, German.

Air Lithuania (<http://www.airlithuania.lt/>) web page is under construction.

There are more smaller operators/enterprises in Lithuania, which do not provide information on the internet.

Water transport

The Services of Port Klaipeda (<http://www.spk.lt/>) provide a lot of information for the tourists and business. There are a lot of references to marine companies, tourist companies and Lithuanian Transport Resources Search Engine. Here it is possible to search through Lithuanian transport resources: sites of Lithuanian shipping, cargo forwarding and stevedoring companies, other sites, related to another kinds of transport. English, Russian and Lithuanian languages are available.

The main operators provide information in English, Russian and Lithuanian.

AB "LISCO BALTIC SERVICE" (<http://www.lisco.lt/>) provides general information on services, company and fleet.

JSC Klaipeda Stevedoring Company (<http://www.klasco.lt/en/>) provides information on services, prices, terminals, etc.

Other services

The Ministry of Transport and Communications of the Republic of Lithuania (<http://www.transp.lt/>) provides a lot of the newest information and references to the sector sites, but the information provided in English is very poor.

The Lithuanian State Department of Tourism works on the Tourism Information Centres network (www.tourism.lt). Tourism information centres are dislocated in various Lithuanian cities and parks and supply information to tourists about accommodation, services etc.

The main conclusions concerning information services and especially internet resources could be summarized as follows:

- Lithuania has a Tourism Information Service network, which provides information by phone and in some cases on the Internet. Sites are, however, scattered and there is no general portal, which will include all transport sectors (infrastructure, supervision, operators etc.) and references to the sites, which are necessary for the route planning.
- The traveller could find general information about schedules, prices, booking and conditions in the Internet. The imperfections: only the biggest operators have well developed sites, some of them do not provide information in English or other foreign languages.

2.2 TTI research activities

1. "EDI in the Port of Klaipeda" (EDI - Electronic data interchange), terms - 2000-2002 m. Dutch Ministry of Economics Port & Maritime Consultants BV). Electronic data interchange in the Port between customs, operators.
2. 1 stage "Telecommunication ring around Vilnius" terms - 2000-2001 m.
2 stage "Telecom Business Development for Lithuanian Railways" terms- 2001-2002 m. Pursued with Dutch companies (NS Railplan)
3. Ongoing international project for the railways "Modernization of signal and telecommunications facilities". Terms - 2001-2007 m. Part of the project budget will be covered by ISPA funds.
4. Ongoing project VIVALDI, under CIVITAS, European commission Directorate for Transport and Energy. It is a 4-year demonstration project and Bristol in the UK is the leading city - Kaunas is the follower. The project consists of the wide range innovative, integrated and sustainable transport pilot initiatives.

In the tourism sector during 2001-2002, two relevant projects were under preparation:

5. National tourist information system, sign-posting and pilot tourism infrastructure in the Utena region. Pajarskas 20-Phare-LI-PAO. Beneficiary: State Tourism Department of Lithuania.

Project focused on development of tourist information system for travellers on internet, Tourism information centres, also accommodation reservation possibilities.

6. Project preparation for the development of bicycle routes and the creation of coherent tourism signposting system. Pajarskas 23-Phare-LI-PAO. Beneficiary State Tourism Department of Lithuania.

The project related to coherent tourism signposting system and will have great influence for the tourist information system development in the future as well as for all travellers.

3 Key issues for TTI implementation

3.1 Drivers and trends

Information to the public transport passengers in towns and settlements is presented by carriers, and in Vilnius it is presented by „Communication Services“. Information to drivers is available in towns, municipalities and their subdivisions. Out of town, such information is under the responsibility of Lithuanian Road Administration and subordinate road transport enterprises.

3.1.1 Institutional (public and private)

1. It is important to integrate the Lithuanian road network into the European road transport system in technical-technological and legal regulation aspects, by making use of the convenient geographical and geopolitical situation of the country and expanding the possibilities of Lithuanian transport firms and their role in the international road transport service market. Integration into the EU and the European transport system will be the most powerful driving force, which will also influence faster TTI implementation.
2. Development and technical parameters of the national road network must meet national industrial needs and the keep pace with the development of individual branches of the economy by reducing transport costs and granting possibilities for free movement of passengers and cargo within the territory of Lithuania. To ensure free movement, more and more TTI technologies must be implemented in towns and republican network, i.e. integrated custom information system will facilitate procedures or urban information systems could relieve congestion.
3. The Information Systems Department of the Transport and Road Research Institute has prepared the strategy of LRA information technology and the Lithuanian Automobile Road Data Bank. The Automobile Road Supervision Information System has also been created. It is a good base for further TTI development.

3.1.2 Technological (data acquisition and service delivery)

- Systems which integrate data acquisition and service delivery are under consideration. A TTI portal which comprises assistance services, weather information, traffic counting, traffic control, fees collection, information on traffic conditions, tourism information etc. is being considered.
- Data about traffic intensity on roads collected from fixed continuous posts with automatic calculators – classifiers „MARKSMAN 660“ function continuously all year round in 14 posts. The system is currently static and should be upgraded.
- The data related to urban public transport are collected mainly in sporadic field research, and no automatic counters employed in data acquisition. The present system is quite expensive and inflexible, so more automatic systems might be employed.

3.2 Key obstacles to overcome

1. Lack of common strategy for TTI system development on State level. It is necessary to identify main actors, distribute responsibilities and duties between them.
2. There is no connection concerning TTI development between public, private companies and authorities. Lack of institutional links for inter-modal TTI development with common portal in internet and other kind of facilities.
3. Differences of opinion on how important the TTI system is for country development, integration into the EU and the Lithuanian market presentation in the public and private sector.
4. Insufficient Public transport financing makes allocation of finances for PT information system difficult within the PT budget structure.
5. According to the strategy, a clear data collection system must be prepared (types, volumes, quality criteria), which will clarify questions of data ownership and data presentation/supply for public usage.

6. There no clear rules enabling access to the data for the public and private sectors, to enable the development of public-private partnership.
7. Existing information system needs international experience and more modern technologies for TTI creation and implementation must be employed.

3.3 Major potentials to use

1. The preparation/integration of TTI Strategy for the transport sector to National Transport Strategy would be very beneficial. This strategy might consolidate the private and public sector in TTI development through clear vision, mutual interests and exemption.
2. The road information system „LAKIS“ could be extended and this system will render more valuable data (real time traffic calculation, traffic control and management).
3. A special committee could monitor the implementation of the ongoing strategy. The committee should coordinate all international and local projects for the TTI development, coordinate activities between actors (road administration, carriers association, tourism department, public and private enterprises) according to strategy and deal with means.

4 Annex

4.1 Key actors in TTI development

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4	institution	LINAVA Lithuanian National Road Carriers' Association
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5	institution	Transport and Road Research Institute
	name / position	<i>J. Patašius (Head of IS division)</i>

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6	institution	VG TU, Transport research institute
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Luxemburg

1 Institutional framework for TTI development

1.1 Legal and public policy context

1.1.1 Enabling framework

All travel and traffic related matters are the responsibility of the Ministry of Public Works (Ministère des Travaux Publics) and more specifically with the administration of Bridges and Roads.

The country's motorway network constitutes the cross-road connecting Belgium, France and Germany.

For the improvement of traffic conditions, priority is given to improving the capacity (and safety) of the road network to applying ITS solutions rather than extending the network with environment unfriendly and land consuming infrastructure works.

Particular attention is given to the improvement of traffic information centres (TICs) and traffic control centres (TCCs), with respect to ensuring European interoperability and homogeneity (specifically cross-border relations). The overall objective of this activity is to allow National TCCs and TICs to communicate with their foreign correspondents for traffic management and information purposes.

Particular attention is being put on:

- Extension of traffic monitoring
- Improvement of weather monitoring
- International traffic data exchange (DATEX)
- Assisted motorway emergencies operation
- Dissemination of traffic and mobility information.

One of the initial accomplishments was the decision to run the exchange of traffic information between operators using the DATEX standard.

Though the Ministry supports the Commission Recommendation, no specification initiatives have been undertaken to implement it as there are currently no private-sector initiatives in this area.

1.1.2 Information Chain

The information chain for TTI service deployment in Luxembourg is generally characterized in the following way, with differences primarily based upon mode:

Road Traffic information services use the following information chain:

- Data acquisition and data fusion are handled by the infrastructure owner, i.e. the Administration of Bridges and Roads.
- Information supply is also handled by the infrastructure owner, mainly via the internet site www.cita.lu

- The transmission is carried out by a third party service providers, i.e. different national radio stations. The Police Grand-Ducale (Ministry of the Interior) organised in six regional “circonscriptions” operates the NTIC in collaboration with the Administration of Bridges and Roads, and passes on traffic and travel information to the commercial radio broadcaster.

For information on *railway connections*, the National Railway company “CFL”¹⁶⁸ has no own information web-site. The CFL site connects automatically to the German railway timetable and journey planner from “Deutsche Bahn”, who takes care of the whole information chain: Data acquisition, data fusion, transmission of information, marketing, support and information supply.

However, ...

- d. Information in the stations is provided through station panels and announcements
- e. On-trip information is provided at the stations through information points/ticketing offices and announcements on trains
- f. Pre-trip information from call centres.

Urban and Inter-urban Public transportation information services generally tend to be managed singly by the transportation provider. Furthermore, only rarely is dynamic information on public transportation made available to final users

1.2 Role of Public Authorities

All ITS-related services are in the hands of the Ministry of Public Works (Ministère des Travaux Publics) and more specifically with the Administration of Bridges and Roads, where all data and information (webcams, levels of service, journey times) are available free of charge. For the moment there are some initiatives involving the private sector in information or added-value services. For instance a website dedicated to people coming from Belgium, France and Germany in order to work in Luxembourg, has set up a service providing journey times by SMS to registered customers. Some telecom operators are also planning to provide traffic information via web, wap, sms, etc. Several companies from Germany and the Netherlands are also interested to get the information from Luxembourg.

1.3 Role of the private sector

The private sector plays an important role in the deployment of TTI services in Luxembourg. All traffic information is being broadcast by private national broadcasters.

Telecom providers are currently also preparing partnerships with Public transport providers (railways and bus companies) in order to allow them to deliver customised information to their clients using SMS and/or WAP.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

(See also description sheet in annex)

¹⁶⁸ Web-site: www.cfl.lu

Funding of TTI (and in general all ITS systems) is mainly financed by public money.

2.1.1 Public Transport

Public transport operators are fully aware of the rising interest in the use of telematic systems, in particular for improved management of the system and for the diffusion of traffic and traveller information.

Available information on public transport (essentially static timetable and tariff information) is disseminated by the majority of transport operators via the following methods (ranked in order of importance)

- Internet
- Telephone Call Centres
- Mobile telephone (SMS and WAP)

Luxembourg city

The city of Luxemburg operates an urban bus network.

Static time table information is given for free on paper leaflets and at the stops.

Pre-trip and on-trip information is also available on the web see web-site¹⁶⁹.

This is an Internet-based service, which consists of information on the bus services: giving an overview of all lines and their itineraries.

It does not include a real journey planner.

Inter-Urban connections

The national railway company operates also a bus network assuring regional and inter-urban connections. Static time table information is given for free on paper leaflets and at the stops. Pre-trip and on-trip time table information is also available in a telephone call centre. Internet information is not available yet.

2.1.2 Road Transport

General information is broadcast to the public free of charge by the different national broadcasters. The Administration of Bridges and Roads has its own website for traffic-info: www.cita.lu

Automatic data collection is based on the following data sources:

- loops: (mostly motorways); the system is essentially based on single loops and was installed since 1998; it records average speeds, densities and numbers of different categories of vehicles;
- cameras: Also since 1998, a certain number of cameras have been installed. the infrastructure is maintained by administration of Bridges and Roads;
- SOS telephones: are installed every 2 kilometres on virtually all motorways; their importance as a source of information on accidents and breakdowns has reduced a lot since most emergency calls are now made through GSM;
- a network of 15 roadside weather detection stations are installed. These are also use for forecasting purposes such as thermal mapping);

¹⁶⁹ www.autobus.lu

The data distribution for pre-trip and on-trip dynamic information uses different channels:

- live radio broadcasts
- DAB services are under discussion but no fixed starting dates have been defined yet
- Internet based services using maps showing real-time traffic situation and travel times. (see web-site¹⁷⁰)

These services are coordinated at national level.

2.2 TTI research and demonstration activities

- Luxemburg has no national research activity. However it is involved on the CENTRICO project.
- Big emphasis is actually put on safety aspects in tunnels, which will be all equipped with the newest equipments (automatic incident detection, smoke detection via video, etc.)

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

1. Development of a common architecture
2. Development of communication protocols, DATEX
3. EU emphasis on need to develop trip time estimates (not just event information) and to ensure that the TERN (Trans-European-Road-Network) is equipped with the necessary instruments to provide the relevant input data

3.1.2 Technological (data acquisition and service delivery)

1. Common implementation of DATEX nodes for the exchange of traffic data
2. Definition of standards for the publication of data for service providers
3. Creation of cross-industry portals providing personalised services
4. Availability of GSM
5. Release of new generation wireless

3.2 Key obstacles to overcome

- Legal questions regarding data ownership, responsibility, liability for users. The roles and responsibilities of the different actors are not defined in a systematic way
- Liberalization of market so that information is available to service providers based upon "just compensation" not on exclusive supplier relationships

¹⁷⁰ www.cita.lu

- Management of information to ensure that only valid and current information is presented to the users. If individuals receive incorrect information, there is a great risk of disenfranchising them permanently.
- Gap of intermodal information (car/rail/ship/public transport)
- Non existence of a EU protocol for intermodal information
- Presentation of information in a user-friendly way so as to communicate the message most effectively

3.3 Major potentials to use

Possibility to concentrate on personalised services, as basic national roadway information is widely available, in particular:

1. providing seamless integration between as information sources
2. information services which communicate effectively in “user friendly” way, based upon the type of instrument (WAP, SMS, Palm, on-board computers, etc.)TTI research activities

4 Annex

4.1 Key actors in TTI development

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4.2 Sources and references

Interviews with above mentioned key actor

EDEN project final deliverable

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www.etat.lu

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www.statec.gouvernement.lu

www.cfl.lu

www.autobus.lu

www.mobiliteit.lu

www.cordis.lu

Netherlands

1 Institutional framework for TTI development

1.1 Legal and public policy context

National policy:

The national policy on traffic and transport was described in the so-called NVVP (National Traffic and Transport Plan), which the former Minister of Transport officially presented on 16 October 2000. This plan meant a shift from the 1980s and 1990s; in these decades policy and action were based on the assumption that it is feasible for government to regulate the volume and direction of transport flows. The new approach accepts mobility as self-evident in today's world. At the same time the plan notes that without policy tuning road traffic and transport face congestion and resulting serious delays. However the plan was not accepted by parliament and the new government formed after the May 2002 elections has a different orientation, with a higher priority for building and extending roads and cancellation of existing road pricing projects. Apart from that, it is expected that the better part of NVVP will survive in a new policy plan, due in 2003.

This policy contains some important starting points which the development of traffic and traveller information services.

Market's role:

Government retains responsibility for the urban/spatial planning. However increasingly we will see government creating frameworks for other players to select their own solutions and to offer their services. Freeing-up the situation for market force, spurring better purchase formulas, public/private joint enterprises, and privatisation will be part of this move to more business-oriented government.

User pays:

The underlying principle of the policy is respect for the choices made by the community; but at the same time users will pay for their choices and the costs will not be passed on the community (as an example: paid information services).

Better utilisation of road, rail and water:

Optimal use of the infrastructure is a must. Contributory measures will include controlled access, incident management and real-time information in the vehicle.

Technology for safety:

Intelligent speed adjustment is an example of greater safety driven by advancing technology. Top policy priorities are programmes to decrease casualties among vulnerable road users like pedestrians and cyclists (combinations with traffic information services could create win-win situations).

In general technology will boost realisation of goals around traffic and transportation. A mass of basic technology is available with potential applications to improve accessibility and safety. The policy will therefore also be directed to ensure the timely and effective deployment of innovations; for example by the promotion of key technologies (where the market cannot yet get innovation moving under its own steam).

Data collection:

The Ministry of Transport, as the national road network manager, regards the collection of basic data on the road networks as its task; therefore the Ministry installed a public owned and operated data collection network along the motorway network. For quality and efficiency reasons the collection has been extensively automated. Provinces and municipalities are responsible for the collection of traffic data on their own roads (on those roads the data collection is done on a more ad-hoc basis; there are no automated networks installed for these networks). Therefore the structural exchange of traffic data between local, regional and national authorities is still a problem. There is some progress but this is quite dependent on local circumstances. But local events (traffic jams or other incidents) are reported by the police to the national TIC; in this way there is some information available for drivers

The new generation of in-car systems could give a quality impulse to traffic data and lead to greater improvements in traveller information. These systems send relevant data (floating car data) to the traffic control centres. In its future plans the Ministry takes account of these developments..

For the moment the Ministry of Transport has the objective to have only one source for traffic information for the motorway and main roads network. The source is the National Traffic Information Centre (given the size of the country one 'national' TIC is sufficient to provide the information needed). This TIC produces from collected traffic data high quality and up-to-date traffic information and offers this to Value Added Service Providers (VASPs). The information is produced on a national level and consists of the following elements: information on traffic flows, congestion, actual and planned road works, traffic related weather forecasts, traffic relevant information concerning public transport and parking problems, advice and announcements from the side of traffic management. Next to that, focussing on regional and local information, some private services are emerging.

The traffic information chain consists of three major parts:

- Data collection
- Data processing
- Data distribution.

For a successful implementation of transport telematics systems and services a co-operation is needed between all three parts of the information chain. The government plays a major role in the collection of information, the processing of the information and in making it available. The private sector is involved in the data distribution (offering of services) and the production and sales of user equipment.

he reason why the Ministry of Transport has chosen to stay heavily involved in the first two parts of the information chain, is because in this way they can keep a grip on matters relating to road safety, traffic flow and road management but also on the consistency of the provided information.

By supplying high quality traffic information the Ministry indirectly creates the foundation for emerging traveller information services. However, in supplying this basic information, the Ministry of Transport sets conditions. Distributors will be required to safeguard the quality and consistency of the information that they provide to the public, while ensuring that it does not endanger road safety. All of these conditions will be set down in agreements before a service provider can use the information for his service (the TIC has a standard set of conditions which form the basis for a contract between them and a service provider). The information is provided

by the national Traffic Information Centre to all service providers that are willing to meet the before mentioned conditions; this to avoid that one party is able to monopolise the market. The information is provided (for free) to service providers. This under the condition that they do not alter the information, the service is in the general interest of society and that the system itself has been approved by the TIC.

Use of Standards:

To ensure continuity of service and for more efficient development of new systems, agreed European standards are used; the most important one's are:

- RDS-TMC 'location database
- The DATEX Data Dictionary
- The DATEX-Net protocol
- DSRC

Enabling Framework:

Using these principles a national RDS-TMC service was set up. Due to the fact that there were many uncertainties related to the setting up of RDS-TMC services the Ministry provided an incentive in the form of a one-off financial contribution. In this way they worked as an enabler to get such a service going. At this moment the TMC service is self-standing.

In-car systems (i.e. navigation units) provide great opportunities, because they can cut down the number of hours motorists loose on their trip. Therefore it is in the Ministry's interest that these new technologies become available in cars; the Ministry encourages the development of these in-car systems and supports them especially where organisational factors are concerned.

An example of encouragement towards this sector is the fact that the Ministry of Transport organised the Automated Vehicle Guidance (AVG) demonstration (1997) an international event with car manufacturers from all over Europe and the United States of America. Another type of support is the involvement of the Ministry in many projects that deal with in-car systems and in this creating a win-win situation for both industry and authorities (industry learns the conditions for marketing and the authorities can bring in their specific needs). Within the AVG program the LDWA (=Lane Departure Warning Assistant) demonstrator executed with European industries and running till early 2003 is a concrete first step towards improving safety and comfort for trucks.

The distribution of information on public transport is essentially the responsibility of the operators themselves. Together they have set up a joint public transport information service (OVR); the Ministry of Transport has supported them financially for, but in 1996 the Ministry decided that the subsidy would be gradually decreased to zero; the year (2000) was the last year with some subsidy and in 2001 the zero-level was reached). The service provides traveller with door-to-door travel-information on a national scale, using all kind of public transport modes. The service started in 1992 as telephone service and was continuously adjusted to the technological possibilities (Internet). The phone service (0900-9292) is not free of charge; there is a fee for the connection time with the service. The internet service (www.ovr.nl) provides the same information for free.

To start up these types of services the Ministry plays an active role in marketing its policy and implementing it in practise. This is partly done through informal meetings and partly through taskforces (composed out of representatives from the public transport organisations and the Ministry of transport) set up to deal with specific topics. The establishment of the OVR was the

result of such a taskforce. At this moment one can get an advice for a door-to-door trip on the Internet (www.ovr.nl) using all public transport modes that are available in the Netherlands.

Several years ago there have been attempts to use the same strategy for multi-modal travel information but until now these attempts were less successful due to the fact private and public transport representatives (public transport operators versus automobile club) have different interests. The idea was to provide trip information using public transport and/or private transport; in this way the traveller would be able to choose the best mode for his needs during that trip (comparing comfort; time needed and costs). But it appeared that the public transport operators and automobile club representatives have quite different ideas about costs and comfort. And also the time needed for a trip using public transport is most of the time longer then using private transport. Providing the public with such a service could even be contra-productive for the public transport because it also displays their disadvantages.

Given the organisational framework in the Netherlands the role of service providers is limited to distribute traffic and travel information as a VASP. The Ministry of Transport itself does not play an active role in the distribution, but it offers incentives and encourages the market to play its own role. An example of incentives and encouragement of the market is the way that the national RDS-TMC service (started as NIKITA; succeeded by TMC4U) was realised (paragraph 2.1). Another type of encouragement lies in the fact that the Ministry sees it as her task to provide (for free) good quality traffic data.

The VASPs use the information provided by the TIC and enrich it with other information and/or edit it in such a way that customers of the VASP recognise the extra value. But the VASPs are not allowed to alter the contents of the traffic information supplied by the TIC.

The private sector is involved in setting up services based on the available traffic data (see TravelStar; paragraph 2.1). Apart from that there are some attempts to set up services using data from GSM networks (a.o. CMG; see paragraph 2.2). These companies try to set up services by combining existing infrastructures (like RDS-TMC and GSM) and equipment (phones, internet, pda's) which can be used in a multi-functional way.

From an organisational viewpoint considerable effort is put into International co-ordination of traffic management, supported by traffic information through the Euroregional project CENTRICO. National investments are tuned to international needs in co-operation with neighbouring countries through this project. Examples are cross-border management on international corridors, international data exchange and harmonisation of services.

1.2 Role of the private sector

Given the organisational framework in the Netherlands the role of service providers is limited to distribute traffic and travel information as a VASP. The Ministry of Transport itself does not play an active role in the distribution, but it offers incentives and encourages the market to play its own role. An example of incentives and encouragement of the market is the way that the national RDS-TMC service (started as NIKITA; succeeded by TMC4U) was realised (paragraph 2.1). Another type of encouragement lies in the fact that the Ministry sees it as her task to provide (for free) good quality traffic data.

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services by combining existing infrastructures (like RDS-TMC and GSM) and equipment (phones, internet, pda's) which can be used in a multi-functional way.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

In figure 1 a graphical sketch is given of the different roles and techniques that are needed to come from the collection of raw data to the distribution of high quality traffic or travel information.

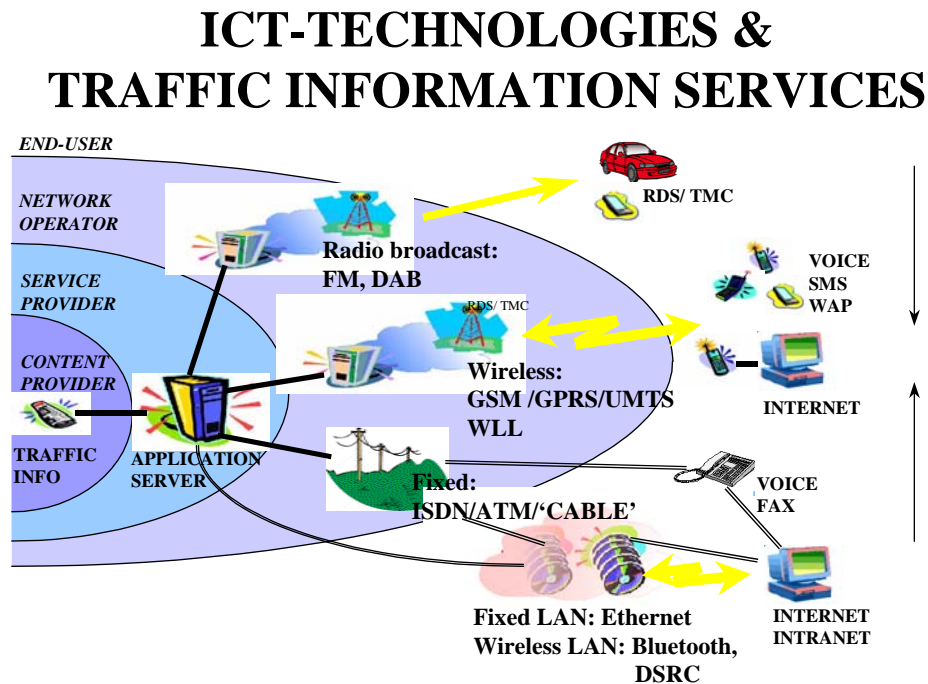


fig.1 the traffic information service chain

In-car systems:

Radio Traffic Information

The classic method to distribute traffic information to travellers is to use the radio channels. Several broadcasters have their once per hour or half hour traffic information services. The list of traffic messages in the Netherlands has become so long during rush hour that only queues longer than 5 km are being reported. The appreciation of the traffic information by the drivers is generally quite high.

RDS/TMC

Since 1998 a digital radio traffic information service called RDS/TMC is in the air in the Netherlands. The advantages over traditional traffic radio broadcasts are that the information is being updated continuously and that the drivers can retrieve and select the information when they require. The system is based on European (CEN) standards, enabling drivers who drive in a foreign country to receive traffic information in their own native language.

The national service in the Netherlands started as a publicly financed service because the commercial value of TMC was not clear at the beginning. A private consortium called NIKITA has operated the service for four years in 2001 a consortium of private companies (Siemens-NL and ANWB) has started a privately funded service called TMC4U.

With substantial navigation systems with TMC functionality on the market, the availability of TMC traffic information has become a strategic issue for navigation systems suppliers.

Although an increasing number of TMC receivers is on the market most of them are linked to navigation equipment and therefore rather high priced. In the lower price segment very little useful equipment is available at the moment. Therefore the Dutch road administration has stimulated the market introduction of reasonable priced TMC equipment through a national project called RIC (Realisation In-Car). A result of this project is:

Travel Star

The Travel Star is a TMC receiver, which is connected to a colour screen PDA, enabling to display TMC messages on a map display of the road network. The advantages of this system are the relative low price and the fact that the PDA is a multifunctional device (when you are not driving it can be used for other purposes). The device has been tested by a selected group of drivers; their reactions were enthusiastic. Some 90 % respondents indicate that the new service has added value over the regular traffic information service. The device is now on the market.



fig.2 Travel star equipment, the RDS/TMC receiver with PDA

Roadside based traffic information systems:

During the last ten to fifteen years a large variety of traffic management systems were implemented on the Dutch motorway network to improve efficiency of traffic flows and at the same time increasing road safety. Especially in the second part of the nineties an enormous effort was made to implement traffic management systems on the motorway network this to deal with the enormous traffic flows in this small but very dense populated country. Main implemented systems are:

Traffic signalling system

The Dutch motorway control and signalling system is a combination of a traffic management and a traffic information system. It warns drivers –automatically without interference of an operator- for incidents and queues downstream the road by displaying a commanded maximum speed. Operators can use the system to close lanes and to set up signals for road works. About 50 % of the motorway network is equipped with this automatic traffic signalling system. This system detects (using loop detectors) changes in the speed of traffic flows due to accidents or other disturbances (congestion) and warns the drivers to adjust their speed to a safe level. This reduces shock waves in traffic flows, increases road safety while at the same time the road capacity is increased.

Fog warning system

Based on the before mentioned traffic signalling system a specific fog warning system was developed and implemented on spots that have reputation with regard to dense fog situations. The system detects reduced visibility, when the visibility level passes given thresholds a warning is given and the local speed on the motorway is automatically adapted.

Monitoring system

Along the entire motorway network a traffic monitoring system is installed. This system detects (using loop detectors) traffic flows (speed, number of vehicles and of which type (i.e. private car or truck)). The data from this system provides essential information for traffic management and traffic information services. The information is collected on a minute basis. Therefore the traffic centres have traffic information with a very small delay (ca. 1 minute); which can be broadcasted almost immediately. Apart from that statistical information is collected.

Dynamic Route Information Panels (DRIPS)

Dynamic route information panels (DRIP's) provide traffic information (queue lengths) about alternative route sections in the network. At some spots the DRIP's provide travel-delay times to the next important crossing. The panels are located above the road at strategic points in the network where drivers can make a choice between two alternative routes to their destination. Currently some 100 panels have been placed and the experience with them is quite good. After the instalment of the panels near Amsterdam, the congestion in that area dropped with some 30 %. Their return of investment rate is therefore very high. Drivers respond positively to the information panels. They appreciate the information on the panels (62%) more than the regular radio traffic information (52%).

The information with regard to travel-times on a certain road-section will be expanded and will in the near future be integrated in more panels.

Ramp metering

Ramp metering systems were implemented on several locations. This to optimise throughput of the motorway network during congested circumstances. The system detects whether the traffic flow coming from a ramp should be adjusted (using traffic lights) to optimise throughput on the motorway. Ramp metering is very interesting because they are quite cost effective (relatively low investment in relation to gain in traffic through put). Implementation of ramp metering however is difficult because there is an interaction needed between the Ministry and a specific municipality (location of the ramp) and it is not in all cases possible to line up the vehicles before entering the motorway.

Variable number of lanes

Recently a system was installed that enables the operators in the traffic centre to adjust the number of lanes that can be used; one extra lane normally being the emergency lane can be used during peak hour to optimise throughput at that specific location.

Special purpose lanes (trucks)

Several special purpose lanes were implemented to give priority to heavy good vehicles.

All traffic management systems are operated and maintained by the Dutch Ministry of Transport. The whole system (building, maintenance and operating costs) is financed with public funds. The costs of the transport telematics part of the system are very difficult to estimate because the works and budgets also include civil works.

Public Transport services

OVR

In 1992 a national service was set-up that covers all public transport modes (bus, tram, metro, train) which provides travellers with a door-to-door trip information service. At this moment the service is completely automated and can be reached by phone 0900-9292 (paid number) and through the internet (www.ovr.nl). It provides you with the optimal and alternative routes that are possible for your trip (including walking time to/from your first/last public transport point, connection times, travel time dependent on mode of transport (i.e. bus/train).

NS

The Dutch railroad operator provides a internet service for their network (trip planning).

In 2003 trials will start in several regions with contactless chipcards for payment of fares, as a replacement of the national “strippenkaart” now in use, which is a paper debiting card, which has to be stamped for use.

2.2 TTI research activities

Travel Star

A project has been started to add navigation functionality to the before mentioned (see 2.1) low priced RDS-TMC receiver. The idea is that if navigation functionality would be available at an affordable price that it would open a large market potential.

Travel time services

In the field of travel time services several initiatives are being developed in parallel.

The Ministry of transport has developed software (based on the data from the monitoring network) for the calculation of travel times of specific routes on the motorway network. The first version of this software has been implemented in 2001 and is now being tested with the partners of the TIC. The software modules will be refined in the coming period.

CMG has developed software for a travel time service based on the location of GSM users (they claim to have overcome the privacy issue). The software for this service is in the testing phase; discussion is going on for the implementation of such a service in several countries.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

1. From collective to individual information.

Traveller needs are by definition individual, new technologies provide interactive communications and therefore more individual services will emerge for which the traveller is (assumed to be) willing to pay.

2. Identifying market segments.

Different market segments need different information and different services. There is not a single product or service that can accommodate every individuals need. Passenger transport needs are different from goods transport needs. There is a marketplace for a variety of services and products. A proper market segmentation is invaluable.

3. Value added services.

Traffic and traveller information does not stand on its own. Future services will emerge which will also address other needs of travellers like parking, ticketing and reservation services. Rather than an information service a total mobility package might emerge.

4. Multi modal and door-to-door services

Most traffic information services are still transport mode oriented. In future one might expect more combined and integrated services which will address the needs and opportunities for multi modal door-to-door transport.

3.1.2 Technological (data acquisition and service delivery)

1. Use of internet technology

Traffic information services based on Internet technology have already evolved enormously over last couple of years but this will continue in the coming years; especially if mobile Internet becomes widely available.

3.2 Key obstacles to overcome

1. Balancing of risks in the information chain.

New and complex services often require high initial investments and can involve potential risks. The risk can vary enormously for each link in the information chain. Organisations in the chain do not like to accept the risk that other parties in the chain cannot fulfil their commitments (planning, required quality level, etc.), in consequence mutual agreement and commitment between the players is a pre-requisite. The introduction of new services are often delayed or cancelled for this reason. (think of the difficult process of the introduction of RDS-TMC services in Europe; chicken and egg problem: first receivers or first quality services).

2. Balances in public private cooperation.

New balances might develop in public private partnership, cooperation is vital when effectiveness and efficiency of addressing end consumer needs are at stake. Services become too complex for one organisation. Many require expertise that is available in the private sector. In the Netherlands this process is already years on its way, but process is slow and difficult. The Ministry can only play a role as an enabler or a facilitator and is not equipped or willing to start up operational services themselves. The private sector is needed for the operationalisation of services and for their specific knowledge of emerging technologies.

3. Market size.

The operation of new services is heavily dependent on what industry players are planning to do with respect to their marketing strategy (the introduction of new technology needs larger markets; therefore it is difficult to set up new services in a small market area). The Netherlands as a small country has very little or no influence on the marketing policy of (electronic or automotive) industries.

3.3 Major potentials to use

1. Use of GSM location data

Until now GSM location data has not been used as data supplier for traffic information services but research is going on to see in which way the privacy issue can be tackled. If such a data source would become available it could trigger the setting up of commercially attractive services (because of the large decrease of investments for the data collection infrastructure).

4 Annex

4.1 Key actors in TTI development

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- 5 <http://www.ovr.nl>
- 6 <http://www.ars.nl>
- 7 <http://www.travelstar.nl>
- 8 <http://www.tmc4u.nl>

- 9 NVVP; 2000; Ministerie van Verkeer en Waterstaat; The Hague
- 10 H.J. Stoelhorst; Actual traffic information in The Netherlands, an overview of experience and developments; Ministerie van Verkeer en Waterstaat; AVV; Rotterdam
- 11 Dynavision; Eindrapportage project Distributie Verkeersinformatie; The Hague
- ...

Norway

1 Institutional framework for TTI development

1.1 Legal and public policy context

1.1.1 TTI as a policy issue

Traffic congestion is an increasing issue in urban areas, and creates several problems. Not only travel delay, but also in terms of energy consumption and air quality. Even though the problems in Norway are small compared with large cities in Europe and the rest of the world, they are increasing. The utilities of the investments made in the road network of Oslo during the last 10 years are already almost exhausted by increased traffic.

A common way of relieving congestion has so far been to build more roads. This solution is becoming infeasible in urban areas, as the lack of space makes it impossible, or too expensive. The use of ITS in general and TTI in particular has been raised as a strategy to solve the problems. The activity in ITS is based on several strategic plans developed by the Norwegian Government and the Research Council of Norway as listed in [0]:

- National plan for transportation, Ministry of transport and communication [0].
- eNorway – ICT action plan, Ministry of trade and industry [0].
- R&D within fisheries, fish farms, ports and infrastructure for maritime transport, Ministry of fisheries [0].
- National strategy on ITS (pre-version), Ministry of transport and communication [0].
- A national R&D strategy for ITS, the Research Council of Norway [0].
- Better, safer and more efficient transport - by ICT, Ministry of transport and communication [0]

The main objective with this work is to increase:

- The safety in transportation
- The utility for the transport network users
- The utilisation of free capacity in the transport network

Concerning the implementation of the Commission Recommendation, little work seems to have been done to explicit fulfil the recommendation. Nevertheless some of the items are already fulfilled. The problem with congestion in Norway is rather limited compared to many other European countries, and the development of TTI services in Norway is still in an early stage. As explained later, a lot of work therefore still remains. Particularly with the regulatory framework for TTI services, but also on the specification and adoption of guidelines and requirements for TTI services and operators.

1.1.2 The role of public authorities

The public authorities involved in TTI are organised on four levels:

- National levels
The Ministry of transport and communication [0] has the overall responsibility for develop-

ment of the transport and infrastructure for all modes. The practical work for each mode is managed by the different government departments:

Road transport:	Norwegian Public Roads Administration ("Vegdirektoratet"), [0]
Air Transport:	Norwegian Air Traffic and Airport Management ("Luftfartsverket") [0]
Rail transport:	Norwegian National Rail Administration ("Jernbaneverket") [0]
Sea transport:	Norwegian National Coastal Administration ("Kystverket") ¹⁷¹ [0]

They are all distributing TTI through national channels such as radio, TV, WEB and Phone services.

- **Regional level**
Five Traffic Information Centrals (TIC) covers a region that consists of several counties. Their main channel for TTI distribution is through a phone service (Call 175 for private transport [0], and 177 for public transport [0]).
- **County level**
Each of the 19 counties in Norway has a local department of Public Roads Administration, which is responsible for data collection in each county¹⁷².
- **Municipality level**
At local level not much TTI is neither collected nor distributed by the public authorities. Most of the traveller information given at this level consists of public transport information given by the local public transport companies. In addition, some cities give parking information (Free space and VMS with guidance to nearest free parking space).

Public authorities do also act as a transport operator, as they are the owners of several bus companies and the National State Railway (NSB). Most of these operators offer TTI services on web or as phone service, with information on timetable and major delays. Some does also provide a trip planner on web. NSB does also provide this information as a SMS service [0].

In some regions the operators has co-operated and funded companies to deal with traveller information. E.g. "Trafikanten" in the county of Oslo and Akershus [0]. These companies provide TTI for all the operators in the region.

1.1.3 Information chain and ownership of data

Generally data collection is mainly handled by the infrastructure owners. The rest of the information chain is handled by both infrastructure owners and service providers, even though the contribution from the infrastructure owners usually decrease as you approach the end of the chain.

For public transport the TTI services are in most cases handled entirely by the public transport company.

Data ownership and the public authorities position as data provider is currently under discussion. This is particularly important for services providing real time information on travel-time, delay etc.

¹⁷¹ Public transport at sea is administrated by National Public Roads Administration

¹⁷² The organisation of Public Roads Administration is currently under revision, and from 2003, 5 units at regional level will replace the 19 county offices. Each regional unit will be divided into smaller local units.

1.2 Role of the private sector

In Norway no private infrastructure owners such as motorway operators exists, and hence private companies relation to TTI is as service providers or transport operators.

Service Providers

A few service providers exist, which are either telecom companies or commercial radio stations. The telecom company (Telenor Mobil) offer TTI as one of their commercial services. Several local and commercial radio stations offers frequent traffic information in their programs, especially during peak hours. P4, the only nation-wide commercial radio station has developed their own traffic central, where calls from drivers reporting on events and traffic condition is the main data source in addition to their traffic helicopter which is in every day during peak hours.

Transport Operators:

Several of the private bus companies offer a TTI service, which includes timetable and messages on major delays. This service is available on web, or as a phone. The private operators do also take part in the co-operated travel information companies mentioned in chapter 1.1.2 above.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 Traffic Info Gardermoen

Traffic Info Gardermoen was the first TTI service that presented travel time information in real-time on Internet. The service was implemented for the main road between Oslo and the new airport at Gardermoen [0, 0, 0].

The system was requested by the Ministry of Transport and was part of the traffic management plan developed for the opening of the airport in 1998. The project was also part of the R&D project "Dynamic data for Road Transport" being partly financed by the Norwegian Research Council.

The service was very successful with a lot of users, including several radio channels, the first 1-2 years. The service is currently down for maintenance. Because of lack of congestion and money for maintenance, the service is expected to be re-opened in a simplified version.

2.1.2 RDS-TMC

The RDS-TMC service is currently under development. A pilot programme is scheduled for summer 2002. The event list is translated into Norwegian, and the reference network for the test site (Oslo and adjacent counties) is coded.

Since RDS-TMC is operational in most other countries in Europe, an implementation in Norway will complete the network. Norwegian users will immediately gain additional benefit of their investment in new receivers when travelling in other European countries. This is expected to increase the potential for RDS-TMC to become an important channel for distribution of traffic information and messages. [0]

2.1.3 Dynamic TTI messages

During the last two years, new channels for distribution of TTI have been developed. One option lets the travellers subscribe to TTI messages by SMS [0]. The last two options include

TTI on WEB and WAP [0]. While the SMS service is commercial the WEB and WAP services are free. Messages gives all types of traffic information, e.g. accidents, congestion and weather conditions. Data are collected from phone calls from drivers, Police and Public Roads Administration, but in very little extent from detectors and sensors.

This service is important because it is among the first who comprise a public private partnership for collection and dissemination of TTI. It is also one of the first services that systematically collects and analyses data from different sources. Previously, only information from Public Roads Administration were available. Either by a WEB-service, or by calling 175. The latter connects the user to a regional TIC. The service at 175 is still in operation.

2.1.4 TTI for public transport

Several TTI services exist for public transport. Most of these are provided by each individual PT company, and gives information about their own routes only. The most common service is to give access to timetables on WEB [0, 0, 0, 0]. Some companies, as the Norwegian State Railway (NSB) gives in addition information about delays and changes in timetable [0]. NSB does also offer electronic timetables as an SMS service[0]. Norwegian Air Traffic and Airport Management gives similar information for some main airports. E.g. at Oslo airport Gardermoen [0]. Information on delay on main railway routes and air services are also given on teletext.

A few multi-modal services exist. E.g. "Trafikanten" [0] which has a WEB and WAP-service that contains a route planner and timetables for all PT routes in a regional area. The service is also available by calling 177, which will connect the user to the regional PT information office.

Trafikanten is the local partner of the national "Ruteopplysningen 177" [0], an association of PT companies and others who distributes PT information. Trafikanten is funded by Oslo og Akershus Trafikkservice AS, which is a private company own by the PT companies in the region.

2.2 TTI research activities

2.2.1 ARKTRANS

The initial phase of ARKTRANS started in August 2000, and the main phase started in 2002. SINTEF Telecom and Informatics is leading the project which is financed by Norwegian Public Roads Administration (NPRA), Norwegian Coastal Administration, Norwegian Civil Aviation Administration, Norwegian National Rail Administration, Norwegian State Railways and the Research Council of Norway [0, 0].

The objective of ARKTRANS project is to establish a system framework architecture that provides a framework for the design, implementation and operation of information systems for inter modal transport. In addition to harmonisation between transport modes, it has been identified a potential for harmonising of freight and public transport.

Currently a national ITS architecture does not exist in Norway and this research will make development and implementation of TTI services easier and more consistent. Hence this project is linked to several of the other projects listed below.

2.2.2 IBIS

IBIS (Integrated Payment and Information Systems) is the name of the Norwegian part of the EU project PROGRESS, started 2001. The project is funded by Norwegian Research Council, Norwegian Public Roads and the GROWTH-program in the 5th framework of EU.

The main objective in IBIS is to show how integration of multi-modal information and urban pricing can be used for demand management [0]:

Good information will be a crucial point for the success of an urban pricing scheme. The users must have full information on all the available travel services. From local studies we know that the overall knowledge about other transport services than those regularly used is rather poor. Travel information is more important for public transport than for individual transport, but with dynamic urban pricing the user charges may differ during the day for all users. An upgraded information system is therefore necessary. Before the PROGRESS-demonstrations, the city of Trondheim will invest in a newly designed travel information system. Travel information will be distributed in real-time through Internet, mobile phones (SMS and WAP), information displays and information kiosks in city centre. During the demonstration period all the services will be offered for free, but in the final solution some of the services are suspected to be commercial pay-services.

2.2.3 ICT in Road Traffic

This project is in the completion phase, and has developed the services described in chapter 2.1.3. The project has gained much and useful experience on co-operation and data flow between different partners in the information-chain for TTI service provision. Real time information from several sources (Public Roads Administration, Traffic surveillance helicopter, police, ambulance, fire department, radio stations and road users) are collected, filtered and distributed to road users by cellular-phone, SMS, WAP or as pre-trip information on Internet.

The Public Roads Administration, police and road users observe and record incidents on highways, roads and city streets. The first challenge was to systemize all the information and to send it back out to the road users. This work involved establishing reliable data acquisition routines, and integration in a centralized database. In the first phase of the project resources was directed towards communication procedures and internal standards for data communication between all the involved information sources and the central telecommunication database.

The project has also focused on the safety aspects of TTI. One of the main goals of the project was to convey information in a safe and user friendly way. Text messages on SMS or WAP is not the solution for in-vehicle information if a driver has to focus attention on small cell-phone displays, but this can serve well as a source for pre-trip

information in addition to Internet. When it comes to driver distraction and interaction when driving, voice input/output is a very promising technology. Controlling ICT-services through voice commands let the driver navigate the system through an “eyes-free” interface. The system responds using speech synthesis, permitting the driver to concentrate on driving. The advanced driving simulator at NTNU/SINTEF has been used to test and develop user friendly and safe interfaces. [0]

2.2.4 DynamIT

DynamIT started in 2002, and is lead by SINTEF Civil and Environmental Engineering. The project is financed by NPRA, Bravida GeomatikkAS and the Research Council of Norway.

The main goal of the project is to develop value-added TTI services, and DynamIT will be a successor to “ICT in Road Traffic” and “Traffic Info Gardermoen” listed above. While the past projects have concentrated on data collection and data distribution, a special effort will this time be put into data processing, analyses and short-time prediction. In addition different models for private public partnership (PPP) will be developed and evaluated. Two demonstrators on different test sites will be established for testing of different detector technologies and algorithms. Among these are the use of AVI technology for estimation and prediction of travel time, taking advantage of the new standardised AutoPASS tags that have been in use since the end of 2001.

It is presumed that if the test site installations become successful, they will be permanent installations that will be further expanded and developed in the future.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

- *Quantitative road traffic information*
Today, most of the information given describes various events such as congestion, accidents or road closures, but without any quantification of suspected delays. Currently development of services with quantitative information such as estimated and predicted travel time is going on (E.g. in DynamIT, See chapter 2.2.4)
- *Integration and interaction between public and private partners*
It has been realised that PPP is necessary for development of efficient TTI services. Organisation of PPP is one of the sub tasks in the current project DynamIT (See chapter 2.2.4).
- *Inter-modal services*
Today most of the services available are for single modes. Inter-modal services will make it easier for the travellers to use different modes for their trips (E.g. IBIS, See chapter 2.2.2).
- *Incorporation of new types of information*
Several projects at the National Public Roads Administration (NPRA) have the objective to integrate different types of dynamic data that could be of interest for the travellers. Typically such as weather condition, pollution and road condition. As a part of this work NPRA has recently carried out a possibility study "A common system for dynamic data" [0].

3.1.2 Technological (data acquisition and service delivery)

1. *TTI on mobile units (WEB --> WAP / SMS / PDA)*
In order to increase the value of the information, more dynamic and on-trip information is asked for. This makes it necessary to develop solutions for mobile units such as e.g. WAP, SMS, PDA and in-vehicle navigators. Chapter 2.2.3 describes some of the recent work on this topic.
2. *Personalised services*
By making the services more personalised, in opposite to the more general information currently available, you will increase the value for the travellers.
3. *Use of toll-tags for collection of travel time information*
Most of the largest cities in Norway have got toll-rings, using electronic toll-tags. The NPRA wish to take advantage of this in the collection of travel-time information.
4. *Map-based services*
Bravida Geomatikk are involved with several projects that aims to develop map based solutions for TTI. This will possibly make the information more accessible.

3.2 Key obstacles to overcome

1. *National ITS-architecture*
The absence of a national ITS-architecture makes it difficult to develop and implement new

TTI services. Work on this is currently going on in the ARKTRANS project (See chapter 2.2.1).

2. *Public authority role as data supplier*

Lack of decision on the public authority's position as owner and supplier of traffic information data makes it difficult for the private actors in the development of new TTI services.

3. *Maintenance of TTI services*

Organisational and financial questions on how to operate and maintain on-line TTI services must be answered, and the role and responsibility of the different actors in the value chain must be clearly defined. Today some successful TTI services have been shut down, partly because of lack of money for maintenance.

4. *Protection of privacy*

By the introduction of new services and technology, it will be important to take care of the privacy of travellers. The laws in Norway are strict in this area, and the data inspectorate was set up in 1980 to ensure that personal data are processed in accordance with fundamental respect for the right to privacy [0].

3.3 Major potentials to use

1. *TTI on major parts of the network*

Establishment of dynamic TTI services that covers the major roads in the main cities has a great potential of increasing the efficiency and benefit for all users of the network, and possibly also reduce the need for investment in new roads.

2. *Use of existing toll-tags in collection of travel time information*

The market level penetration of toll tags are as high as 80% in some cities in Norway. This implies that the use of toll tags for collection travel time information has a great potential.

4 Annex

Key actors in TTI development

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Norwegian National Rail Administration, www.jernbaneverket.no/english

Norwegian National Coastal Administration, www.kystverket.no

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Poland

1 Institutional framework for TTI development

1.1 Policy context

The present central government structure is promising the development of ITS and, more specifically, TTI. After the last election 3 ministries (dealing with transport, communication and building sectors) have been merged and a new Ministry of Infrastructure has been established. Among others, it took over all functions formerly being under a responsibility of Ministry of Transport and Maritime Economy. It is now also responsible for all matters concerning telecommunication. Consequently, now the future of ITS and TTI is in one hands. New government also merged former Public Roads Directorate (GDDP) and Agency for Motorway Construction and Operation (ABiEA) into the General Directorate of National Roads and Motorways GDDKiA.

The new government formulated an action plan for the development of infrastructure, which was presented in the document *Infrastructure - key to development* (part of the new economic strategy adopted by the Council of Ministers on 29 January 2002). Several points of this document are relevant to the **telematics** topic and, more specifically, to the topic of this report. One of the objectives of the new strategy is the creation of an **Information Society**.

Another document accepted by the Polish Government (in 2001) called *e-Poland* –, contains 13 points concerning telematics. Some of those points include plans of development of TTI systems. For example, it is stated that national telematics architecture should be developed by 2003. It also includes plans of the development and wider use of Internet, GSM solutions and RDS system. Among the main tasks there is a creation of a Central Transport Database. The document *e-Poland* has been based on *e-Europe* document and includes details of a government strategy to development the Information Society until 2006. It lists the main projects, which should be implemented, possible financing sources and entities responsible for their implementation.

Despite the positive recent progress in the sphere of high level policy, ITS and especially TTI implementation are not yet generally comprehended as an urgent necessity in the Polish transportation sector. The main attention is (naturally) being turned to the legal and institutional preparation for EU accession and to the maintenance and development of basic transport infrastructure.¹⁷³

Although mobility management has not been mentioned, it is obvious that the accelerated development of information technology (IT) may bring about considerable improvement in TTI systems and changes in travel behaviour. In particular, this concerns mostly parts of the transport system, which are under the central government supervision, such as national road network.

Unfortunately, the scope of responsibilities of the central government does not include regional and local road and public transport systems. At the beginning of the transition period, the State has moved from the system of extreme centralization to total decentralization and, in case of public transport, deregulation. It has totally withdrawn from its role as an owner, financier and supervisor of urban transport. Left alone, cities had been forced to solve emerging problems individually, without any assistance, for example in the form of guidance, dissemination of knowledge or financing research and development works relating to local problems. This gap

¹⁷³ paragraph from PST/ITS report

has been partially filled up by associations of cities, metropolitan areas and urban transport companies. Nevertheless, the present legal/organizational structure does not form a positive environment for implementing telematics and, more specifically, TTI at the local level.

At the local level, there is variety of organizational structures and division of responsibilities. In some large cities and agglomerations, public transport authorities, responsible for organising public transport services, have been established. Services are provided by one or more operators (generally municipality owned companies but in the growing number of cities also private operators). In these cases, provision of TTI is controlled by the authority, which either builds one central system and/or assigns responsibility to operators. In other cities operators are responsible for TTI. Although there is a growing understanding that advanced systems of TTI are among crucial criteria of public transport quality, development of these system is not on the top of priority lists due to financial difficulties.

Road TTI should be funded on the national level, regions or local municipalities, but none of these institutions has it as an investment priority.

1.2 Role of the private sector

As in most countries of the region, the role of the private sector is in designing, providing, operating and maintenance of ITS. The situation of the private sector in TTI activities is very difficult not only because of the so far limited willingness of the public sector and transport operators (both public and private) to invest in the TTI area. In addition, there are legal barriers. The possibility of necessary data acquisition for TTI systems is very limited. According to the Polish law, private companies cannot install their own equipment within a public road corridor. The other problem is a lack of regulation on commercial usage of data collected by public institutions. Finally, private transport companies are rather in the first stage of development, so they do not concentrate on development of TTI services.

One of the chances for private sector to take part in developing and providing TTI services is usage of public-private-partnership (PPP) structure. In Poland it has been so far used only in the Motorways Development Programme and there are some attempts at its implementation on other road projects. Wider application of PPP structures could not only bring necessary funds but also create a possibility of more commercial usage of a public database. In that case the database would be the public sector share in projects financed via the PPP model.

2 TTI service implementation and research

2.1 State-of-the-art for TTI services

In the private and public sectors in the transport sector, access to and ownership of computers, internet and GSM mobile phones is now widespread.¹⁷⁴

2.1.1 Intercity Roads

Information via Internet on the GDDP Web Site.

This web site (www.gddp.gov.pl) was created by the former General Directorate of Public Roads (GDDP), which is a part of a new General Directorate of National Roads and Motorways (GDDKiM - see point 1.1) since 1 April 2002. Besides usual information on activities, structure and contact details, it includes a part that is useful to travellers and can be regarded as TTI

¹⁷⁴ summarised from PST/ITS Technology report

solution. That part includes information on current situation on national roads. Providing precise and dynamic information was enabled by implementation of two GDDP projects "Winter" (ZIMA) and "Traffic Disturbance - Road Works" (Utrudnienia). Both of them based on the information gathered from all local branches of GDDP (via telephone or internet). First service provides information on road condition during the winter period. Second one provides data about road works and closures and accidents/incidents with longer-term impact on traffic conditions. Information is presented on maps and in tables and is divided into five sections: map on weather conditions, map on road conditions, map on pavement condition, tables with description of the nature of disturbance and other messages of GDDP (presently GDGKiA). Together with information on road closure it is possible to get information on suggested detours. The same information can be obtained during a trip by telephone.

The other application, which is currently introduced by GDDKiA, is installation of about 100 VMS signs providing real-time information. So far, this has been limited to:

- (a) signs informing about air and pavement temperature
- (b) signs informing about the speed of the vehicle, reacting on non-compliance with sectional speed limits
- (c) movable VMS informing about the temporary traffic disturbances caused by road works and other occurrences. All these are used in limited numbers and only on major roads. Plans for using VMS on toll motorways are described in the following point.

Central database

In 2000, the Polish government set up a program, which aimed to create a central database for all major components of the parts of transport. The work has started from roads, specifically from road inventory and data collected from meteorological stations. It is expected that this database will be used for TTI purposes.

Motorway Development Programme.

The national Motorway Development Programme, which envisages construction of 2600 km modern motorways include plans of the development of TTI solutions. It has been assumed from the beginning that motorways will be built with wide application of advanced telematics solutions. Since toll motorways are to be built and operated by the private concessionaire, the operator of motorway is responsible for introduction of modern traffic management systems and among others introduction of VMS signs. The first VMS are to be installed on a section A-4 motorway between Kraków and Katowice (61 km). Stalexport S.A., a concessionaire, is expected to introduce the system this year, however - due to some financial problems - there may be some delay. All telematics solutions introduced by Stalexport come from Kapsch company.

Autostrada Wielkopolska S.A, concessionaire for the section of A2 motorway (Western border of Poland to Konin - 150 km) will also install advanced TTI system on this section, which will be operated by this company. Other concessions, which are currently being negotiated, also contain TTI solutions. However it is possible that - because of difficulties with implementation of the BOT system in the development of motorways - the new government will select another system of the programme implementation. Consequently, it is not clear yet who will be responsible for the introduction of TTI on other sections of motorways in the future.

Unfortunately, there are no TTI systems on roads of lower category (below national roads) except traditional radio information (messages emitted by public and private radio stations) based on limited information obtained from various sources. Some stations are cooperating with taxi-drivers, which provide information on congestion in systematic way.

2.1.2 Urban roads

As it was described in chapter 1, local governments manage urban roads. Currently, according to the knowledge of the authors of this report, none of Polish cities installed an advanced system of traffic management, which includes TTI functions. This does not mean that there are no urban traffic management centres (managing traffic signal control) but they still not cover the whole city area and do not have TTI sub-system. One of the most advanced systems was installed in the centre of Poznań (financed through the EUREKA programme). It, uses dynamic centralised flow optimisation, which could provide good basic data for TTI.¹⁷⁵

In fact, several cities have started developing advanced complex traffic management systems. In Warsaw, the City Council decided that a Central Traffic Management System (CEZAR) will be installed. According to the project, the system will be built of 3 sub-systems: signal traffic control system (over 400 intersections), traffic management on major roads (expressways and semi-expressways) and the Traffic Management Centre. The system will monitor traffic (including detection of incidents and reaction) and provide information for travellers using the media (radio, internet, etc.). The system is to be implemented as a turnkey project and the tender is now in the second - final stage. Three leading international companies specialising in systems of this type have been selected. It is envisaged that the first phase will be operational in 2004. This will mean an advanced traffic management centre within a few years, which will perform TTI function in its most advanced form.

Similar projects were initiated in other Polish cities, for example Szczecin.

At this point, an ambitious initiative of the private sector has to be mentioned - TTI services on Internet web site: www.korkonet.pl (ang jamnet). This service (see service profile) provides information on situation on Warsaw streets. It uses digital cameras, located in points of Warsaw central area where traffic congestion situation is usually most difficult. On the main page there is a map with schematic plan of Warsaw streets with marked position and direction of cameras. So far there are 21 cameras installed. Pictures are refreshed every minute. Obviously to finance this service, web site is used for advertising. The site is developing quickly into serious project. On the same page user can find links to public roads and public transport information, city maps and information on situation on cross borders. To attract the user, information about location of automatic speed controls and ticket controls in city public transport are offered. In the second phase of development, the company started offering information on traffic conditions through an SMS service. The user has to subscribe to that service on special web site. He can choose up to 10 routes within Warsaw borders. To get the information on the situation on one of them he sends an SMS to a special number. Subscription cost is low (around 2 EURO per month) and for that price the user can get up to two messages a day. Currently all three GSM operators provide that service. Generally, the "korkonet" site is very well designed and in a short time has become very popular in Warsaw.

2.1.3 Public transport

At present, the traveller has the possibility to use traditional ways of informing himself about trip time, cost (price), comfort of travel (class of vehicle), connections and additional services, e.g. luggage transport, insurance, booking of places. This can be done at stations, information kiosks, by phone, and by internet.¹⁷⁶

Polish Airlines - LOT

¹⁷⁵ Poznan case from PST/ITS report

¹⁷⁶ paragraph from PST/ITS report

Polish Airlines - LOT provides standard information service on its web site (www.lot.com.pl), including booking and ticketing.

Polish Railways (PKP) web site

One of the first more advanced TTI applications in Poland was a web site of the national railway operator PKP (www.pkp.pl). On that site, besides usual options such as general information about the company, timetables, fares, etc. the user is provided with a trip planning option. This service finds connections between chosen cities in Europe and gives a possibility of finding optimal routes. That option is based on a solution developed by the German Rail Operator (DB). The second option worth mentioning is ticket booking. PKP also offers a wap version of the site <http://wap.pkp.pl> with a trip planner function. Both services are clear, logical and easy to use, even to people with limited skill in the use of the internet.

Public transport in cities.

As was described in point 1.1, independent councils govern cities and there are a variety of solutions applied. The situation in introduction of TTI solutions in urban public transport can be characterised using the example of Warsaw ZTM. The Public Transport Authority provides the main information on local transport services. Pre trip information can be obtained from a call centre or web side (www.ztm.gov.pl). That web site is divided into seven parts. The most interesting section is on timetables. A new version, which is now running as a trial, has more advanced solutions and there is a route - finder option. After choosing origin start and destination points and setting other requirements, the user gets all sensible routes with the other necessary information such as walking distance and travel time. The ZTM site is moving in a very promising direction. Regarding the on-trip information, there are two services provided: (a) a wap service, which provides information on timetables, and (b) real-time information provided on board in Warsaw trams and buses by operators. The system is currently under development and the service (electronic sign boards and voice) is provided only in newer vehicles.

So far, information provided on public transport stops is limited to printed timetables. The situation in other Polish cities is similar to Warsaw. At the end of 2000, information via internet was provided by all transport authorities and 40 % operators. More advanced dynamic information is provided only in newer vehicles. Advanced systems of real-time on-stop information are designed mainly for tramway lines, which are to be upgraded (Katowice, Lodz, Warsaw).

Payments systems are also becoming a promising information medium. Electronic municipal cards were implemented in Warsaw in 2001, which allow payments by smart-card in urban transport¹⁷⁷. An advanced system of fare collection with the use of contactless cards (electronic purse) was also implemented in Kalisz in 2000.

2.1.4 Freight transport

Advanced methods of transport logistics are applied in a growing number of transport companies, especially larger ones. Among others, they are using available software and databases such as MAPINFO, which is now delivered with detail maps for most areas. Various tools are used for optimal planning of routes, including distribution/delivery services. Some larger companies are building their databases.

2.1.5 Inter-modal transport

Delivery of inter-modal information on door-to-door transport is still not available at present (with the exception of walk-PT combination in the trial ZTM route finder described above) mainly because of the low level of co-operation at the operating level between transport mode-

¹⁷⁷ paragraph from PST/ITS report

sHowever there are more and more examples of co-operation on integrated PT services, which may well raise the level of information at least within PT systems.¹⁷⁸

2.2 TTI research activities

Several Polish universities and research institutes are developing research and education in the area of telematics, more specifically, ITS and its part - TTI. There are two groups of schools, which are more active: transport departments at technical universities and departments dealing with logistics in economic schools. Unfortunately participation in EU projects dealing with ITS is so far limited. TTI services were dealt within the QUATTRO project (4th Framework Programme) in which the co-author of this report participated.

Generally, at this stage, most attention in research and education is directed to traffic management (railways, roads, air and sea transport). For example, at the 1st International Conference on Telematics in Transport (Ustron, 14-15 November 2001) only one of 19 papers was devoted to TTI matters.

3 Key Issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

Growing motorization and congestion directs attention of the public and mass media to all ways and measures of improving the efficiency of the transport system. Among them advanced methods of TTI are gaining a stronger position.

At the state level, there is evidence that the climate for the deployment of ITS, including TTI services, is positive. It has been reflected in the last documents and declarations concerning building the Information Society and priorities in transport policies.

Much credit for this shift in policy can be given to the pressure of EU policy and activities stimulating ITS development in Poland, e.g. the initiative eEurope+¹⁷⁹ The Ministry of Infrastructure has appointed a new team at the beginning of 2001 to deal with information society technologies, which will overlook the implementation of TTI and the Polish Telematics Association in Warsaw has been established to help co-ordinate telematics development between public and private sector. Both teams will help drive the implementation process.¹⁸⁰

In the area of Public Transport, the growing pressure for quality alternatives (PT systems) in the face of rapidly increasing traffic congestion will prove a strong driver for development of advanced information services that satisfy the travellers information needs.¹⁸¹ In fact the positive response of targeted groups (passengers) to advanced real-time information services in local public transport (trams and buses) means that local governments are attaching growing attention to these services.

Private sector offers practically whole spectrum of technological and software solutions available on the global market. Among various initiatives, real-time information on traffic conditions

¹⁷⁸ paragraph from PST/ITS report

¹⁷⁹ from PST/ITS report

¹⁸⁰ from PST/ITS report

¹⁸¹ paraphrased from PST/ITS report

in Warsaw (www.Korkonet) provided without any financial support from the public sources deserves special attention as it demonstrates willingness and potentials of the sector.

3.1.2 Technological

The Motorway Development Programme, which envisages application of advanced ITS technology (monitoring, VMS etc.) will inevitably accelerate deployment of TTI on roads in Trans-European Helsinki Corridors. It will start with the A-4 motorway.

In urban areas, the installation of first central traffic management systems (such as CEZAR in Warsaw - see point 2.1) will most likely have a great impact on other cities.

In urban public transport, deployment of advanced TTI services will be accelerated after development of advanced vehicle location systems, which are to be installed by many operators. Among others, it will enable real-time information on PT stops.

3.2 Key obstacles to overcome

In Poland, as in other transitional economies, priority in national and local transport policies is still given to capital-intensive infrastructure projects. While investing in "software" solutions proved to be much more efficient and effective, it is still difficult to get interest of policy-makers in this direction. Some positive signals have been described in earlier points. Generally, more finances resources should be allocated to ITS/TTI, including research and education (see point 3).

TTI services are provided within transport sub-sectors without co-operation between these sub-sectors. Institutional bridge should be created by the state, which could help to promote and develop inter-modal TTI services.

There is insufficient co-operation of all group and entities: universities/research institutes, public and private sector and associations such as PST, SITK etc. Chamber of Urban Public Transport (IGKM) can serve as a positive example of co-operation between various partners, which lead to the progress in the efficiency and quality of urban transport.

Knowledge of ITS/TTI potentials is limited. This has to be improved through adjusting programmes of education at universities and, first of all, the development of continuing education.

Legal environment limits data collection and use. Questions of data ownership and access to publicly owned data should be clarified. Private sector should have possibility to provide TTI services in co-operation with traffic management systems.

There is still a lack of general and standard concept of implementing ITS systems in the transport sector, with the character of a government document (strategy and national architecture).¹⁸²

3.3 Major potentials to use

Extremely rapid development of telecommunication.

Computerisation of the society and the growing number of internet users.

Declared intention of the central government to build the Information Society and make wide use of ITS solutions.

¹⁸² from PST/ITS report

As was mentioned earlier, private sector offers practically whole spectrum of technological and software solutions available on the global market.

4 Annex

4.1 Key actors in TTI development

In addition to 3 persons listed in the PST report, the following persons can be considered as key actors in TTI development.

Persons marked *) should be considered as subject to confirmation because of structuring new established GDDKiA

1	Institution name / position	ITS Technology Tomasz Krysiak / President of ITS Technology, President of Scientific Foundation „Obecność”
	address	ul. Jagiellońska 21/97, 05-120 Legionowo
	phone	+48 0602559874
	fax	
	e-mail	itstechnology@wp.pl
	involvement	Main decision maker in development of telematics
2	Institution name / position	Polish Telematics Association Piotr Jaglak / President of PST, V-president of Scientific Foundation „Obecność”
	address	ul. Szpacza 2, 04- 238 Warszawa
	phone	
	fax	
	e-mail	itstechnology@wp.pl
	why suitable	active in all areas of ITS development and head of ITS association
3	Institution name / position	Polish Telematics Association Kazimierz Bartczak / V-president of PST, advisor of Polish Minister of Infrastructure in area of ITS Institution
	address	ul. Szpacza 2, 04- 238 Warszawa
	phone	
	fax	
	e-mail	kbartczak@mtigm.gov.pl
	why suitable	renowned expert in ITS area in Poland
4	Institution name / position	Mr. Włodzimierz Bilski*) Deputy Director,
	address	ul. Wspólna 1/3, 00-921 Warsaw, Poland
	phone	+48 22 6284909
	fax	+48 22 6219557
	e-mail	wbilski@gddp.gov.pl
	why suitable	responsible for the development and TTI on national roads
5	Institution name / position	General Directorate of National Roads and Motorways Mr. Stefan Sarna Head, Motorway Infrastructure Division
	address	ul. Chalubinskiego 4/6, 00-928
	phone	+48 22 6294048
	fax	+48 22 8300584
	e-mail	asarna@abiea.pol.pl
	why suitable	Responsible for deployment of ITS solutions on toll motorways
6	name	Prof. Jan PIECHA
	position	Profesor
	institution	Institute of Transport, Silesia University of Technology
	address	ul. Krasińskiego 8, 40-019 Katowice
	phone	+48 32 255-4885 ext. 330

	fax	
	e-mail	piecha@polsl.katowice.pl
	why suitable	One of leading researchers promoting ITS deployment
7	name	Mr. Stanislaw Karasek
	position	Vice-President
	institution	Chamber of Urban Public Transport (IGKM)
	address	ul. Woronicza 27, 02-640 Warsaw
	phone	+48 22 8482101
	fax	+48 22 8482102
	e-mail	igkm@igkm.com.pl
	why suitable	IGKM has 212 members, incl. 130 operators and 16 transport authorities, research and private sector entities. Mr. Karasek is responsible for the promotion of new technologies.
8	name	Dr. Jerzy Suda
	position	Adiunct
	institution	Transport Department
	address	ul. Koszykowa , Warszawa
	phone	+48 22 6607585
	fax	
	e-mail	j.suda@wt.pw.edu.pl
	why suitable	Since many years lecturer and consultant specialising in ITS
9	Name	Mr. Adam Bremer
	position	Administrator of PKP web site
	institution	Polish Railways (PKP)
	address	ul. Szczesliwicka 62, 00-973 Warsaw
	phone	+48 22 5249215
	fax	
	e-mail	a.bremer@pkp.com.pl
	why suitable	responsible for web site which is crucial for TTI in Poland
10	Name	Mr. Krzysztof Szalwa
	position	President
	institution	E-monitoring Sp. z o.o.
	address	ul. Przemysłowa 30, 00-450 Warsaw
	phone	+48 22 4552400
	fax	+48 22 4552401
	e-mail	korkonet@korkonet.pl
	why suitable	President of a innovative private company providing real-time information on traffic condition through internet and mobile phones (SMS service)

3.4 Sources and references

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Portugal

1 Institutional framework for TTI development

In Portugal TTI services had been developed along the last decade. This development has been done by the Central and Local administration, by public / private partnerships, by public and private operators, and by infrastructures managers. Although this development is conditioned by restriction of funding, and need more co-ordination for the interoperability of solutions and more research.

On the one hand, the administration concedes some subsidies for new technologies to PT operators, but not sufficient envisaged all new ITS tools in these fields. On the other hand, private operators are commercially oriented and therefore minimise their costs, inhibiting higher investments without direct and immediate profit.

The desirable articulation of the sector, more funding and a better and more generalised dissemination of good results, can encourage better and more the implementation of ITS and particularly TTI.

This progressive and further articulation is important regarding the existence of different ministries and institutions with responsibility in the field of transports. With the existing structure it becomes difficult to co-ordinate the system and arrive to articulate and interoperable solutions. For this reason some progress are ongoing as for example the Transport Metropolitan Authorities in the main areas and the recent conclusion of the study for the strategic guidelines for road passengers transport sector

Some other networks articulating different public and private entities had been developed such as for example: - RAIAR (Rede de Acesso à Informação de âmbito Rodoviário - Access Network to Road and Vehicle Information) that concerns in a communication network that allow the different entities of the road sector to have the information that his own activity needs; - SIST (Sistema de Informação sobre Transportes - Information System about Transports) the first phase of this project that aggregate all the statistic information of the sector is now accessible at internet; - SAIT (Sistema de Acesso a Informação de Transportes – Access System to Transport information) cohids makes information available in real time to entities that fiscalize the sector concerning operator, driver and vehicles by mean of mobile with wap and internet.

Regarding the situation and complexity of the implementation of the EC Recommendation of 4th July 2001 on the development of a legal and business framework for the participation of the private sector in deploying TTI services, for the moment it was not possible to stabilise the time table and identify the steps done about the implementation of that Recommendations.

This issue only concerns TTI development. Besides some important projects have been developed with applications of ITS in this domain but they don't concern this kind of information.

1.1. Legal and public policy context

Although some successful public private partnership had been done to develop TTI services currently there is no legal framework that defines the participation of the private sector in the deployment of telematics-based traffic and travel information services in Portugal.

As regards road traffic, data collection is carried out by the Traffic Control and Information Centre (CCIT) of the Portuguese Road Institute (IEP), which belongs to the Ministry of Public Works, Transport and Housing (MOPTH), by the road concessionaires and by the City Councils.

For City Council roads, the main Portuguese City Councils have its own traffic centres with, for the moment, no inter-link with the CIRPOR.

For national roads, including IPs (Itinerário Principal – Main Route) and ICs (Itinerário complementar – Complementary Route), without concessions, data collection is done by CIRPOR.

For concession roads, data collection is carried out by the concessionaire, which has the obligation (according to a protocol) to make this information available online to CIRPOR. (Control e Informação de Tráfego Rodoviário em Portugal – Control and Road Traffic Information in Portugal). However, CIRPOR has the right to install their own data collection equipment on concession roads.

IEP is responsible for the road equipment instalment and therefore every type of equipment to be installed (even in the Concession Roads) has to have its project approved by IEP.

Road equipment is owned by the respective Concessionaire, City Council or IEP.

It is planned that CCIT of CIRPOR becomes the sole data processing centre giving information about traffic and that City Councils and concessionaires only make information available to CCIT

As far as the relation of CIRPOR with other authorities is concerned, it has to be underlined that CIRPOR has a permanent police officer to ensure that accidents are solved quickly and with the most appropriate equipment and staff.

The rail transport sector also has Traffic Control Centres (CTCs) to manage traffic data of the Portuguese rail network. They are owned by the National Railway Infrastructure Manager (REFER).

The air mode has a National airport manager (ANA - Aeroportos de Portugal, S.A. - Portuguese airport operator), which collects data on flight departures and arrivals, making it available to traveller through different TTI services.

Regarding urban public transport, data on timetables, arrival times, service interruptions, amongst others, are collected and owned by the respective operator, which have different TTI services available to the public.

Usually, each PT operator has its own initiatives in terms of data collection and information provision, with the exception of the AMMOS (Access Multimodal Multimedia Oriented for services) and SIGITI (Geographic Interactive Information System for Interurban Transport) projects, the first one from a consortium initiative and the second one of DGTT (Direcção-Geral de Transportes Terrestres – General Directorate for Land Transport) initiative.

These recent projects in Portugal gather data on all transport modes and link transport databases. Both are Internet based, but also envisages multimedia kiosks, although not yet available. SIGITI is yet an on-going project.

The Portuguese legal framework in this sector is not very enabling. Transport operators start most of the TTI initiatives but with the financing support of DGTT, regarding bus transport. Besides, DGTT is the only sponsor of the SIGITI project in view the development of an Internet

site for multimodal transport information. Also, a number of actions came from special public institutes.

Thus, it can be concluded that many TTI initiatives are directly or indirectly public sector driven, via the initiative of the Transport Ministry or one of its special institutes (IEP) or via the publicly owned transport operators/infrastructure managers.

In spite of the different projects and measures referred in this documents there are no strategic programme that explicitly state the relevance of TTI as a policy issue in this sector.

1.2. Role of the private sector

The role of the private transport sector is not yet enough relevant in Portugal in the ambit of TTI services. Commercial companies and industry are developing technologies and tools regarding the offer of new services. Even some of TTI services are provided by operators' initiative, this Portuguese main operators are public owned companies and therefore the private sector has a minor influence, since these systems are very expensive and for that reason are only viable with substantial financing incentives.

The exceptions are some private owned public transport operators or some media related entities, such as radio and television channels

Information is also delivered by some road infrastructure private entities, by mean of VMS. The data and images are collected by ATS and CCTV.

ACP, the Portuguese private vehicle club, is also an important reference in the Portuguese private sector as it is the most important passenger assistance club for private road transport in Portugal, which is developing a traffic information system for its members.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Real time information on flight departure and arrival times and other air transport related information are collected and distributed by ANA in three main ways:

1. Information Screens in Airports

Information on flight departures and arrivals in real-time is available on screens before and after the check-in point.

This kind of dynamic passenger information (DPI) indicators are also installed just before the departure gate, with data related to a specific flight, i.e. flight number, boarding time, airline and destination.

2. Internet

The ANA Internet site has a real-time information on departures and arrivals in all Portuguese airports (flight number, airline, destination, schedule, check-in time, status and flight track). It is possible to search by hour, day, origin and destination. In the main page there is also a WAP simulator and a link to all Portuguese airports and the Macao airport website.

3. Telephone service for information on departure and arrivals

No statistics on the use and impacts of these services exist.

4. Wap and interactive TV

ANA also developed a WAP and interactive TV interfaces for the real-time information on departures and arrivals in all Portuguese airports. This information is available via a **WAP service** of the three Portuguese mobile telecommunication companies in Portugal as well as through a recent interactive TV channel.

There are only two **multimodal TTI service projects** in Portugal.

The **AMMOS website** is a multimodal information system for the Lisbon Metropolitan area. It is already implemented and constitutes a new system in Portugal. The project includes all main transport operators in the Lisbon area, namely Carris¹⁸³, CP¹⁸⁴, Metropolitano de Lisboa¹⁸⁵, Transtejo¹⁸⁶ and air mode information delivered by ANA¹⁸⁷. It was also funded by the Internet provider (TELEPAC) and the managing entity of the EXPO 98 event. The site was developed by GISmídia.

The website allows the optimisation of the different public transport lines, taking into consideration the schedules, and giving the final user the possibility of choosing by their preferences. It allows journey planning, journey times and route planning. Besides, it has also available departures and arrivals on the Lisbon Airport. The site also integrates tourism information and other complementary information like parking, health, education, safety..., allowing route planning from and to these places.

Within the AMMOS project it is planned to install multimedia kiosks with tactile screens in the public transport stations, multimodal points and shopping centres. These kiosks will have small printers, giving the passenger the possibility of having the required information on paper. Another envisaged option is the acquisition of tickets. The equipment will be vandalism proof. Digital cartography is used and the information of different operators is merged.

A second and similar project has been under study in Portugal. It relates to **SIGITI**, commissioned by the Transport Ministry (DGTT) and partly supported by the FEDER. It consists in an Internet site to act as the sole Portuguese Multimodal Transport information Site, integrating the AMMOS Site. If implemented, it would allow the choice of the best transport solution for the desired journey, not only for urban centres but also for the whole Portuguese mainland. It is envisaged to equip this site with digital maps, schedules and an Intelligent System for journey calculation. Like in the AMMOS site it is planned to include complementary information.

DPI (Dynamic Passenger Information) indicators are found in **railway stations and in the underground**.

Traffic data on **rail transport** is collected by the Centralised Traffic Command Centres managed by the Portuguese Rail Infrastructure Manager (REFER).

¹⁸³ Road Urban Public Transport Operator in Lisbon

¹⁸⁴ Main Rail Operator in Portugal

¹⁸⁵ Lisbon Underground Company

¹⁸⁶ Inland Transport Operator in the Tagus River (Lisbon)

¹⁸⁷ National airport manager

This data is used by the two Portuguese railway operators, *CP - Caminhos de Ferro Portugueses*, *EP* (the publicly owned Portuguese Railway Enterprise) and *Fertagus* (a private company operating the Tagus River Bridge since 1999).

Fertagus has the most up to date technologies. They provide the following TTI services:

1. DPI displayed on TV screens inside stations with information on time, delay, next train schedule and destination. There is one screen for each way.
2. An acoustic signal some seconds before the train arrival, indicating the platform, destination and time of arrival.
3. At each platform, a DPI indicator with information on real time, the train destination and the time of the next train.
4. Inside each train, a DPI indicator with the information on the next station, temperature and time. Before the arrival of trains in stations, the same information is also announced orally.

CP has the following TTI services available:

1. DPI screens in stations and on platforms (not in all stations) with information on arrival time, type of journey (urban, suburban and other) and the train destination.
2. DPI indicator inside some trains with information on the train destination, the next stop and the temperature;
3. Recorded messages with information on the next stop;

Lisboa is the only Portuguese City with an **underground system**.

The Metro of Porto have been just now inaugurated and operate only in some lines.

In both, the only available TTI service is a VMS on each platform giving information about the destination of the next vehicle (some minutes before it arrives) and some other passenger information (for example, on the introduction of new tickets). Just before the train's arrival, an acoustic signal indicates the arrival. Inside vehicles there is a DPI indicator with the name of the next station. There are vocal announcement informing about the next stop and possible connections with other transport modes. In relation to **road traffic information**, the **Traffic Control and Information Centre** (CCIT) of CIRPOR of the Portuguese Road Institute (IEP) gathers data provided by cameras installed on the different roads (either their own roads, of Concessionaires or City Councils roads) and by traffic sensors.

CIRPOR employs operational staff for data processing. The information is dispatched to panels installed on certain roads through optical fibre. The information provision regards any kind of incident, such as accidents, congestion, alternative roads, weather conditions or other relevant traffic information.

At moment traffic images are also sent to two main **Portuguese TV channels** (SIC Notícias and RTP), which directly process them for their news.

For the end of 2002 CIRPOR plans to have a single traffic information telephone number, an Internet site and a service of information supply to the mobile telecommunication companies

(where traffic information can be accessed via WAP, SMS or portable computers, with images incorporated).

Furthermore, CIRPOR, the Police Transit Department and sometimes travellers (via toll free phone numbers) supply traffic information on main roads in urban areas to **radio stations**.

The **Automóvel Clube de Portugal (ACP)**, a private vehicle association, has a traffic information system available for its members. This information can be accessed by (mobile) phone (voice or SMS data). This service works 24 hours a day.

The road information available in Portugal includes physical circulation conditions (national and international roads), traffic, weather and itineraries. The data sources are the Portuguese Road Institute, INM – National Meteorological Institute, ACP FACTS, European Road Information Centre - ERIC¹⁸⁸ and similar Clubs. The data can be obtained by GSM, RDS, Internet (www.acp.pt) and written publications (leaflets).

The ACP FACTS system (FIA/AIT common touring information system) distributes updated tourist information on about 65 countries. This database is weekly updated by the OTA (International Vehicle and Tourism Organisation). It provides data on the following issues: useful data and legislation about different countries (including road legislation); transport information, hotels, camping, motorways, tunnels, bridges and the respective tolls and, at last, the fuel prices.

Public transport operators offer various types of **TTI services**.

1. The main Portuguese public transport operators have **Internet sites**, for some of them the possibility of a personal search by line operated or desired timetable exists. All companies have information about the company, timetables, tickets, prices, news, contacts, alternative modes, links, etc.
2. In many cases this information can also be accessed via a **WAP service** of the three Portuguese mobile telecommunication companies in Portugal.
3. Most operators also have **toll free telephone numbers** available for information on lines, timetables, strikes, and other relevant issues.
4. Additionally, a few operators have at the stops **Variable Message Panels (VMS)** based on GPS technology and Tetra, indicating the bus numbers, the destinations and the waiting time.
5. Information on the main trains is available in **ATM**, which also allow for the acquisition of the respective tickets.

2.2 TTI research activities

Reporting to the TTI research activity two studies are on going, concerning the passenger information systems, one commissioned by the Lisbon Underground and other by the public transport operator of Oporto (STCP).

STCP commissioned a study on 'Passenger Information in the STCP network'. Currently public information systems in most Portuguese public transport networks are based in the assumption that most clients are current users of a restrict set of lines not requiring much information.

¹⁸⁸ The European Road Information Centre (ERIC) is a pan-European Federation providing information of transit and tourism.

Therefore the difficulty of having the necessary information on the right time is a strong disincentive to the bus network usage. This project especially aimed at those who are not usual passengers, trying to make the information available to all.

The studied information system envisaged a large number of information types and was divided in the following 3 phases:

Strategic – Pre-trip information on the existence of the service (e.g. radio announcement and outdoor publicity);

Tactic – Pre-trip information to allow for trip planning (e.g. maps and timetables, itinerary suggestions via phone or a help desk);

Operational - On-trip (static: e.g. stop-centred maps, route diagrams, description of the route on the outside of the vehicle; dynamic: e.g. indication of the waiting time until the next bus arrival, audio message with announcement on service disruptions, bus call via phone, etc.) and after-trip information (e.g. announcement of the next stop and possible connections and main destinations at walking distance)

It was also envisaged that all necessary information for the functioning of this system would be centralised in a common database and regularly updated.

The Lisbon Underground study envisaged the integrated treatment of the public information in the Lisbon underground network, including permanent and variable information. The principal objective was to facilitate the orientation of passengers in stations, thus mainly to ease the platform choice when entering or exiting the system. The project envisaged also exceptional information, such as in case of service protuberance.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

Currently a large number of initiatives are still locally driven and satisfy the interest of a single operator. This is especially true for the information systems managed by PT operators.

As an example, the initiative of urban transports enterprises that has developed their own projects of public information with VMS at bus stops.

However, the recent multimodal Internet site projects show that collaboration between various authorities in the transport and related fields is starting, thus could indicate a coming trend towards more multimodal, far-ranging and interactive systems.

The AMMOS project is a local initiative, as it is a multimodal information system of the Lisbon Metropolitan area, including the main transport operators in Lisbon area. Apart from that, it includes the updated timetables of the Lisbon Airport flights and other relevant information about Lisbon area.

The Portuguese study, SIGITI is a national ongoing initiative. It envisages the development of an Internet Site, to become the sole Portuguese Multimodal Transport information Site, integrating the AMMOS Site, and other eventual local sites, therefore can be considered a national initiative by the Transport Ministry.

It is planned to have, in a later stage, all the SIGITI concerned information available also via kiosks, WAP, GPRS and UMTS services, Callcenters.

The main objective of these two projects is to provide a better service to the customer, supplying traffic and traveller information through the most recent technologies.

CIRPOR has a national range and in future CCIT the traffic control centre of the Portuguese Road Institute (IEP) is expected to centralise all the traffic and traveller information gathered through the Concessionaires, the City Councils and its own equipment on its roads. This inter-linkage will be funded by CIRPOR in order to uniform and integrate the available information. The data will be then sold to the TV and Radio channels and freely available to the City Councils. The traffic information will include recommended routes for through-traffic when other roads are in congestion.

Besides, the CIRPOR intends to be a privileged access to the road, rail and inland transport operators, enabling the exchange of information between road and PT institutions. However, currently no co-operation between CIRPOR and PT operators exist.

3.1.2 Technological (data acquisition and service delivery)

Acquisition:

Reporting data and image, they are collected in the CCIT through optical fibre from ATS and CCTV installed on the roads

Concerning buses, the data is acquired by GPS and transmitted to the control centres by TETRA.

In the other cases the data is collected by means of an integrated system with a support informatic.

Delivery:

The information is sent from the CCIT to the drivers by means of VMS and to the public diffused by TV channels and internet

Public transport information is disseminated by means of VMS at the bus stops and by internet

The future direction for data delivery seems to be Internet and mobile phone.

3.2 Key obstacles to overcome

As initially referred, although the steps given for co-ordinate the development of ITS, and particularly TTI, they are not yet enough. Subsist the lack of a multimodal policy in this field and co-ordination of the sector as a whole, and also the delay of the application of the above-mentioned EC Directive.

Although the progressive interest about these matters it subsists a not very strong support from the research sector, which comes as barrier

Apart from the above-mentioned Internet projects, inter-linkage between traffic databases is still very much in its infancy.

Besides, there are the privacy rights, which always origin a point of discussion

As an example, on account of privacy rights, very good Portuguese projects such as RAIAR and SAIT, articulating all kind of information from road transport, drivers, vehicles, infrastructure, accidents, are not yet been explained.

Limited funding availability and difficulties of finance support may become an obstacle to the development of the sector where subsist some structuring retards aggravated, regarding the peripheric situation of Portugal.

At last, there is also a lack of statistics on TTI use and its impact.

3.3 Major potentials to use

Portugal is one of the EU countries with the densest ATM network. This could be a future channel for traffic and travel data dispatch, thus constitutes a great potential.

In addition, the mobile phone availability is very high (8 out of 10 Portuguese people).

The progressive research in some Portuguese universities, the increasing initiative of segments of technologic industry, the modernisation of the central and local Administration and the globalisation of the enterprises seems to be an important milestone in the development of TTI services in Portugal.

The big new public works in transport sector, with all recent technologies incorporate will become modernisation factors. As the most recent example, we have the new light rail system in Porto.

Regarding the private sector, the ACP has taken some initiatives, which may represent a major potential to its associates and can influence the national context towards the development of TTI services

Finally, Portuguese people seem to fancy Internet, even if the computer availability is still relatively low linked to internet

4 Annex

4.1 Key actors in TTI development

1	Institution Name / position	Portuguese Airport Manager ANA, Aeroportos de Portugal, S.A.
	involvement	Ms. Isabel Rebelo (Information Systems Direction Assessor)
	address	Initiative and ownership of TTI services (DPI indicators and Internet Site) ANA, Aeroportos de Portugal, S.A. Rua D – Edificio 120, Aeroporto de Lisboa 1700-008 Lisboa Portugal
	phone	+351 21 841 35 00/+351 21 841 39 00
	fax	+351 21 840 27 47
	e-mail	Isabel.rebelo@ana-aeroportos.pt
2	institution name / position	Urban Public Transport Operators Carris, Companhia Carris de Ferro de Lisboa, S.A. (BUS operator in Lisbon) Ms. Maria Adelina Rocha (Administrator)

	involvement	Initiative, ownership and involvement in TTI services(Internet Sites, free telephone lines and AMMOS)
	address	Companhia Carris de Ferro de Lisboa Rua 1º de Maio 103 1300-472 LISBOA Portugal
	phone	+351 21 361 31 34/+351 21 361 30 00
	fax	+351 21 361 30 55/+351 21 361 30 69
	e-mail	linha.aberta@carris.pt
3	institution name / position	Urban Public Transport Operators STCP-Sociedade de Transportes Colectivos do Porto, S.A. (BUS operator in Oporto)
	involvement	Initiative and ownership of TTI services(Internet Sites and free telephone lines)
	address	Mr. Marques da Cruz (Marketing Sub-Director) STCP, S.A. Av. Fernão Magalhães, 1862 13º Cp 4350-158 Porto Portugal
	phone	+351 808 200 166/+351 22 5071000
	Fax	+351 22 507 11 50
	e-mail	Clientes@stcp.pt
4	institution name / position	Public Transport Operators Rodoviária de Lisboa (BUS operator in the Lisbon Metropolitan Area) Ms. Silvina Pedroso (Technician of the interactive system of Information to passenger)
	involvement	Initiative and ownership of TTI services (Internet site).
	address	Rodoviária de Lisboa Av. Brasil nº45-1º 1749-053 Lisboa Portugal
	phone	+351 21 959 24 54/+351 21 792 81 90
	fax	+351 21 959 44 39
	e-mail	http://www.rodoviariadelisboa.pt/apoio.htm
5	institution name / position	Ferry boat provider on the Tagus River Transtejo – Transportes Tejo S.A. Mr. Pedro Rolo (Financial Director)
	involvement	Initiative, ownership and involvement in TTI services (Internet Site, E-mail, Telephone number, Fax and AMMOS)
	address	Transtejo – Transportes Tejo S.A. Rua Áurea 181, 4 1149 - 020 Lisboa PORTUGAL
	phone	+351 21 882 03 41/+351 21 347 92 77
	fax	+351 21 882 03 65/+351 21 346 09 02
	e-mail	ttejo@transtejo.pt
6	institution name / position	Ferry boat provider on the Tagus River Soflusa (owned by Transtejo)
	involvement	Initiative and ownership of TTI services (Telephone line for information)
	address	Mr. Armindo Bento (President of the Administrators Board) Soflusa Av Infante D. Henrique – Estação Sul e Sueste 1100-282 Lisboa Portugal
	phone	+351 21 888 37 96/7

	fax	+351 21 886 18 71
	e-mail	Abiria@mail.cp.pt
7	institution name / position	Main Portuguese Railway Operator CP Mr. José Gaspar (Information Systems Director)
	involvement	Initiative, ownership and involvement in TTI services (AMMOS, DPI, Internet site, telephone number and ATM service)
	address	CP Calçada do Duque 20 1294 Lisboa Portugal
	phone	+351 21 381 89 29/+351 21 321 57 00
	fax	
	e-mail	Jrgaspar@mail.cp.pt
8	institution name / position	Underground Operator Metropolitano de Lisboa (Lisbon Undergroud) Mr. Guilhermino Rodrigues (Administrator)
	involvement	Initiative, ownership and involvement in TTI services (Internet Site, telephone line, AMMOS and DPI)
	address	Metropolitano de Lisboa Av. Fontes Pereira de Melo, 28 1069-095 LISBOA Portugal
	phone	+351 21 798 06 94/+351 21 350 01 15/ +351 21 350 01 00
	fax	+351 21 350 01 18/+351 21 357 49 08
	e-mail	metro.relpub@mail.telepac.pt
9	institution name / position	Railway operator Fertagus (Railway Operator in the Tagus River Bridge)
	involvement	Initiative and ownership in some TTI services (DPI, Internet Site and WAP service)
	address	Ms. Ana Cristina Dourada (Administrator) Fertagus Estrada do Pragal, 23 2800 Almada Portugal
	phone	+351 21 294 97 00
	fax	+351 21 294 97 99
	e-mail	Fertagus@fertagus.pt
10	institution name / position	Radio Stations Renascença Radio Station Group Ms. Marta Ventura (Traffic Information Responsible)
	involvement	Involvement in TTI services (provision of traffic information regarding the main Urban Roads)
	address	Rádio Renascença,Lda. Rua Ivens, 14 1249-108 Lisboa Portugal
	phone	+351 21 323 92 00
	fax	+351 21 323 92 99
	e-mail	Info@rr.pt
11	institution name / position	Land Transport General Directorate (part of Transport Ministry) DGTT-Direcção Geral dos Transportes Terrestres Ms. Carlota Sales Henriques (Portuguese Representative of Telematics for the European Commission)

	involvement address	Involvement and funding of the SIGITI project DGTT-Direcção Geral dos Transportes Terrestres Av. Forças Armadas 40 1649-022 Lisboa Portugal
	phone	+351 21 794 90 28/+351217949000
	e-mail	Chenriques@dgtt.pt
12	Institution name / position	Railway Infrastructure Manager (REFER) Centralised Traffic Command Centre (CTC) of REFER Mr. Alberto Grossinho (Circulation Management Director)
	Involvement	Ownership of TTI services (Railway Traffic Centre which provides information to the DPI indicators and the voice messages in the stations)
	Address	Rede Ferroviária Nacional REFER EP Estação Sta. Apolónia 1100-105 Lisboa Portugal
	Phone	+351 21 881 60 20
	Fax	+351 21 881 62 74
	e-mail	http://www.refer.pt/pt/comentarios.php
13	Institution Name / position	Portuguese Road Institute (IEP-Instituto de Estradas de Portugal) Traffic Control and Information Centre (CIRPOR) of IEP Mr. António Manuel Rodrigues (Director of the Telematic Department)
	Involvement	Ownership of TTI services (Road Traffic Centre which provides information to the Panels in the roads, to the TV channels and Radio Stations)
	Address	IEP-Instituto de Estradas de Portugal CIRPOR Praça da Portagem 2800-225 Almada Portugal
	Phone	+351 21 294 73 28/+351 21 294 71 00
	Fax	
	e-mail	iep@iestradas.pt
14	Institution Name / position	TV Channels SIC Notícias Mr. César Santos (Traffic information responsible)
	Involvement	Provides traffic information to the passengers.
	Address	SIC Notícias Estrada Outurela 119- OUTURELA 2795 Linda-a-Velha Portugal
	Phone	+351 21 417 31 11
	Fax	+351 21 417 31 58
	e-mail	Cesarsantos@sic.pt
15	Institution name / position	TV Channels RTP Ms. Isabel Silva Costa (Co-ordinator of the traffic TV program 'Bom Dia Portugal')
	Involvement	Provides traffic information to the passengers.
	Address	RTP Gabinete de Relações Externas Avenida 5 de Outubro, nº197 1050-054 Lisboa Portugal
	Phone	+351 217 947 000

	Fax	+351 217 947 273
	e-mail	rpublicas@rtp.pt / opinioes@rtp.pt
16	Institution name / position	Private Vehicle Club ACP- Automóvel Clube de Portugal Mr.Gil Estevez (Information technology service Chief)
	Involvement	Initiative and ownership of TTI services (traffic information system)
	Address	ACP- Automóvel Clube de Portugal Avenida Eng Duarte Pacheco Shopping-lj 1122 Lisboa 1070-100 LISBOA Portugal
	Phone	+351 21 942 91 00
	Fax	+351 21 942 91 78
	e-mail	Gilestevez@acp.pt
17	Institution name / position	Private company for Parking Esli-Parques de Estacionamento de Lisboa SA Mr. Artur Marques (Maintenance Responsible)
	Involvement	Ownership of TTI services (supply of equipment and systems for Car Parks)
	Address	Esli-Parques de Estacionamento de Lisboa S.A. Praça Restauradores Pq Estacionamento Subt - Lisboa 1250 LISBOA Portugal
	Phone	+351 21 384 73 00
	Fax	+351 21 384 73 50
	e-mail	esli@mail.telepac.pt
18	Institution name / position	GISmédia Multimedia and Geographic information systems company Ms. Maria do Carmo Lucas (Administrator)
	Involvement	Involved in the AMMOS project
	Address	GISmédia Av. EUA 57 S/Loja 1700-165 Lisboa Portugal
	Phone	+351 21 387 04 13/+351 21 843 55 00
	Fax	+351 21 843 55 09
	e-mail	Mcr1@isegi.unl.pt
19	Institution name / position	Telepac-Comunicações Interactivas SA Interactive Communications Company Mr. Carlos Batalha (Quality Director)
	Involvement	Involved in the AMMOS project
	Address	Telepac-Comunicações Interactivas S.A. Rua Dr António L Borges 1 Miraflares 1495-131 ALGÉS Portugal
	Phone	+351 21 790 70 96/+351 217 907 000
	Fax	+351 217 907 001
	e-mail	Cbatalha@tp.telepac.pt
Sources and references		
	http://www.telepac.pt	Telepac web site
	http://www.acp.pt	ACP web site
	http://www.ammos.pt/	AMMOS web site
	http://ana-aeroportos.pt/	Airport manager web site
	http://www.transtejo.pt/	Transtejo web site
	http://www.fertagus.pt/	Fertagus web site
	http://wap.fertagus.pt	Fertagus WAP service

<http://www.cp.pt>
<http://www.carris.pt>
<http://www.stcp.pt>
+351800208208
+351210336500
351800201287

<http://www.rodoviariadelisboa.pt/>
<http://www.metrolisboa.pt/>
<http://www.rr.pt/>
<http://www.>
<http://www.dgtt.pt/>
<http://www.dgv.pt>
<http://www.gepmes.pt>
<http://www.refer.pt/>
<http://www.iestradas.pt>
http://informacao.siconline.pt/SIC_Homepage/
<http://www.rtp.pt/>
<http://www.gismedia.pt/>
<http://telepac.sapo.pt/>

CP Web Site
Carris web site
STCP web site
Information phone number of CP
Information phone number of Soflusa
Radio station: phone number for traffic information
Rodoviária de Lisboa web site
Lisbon Underground web site
Renascença Radio Group web site
Ministry Public Work, Transport and Habitation
General Directorate of Ground Transport web site
General Directorate of Traffic
Gabinet Studies and Planning
REFER web site
Roads Portal
SIC web site
RTP web site
GISmédia web site
Telepac web site

Romania

1 Institutional framework for TTI development

Romania, as a country in transition, is making a huge effort to transform its very centralised economy into a free market economy. In this process the Gross Domestic Product has decreased dramatically in the period 1989 –1999 and the majority of economic sectors have had difficulties to adapt. In spite of this decrease there are branches, which have shown significant increases: road and air transport, communication and information technology.

In road transport, the investment has focussed on rehabilitation and new roads, , without associated services.

1.1 Legal and public policy context

National policy transport development derives from the Transport Master Plan (1996-1998). The Master Plan defines the market requirements, the development trends till 2015, in various scenarios, covering all modes of transport. The main town have prepared separate Master Plans. These Master Plans, made by recognised international consultancy companies, establish the infrastructure and vehicle development, in a classic way without including ITS as an integral part of the transport system. The Master Plans include recommendations for ITS, mainly traffic management systems at national and local level.

The national transport policy focuses on classic infrastructure, ITS implementation is seen as the second step of the transport development. The absence of a national ITS strategy and the feeling of the decision people that ITS is a tool for tomorrow has maintained the investment in ITS applications at a low level.

A change might be expected, taking into account that:

- The national priority, the integration in the European Union, includes measures of inter-operability in the transport field. Most of them impose intelligent transport services, as defined in twining projects for preparing the accession process.
- The information society has become a main objective of the governmental programme
- At professional level, experts and professional organisations have become active in promoting ITS
- The returns of existing ITS applications are significant in many cases

The level of ITS implementations is dependent on the mode of transport:

- The air and maritime transport, based on their global area of coverage, respect international requirements. The basic ITS applications are implemented. We might mention the new generation of Air Traffic Control and Vessel Traffic Management and Information System, in operation at national level and in Constantza port.
- ITS applications are used, in inland waterway transport and in railway transport, to support traffic monitoring and infrastructure management. The owners of the systems are national administration state owned companies.
- In road transport, ITS implementation is at a low level. Recently, the institutional framework has changed. The tasks and responsibilities of the national, regional and local road administrators were modified and the process is continuing. Many activities have been transferred to the private sector. Each actor has developed independent ITS applica-

tions, taking into account his immediate interests (e.g. commercial fleet management, infrastructure management). The public-private partnership is in an incipient stage. The preparation of a strategic ITS implementation plan is imminent. Romanian experts define the priorities of ITS implementation in Romania as follows:

- Traffic management and control
- Traffic and traveller information
- Infrastructure management
- Fleet and freight management
- Incident management
- Public transport has two components: surface transport and underground transport. For surface transport, municipal authorities are preparing projects for traffic management and traveller information. The underground transport is already equipped with a complete automated traffic control system.

The issues of Traffic and Traveller Information, in the absence of a strategic ITS implementation plan, has not had not a clear perception at national and local level. Each actor perceives the necessity of TTI according to its own tasks and possible benefits. Transport administrators have usually implemented traffic management systems to perform their tasks and use the information acquired by the system, inside the company, for better administration. They consider the information as proprietary and disseminate it to others only if the regulations enforce it or in the framework of a mutual agreement. Most of them refuse to make the traffic information public in order to avoid an external interpretation of the quality of traffic management.

Besides this, public transport operators are directly interested in providing travellers real-time information about the time schedule of their vehicles. Further, many service providers are beginning to include traffic and traveller information services on a commercial basis or to enrich the quality of broadcast information. There are GSM providers, who offers value added services. For example DIALOG has implemented information service named "Info Util" that include information about the status of the transport ways: national roads, railways, navigable channels, ports and airports. INFOTRAFIC SA offers value added services:

- www.transnet.ro - e-commerce in freight road transport
- www.transportal.ro is a portal with general road transport information. It is in preparation a value added services for road planning travel and transport. The negotiations are initiated with the owners of the traffic and road status databases. The service will offer information about:
 - Road network
 - Road infrastructure restrictions
 - The limitations of the speed and tonnage
 - Temporary restrictions, caused by road maintenance, rehabilitation and civil works
 - The actual status of the roads
 - The accidents statistics

- The route optimisation, taking in account the actual restrictions

In the TTI chain (data acquisition, data fusion, information supply, information transmission and dissemination, marketing and support), different service providers could normally be involved. They must agree to interconnect their transport databases or establish data exchange rules.

The current Romanian legislation assures only a frame for TTI services development. The implementation of efficient TTI services requires particular agreements between the interested actors.

The European Directives for interoperability of the transport services represents a good framework for TTI services development. Romania is in the process to align the legislation to the European one. Many European Directives and Recommendations in the transport field are already transpose to Romanian legislation with visible effects and the process is continuing.

The Commission Recommendation on the development of a legal and business framework for the participation of the private sector in deploying TTI services - C (2001) 1102 is too recent to have practical effects, but it s a framework for future development. The Recommendation will accelerate the legal and technical framework for TTI development.

The TTI services have met strong barriers in their current implementation:

The knowledge and experience of TTI technologies and benefits are limited

The road administrator (national, regional or local) has the task of assuring an efficient and secure traffic together with road police. They use traffic information mainly for their own interests. The user information is not a clearly defined activity.

The public-private-partnership is in the incipient stage. The private companies are not confident in a partnership with public companies or authorities. In principle they are right. The privatisation process is continuing and the institutional framework is aligning to the European one. Also the process of decentralisation of the public services is not finished. This process could modify the structure and the activities of the public or owned state companies and could affect the partnership agreements.

The TTI services and development trends in European Union are not at a mature and stable stage. So TTI implementation decisions need supplementary research work and studies, and implies considerable risks.

1.2 Role of the private sector

The private sector is the motor of TTI development. The aims for providing traffic and traveller information are:

- The public transport operators develop their own TTI services to improve the quality of their basic service and to attract new travellers (METRO SA have design, manufacture and install the automatic traffic control, with TTI functions, for the underground operator METROREX SA, which provide time schedule information on web pages and real time information in stations and in vehicle)

The broadcast providers include traffic information to increase the rating (Many Radio FM providers include traffic information; The traffic information are gathered from road administrators and road police under a mutual agreement).

- Providers develop value added TTI services on a commercial bases (TRANSINFO SA, a company specialised in e-commerce in transport field, begins to provide TTI services for road transport at national level)

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

TTI services are in the incipient stage in Romania and do not represent, as in the EU, a well-defined domain. The existing applications are completely independent, in the absence of a national plan or clear objectives. They have met immediate needs, usually in connection with traffic and fleet management applications. These systems perform data collection, data processing and data transmission in a particular area, mainly for own use and secondarily as a TTI service. There is no traffic information centre at central or local level.

The TTI demand is increasing and the following selected examples present the state of the art of the domain.

Road weather information system

The system is implemented on the main national road DN1, Bucharest – Brasov, 160Km and represents a large-scale pilot project. Research works and studies, which had established feasibility, the requirements, and the accuracy of technological solutions have preceded the project.

The main functions:

- Automatic acquirement of road weather parameters
- Local data collecting and processing
- Short term (2 hours) and medium term (24 hours) road weather forecast
- Issuing warning and alarms
- Information of the drivers through variable message text and graphic panels
- Data transfer between all stations and to info-kiosks
- Road weather data recording and dissemination

The processed road weather data are used to improve road viability, especially in the wintertime and for real-time information of the drivers about the road weather status.

The system infrastructure (communication, computer network and panels) can also be used for other purposes. The local or central station is usually used to send traffic messages to panels.

Radio FM information on road network

Traffic and weather information are periodically broadcast. Many of the FM providers are local, so the information might be focussed on the radio coverage area. The name of the “infotraffic” provider and the frequency is advertised on the roadside.

The provider receives the traffic and weather information by fax or phone from the local road administrator and local authorities. None of this information is generated by automatic systems.

Traffic and traveller information in the Bucharest Underground network

The underground network is equipped with an Automatic Traffic Control System. The system assures the traffic and power supply monitoring, traffic safety and traveller information.

In the stations traffic information (the time till the next train, the train direction, the train composition, the time schedule modification) is displayed on coloured graphic panels.

Inside the train, the traffic information (the next stop, the direction, the time schedule modification) are received as voice synthesized messages.

The underground network plan, entrance points and the time schedule are available on the web site.

2.2 TTI research activities

Mobile communication platform – GSM Railway - with safety functions.

Period 2001-2003

Partners: Railway research centre – AFER; ITS ROMANIA; Transport Research Institute - INCERTRANS

The research will be finalized as a pilot sector, 60 Km of a main railway, assuring:

- Train control
- Interface with interlocking system
- Communication with maintenance teams
- Traffic and traveller information
- Private traveller communication

Urban Traffic Management System

Period: 2001-2004

Partners: Information Systems Institute – SIAT; POLITEHNICA University Bucharest; RASSCO TRAFFIC Company

The project will develop: logical and system architecture, design and implementation of a experimental model, cost – benefit evaluation

The experimental model will include a TTI module.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

1. The strategic national plan for ITS implementation will be a solid framework. The plan will define national architecture, available technologies, required institutional framework, cost-benefit evaluation, the priorities, the main public and private actors and the public-private partnership framework.

2. The implementation of a TTI service must be preceded by traffic management systems and fleet management systems implementation. These systems will create the traffic databases and the location of the vehicles, as basic information for TTI services.
3. To interconnect the proprietary databases of the different actors it is necessary to create a legal and institutional framework.
4. The TTI services might be developed at three levels:
 - Independent (local) level: The TTI service covers a single mode of transport in a limited area (e.g. Public surface transport in a town; Underground transport; Regional road transport). The service could be supplied by the company that assures traffic management or by specialised TTI companies.
 - National and/or inter-modal level: All traffic and traveller information must be gathered in the dedicated databases and sent in the multiple standardized ways to users. The standards have to be internationally recognised to create the possibility to pass to the international level

3.1.2 Technological (data acquisition and service delivery)

1. The traffic management systems are the basic source of data. It is preferable to use image-processing sensors as a traffic detector. These sensors assure many other functions: speed measurements, traffic monitoring, incident management, speed enforcement
2. Means of delivery of information:
 - Text and/or graphic variable message panels along the road and in stations (mandatory)
 - Web pages for pre-trip and general information
 - RDS-TMC, etc (standard European services)

3.2 Key obstacles to overcome

1. Rolling out the ITS national implementation plan; TTI services must be included in their proper position.
2. The wariness of the decision makers, the transport specialists and the civil society about the possible content, the costs and benefits of the TTI services
3. Lack of legal and technical framework to interconnect the proprietary databases of the public and private sector.
4. Insufficient funding of TTI services; the inclusion of the TTI systems as a component of a national safety investment plan

3.3 Major potentials to use

1. The existing national priorities of transport and information society development (research, investment);
2. The European interoperability requirements in transport field, in the context of accession
3. Technological and know-how transfer from the EU,

4. The existing professional expertise in Electronics, Communication and Information Technology

4 Annex

4.1 Key actors in TTI development

1	institution name / position involvement address phone fax e-mail	POLITEHNICA University of Bucharest <i>Prof. Corneliu-Mihail ALEXANDRESCU / Vice Rector</i> <i>Leader of the transport telematics specialisation</i> Bucharest, Sector 1, 313 Splaiul Independentei St., Corp R +401 410 1870 cma@eltrans.pub.ro
2	institution name / position involvement address phone fax e-mail	National Administration of Roads <i>Petre DUMITRU / Quality Assurance Director</i> <i>Research background in ITS. Promotor of ITS development</i> Bucharest, Sector 1, 28 Blv. Dinicu Golescu, 8 th floor +401 223 2606 +401 312 0984
3	institution name / position involvement address phone fax e-mail	METROUL SA <i>Constantin DUMITRESCU / Automatisation Departamanent Manager</i> <i>Active in ITS design and implementation. Excellent commercial understanding</i> Bucharest, Sector 5, 3bis Gutemberg Str. +401 315 7036 +401 312 4335 dumitres@mail.moronet.ro
4	institution name / position involvement address phone fax e-mail	Ministry of Public Works, Transport and Housing <i>Mihai DIONISIE / Deputy Director of Strategy and Information Directorate</i> <i>Influence at ministerial level in legal and institutional aspect of ITS</i> Bucharest, Sector 1, 28 Blv. Dinicu Golescu, 1 st floor +409 514 4207 +401 224 9024
5	institution name / position involvement address phone fax e-mail	Romanian National Association of Hauliers <i>Valentin MIRESCU / Vice president</i> <i>Excellent understanding of the public-private partnership</i> Bucharest, Sector 4, 60 Enachita Vacarescu Str. +401 336 7061 +401 337 48 58 office@untrr.ro
6	institution name / position involvement address phone fax e-mail	ITS ROMANIA - NGO <i>Dorin DUMITRESCU, Ph. D ? General Director</i> <i>Promotion and correlation of ITS activities</i> Bucharest, Sector 1, 313 Splaiul Independentei St., Sala JE 008 + 409 327 3993 +401 411 7039 ddumitrescu@totalnet.ro

4.2 Sources and references

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Slovakia

1 Institutional framework for TTI development

1.1 Legal and public policy context

The strategic documents (mainly from the year 1999) of the Ministry of Transport, Post and Telecommunication of Slovak Republic (MTPT) declare the general needs of IS/IT development in Transport policy. In the year 2000, the Government has signed up to the common European activity – the e-Europe program. The role of ITS is not concretely defined inside the material and therefore the complex solutions and benefits of advanced transport applications are not supported by the Government. Changes in this field of activities are expected from 2003. TTI services are not addressed directly at all. The effort is in the hands of the private sector but state transport policy gives no priority to developing integrated transport information services.

From 2002 the MTPT has started Grant Research and Development Projects in Transport and some of the grants cover ITS activities oriented to the institutional and system architecture of ITS as a whole.

Hopefully in the year 2003, the state will sign up to the new EU Transport Policy White Paper, placing more emphasis on the user and the information society. Even though, in Slovakia, several projects are oriented towards ITS applications, there is a lack of the common strategy and policy to business models supporting financing of investment and operations of TTI systems.

Ownership of traffic data and data collection equipment is in the hands of the state or municipal administration. The core of this problem is given by the legislation – the Road Act, where the state or the municipality is responsible for all “objects” and works on roads. The quality of the operation and road conditions is completely in public sector hands. Therefore there is not a public requirement to co-operate with the private sector on the collection and exchange of data. There is not an institutional space for the data collection activity of the private sector.

The usage and requirements of proprietary traffic and travel data required to achieve a higher level of co-operation on the interconnection of transport databases, do not exist. Only one way is possible: *to create a legal and institutional environment with several possibilities of how to invite the private sector into traffic data collection, processing and distribution, together with the definition of the rules, responsibilities and cooperation between public and private sector in the Road Act.* Some of these regulations might be:

- to create an information chain according to the law in which the licensing policy for the data acquisition and processing, data fusion, information supply, information transmission, marketing and support on the PPP principles will be declared;
- the definition of TTI applications which are priorities for the transport service as a public interest and the rules (legislative, content of the service) should be declared by state, region and municipality level because of the unique level and quality of traffic data;
- ITS architecture is a common effort of public and private sector;
- the ITS applications including TTI services should be a priority for the whole society as an information chain for better transport services and should be a part of the state transport policy;

Nowadays in Slovakia, there is no co-ordinated TTI development in regional and national government, city or regional transport authorities. The regional parliaments exist only from last autumn and there is a lack of general TTI requirements from the regional governments or ITS services generally;

In Slovakia, on the road network and public transport, the true private transport operator does not exist. The railway is now split up into two state commercial companies and the rail traffic services will be privatised. At the beginning of the second half of the nineties several advanced transport control systems were deployed. The private sector participated in these activities and introduced new trends of IT and IS in transport to the public administration. During the years 1995-7, the first major project on the Motorways was implemented, which was a common effort of private and public sector activity. After 1998 ITS philosophy and deployment was dealt a blow by the Government decision to scale down the Motorway construction programme.

Road Sector

Provision of traffic information on the road network is given on the free phone number in the mobile phone network and is broadcast by private radio station. There are no rules according to RDS/TMC. Moreover there is general traffic information news (mainly during the wintertime) that is transmitted to all radio stations but without the stable and operative background of road/traffic operators. If there is an official problem on the road network (reconstruction, traffic diversion on state network), the responsible body from state or municipal administration or police call the radio to broadcast the information. This is done only twice a day according to the legislation, which determines the responsibilities of the Slovak Road Administration.

Co-operation among the operators does not exist. Legislation is being prepared on the general emergency call number 112, which will start the co-operation among the traffic/transport and emergency operators.

Traffic information is collected through loops on motorways (mostly on new infrastructure). There is complete information about the number, class and weighing data in 15 minutes time interval for each lane. In the first phase, the idea is to have between the motorway crossings min. one counting profile. According to the traffic volume the density of counting profiles will be denser. The rest of the road network had in the past app. 50 loop profiles but nowadays this system is not working. From the road network (1st, 2nd and 3rd class roads) there is officially only the manual counting results in five-year time intervals.

A major problem in Slovakia is that the development of ITS applications are an effort of the private sector only, without general and common goals and a level playing field which must be guaranteed by the state, regional or municipal administration. The implementation of ITS applications are not co-ordinated by a common architecture or by PPP principles.

Public Transport

There are only passive applications of TTI services for public transport including paper schedules and other information, telephone services and internet pages.

Public transport, however, in medium sized cities and regions is in the privatisation process. At the end of this year, all public operators and owners of this infrastructure will be privatised. This may prove an opportunity for development of more advanced systems.

There are no real-time PT schedules, but there are "passive" schedules on the internet. The railway has on-line loading of coaches on trains and reservations on the Internet.

Implementation of electronic payment has begun in several cities, which have an architecture supporting TTI services. The activity has been made by the private sector and the implementation is without public administration support.

1.2 Role of the private sector

Most ITS systems developers in Slovakian ITS are local companies while basic technology is imported. The private sector, although strong and prepared, has not so far been not responsible for any TTI development. There is a natural role in Slovakia for the private sector to take over the main role in this field of activity but as has been identified, the legal system is not prepared. Road infrastructure owners and managers are state owned only and at this time it is impossible to create a framework to involve the private sector as traffic operators of the infrastructure. Therefore TTI services are not a co-operative effort of public – private partnership.

The transport operators market has started and in one - two years will be operable in all Slovakia. It is important to create stable rules on the traffic/transport information chain which must be made at a legal and standardisation level. The definition of these should be the job of the state;

Integration of information service contents is a future PPP activity. The integration of payment, booking and other options for transport transaction, including non-transport-related services does not exist. There is only the “passive” Internet info system of each public transport operator. In Bratislava and Kosice, a scheme of integrated public transport (city public transport operator, interurban bus public transport and railway transport) is being deployed with joint fares and co-ordinated time schedules. The support from the state is not complex even though the operators are state and municipal owners;

- Partnerships and co-operation with the public sector in relation to TTI development, revenue sharing does not exist at all.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

In Slovakia the advanced traffic control systems are being developed. As regards the state-of-the-art situation of TTI services it is possible to declare:

implementation: advanced TTI services are not available to users, and they are only in the planned stage;

market prospects: in Slovakia an institutional and legal environment for TTI (enabling PPPs) has not been created; this is key.

A working advanced ITS application is the Motorway Information and Control System (MICROS) working on the 65 km section of Motorway around the city of Trencin. This year the 15 km motorway section in Bratislava together with the central control room of the Slovak Road Administration and the 5 km long Motorway tunnel on East Slovakia (Branisko) will be completed. The architecture is made according to the state-of-the-art philosophy, which is open for communication among other control and emergency systems as well as the TTI applications;

Using the architecture of the motorway control system, plans are made for a so called “Tourist Information System” which will contain real-time information from the motorway network on traffic jams, traffic diversions, road and weather conditions on the motorway network. The idea is to build up kiosks at parking areas on the motorway, to pass the information to the mobile

phone network and navigation applications, but the investment will not be a state one. It will be a private investment when there is interest from the private sector. The private sector in turn is waiting for the right institutionalisation rules and licensing policy to be formed.

Several cities in Slovakia have electronic fare collection in public transport. The architecture is prepared for TTI applications.

2.2 TTI research activities

This year, the MTPT has officially started research projects on ITS activities in Slovakia. The ITS Slovakia Association, Transport Research Institute and the Universities have been invited to make these ITS Studies. The research and study works are oriented on the general definitions of needs and the role of the state in the co-ordination of the information society. The research on the information society is oriented to the e-Europe project covered by the EU. Research projects progress in one-year budget steps according to the generosity of the state budget.

- the System and Organisation Architecture of ITS in Slovakia is only the most important research project for ITS. The ITS system and organisation architecture is oriented towards the KAREN architecture;
- an international activity on Electronic Toll Collection is covered by the support of the French Government;

3 Key issues for TTI implementation

The key current issues for TTI implementation can be described as follows

- to start deeper discussion between private sector and state/regional administration and politicians;
- to create the legal and institutional rules for the ITS market – services and operation,
- define the needs for the ITS architecture which must be covered by the state (Ministry of Transport),
- to start the digital map for ITS need together with the philosophy of mobile traffic/transport information systems;
- create the legal environment for the RDS/TMC service;
- create an unique architecture for Electronic Fee Collection on the traffic/transport market in Slovakia;
- to build and deploy the new ITS application as a complex service. It is not a good way to construct only advanced control systems oriented to the need of operations but instead they should be constructed as joint applications for operators and travellers. These will be the way forward for TTI application deployment.
- the first activity of the private sector is to create a common effort on the ITS architecture in Slovakia, and to push for the creation of the PPP with its legal and institutional rules from which is possible to continue with the TTI deployment.

3.1 Drivers and trends

3.1.1 Institutional (public and private)

Although there is no national policy or application basis for TTI at the moment,

1. the current ITS research programme to develop a common architecture open to TTI development and
2. the activities of the Slovakian ITS society
3. the take-up of the e-europe programme
4. the imminent take up of the new European transport policy white paper are acting as strong drivers of TTI development.

For real progress, however, there is a need to develop the following key drivers

5. the legal environment for traffic information services and emergency services;
6. the institutional role of PPP;
7. a minimum of two pilot projects of TTI services.

3.1.2 Technological (data acquisition and service delivery)

The existing road management systems and electronic fare collection in PT provide a strong starting base for future TTI systems, however there is still a need to develop the following technical drivers:

1. common need and definition of data acquisition on the state, regional and municipality level;
2. an obligatory database for the statistical data and on-line data which is the base need control traffic systems and the TTI services;
3. a possibility for traffic data acquisition, processing and dissemination as a licensing commercial activity for the private sector.

3.2 Key obstacles to overcome

The key obstacles can be briefly described as the following:

1. lack of information and interest within the state administration
2. lack of legal and institutional rules especially enabling PPP
3. the lack of interest in a common ITS architecture.

3.3 Major potentials to use

Opportunities can be seen in the privatisation of local PT and the development of the motorway management systems, which provide a solid base of TTI data for further private development

The applications with the most development potential are as follows

1. TTI application for road network according to the dynamic RDS/TMC service;
2. TTI service for integrated on-line public transport information.

4 Annex

4.1 Key actors in TTI development

- | | | |
|---|--|--|
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Slovenia

1 Institutional framework for TTI development

1.1 Main actors and competencies

According to the institutional structure the responsibilities for transport issues are divided between three main public authority institutions:

- ◆ The Ministry of Transport with respective directorates
 - ◆ Roads: The Directorate for Roads (Direkcija Republike Slovenije za ceste - DRSC) and the Motorway Company of Slovenia (Družba za avtoceste v Republiki Sloveniji d.d. -DARS) and the General Inspector for Roads;
 - ◆ Railways: The Directorate for Railroads (Direkcija za železnice) and The Railroad Operator (Slovenske železnice)
 - ◆ Sea and Ports: The Agency for Maritime Transport (Uprava za pomorstvo)
 - ◆ The Civil Aviation Agency (Uprava za kontrolo letenja)
- ◆ The Police Department of the Ministry of Interiors (Policijska uprava Ministrstva za notranje zadeve – PU MNZ),
- ◆ The Cities' Authorities.

1.1.1 Road transport and authority levels

The Ministry of Transport is the central authority for transport policy and general plans regarding the deployment of transport policy.

The Ministry of Environment is responsible for the general plan (spatial plan) and for – major infrastructure - alignment as well as for negotiation with the regional and local authorities and the public involved.

The construction part is under direct supervision of the Ministry of Transport, DRSC and DARS.

DARS and DSRC have almost identical responsibilities although the Motorway company (DARS) is a private company 100% owned by the State and The Directorate for Roads (DRSC) forms an integral body inside the Ministry of Transport.

For the co-ordination between the road authorities involved and the Road Police the Ministry of Transport is directly responsible.

For purposes of traffic management the infrastructure operators gather data separately and these data (AADV, traffic structure, accident statistics etc, camera captures, weather station info) are published yearly and available through different media. For the time being there is no a Central National Traffic Management Centre nor a Central Traffic and Transport Information Centre.

Several subsystems have been established for Tunnel traffic control and management, camera monitoring of main motorway connection to the interstate road, cities traffic lights management centres etc.

The collection of valuable traffic data is collected by DARS, DRSC as well as by the road police and then dispatched to different end-user providers (radio, internet, mobile info and WAP) via two main info cluster systems:

1. the Automobile Club of RS Info System (AMZS, Avtomoto zveza Slovenije d.d.) and
2. the DARS info system

1.1.2 Public Transport

The provision of local public transport services is undertaken by private and public owned companies. With the exception of the Slovene Railroad company all the others public companies are either co-financed or under full control of the local authorities.

1.1.3 Railways

For rail transport, the national authority responsible for technical standards, regulation, and control is the Ministry of Transport and the Directorate for Railroads. The national railway company (Slovenske železnice - SŽ) is still a public owned company and the passenger transport is still fully subsidised.

All relevant railway operation data and incident information is collected and processed by the SŽ information and maintenance and made available to end-user providers.

1.1.4 Aviation

For air transport, the national authority responsible for regulation, control and technical standards is the Aviation Control Agency. It supervises operation and development in the sector, but also collects operation data and incident information.

The airports are managed by public companies and private companies.

The airport companies exchange traffic data and incident information with the private airlines.

1.1.5 Maritime Transport

For water transport the national authority is the MOT and the Maritime agency. There is virtually no significant inland navigation therefore the operations regard mainly the sea transport and the sea ports.

However (concerning the passenger transport) common databases on schedules and tariffs are available at the regional level and via internet.

The Ministry of Transport (MOT) and the Port of Koper are involved in a construction of the second rail track for cargo despatching as a integral part of the 5th TEN corridor.

1.2 Policy orientations

1.2.1 National level

Mobility oriented TTI services are part of a broader policy strategy for the implementation of intelligent transport systems (ITS) in the Republic of Slovenia. The Ministry of Transport has recognised ITS as a very promising tool to reach goals published in transport policy documents for it is becoming more and more clear that all these goals cannot be achieved only via building new infrastructures.

ITS systems do offer some valuable possibilities and answers to the challenge imposed from the ever-increasing volume of transit vehicles and from the growing expectations of drivers, travellers, transport companies etc. for a more informative and safer driving and travel experience.

The Ministry of Transport of Slovenia has recognised two major areas to be of the highest strategic importance for further development of ITS:

1. Road management and TTI:

- Further development of traffic and environmental monitoring systems for basic road data capturing and operation and maintenance needs (roads and motorway operators);
- Integration of the above mentioned systems in a single traffic management centre (TMC);
- Creation of a single Traffic and Traveler info system covering all modes;
- Establishment of Public and Private Partnership for end users Information providing (broadcast radio stations, mobile operators, internet etc).

2. Deployment of a Free Flow Electronic Toll Collection System. A new system is being conceived for road pricing

- based on *exact data about distance covered and category of vehicle used* (in free flow, without toll plazas, traffic jams, or other negative impacts caused by on site toll payment present today on Slovene motorways);
- with possible automatic toll collection on other roads (flexible pricing scheme), or all roads respectively, which makes it possible to introduce *real and efficient “road pricing”*, and through that *efficient traffic and transportation management*;

Some further applications will be analysed like:

- Controlled access to the traffic sensitive city centers, pedestrian zones etc.;
- Parking payments;
- Traffic guidance based on real-time traffic data
- etc.

The eventual integration of these two systems - in terms of standardised data, standardised communication protocol used etc. - makes them a ambitious challenge for the deployment of future integrated ITS systems in CEE and Europe.

ITS is also recognised as very important and thus envisioned also in the e-Slovenia Action Plan proposed from the Ministry for Information Society to the Government of the Republic of Slovenia in 2002 and in the e-Government Action Plan 2002-2004.

In this, a clear division of roles between private and public activities is envisaged. While basic infrastructures and services of control and information are considered the responsibility of the public sector, new value-added and personalised services should be provided by the private sector.

Similar to some other EU member states the Strategy for ITS Deployment recognised:

1. the private sector at the R&D core while the Public Authority sector is responsible for the development of strategies and directives for development;
2. the priority have projects with a integrative approach and a services aimed to end-user in a multimodal deployment framework;
3. systems and services are encouraged to follow the EU standards for architecture, data exchange, interoperability etc.

The development of ITS thus figures as a horizontal task that requires investment and innovation to improve transport efficiency, safety and environmental protection, to create a framework for new technology use in transport and communication, to enhance public and private services, and to increase budgets for public implementation.

1.2.2 EU Regional Initiatives

In 2003 Slovenia has been formally invited to join the CORVETTE Euro-regional project (part of TEMPO).

While the activities in TEMPO Euro-Regional projects relating to data exchange have in the first years aimed mainly at establishing cross-border exchange of traffic and travel related data for use in cross-border traffic management applications (e.g. harmonised traffic re-routing on cross-border corridors), a new focus has emerged: the European Commission's recommendation on the development of a legal and business framework for the participation of the private sector in deploying telematics - based Traffic and Travel Information (TTI) services in Europe of July 2001 (Recommendation 2001/551/EC).

In order to get even close to this legal and business framework, a high quality data and reliable network has to be established per country as well as for cross boarder info interchange.

Based on the CENTRICO TIS positioning paper on cross-border traffic information, management and control activities of the EU and specially on TEN_T goals and The white Book (2001) Slovenia as one of the CEE countries' soon to be member of EU an opportunity and a vehicle to build a systematic approach to deployment is using suggestions and experiences gathered from the developing communication technology (DATEX) for cross-border traffic management in the scope of the euro-regional projects CENTRICO (North West Europe) and CORVETTE (alpine countries) as well as projects like KAREN and FRAME for System Architecture.

In Slovenia a Traffic Control Centres (TCCs) does not exist on a national scale. The importance of TCCs are though recognised as a major topic to address and the national TCC has been presented in the "ITS action program and deployment strategy 2004-2008 as a project of highest priority.

Also included is the idea to examine the issues surrounding the development of cross-border and pan European services – more specifically the positioning of the traffic information centres

in relation to the private service providers, the concept for easy access to traffic data and information available from traffic centres and international services.

For the time being Traffic Information Services (TIS) are provided in Slovenia (Automobile Touring Club, National Radio and Television – RTV SLO, mobile operators wap services) but it does not meet the real public need nor is these service fully delegated to the private sector. The allocation of data is not systematic and content not always reliable.

The EU expansion includes new requirements to infrastructure operators and traffic information providers. According to given prognoses transport activities between the EU and CEE countries will increase. Prognoses predict a raise of traffic volume, especially in the field of heavy trucks, by a great percentage even within the next few years. This will lead to bottlenecks on the existing Trans European Road Network (TERN). Adequate traffic management and control and precise traffic information will be necessary. The connection of Traffic Information Centres (TIC) and Traffic Control Centres (TCC) and a cross border information exchange builds the basis for national transport management activities and for high quality (individual) traffic information. Cross-border TIC/TCC facilities can provide significant support for the helsinki corridors, which are currently reviewed and will improve the effectiveness of the TERN through better demand management and rout guidance. In case of cross-border traffic on Long Distance Corridors (LDC) the decision for a specific route or in case of an incident the decision for an alternative route will be taken in a very early stage of the journey. In order to be able to fulfil their duty TICs and TCCs are set to be equipped with new algorithms, state of the art hardware, optimised software and other new technologies. In some countries TICs and TCCs probably have to be renewed or even build up for the first time. This effort has to be increased in order to enable the TICs and TCCs to sustain an excellent level of service for the road users. This will contribute to the reduction (or at least to the avoidance of an increase) of the predicted negative impacts of road traffic.

In addition to TIC and TCC improvements, the networking between traffic centres for both traffic management and control and provision of traffic information services gains in importance.

Legal and contractual considerations on national and international data exchange, including the aspects of provision and usage of information, have to be fixed in contracts called Interchange Agreements (IA).

CORVETTE

Legal and contractual considerations on national and international data exchange, including the aspects of provision and usage of information, are reflected in contracts called Interchange Agreements. The objective of this activity is the elaboration of an international consensus for the preparation of the Interchange Agreements, consideration of liability aspects, evaluation of the data exchange based on the experience with the Interchange Agreements which were elaborated in CORVETTE IV.

The existing Interchange Agreements have to be updated according to the changing situations and according to new data contents which shall be exchanged in the existing framework. New (possibly private) TICs have to be evaluated according to their added value and other TICs/TCCs may be introduced into the data exchange network. Also envisaged are a number of links among the TICs/TCCs which were not directly linked within CORVETTE IV.

The technical part of this activity will concern the following topics:

- Inclusion of new data sets which are of interest for the respective parties

- Definition of the technical parameters enabling the connections erected in CORVETTE IV to enable them to cope with the new data sets
- Consideration of the evolution of the DATEX protocol in order to reflect the requirements of the extended data contents to be exchanged
- Implementation of connections to new TICs/TCCs providing substantial benefit to the project as well as between TICs/TCCs in the CORVETTE data network not directly linked where assessed to be necessary.

The expected impact of this initiative is a:

- Improved overview for the TIC/TCC operators regarding the traffic situation and the expected traffic flows which are expected to enter their networks
- Increased safety for the road user because of improved level of information
- Reduction social-economical costs because of reduction of delay on major Alpine routes
Reduction of environmental damage due to reduction of fuel consumption
- Improvement of data sets to be exchanged will benefit the overview of the operators regarding the traffic situation at the borders of their sphere of influence

Improvement of traffic flow within the networks of the operators due to faster and more comprehensive data basis.

Larger cities (Ljubljana, Maribor, Koper) are also interested in actively deploying ITS, namely in the areas of parking management, traffic management, traffic and traveller information and public transport.

There is consensus to actively make use of open standards and system architectures, and the political context is mostly favourable as regards public-private partnerships.

The public transport operators' are in a strong need for a standardised inter-modal timetable and exact tariff information for the end-users.

1.3 Laws and regulations concerning TTI services

There is no regulation concerning the TTI services. The Public Road Act (Zakon o javnih cestah) mentions that both DARS and DRSC are responsible for the management, maintenance and information of the users on the conditions of the infrastructure they are responsible for.

Therefore - to reach the requirements stated in the Commission recommendation on the "development of a legal and business framework for the participation of the private sector in deploying TTI services" – a National Traffic Mgmt and TTI Centre is a major step toward that goal.

Due to the existing public authority structure, the private sector has not yet took the active role as in some EU member states. Furthermore, due to small traffic volume it does not seem feasible to expect larger investment in information infrastructure from the private sector.

1.4 Role of the private sector

As a result of the above the most active role may be expected from the telecommunication operators and namely the internet and mobile telecommunication operators.

Private companies are involved as service providers (like the AMZS info channel which daily collects information on road works, roads and weather conditions and along with some useful information for transit and less frequent travellers every hour update info and deploy them via private and a public radio network, internet and WAP/GSM channels.

1.4.1 Data providers

For road traffic data collection and processing, the only two companies that collect in a systematic way and classify and distribute traffic data are DSRC and DARS.

The third contributor to the system is the Road police Department via the local information centres (OKC).

The installed roadside equipment (i.e. AADV loop detectors, weather stations, cameras) along the motorway network and on the federal road network (mostly bridges and tunnels), serves mostly for statistic purposes while a reduced numbers of cameras and forthcoming introduction of Variable Message Systems (VMS) connected to the tunnel's and motorway control centres offers some basic data to travellers on accident, queues and deviations.

Applications for travel time calculations and prognosis are still to be developed while for other traffic relevant information (weather predictions, road conditions, planned incidents, etc.) roadside equipment is still being installed and studied to connect to the single national TMC and TTI Centre.

1.4.2 System and solution provider

The main companies involved in ITS in Slovenia are companies like Traffic Design (system integrator) and Iskra Sistemi (communications) and Družba za državne ceste - DDC (A Company for State Roads).

Traffic Design and Iskra sistemi are the solution providers also for the actual Slovene 2,45 GHz motorway electronic tooling system based on Combitech / Kapsch technologies.

The third mentioned company - Družba za državne ceste (DDC) - is responsible for tendering and for the engineering part of virtually all major investments on roads and motorways in Slovenia.

1.4.3 Equipment manufacturers

With the exception of Iskra Sistemi, there are no equipment manufacturers of major importance for the traffic equipment.

1.4.4 Service providers

For road transport there are two major providers on the Slovene market:

1. AMZS d.d. is a private owned company established in 1947 and is a major contractor of DRSC for organising and distributing information to the end users. With the exception of the data base of major road maintenance activities (developed and updated by DRSC), they do not have their own source of data. The data is collected via *.ftp files from DARS and OKC, via "driver to driver" informations get thru the national radio, then filtered and distributed to the end users by internet or radio stations (on a contract base). AMZS does not have a radio channel of their own. The information could be retrieved also via WAP and GSM-info.
2. DARS have a service of their own named DARS Kažipot (DARS "show me the way") and this service is available for a couple of years now. Here a traveller can get info on travel routes, motorway's surface conditions, distances in SLO and EU, price for tolls and some

other useful informations. Some of this information are distributed to the drivers also via Variable Message Systems by the (and above) the motorways. DARS have for a second year in the row a free-of-charge info-telephone 080 2288 where information on particular section of the motorway can be obtained in both slovene and english language. Dars is very active also in providing multilingual information on info-kiosks along the highway (on parking lots and gas stations).

1.4.5 Mobile network operators

The only operator actively involved in TTI service delivery is Mobitel, the biggest operator in Slovenia. The information the user gets is the one AMZS supply to Mobitel. This situation will supposedly change with the deployment of UMTS.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 Inter-urban road networks

The automatic data collection system (public) currently covers all the motorway network in Slovenia, the main state roads and urban intersections. The collection of this data is collected on a daily rate or periodically via detection loop and lately with a help of cameras. Moreover, an on-line network of information system for weather conditions (weather stations) has been completed for the motorway part of the network and is being enlarged. There are also several WS on state roads but generally their number cannot guarantee a reliable data for all major roads.

Based on these sources, traffic status (collected from OKC and maintenance operator service), and incident detection, road works and special events, a route recommendations is made freely available only on (VMS – just few of them; radio, free telephone line) and pre-trip (internet).

A real private TTI services is not yet available.

2.1.2 Urban networks

Urban TTI service provision refers to both, public and private transport. Two major cities, Ljubljana and Maribor, have a traffic control centre for the supervision, control and retrieval of data from traffic lights, loop detectors, cameras. No information service is based on this activities.

Public transport

The public transport companies operating bus and railroad train are discussing a possibility to deploy a common payment tool.

The Ministry of Transport is aiming to integrate different payment for the infrastructure and service with a unique “electronic purse”. Different means are going to be tested in 2004 and elaborated, in particular regarding framework agreements, certification, accounting, central clearing, blacklist administration and the operation of a call-centre, urged by the preparation of a call for tender for implementation.

To the traveller, operators provide mostly static pre-trip information on timetables and fares (internet), and on-trip information at stops/ stations.

Implementations in cities and agglomerations

Comparing urban TTI service provision in cities and agglomerations, however, relevant differences exist regarding the distribution of roles between the public and the private sector. Specific models have been designed in each case, depending on multiple local parameters such as (ITS) development status, economic conditions, strategic orientations of key actors aiming to shape a integral transport management system solution. A model is going to be developed with the help of experts from AVV-NL.

All these initiatives will be based on public-private cooperations, without commercial risk-taking for the public sector.

2.1.3 Railway network

For rail passenger transport the provision of real-time information about the traffic status especially at stations (VMS) is currently in development. Information is available also thru internet.

2.1.4 Aviation

For air travellers, real-time information is made available by the airport companies pre-trip (internet) and on-trip (VMS, phone enquiry). For trip planning, static information on schedules and fares is also provided by travel agencies or the airlines themselves through the internet and by phone.

2.1.5 Navigation

All relevant information for safe and economic water transport operation can be received by phone. through a central on-line system (ELWIS),¹⁸⁹ run by the WSV. Operators provide static information about schedules and fares for shipping passengers mostly through the internet, for small lines only by phone.

2.2 TTI research activities

In national transport and ITS research, responsibilities are divided between the Ministry for transport and DRSC. The co-ordination of horizontal tasks (e.g. project management and evaluation) is carried out by thematically focused large research institutions (Institutes at the Universities of Ljubljana and Maribor and private companies like OmegaConsult and DDC) and with a ever larger number of contributions from European research institutes (NEI, NEA, DorschConsult etc.)

3 Key issues for TTI implementation

3.1 Drivers and trends

- *The Government and the Parliament* have decided to introduce a distance-related road pricing system for all categories of vehicles until 2008. A study has to show the most feasible and information advanced way of payment for the infrastructure use as the base data core for other ITS systems.
- *Mobitel, the biggest network operator (the other are Simobil, Debitel and Vega)* is looking for possibilities to recover the enormous investments made for the UMTS license. TTI still seems to represent an important market here, but requires new legislative acts and new cooperations.
- *National research and demonstration projects* are creating know-how and enhancing cooperation between local and international actors, thereby facilitating “good practice” transfer.
- *GSM deployment* and the recent start of the EU Galileo programme , the availability of mobile devices enhances the service demand and in turn opens up new possibilities for contents (location-based services) and applications (tracking).

¹⁸⁹ <http://www.elwis.bafg.de>

3.2 Key obstacles to overcome

- *High demand vs no payment:* Users are already paying for the use of the infrastructure and therefore are expecting this kind of service for free.
- *Business models:* to develop user oriented service contents and billing models that can be marketed successfully the private sector expect the public authority investment in the basic info infrastructure.
- *User awareness:* Politically desirable TTI services (inter-modal public/private transport) are not requested. The main choice of transport is a private owned vehicle.
- *Information reliability:* High quality standards need to be met in order to ensure that TTI services do not provide “outdated” or “wrong” information. Also a end-user expect a fully personalized and location based information
- *Data availability:* Few data are currently available at the urban level. Few are available for railroad and maritime transport. There is no a unique info-portal for all modes of transport.

3.3 Major potentials to use

- The different *local actor networks* should be integrated at the national level.
- *Public-private partnerships* needs to find a better balance between public and private interests. The gaps between limited resources and high political interest in TTI service provision (for the public sector), and between low demand and a business case (for the private sector) need to be bridged. A commitment to invest in a basic information infrastructure must be assured from the PUBLIC Authorities.

4 Annex

4.1 Key actors in TTI development

- | | | |
|---|--|---|
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Spain

1 Institutional framework for TTI development

1.1 Legal and public policy context

Public Administrations play a key factor in Spain in all the items related to the provision of TTI services at the national, regional and local levels. In order to understand the legal and public contexts, the three national administrations that deal with most TTI matters have been specified:

The Ministry of Science and Technology (in the past, Ministry of Industry) is in charge of managing all the matters related to telecommunication and information society. It is in charge of the management of the different R & D programs, which includes the coordination with the European Union. More exactly, the Ministry of Science and Technology is the administration responsible of promoting the Commission Recommendation on the development of a legal and business framework for the participation of the private sector in deploying TTI services in Spain.

The Ministry of Transport and Public Works is in charge of managing all the transportation modes and infrastructures: railway, road, airway, and maritime transport. These competences include TTI services. The Ministry of Transport and Public Works can be considered as the more important administration for TTI.

The Ministry of Interior is in charge of road traffic management and traffic police. Some of the competences of the Ministry have been moved to regional administrations in Catalonia and the Basque Country.

Any of the above mentioned administrations manages the infrastructure that uses public resources or data obtained from such resources, including all legislation issues. Nevertheless, the ownership of traffic data is different depending on the transportation mode being used:

Road transportation

All the systems used to collect traffic data obtain their data from the equipment being installed in the road and deployed by Public Administrations. Up to now, permission has not been provided for private companies other than road operators to install road equipment. An important source of road data is the traffic police, which sends such information only to Public Administrations.

A legal framework has not yet been established in Spain that allows private companies to use the data obtained with public funds. The Spanish Administration is aware of the Commission Recommendations while it is considering how to approach the issue of establishing a legislation. The legislations of other European countries are being currently studied, focussing mainly on the French legislation.

Regarding private data, in the road sector they are only related to toll motorways, which are obliged to send to the Spanish Road Authority all information that could be relevant for traffic safety. The Spanish Public Administration is the entity responsible for road traffic management, the only one allowed to use private road equipment, such as VMSs (Variable Message Signs) that are installed in a toll motorway managed by a private company (toll concessionary). The information exchange takes place normally from private companies to public administrations.

Interconnection of databases is now emerging in Spain. The provision of traffic competencies to regional administrations and the near standardisation of DATEX (Data Exchange) protocols will have an influence on the interconnection of databases. Also, the DATEX system will allow the interconnection at international level. Spain and France are already interconnected. In the interface between interurban and urban information, big cities usually have their traffic control and information centres interconnected.

As for the information chain, there is nothing regulated, except for minor items or punctual agreements. For example, for TTI information broadcasted via radio, Traffic Management Centres usually have their own press cabin. The experience in the past shows that a unique traffic problem is informed of differently depending on the journalist. However, a professional from the Public Administration is the one who gives the same information to the broadcasting channel that emits TTI information. The same happens with other media: GSM or DAB operators can obtain and broadcast traffic information if some minimum quality level is guaranteed and some type of agreement has been signed.

In recent years, GSM operators or companies dealing with the provision of alerts via GSM/SMS have come to the arena. They usually provide information obtained from different sources (such as public administrations, private road operators or automobile clubs) and they are in charge of all communication costs and of the deployments needed to offer the TTI service. The main benefit for them is users' fidelity.

Air transportation

There exist two different sectors that offer information systems:

On the one hand, the public sector, represented by AENA, which is in charge of distributing, monitoring and managing air traffic and airports in the Spanish territory. AENA has available free information for users with a non-profit interest, such as flight schedules, companies that fly to any of the Spanish airports, flight incidences, etc. Such information is provided in the panels deployed in each one of the Spanish airports, in the Internet and in the Customers Service Telephone. AENA is expected to be private in a few years from now.

On the other hand, the private sector, composed of air companies, mainly. There exists a clear tendency to carry out TTIs through the Internet, which offers useful information for the user for free, and whose main objective, apart from offering an informative service for clients, is to sell long-distance plane tickets (the user does not need to leave home or the office to buy the tickets). Moreover, the Internet also gets back part of the market that travel companies currently control by selling 80% of the plane tickets of the air companies.

The flow of information between the public and private sectors is fairly scarce. AENA (public sector) monitors which companies are flying, their flying schedules and the airports they are using, but AENA does not have any information on the number of seats available, prices, etc. The air companies (private sector) obtain information on flying permits, exits and arrival schedules as well as incidences from AENA.

Rail transportation

Rail transportation is currently public, although the Spanish government is foreseeing to liberalize the sector and to make private companies responsible for it. When this happens, the true potential of the information systems (TTI) that can be offered could be appreciated. Currently, RENFE (entity responsible for railway infrastructure management) is offering information to the user by means of informative panels in the main train stations of the country. Also, in the Internet, RENFE offers all types of information related to the company, makes it possible for the passenger to plan his/her trip and to make a reservation without having to go to the selling

points. Other types of information useful for the traveller can be obtained in the Customers Service Telephone.

There is also a local public sector (Madrid, Barcelona, Valencia and Bilbao) in the underground lines, which offer information through informative panels and whose infrastructure could be improved with time, making it possible for all the train stations to use such service, offering more detailed information, etc. Each one of the local governments and city halls in the country has a responsibility over the public transportation means.

Marine transportation

The public administration is the owner of ports and services related to TTI are mainly dealing with maritime traffic and rescue. The private operators are the ones in charge of offering such service. The main company in Spain is Trasmediterranea, which has information about the company, schedules, ticket reservation, etc in the Internet. Such service is also free and tries to displace travel agencies in selling tickets so as to save the money that is currently being paid on commissions.

Bus transportation

Spain has two different sectors:

Public sector (local transportation firms). The most advanced TTIs are related to the information available in the Internet on fares, schedules, routes of public buses and a Customers Service Telephone. There is no information regarding the time left for a bus to arrive to a bus stop and there are also no informative panels.

Private sector (firms at national level). The private sector is in charge of carrying out long distance routes in Spain. The TTIs that the companies offer are similar to those of air and train companies: information on the company and the possibility of making on-line ticket reservations. The companies also have a Customers Service Telephone to carry out the same tasks. The companies, however, do not provide any information on bus exists and arrivals through informative panels, the bays being used, etc.

Travel agencies

This is a completely private sector, whose main tasks are journey planning and, therefore, offer a service fairly complete for the client. The circulating means used is the Internet. Apart from the information given by the agency, it is possible to plan any kind of journeys, reserve any type of tickets (plane, ship, train, bus, etc.), check schedules to travel using the modes wished. Therefore, travel agencies provide an TTI that covers all the information related to the rest of transportation modes, but such information is pre-trip information, never in real time.

The TTIs of travel agencies have been included in the scope of transportation modes because they are currently selling about 80% of plane tickets apart from a high percentage of sales in other transportation modes. Most users that plan a trip go to travel agencies, but users resort to them mainly because agencies offer tickets for an itinerary with different transportation modes, hotel and entertainment reservations as well as reservation for leisure places. In this way, it seems that travel agencies offer the most important multi-modal and inter-modal transport services, including TTI information for all transportation modes.

To conclude, the level of deployment of a national framework for TTI services is very different depending on the transportation mode being involved and on the administration that is in charge of it. As an inter-ministerial matter, the common progress of TTI services is very complicated and public administrations do not consider a common framework as a priority. In this way, TTI services are progressing in different ways and different speeds depending on the transportation

mode. Despite the progress difference for TTI services, all the national R & D programs from the publication of the Commission Recommendation have considered the fact that projects related to improve public-private partnership for TTI services are subject to funding.

1.2 Role of the private sector

TTI services in Spain have been highly influenced by Public Administrations. This is the reason why very few private services are currently available (examples are included in the Spanish TTI Services document, service numbers 11, 12, 13, 14, 23, 24, 16, 30, etc) and they are mainly related to telecommunications providers. In any case, the cooperation established up to now is mainly based on a share of the provision cost of TTI information and on the economic benefit of the telecommunication operator, which is obtained from the use of the telecommunication network and never from the cost of the information content.

Spanish Public Administrations decided in the past to offer some TTI services free of charge. After a while, some of these services have been collapsed due to their own success: it is easy to access them and they are moreover free of charge. Such collapse has been produced due to the amount of people that tries to access free TTI services.

Taking into account the amount of accesses to the TTI free services, which produce an increasing request of national budget, some of the public administrations that in the past decided to offer the services for free have been trying to reconsider their initial position. Moreover, since the TTI service demand is changing depending on the period of the year, it is difficult for public administrations to decide which staff is mainly public servants and to increase or to reduce the amount of people devoted to any specific task (i.e. there is a lack of flexibility in re-direct staff for the service).

The proposed solutions that have been taken up to now are:

To ask users to pay for the services

To subcontract the services

The first idea has received a negative answer on the part of Spanish people. People that up to this point have had a free service do not want to pay for such service. People are aware that the service is paid in any case with taxes but they do not want to pay for the service directly. Most of these people accept to pay for the cost of the communication to obtain information but not for the cost of the service. A possible solution would be a change in the service offered or to provide some evident added value. The second idea is still under discussion and may be the solution. Companies specialised in offering different types of services to administrations or system integrators could be the ones that obtain the main benefits from these type of approaches. Nevertheless, taking into account the currently working free services, it is not easy to create parallel payment services, especially when the added value is not so clear.

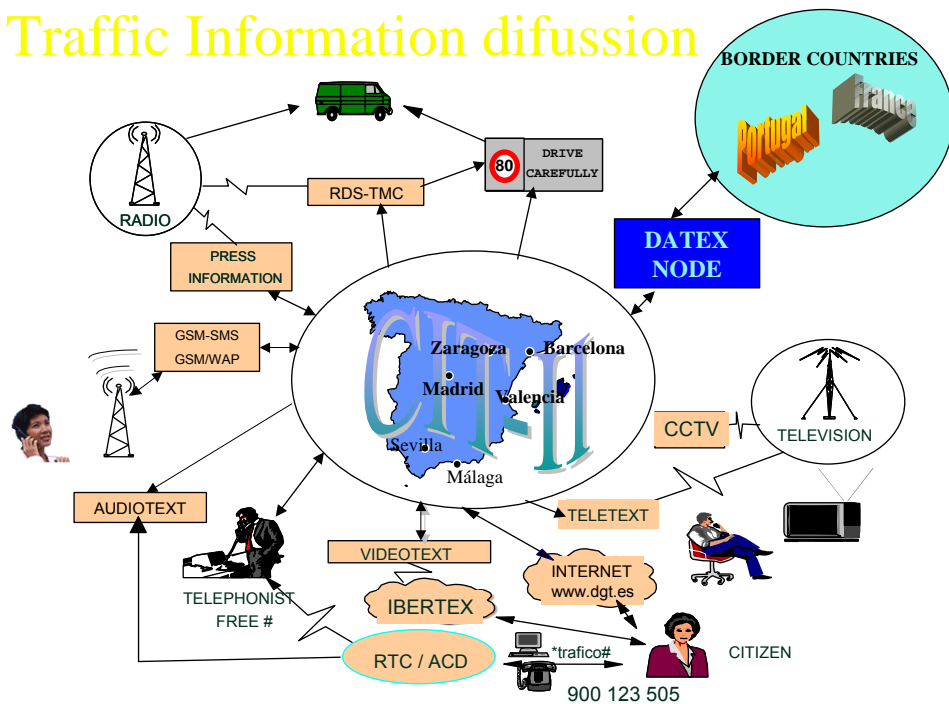
2 TTI service implementation and research

2.1 State-of-the-art of the TTI service implementation

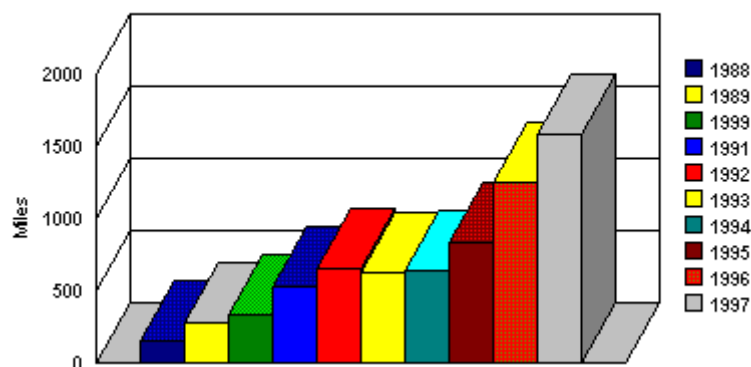
Currently, in Spain there are a wide variety of operative Information Systems that can be accessed through the web, the telephone, wap systems, etc. The Information Systems this report focuses on have different development levels, from those that provide the most complete and varied information to those that are simple and schematic. From the systems analysed, the most representative in Spain are the following ones:

- DGT Traffic Information Services:** DGT is the Spanish Traffic Road Administration. It is responsible for the traffic management in most of the Spanish interurban roads (except for Catalonia and the Basque Country). The DGT is in charge of the deployment of all ITSs (Intelligent Transport Systems) in the Spanish roads, which include optical fiber, traffic data capture stations, CCTV cameras, the Spanish network of TCC/TIC (Traffic Control Centres and Traffic Information Centres) and the interconnection of centres, the information coming from the traffic police, and the information coming from other countries. All this information is merged in a traffic database (CIT-II Concentrator) and then used to feed the different traffic information systems. The TTI architecture is presented in the following figure.

Traffic Information diffusion



As for to the use of the DGT TTI systems, the most widely used is the free telephone number. The table below reflects the amount of telephone calls received in a year. The last year in the table is 1998 with over 1,5 millions of telephone calls.



In the year 2001, the number of telephone calls was over 2 millions. The biggest amount of telephone calls is normally related to snow problems. In some winters, over 300,000 telephone calls were received in a single day (not all of them attended), which caused congestion of the Spanish Telefonica in the Madrid area, a high percentage of which were calls carried out from cellular telephones. During the year 2002, the traffic driving law has been changed so as to forbid the use of the telephone while driving. It will surely reduce the amount of telephone calls.

- ❑ **DGC Road Information Service. Tele-ruta.** Spanish Road Administration offers non interrupted information about road status including mountain passes via web (www.mfom.es) and wap. The information is mainly related to road works and snow which could affect the road traffic.
- ❑ **Airlines services.** All Spanish airlines companies offer TTI services. Good examples are IBERIA, Spanair and Air-Europa. Iberia Information System could give an idea of the level of development of the Information Systems at a private level in this sector. Iberia Information System is fairly complete because it offers a wide variety of information and it is completely accessible for the user. It has been functioning from March 1996 and has focused from its implementation on competing in the world wide market. The web has a mean of 25,000 visits, whose duration is approximately 10 minutes, mainly on fares, reservations, destinations, and schedules. In the other side the Spanish Airways Administration AENA, also in charge of the Spanish airports offers in internet one of the best information services in Europe.
- ❑ **RENFE:** Renfe is the Spanish public operator for railways which offers an information system with a public character within the field of train transportation. It provides a wide variety of information on this type of transportation. It has been active from 1995 but it only has national coverage. Within the Information System of the sector, Renfe is the most important one, because not only does it supply information on the firm, but also it is possible to contact the main firms of railroad transportation (train and underground) at the national level. Renfe is a public transportation company that is dependent on the Ministry of Foment (Public Administration), which is due to the fact that trains move in the road network of the State (either local, regional, long-distance, or high speed trains). Renfe is in charge of organizing, regulating, planning circulation, controlling the network operators, the external agents, as well as checking the follow-up of the train traffic that has a national coverage. At the provincial level, the use of the underground lines correspond to the government of each province (for example, Trains of the Generalitat Valenciana, Euskotren, Basque Underground, Metropolitan Transportation of Barcelona, etc).
- ❑ **Intercity bus services.** There is a good deal of electronic traveller information services in the intercity us services, but within the large private bus transportation firms, Grupo **ALSA / ENATCAR** is the most important Information System that has national coverage. It provides detailed information on schedules, fares, on-line purchases and reservations. It is also quite a complete system, because it is possible to find out about the structure of the firm, the services and products offered that are not merely journeys by bus. As examples of the rest of the services that the company offers, it is important to mention bus rentals for discretionary services, cars and limousines rentals, college transportation, courier company services.
- ❑ **TRANSMEDITERRANEA:** Within the sea passenger transportation with a private character, Transmediterranea is an important information system. The services offered are very varied. They range from on-line purchases, schedule consultations, reservation of cruises, etc. It is a system of information similar to the one offered by Renfe.

- ❑ **TRAVEL AGENCIES:** As an Information System, travel agencies have the widest scope, because they supply very complete multi-modal information. They are very varied and have a private character. The amount of information provided varies according to the importance of the firm that they are representing. In those analysed, the information is very important: journey planning, ticket purchases, hotel reservations and purchase of special services (charter), all of them without having to move. However, one of the most important limitations that travel agencies have is that they do not have their own information but depend on other sources to offer such information. Travel agencies wholly depend on other data services, such as Amadeus, the different air companies, Aena, etc, to gather and give information through their servers. Another important limitation is that, although providing very complete information, it is really a close system that shows an array of options to choose from, differently from what a traditional agent can provide, that is, many more options to personalize a journey completely.
- ❑ **PUBLIC AND METROPOLITAN TRANSPORTATION:** In this section, the different types of transportation means with metropolitan and urban coverage should be included, which consists of the urban buses network, underground and interurban trains that cover those lines not integrated in the rail network of Renfe. The following information systems should be stressed:
 - TRAINS OF THE GENERALITAT CATALANA (FGC): FGC is an information system financed by the Generalitat Catalana (Public Administration) that supplies interactive information. The FGC provides the coverage of the rail lines not integrated in Renfe (interurban coverage), users' profile, number of travellers, etc. It is an information system created and managed within the same company.
 - TRAINS OF THE GENERALITAT VALENCIANA (FGV): FGV is one of the most simple information systems analysed. It combines little interactive information with a great amount of passive information. It belongs to the Generalitat Valenciana (Department of Public Works, Urbanism and Transportation) that provides financing for the development of the system that is created and maintained in the company. From the FGV, we can visualize passive information related to urban transportation by bus.
 - EUSKOTREN: In its web page, Euskotren provides all the information related to urban and interurban transportation in the Basque Country. It combines interactive and passive information. Euskotren is a Public Society that is dependent on the Basque Government (Department of Transport and Public Works) from whom receives information.
 - NARROW RAIL TRAINS (FEVE): FEVE provides interactive information on the train lines non -covered by Renfe in the north of Spain, train schedules, fees, etc. It is a public company whose objective is to provide train services for travellers and goods. FEVE depends on the Ministry of Foment and, therefore, it receives public financing.
 - MUNICIPAL TRANSPORTATION COMPANY OF MADRID (EMT): EMT is an information system that is included in the Information System of the Community of Madrid. There is interactive information for bus lines (network scheme or space provided by buses of a given line). EMT belongs to the Transport Consortium of Madrid, created as union of public and private companies to manage and coordinate the urban and interurban public transportation in Madrid. EMT receives contributions both from the Public Administration in the Government of Madrid and from the Private one, through the bus transportation companies that is formed of.

- MUNICIPAL TRANSPORTATION COMPANY OF VALENCIA (EMT): Information system created in the transportation company and that manages it. The information that EMT provides is interactive, it is possible to check schedules, the scheme of the lines network, etc. The Valencian City Hall is responsible for EMT. It is therefore public and its financing is also public.
- METROPOLITAN TRANSPORTATION OF BARCELONA (TMB): TMB includes the metropolitan trains of Barcelona and the underground and bus lines, as mentioned above. The same company manages the system maintenance and receives public financing because it is a public company belonging to the Generalitat Catalana. The different companies of public transportation are associated in the Authority of Metropolitan Transport (AMT), consortium formed of the Generalitat Catalana, the Municipal Transportation Company (EMT) and the Barcelona City Hall.
- VALENCIAN UNDERGROUND: The Valencian Underground can be found in two servers, the one that corresponds to the Trains of the Generalitat Valenciana or independent within another system (www.metrovalencia.com). In both servers, the information provided is the same: network maps, schedules or fees presented as passive information. This information system has been created within the same company, with the support of the Public Administration because it is dependent on the Department of Public Works, Urbanism and Transportation.
- BASQUE UNDERGROUND: The information provided is interactive. It is possible to check schedules, fees, lines (network schemes) as well as linking private transportation companies (interurban buses, FEVE trains). The Basque underground is a public company that receives financing from the Basque Government.
- BARCELONA UNDERGROUND: Interactive information system shared with the bus transportation (TMB web). It is supported by the Generalitat Catalana because Barcelona Underground depends on it and it is also part of the AMT (Authority of Metropolitan Transportation).
- MADRID UNDERGROUND: Information system included in the Transportation System information of the Madrid Community. There is interactive information on schedules, fees, lines, etc. Financing is received both from public contribution (Government of the Madrid Community, Madrid City Hall) and from private (private transportation companies that belong to the Consortium). You can access it through the Consortium web or through their own web.

2.2 TTI research activities

Some of the activities in the TTI field that have been developed or are being developed are the following ones:

- ❑ RENFE is trying to incorporate an SMS service to its information System, which will provide information on incidences, news related to events in the railroad network, etc.
- ❑ AENA started an SMS service which supplied punctual information on flights, schedules, incidences, etc. This system worked (or was on trial) for a long time, but it was later cancelled due to its non-success among users, because its use was scarce.

But the most important new developments are coming from the place of the telecommunication operators at all levels:

- RDS-TMC service is now operative in the whole country. It will allow drivers to have road traffic situation in their own language.
- DAB (Digital Audio Broadcasting) is starting to provide service, in spite of the fact that very few receivers are available for end users. Currently, licence to 10 different DAB operator has been provided, most of them interested in including TTI services.
- GPRS services. Currently, several of the services offered via GSM/WAP are studying the possibility of using GPRS to reduce the price of telephone use and to improve the service offered. As an example, there are research projects dealing with the provision of an itinerary calculator which provides map information over the GSM.

Different projects also deal with the use of new standards for information exchange, such as XML, which will allow to interconnect databases and to maintain the presentation of information in the language or structure used for the information content.

3 Key issues for the TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

At the institutional level, the provision of TTI in Spain will be characterised by possible arrangements among the different administrations. To promote these arrangements, it will be necessary something more restricted than a Commission Recommendation.

Some type of directive could be a help to move the situation in Spain. As an example, for the interoperability of Electronic Fee Collection Systems for the European Commission, the obstacle that is really important to overcome is to find out who requests the system, using a directive already announced in the White Book. In another way, the telecom operators are starting to be key actors for TTI deployment, although they are more interested in the promotion of telecommunication infrastructures than in the provision of TTI.

TTI end users, who are supposed to be the big engine to move the market, requesting better TTI services are currently happy with the information received, especially when the information received is free of charge. People have assumed that time should be spent in congestion, delays, etc, and only request better information in special circumstances, such as:

Big movements of travellers: in holiday season

Closure of travel services: weather incidents, transport strikes, etc

Finally, service providers' commitment on the quality of the service offered: amount of information, reliability, easy access, real-time, etc, and personalised information will be key factors for the promotion of TTI services.

3.1.2 Technological (data acquisition and service delivery)

Technology plays a key factor in the promotion of TTI services for the upcoming year, although it is important in all the information services. The most important contribution of technology is to help the expansion of the Internet. Internet is a current technology but in Spain, it has not arrive fully to end users. Spain is one of the European countries that uses Internet the least at home, although such trend is assumed to have changed in a few years from now. The extension on the use of the Internet will allow end users to find out about all the possible services they could access through the Internet, where TTI services are included.

Availability of UMTS terminals and services to provide multimedia information is assumed to be another one of the technological drivers. In fact, people have been a little reluctant to use WAP services, due to the poor service WAP offers in comparison with SMS.

The final approval of Galileo will also have an influence in the Spanish market. It has been foreseen to promote the R & D project which present applications for Galileo positioning services in Spain. Moreover, it is not to difficult to think in the future car as equipped with a positioning system. This will sure an influence on the TTI services.

3.2 Key obstacles to overcome

In this report, it has already been stated the importance of the Spanish public administrations in the deployment of TTI services. Such administrations are usually close organisations, normally reluctant to changes and that are thinking more about their competences than about their duties

with citizens. This is still more important in a country such as Spain with public administrations both at national and regional levels (quasi federal).

Several administrations produce logically the split of competences and services. In this way, allowing the possibility of providing overall TTI services is necessary to improve easy agreements between administrations or to create an organism in charge of obtaining feedback from the different administrations. This is also true for administrations with different competences, such as competences over different transportation modes. In this case, it could be interesting the creation of inter-ministerial agreement or entities.

Regarding matters focused on end users, the most currently used telematic media for TTI services are the Internet and cellular phones. Both of them may be improved in Spain:

- The Internet has not been used enough in Spanish homes (as in other European countries), so more promotion of the Internet service is possible.
- When the Internet is being used, the service quality (data rate) is not appropriate for multimedia services. In this way, the current promotion of ADSL by most of the network operator together with the optical fiber promotion would have influence on the deployment of the Internet connections.
- Cellular phones have been deployed very much; however, the services used have been mainly based on voice and SMS. The WAP service has not had the foreseen impact (as it has happened in most of Europe) and people are still waiting for the appropriate mobile terminals. PDAs may be a solution or it may still need to wait for the terminal based on UMTS.

The possibility of selecting the language for the information that has been required is an important factor for the whole Europe. At this moment, it is easy to access national services because they are provided in the national languages but, when travelling across Europe, most of the service has not been developed in English yet. This also includes the promotion and publicity of European wide services. The easiest way to find out whether or not a user is interested in a service is the moment the user accepts to pay for that service. This is a clear indicator of the service utility and of the information provided. In this way, the content of the information to be provided still needs improvement.

3.3 Major potentials for usage

Currently, the potential of using new more advanced or elaborated TTI services is very reduced. The reasons are the different items already pointed out in "Key obstacles to overcome". However,:

the ever increasing amount of people travelling across different countries (for tourism or business reasons),

the creation of parallel possibilities for travelling between two points (with the high deployment of new High Speed Trains which could be a competence of air transportation),

and the ever increasing time spent in congestion situations in the whole Europe

will quickly push end users to have coordinated and good TTI services, which could only be made possible by making transport and traffic database publicly available.

4 Annex

4.1 Key actors in TTI development

Different key actors have been provided. The most important ones are the first four key actors, which have been included in this page. The first three are related to road traffic information, which is one of the most deployed in Spain at this moment. The fourth one is for the Spanish Ministry of Transport (Ministerio de Fomento). The person indicated in the fourth position is responsible of designating the correct contacts for all the transportation modes, which are different from the road (railways, maritime & airways) and that are coming from the different Departments of the Administration. In the second page, there are other important actors, but secondary in relation to the actors of the first page. Note that in relation to this second page, several of the actors do not provide personal contact information.

Most important key actors:

1	institution	Dirección General de Tráfico
	name / position	<i>Federico Fernández Alonso / Director Adjunto de Circulación</i>
	involvement	<i>Key in road traffic management in most of the country roads</i>
	address	Josefa Valcarcel, 28 (28027- Madrid)
	phone	+(34)-91-3018279
	fax	+(34)-91-3018540
	e-mail	federico.fernandez@dgt.es
2	institution	Servei Càtala de Transít
	name / position	<i>Leif Thorson / Proyectos Europeos</i>
	involvement	<i>Key in road traffic management of Catalan roads</i>
	address	Via Layetana, 69 (08003- Barcelona)
	phone	+(34)- 93-4840000
	fax	+(34)- 93-4840421
	e-mail	lthorson@correu.gencat.es
3	institution	Dirección de Tráfico
	name / position	<i>Iñaki Eguirra / Proyectos Europeos</i>
	involvement	<i>Key in road traffic management of Basque Country roads</i>
	address	Duque de Wellington, 2 (01010- Vitoria)
	phone	+(34)-945-018873
	fax	+(34)-945-018750
	e-mail	ieguirra@utap.ej-gv.es
4	institution	Ministerio de Fomento
	name / position	<i>Pedro Tena / Secretaria Técnica de Transportes</i>
	involvement	<i>Key for all transport modes but mainly terrestrial and air</i>
	address	Paseo de la Castellana s/n (28071- Madrid)
	phone	+(34)-91-5978747
	fax	+(34)-91-5978749
	e-mail	ptena@mfom.es

Secondary or complementary TTI actors:

5	institution	AENA
	name / position	<i>Ramón Diago / Jefe del Departamento de Gabinete (Valencia)</i>
	involvement	<i>Key for control to all air transport modes in Spanish's territory</i>
	address	Carretera de la Base s/n. CP.28850. Torrejón de Ardoz. Madrid.
	phone	+(34)-91-6564013 (Madrid) +(34)-96-1598512 (Valencia)
	fax	+(34)-91-6566000
	e-mail	-----
6	institution	IBERIA
	name / position	<i>Juan Sastre / Delegado del Departamento Comercial de Levante</i>
	involvement	<i>Key for air transport mode.</i>

	address	C/ La Paz 14. (46003 – Valencia)
	phone	+(34)-96-3513994
	fax	+(34)-96-3520677
	e-mail	-----
7	institution	RENFE
	name / position	-----
	involvement	<i>Key for train transport mode.</i>
	address	Paseo de las Delicias 61. (28045 - Madrid)
	phone	+(34)-902-105205 (Large Routes Department)
	fax	-----
	e-mail	-----
8	institution	RENFE
	name / position	<i>Maria Dolores Civera</i>
	involvement	<i>Information service</i>
	address	Valencia
	phone	+(34)-96.3537110
	fax	-----
	e-mail	-----
9	institution	FFE
	name / position	<i>Juan Altares / Departamento de Servicios de Información</i>
	involvement	<i>Key for train transport mode.</i>
	address	C/ Santa Isabel 44. (28012 - Madrid)
	phone	+(34)-91-1511013
	fax	-----
	e-mail	fuccu20@ffe.es (not personal e-mail)
10	institution	TRASMEDITERRÁNEA
	name / position	-----
	involvement	<i>Key for ship transport mode.</i>
	address	C/ Alcalá 61. (28014 - Madrid)
	phone	+(34)-91-2438500 +(34)-91-2438555
	fax	-----
	e-mail	correom@trasmediterranea.es (not personal e-mail)
11	institution	Grupo ALSA / ENATCAR
	name / position	-----
	involvement	<i>Key for bus transport mode.</i>
	address	C/ Miguel Flea 4. (28037 - Madrid)
	phone	+(34)-902 422242 (Customer Services Telephone)
	fax	-----
	e-mail	-----
12	institution	Agencia de Viaje del CORTE INGLÉS
	name / position	<i>Vicente M. Medina / Servicio de Informática</i>
	involvement	<i>Key for all transport modes.</i>
	address	Travesía Costa Brava 4. (28034 – Madrid)
	phone	(central office) : +(34)-91- 3798000 /+(34)-91- 3874700
	fax	+(34)-91-3721864
	e-mail	Vicente_medina_prados@elcorteingles.es
13	institution	HALCÓN VIAJES (Globalia e-bussines)
	name / position	<i>Javier Hidalgo Gutierrez / Consejero Delegado de Globalia Corporación Empresarial</i>
	involvement	<i>Key for all transport modes.</i>
	address	Poligono Son Noguera. Carretera Arenal (07620 – Lluc Major – MALLORCA)
	phone	+(34)-97-1178100
	fax	+(34)-97-1178360
	e-mail	

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Sweden

1 Institutional framework for TTI development

1.1 Legal and public policy context

1.1.1 National policy

The Swedish National Road Administration (SNRA, in Swedish Vägverket) is the national authority assigned the overall sectoral responsibility for the entire road transport system and thereby special responsibility for all development within this sector. The SNRA is also responsible for drawing up and applying road transport regulations. The responsibility role includes the task of leading the development and co-operation between key actors within the whole transport sector, regardless of mode of transport. The co-operation is crucial to the further development of a more efficient road transport system. This applies both to goods and passenger transports.

This sectoral responsibility involves representing the State at a national level in issues relating to the environmental impact of the road transport system, road traffic safety, accessibility, level of service, efficiency and contributions to regional balance, as well as in issues relating to intelligent transport systems, vehicles, public transport, modifications for the disabled, commercial traffic in addition to applied research, development and demonstration activities within the road transport system.

For the past couple of years, seven EU countries have been working together on mobility management issues within the EPOMM project (European Platform on Mobility Management). Sweden is represented by the National Road Administration in this project.

Key goals include greater use of more environmentally-sound modes of transport, improvement of accessibility, more efficient transports and use of land and less demand for transport in motorised vehicles

In June 1998 the Swedish government agreed on a new transport policy. One of the results of this agreement was that a new agency, Rikstrafiken (The National Public Transport Agency), was established in 1 July 1999. The task of Rikstrafiken is to co-ordinate long distance public transport by buss, train, boat and flight, focusing on sustainability, high quality, safety, the environment and the best interest of the travelers. This will be done through problem analysis and co-operation with the market's main actors and also by keeping an continuous dialogue with the travelers. In order to achieve greater accessibility and regional development it is necessary to analyse long-distance collective transport, including coordination of timetables, ticket systems and information. Rikstrafiken will also, on behalf of the government, procure long-distance collective transport which is not currently being provided by the transport authorities or the commercial transport operators, but which is motivated by transport policy.

Other important tasks for Rikstrafiken are to make travelling easier for people with special needs and to ensure that equality of opportunity is observed within the collective transport sector.

Samtrafiken (The Swedish Public Transport Coordinator) is owned by all rail operators and all County Public Transport Authorities (PTA:s) in Sweden. Samtrafiken was established in 1993 to make it easier to travel by train and local and regional public transport (bus, rail and ferry). The objective of Samtrafiken is to get more passengers travelling by public transport with a focus on intermodality and seamless travelling. Most travellers do not start their journey at a railway station and do not end their journey at a railway station. They need to combine rail transport with other modes of transport. The meaning of the swedish word "samtrafik" is joint traffic or co-

ordinated public transport.
Samtrafiken is not a trade organisation. There are two trade organisations for the owners of Samtrafiken, one for rail operators (The Association of Swedish Train Operators) and one for PTA:s (The Swedish Public Transport Association).

Goals in Transport Policy

In June 1998, the Swedish parliament adopted the Government's proposal on a new transport policy as presented in its Bill (1997/98:56) concerning "Transport Policy for Sustainable Development". The Government Transport Policy Bill stipulated the following goal:

"The overall goal in transport policy is to ensure a socio-economically efficient transport system that is sustainable in the long term for individuals and trade and industry throughout the entire country."

Goals in environmental Policy

In May 1999 the Swedish Parliament adopted the Government's proposal concerning environmental policy based on its Bill (1997/98:145) Swedish Environmental Goals. Environmental Policy for Sustainable Swedish Society". The Government Bill on Environment Policy stipulates the following goal:

"The overall goal in the environmental policy is to be able to hand over a society to the next generation in which the major environmental problems in Sweden have been solved. Further, Sweden shall be a driving force in the international arena and be a leading country with respect to ecologically sustainable development."

National Plan for the Road Transport System

The SNRA's interpretation of the transport and environmental policies together with the Government's instructions constitute the basis for its operations. This interpretation is presented in the "National Plan for the Road Transport System 1998-2007", which the SNRA Board of Directors sanctioned as a proposal in March 1998. This plan was then adopted by the Government in June 1998, with certain modifications emphasising the importance of road safety, amongst other things.

In the national plan, the following principal areas have been identified as strategic in the development towards economical, social and environmental sustainability in the long term:

- The infrastructure
- Vehicles and fuels
- Users of the road transport system
- Co-ordination and organisation of traffic
- Interaction between individuals in the society, result-oriented way of working

Special measures for better road safety

When the Government adopted the national plan for the road transport system 1998-2007, the SNRA was commissioned to draw up a special road safety plan for the period 1999-2003.

The special road safety plan, which the SNRA Board of Directors approved the Feb. 1999, was then submitted to the Government for ratification. Subsequent to revision, this resulted in a

governmental eleven-point programme for improving road safety, which was presented in a special governmental memorandum entitled “Sweden in the Forefront for a Safe Road Transport System”. This was dated in April 1999.

National Programme for ITS

For several years, the SNRA has been working on traffic management and information for a more efficient use of the road and street network. The “National Programme for Road Informatics in Sweden”, which was approved by the SNRA board of directors in 1999, contains a strategy for increasing the use of information technology in traffic. The strategy involves the time period 1999-2007, and consists of the following corner stones:

- Focus on user needs and user acceptance
- Transport policy goals and principles are fundamental
- Goals for economical growth shall be considered
- Development shall be based on science and verified experiences
- Close co-operation and a clear definition of responsibilities between different parts and actors.

To increase the use of ITS action plans have been established with focus on

- Supplying basic data on roads and traffic
- Trial activities involving users
- Good support when implementing strategies
- Promoting co-operation on a broad front to achieve common goals.

R&D

As far as R&D activities at the SNRA are concerned, the instructions as contained in the Swedish Book of Statutes (SFS 1997:652) are as follows:

“The SNRA shall endeavour particularly to ensure that socially motivated applied research, development, and demonstration activities within the road transport system are planned, initiated, implemented, documented and evaluated and that the results are distributed.”

In 1999 the SNRA Board of directors approved the Indicative Programme for the period 2000-2009. The purpose of the program is to direct R&D activities at the SNRA towards prioritised areas, and describe how R&D can be used as strategic means for the efficient attainment of goals in transport and environmental policies.

The R&D area aims are gaining knowledge that will provide a basis to further develop the co-operation between different modes of transport and the players concerned.

1.1.2 Data bases and collection

Traffic information for the road network originates from the SNRA or the cities local traffic authorities. There is a great need for digital road information. Several companies are already initiating programs to introduce advanced electronic in-car navigation systems. Transport companies and the forestry industry are building systems for making transport more efficient.

National Road Database

Road traffic safety and road management are other areas of major development potential. The Swedish government has therefore issued directives to create a nationwide road database, containing up-to-date information that fulfils particular quality standards. The Swedish National Road Database (NVDB, In Swedish Nationell Vägdatabas), is unique in its scope and content even on an international scale.

The aim of NVDB is to meet the immediate and long-term need for fundamental road information, and to be accessible both to the public and private sectors. The purpose is to create the right conditions for a breakthrough of ITS. The nationwide database contains up-to-date, quality-assured information on the entire Swedish road network (digital map containing all of Sweden's roads, road names, road numbers, speed limits, applicable traffic rules, etc) and is managed by the SNRA in association with the Central Office of the National Land Survey, the Swedish Association of Local Authorities, and the forest industry. NVDB is one of society's foundation databases, with three major areas of application: ITS, social planning and road management. The benefit of the NVDB increases the more the database is used by public and commercial organisations

The aim is that NVDB should provide a basis for enabling all public and commercial social planning and ITS systems to communicate. In the long term, NVDB should be able to be integrated into a nationwide transport database encompassing all means of transport, i.e. road, rail, air transport and shipping. A well-functioning nationwide database is a fundamental condition for modern social planning, and for helping ITS make a serious breakthrough in Sweden.

TRISS

The SNRA traffic data is collected in a traffic database called TRISS. Information into the system comes mainly from SNRA roadside equipment (such as road weather stations, traffic loop detectors, information and traffic data from camera or video based systems) and contractors for maintenance. Operators at the traffic management centres (TMC's) are committed to update the database with incidents that are not automatically registered. There are several traffic management centres and all are connected to TRISS.

- *Data content*

Information accessible through NVDB and TRISS might origin from the SNRA data collection systems, but also from the Swedish Meteorological and Hydrological Institute (SMHI), City Authorities, SOS, the Police of road ferry companies. The information content includes the following areas listed below:

- *Static information*

Road names, road numbers, speed limits, applicable traffic rules, digital map, tables of distances, plan for winter maintenance, information on rest areas.

- *Historical information*

Traffic data on flow, speed and vehicle types

- *Periodic information*

Information on construction or maintenance work, closed roads.

- *Dynamic information*

Incident information, weather data, road condition, load restrictions and real time traffic data and travel times where applicable.

1.1.3 Co-operation

The information in TRISS is available to private as well as public actors. Radio stations can obtain information from the database and the information can also be used by service providers.

The Swedish Radio Company (SR) national, regional and local traffic departments are responsible for the distribution of incident information. SR collects information from a number of sources; SOS Alarm service, the SNRA, City authorities and the public. Information is handled in the SR database called "OJJE".

Traffic information is distributed through the RDS channel. All traffic messages are distributed via the local traffic stations. RDS/TMC is used to only distribute information with is of interest for the driver in a certain geographical area.

DAB (Digital Audio Broadcasting) has been used by SR since 1995 over selected parts of Sweden.

This year a joint TMC, "Trafik Stockholm" ("Taffic Stockholm") was inaugurated in the capitol of Sweden, Stockholm. Through the establishment, data could be exchanged across the organisations.

In Sweden's second largest city Gothenburg, discussions about solving the data exchange between the organisations have been going on for many years. Until today no joint traffic management centre has been set up. However, the TMC operators at the local traffic authority and the regional SNRA office have good relations and exchange information through direct contact when larger incidents occur.

Use of Standards

International co-operation in the field of ITS is extensive. Knowledge-sharing and learning from the experience gained in other countries is common both in Sweden and elsewhere. Sweden is very active in EU- and other international co-operation.

One important reason for the SNRA's involvement in international forums of co-operation is to ensure Swedish interests in connection with the work on international standardisation. Sweden has signed the MoU's on DATEX and TMC. Regarding DATEX the comissions recommendation are being followed and regarding TMC, the recommendations have been implemented.

Listed below is a selection of the bodies in which Sweden is represented:

- DGIII, DGVII, DGXIII within the European Commission
- Standardisation bodies
 - CEN
 - NVF53
 - ISO 204
 - SMS2460
- CEMT
- ITS expert group:

- SMC – Supervisor Management Committee (data exchange between countries)
- HLG – High Lever Group
- PIARC – world-wide association of road authorities
- ERTICO – forum of co-operation for ITS in Europe (Sweden active in steering Committee)
- ERTICO –PAS (Public Authority Sector)
- NMR – Nordic Council of Ministers
- WERD – association of Western European Road Directors. Sweden is responsible for subgroup Telematics area HMI
- [TEN-T](#) - Trans-European Network for Transport
- IPC and EPC (Programme Committee for world and European congress on ITS)

1.2 Role of the private sector

The private market does not collect traffic information or data. Several business cases have been tried over the years, all with the same conclusions. The Swedish market is too small for private actors to start their own transport data systems. There is little or no interest of private companies to lead the development. Transport data is therefore handled by the public organisations such as the SNRA and the local traffic authorities. The data is supplied free of charge to any potential service provider. Today there are ongoing R&D projects and discussions looking at the co-operation between the public and private companies, where private companies are able to act as service providers of TTI-services. When the public data collection systems have expanded, for instance in the larger cities, opportunities for the private actors will occur to connect PT and car travel information. There is a belief today that information on comparison of travel times will be of interest as well as multi modal trip planning. Today the development

As mentioned above, the information in TRISS is available also to other actors. Radio stations can obtain information from the database and the information can also be used by service providers. An example of that is the private actor “Columna” who has developed the commercial service “Speechtime” in co-operation with the SNRA. Via Datex the TRISS information is collected and transferred to speech format. Payment is handled through an adjusted telephone charge. More services, like Speechtime, are likely to appear in the near future.

WAP is also a trend which is much discussed. For Stockholm PT information can be obtained from wap.sl.se and wap.trafiken.nu. The same information is under research also in Gothenburg. The main actor for this is the regional traffic company Västtrafik.

Private companies, for instance Gothenburg based company “Infracontrol”, are also developing pocket pc for dynamic traffic information. Infracontrol are hoping to carry out R&D field trials with a pocket pc during the year. Services are built on TRISS (incident information, real time information and average travel times), and KomFram (includes incident information, real time information and time tables) data and include travel time by PT, travel times by car, weather information and the possibility to set alarms for departure times connected to your personal location (e.g. real time buss departure plus your 10 minutes walk to the buss stop).

Navigation systems with dynamic route guidance (for instance Volvo system) are also available for Sweden, but have been left out in the country report, since this is no unique feature for Sweden.

In the project OPTIS, the SNRA works together with private companies to evaluate floating car data, where private cars equipped with positioning systems transmit traffic data in real time. The data is used to produce a real time view of the traffic situation. The project deals not only with transmission of data, but also the use and effectiveness of floating car data.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 TTI implementation reference cases

The main output from TRISS is the nation wide service called “läget på vägarna” (“current road situation”), www.vv.se/triss/trafikinfo/map.htm, where all traffic messages in TRISS are displayed either on a map or in text. The web site has been up and running for several years, and improvements are made continuously. As a relatively new feature, for Gothenburg real-time camera pictures present the current traffic situation. There are also links to www.trafiken.nu, which is Stockholm’s special web site. “Trafiken.nu” is a co-operation between the regional SNRA office, the regional PT company and the city of Stockholm. The web service is under continuous development. Also Malmö and Gothenburg are looking at co-operation across the organisations. It is seen as important to collect all traffic-related information “under one roof”.

Real-time PT information is available in several cities, for instance Gothenburg, Stockholm and Jönköping. Systems are based on on-board GPS units or sensors. Vehicle position and accuracy in relation to timetable is distributed in real time to traffic control centres, web sites, PT station monitors and buss stops. (The data system is also used for PT priority at traffic lights.)

In Gothenburg, the R&D project “Gotic Research” conducts research and practical trials in the information sector – specific to public transportation. The project is running in association with researchers and suppliers involved in the sector. The aim is to develop a system specially adapted for Gothenburg for the presentation of real-time information, produced and transmitted by traffic control system “KomFram”, to passengers on the public transport network. The centre for passenger information about disturbances is in operation since 1995 but still subject to new research and development. The overall object is to improve the quality and efficiency of public transportation in the interest of economy, the environment and road safety, as well as the well-being of the travelling public.

Samtrafiken (see above) hosts an intermodality national wide service through “TågplusGuiden (The “TrainPlus Guide”). At the web site www.tagplus.se information regarding the entire journey (“door to door”), before travelling is available. The service covers all train services and all major regional public transport services (bus, train and boat services) in more than 2 000 cities, towns and villages in Sweden. Samtrafiken has created a national database (RDB) with timetable information, directories of stations and stops, transfer times (times for changing modes) etc. The information system is also available on CD-ROM. Timetable information is also provided by booklets and a timetable book for trains in the whole country. Samtrafiken is also promoting better sign-posts at stations and terminals, maps, local time-tables, etc.

- [“www.trafiken.nu”](http://www.trafiken.nu)

As mentioned above, trafiken.nu is in the forefront of working with a cross-organisation perspective. Trafiken.nu will improve to include more cameras, information on current traffic situation according to congestion, improvement in calculation of travel times by car, information from road assistant teams, status on escalators and elevators in connection to subways, information on bike roads and bike&ride, applications for personal pc’s and co-operation with other service providers.

- “Läget på vägarna”

<http://www.vv.se/triss/trafikinfo/map.htm>

Web site of the SNRA. Has been operated over several years. Include road weather, incident information, rest area information; weather information from SNRA weather stations, and SNRA operated ferry timetables.

- “Öresunds bridge information”

Reference case for cross-border co-operation. Information includes inter-modal travel information and a route planner.

- “www.sj.se”

Rail and buss company trip planer. Includes booking and purchasing facilities.

2.2 TTI research activities

WAP is considered as one of the coming trends in Sweden. For Stockholm PT information can be obtained from wap.sl.se and wap.trafiken.nu. The same information is under research also in Gothenburg. The main actor for this is the regional traffic company Västtrafik.

Current trends also involve mobility management and multi modal travelling. Traffic problems are not to be solved only by new roads, but also through a higher degree of PT travellers. Actions for increasing the numbers of PT travellers involve smart payment, to be able to use the same ticket or smart card for different modes of transportation and also for parking.

Currently there is also the R&D EU financed project, PROGRESS, where one part consists of looking at road charges in connection to mobility management. –Can the road users be influenced to change their mode of transport through road pricing? For effective mobility management there would need to be information systems for road users who want to switch mode of transport on-trip or pre-trip.

The SNRA, western region, and Västtrafik carried out a project, IMPULS, in this field in the year of 2000. The project aimed at influencing travellers by car to switch mode of transport to train. The information was supplied through the presentation of travel time information by train and car in real time through on a road side sign. Travel times were presented at a location approximately 30 km north of Gothenburg, where there was a P+R parking lot free of charge available. Results showed that even though the travel time car and road during morning traffic in most cases were longer than by train, the road users were unlikely to shift modes of transport. Loss of flexibility and information at a late stage were given as prime reasons for continuing by car.

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

The subjects listed below can be regarded current trends in Sweden.

1. Cross-organisation co-operation and data exchange. –Improving quality of data and ensuring that all data is served in the same format, enabling service providers to use all accessible data. The co-operation is both between different public organisations, but also

between public organisations (suppliers of data) and private companies (e.g. service providers).

2. Travel times –to be able to inform the public of real-time travel times. Through this information the public is able to choose different travel mode or time for departure. This trend is supported mainly by public actors such as SNRA, traffic authorities and the regional PT-companies.
3. Multi-modal and door-to-door services. This trend is supported mainly by public actors such as SNRA, traffic authorities and the regional PT-companies.
4. Services and means of transport and travel information – R&D for evaluation on market for service providers. Actors involved in this trend are the public authorities, research organisations and private companies e.g. Volvo, Columna, Infracontrol.

3.1.2 Technological (data acquisition and service delivery)

Regarding technological trends, the trends include

1. Floating car data – to increase the number of input data sources and also to cover a larger area. This trend is supported mainly by public actors such as the SNRA, traffic authorities, and different private companies.
2. Internet – improving the on-trip information. This trend is supported mainly by public actors such as SNRA, traffic authorities and regional PT-companies.
3. Information through mobile telephone communication, including both text and camera pictures. This trend is supported by public actors such as SNRA, traffic authorities, regional PT-companies as well as private companies.

3.2 Key obstacles to overcome

The main obstacle in the development of TTI services is the size of Swedish market. There is no market for private companies to establish their own data collection systems. The public is not interested in paying for services which they can get free of charge from the public authorities. Policies are that input data needs to be monitored by the SNRA and City authorities. Budget for investments are limited due to the present economical situation in Sweden at the moment.

The use of mobile telephones and internet in traffic and transport information puts integrity at focus. Security systems for integrity must be considered when dealing with private drivers as data sources.

3.3 Major potentials to use

The SNRA has information on all planned road works. The combination of this information, information on travel times and comparisons between modes of transport could be of interest for the Swedish market. The information needs to be “tailor made” for the customer or for a geographical location to make the information more attractive.

As mentioned above, floating car data could prove to be of great use for both public and private companies in the development of future high quality services for the public.

4 Annex

4.1 Key actors in TTI development

1	Institution name / position Involvement	SNRA (Swedish National Road Administration) Johnny Svedlund/Project manager traffic information Owner of road traffic information, infrastructure for data collection and traffic database. Operator of Incident management. Also involved in research and development for new traffic information products. SNRA regional offices are directly involved with activities with regional traffic companies and authorities. Stockholm, Gothenburg and Malmö offices are especially active. www.vv.se
	Address	871 87 Borlänge
	Phone	+46 243/75000
	Fax	+46 243/75825
	e-mail	Johnny.svedlund@vv.se
2	Institution name / position Involvement	Västtrafik Gunnilla Wicktor /Information director Traffic information and journey planning for PT services for Western region Västtrafik is the main PT actor in the Gothenburg and Western region. Västtrafik have been a key actor in PT information development over the years. Västtrafik is also supporting research projects on PT traffic information. www.vasttrafik.nu
	Address	Box 123, 541 23 Skövde
	Phone	+46 500-46 44 22
	Fax	+46 500-48 91 48
	e-mail	Gunilla.wicktor@vasttrafik.se
3	Institution name / position Involvement	Øresundsbro Konsortiet Developer and manager of traffic information system at Öresundsbron. Key actor or rather "one of its kind" in Sweden, since they are dealing with traffic and information from two countries. Also key actor in road user charge. www.oeresundsbron.com
	Address	Kundeservice Nyropsgade 42 1782 København V Denmark
	Phone	+45 70 23 90 40
	Fax	+45 33 41 65 80
	e-mail	Kundeservice@oeresundsbron.com
4	Institution name / position Involvement Address	SJ (Statens Järnvägar or Swedish Rails) Maria Löf (+46 690 675 30) /Manager dept. traffic information Main operator and supplier of railway information. System also has the possibility of bookings and purchasing tickets on line. SJ AB Head Office SE-105 50 Stockholm
	Phone	+46 8 762 20 00
	Fax	+46 8 411 12 16
	e-mail	sjinfo@sj.se
5	Institution	Trafiken.nu

name / position	Alf Peterson/SNRA
Involvement	Joint responsibility for traffic information involving City of Stockholm, SNRA Stockholm Region and PT company SL. Good example of co-operation between organisations. Trafiken.nu is under continuous development and will be upgraded this year.
Address	Trafiken.nu also has links to flight, rail and boat information. Vägverket/ SNRA Box 4202 171 04 Solna
Phone	+46 8 757 66 00
Fax	+46 8 98 30 30
e-mail	Info@trafiken.nu or alf.peterson@vv.se

4.2 Sources and references

- 1 <http://www.trafiken.nu>
- 2 [http:// www.oeresundsbron.com](http://www.oeresundsbron.com)
- 3 [http:// www.vv.se](http://www.vv.se)
- 4 [http:// www.sj.se](http://www.sj.se)
- 5 <http://www.vv.se/triss/trafikinfo/map.htm>
- 6 <http://www.vasttrafik.se>
- 7 SNRA ; 2000 ; Indicative Programme for R&D 2000-2009 ;Borlänge ; publ 2000 :18E
- 8 [http:// www.slutf.se](http://www.slutf.se)

Switzerland

1 Institutional framework for TTI development

1.1 Legal and public policy context

1.1.1 Road transport and authority levels

In Switzerland, the federal government (the Federal Department of Environment, Transport, Energy and Communications (UVEK)) defines the general orientations of national transport policy. In terms of the national road network the Swiss federal roads authority directs planning, finance, construction, operation and maintenance. Switzerland is a Federal state with 26 cantons. These cantons operate all affairs concerning planning, construction, operation and maintenance.

In 2003 two national legal regulations concerning traffic information and traffic management come into force: The competence for all aspects concerning traffic information is on the level of the cantons are in charge of the traffic information whereas the federal government has only competence in co-ordination of traffic information and support of the cantons. The details of this regulation has to be defined. Also in terms of traffic management the cantons are independent apart from the border crossing transalpine heavy goods traffic, for which the federal government is in charge.

A political strategy of road traffic telematics 2010 was elaborated in 2001 by the federal government. Ten basic principles are postulated such as traffic information, traffic management, intermodality, data warehouse, assistance services, public private partnership, finances and fee road pricing.

There are several projects with the scope of finding a new architecture for TTI in Switzerland. A core problem to solve is the definition of a structure of data warehouse for all TTI data. This will clarify the responsibilities of collection and processing traffic data.

1.1.2 Railway transport

There is no legal basis or public policy for traffic information for this mode.

1.1.3 Air transport

There is no legal basis or public policy for traffic information for this mode.

1.2 Role of the private sector

Actually Switzerland has no official TIC. Viasuisse is a joint venture of the official swiss radio stations (srg ssr idée suisse) and the national railways (SBB) and acts as service provider for a national service and plays the role of a quasi official TIC. They are supported by the federal government and the cantonal polices.

A second actor in private TTI services is Traffix, a private company. They collect data and provide it to some broadcasters in Zurich, Winterthur, Bern and Lucerne.

Except these two providers, there are at the moment no further TTI services or TTI industry in Switzerland.

Several organisations (mainly public authorities in collaboration with private companies) are testing new services with the data collected by the road operators with fixed data capture stations (mostly inductive loops) on links and nodes. No commercial service exists at present.

At present a circle of interested companies with research projects has access to public data.

Regarding data quality a Swiss research project (Qualittraffic) will show the level of traffic information and measures to improve data and information quality.

It is not possible for private sector organisations to collect their own data with roadside equipment. They have only the possibility to work with floating car data systems with the agreement of the motorists.

On the other hand private sector organisations have free of charge the right to lead through data cables along motorways. Several companies are using this right for telephone services and other information transport.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

2.1.1 Road transport

Radio: On national level “SRG SSR idée suisse” covers the whole area with a service of traffic information which is at least every 30 minutes on air. The service contains messages about traffic congestion, recommendations and traffic forecasts in case of special situations and events.

On regional / local level there are several local radio stations providing traffic information based on data from Viasuisse or own data collection in form of motorists calling.

RDS-TMC: “SRG SSR idée suisse” covers the whole area of Switzerland with RDS-TMC services.

TV: Every TV station with Videotext offers a pre-trip traffic information service based on informations provided by Viasuisse

Telephone: A telephone service (# 163) is operated by the mobile phone company Swisscom, based on data from Touring Club Switzerland TCS inforoute. This service covers the whole motorway and national road network.

VMS: Motorways are more and more furnished with variable message signs. The use of VMS for traffic information is increasing, also for re-routing. There is a project of the Swiss federal roads authority to investigate the possibilities to indicate travel time messages (forecast depending of the actual traffic situation) on VMS.

SMS: Each of the three Swiss mobile phone companies offer a traffic information service by SMS. The services are available in push and pull modus. It is possible to choose selected motorways. Data source is Touring Club Switzerland TCS inforoute.

Internet / WAP: Pre-trip information is offered by several Websites like www.tcs.ch, www.txt.ch, www.truckinfo.ch and others. Some of them offer also a WAP service.

Traveller information: At present there is no nationwide service in operation or planned. On regional level the Website www.transbasel.com offers a full multi- and inter-modal traveller information service in a test stadium. A financial support for operating costs by the government is still expected.

2.1.2 Railway transport

SBB (Swiss national railway company) is partner of Viasuisse, the leading traffic information provider in Switzerland. They provide the same media like road traffic informations.

Regarding Traveller information services SBB provides a pre-trip information service by Internet. A part of this service contains a door-to-door (address-to-address) timetable. These services are free of costs.

For pre- or on-trip traveller information SBB provides timetable information with costs from station to station by SMS service as well as by WAP (free of cost, only transmission costs).

Most of the urban transport companies offers a free of costs timetable by Internet. Some of the companies provide service telephone number with costs for traveller informations from door-to-door. Some information are based on SMS.

2.1.3 Air transport

There is no official traffic information about air transport in Switzerland. Each air transport company (eg. Swiss) and airport operator is about to inform their customers about delays and other problems in form of Internet and mobile phone applications (SMS).

The five most important airport operators offer a online timetable for arrivals and departures by internet as well as by Teletext (Videotext on Television).

2.2 TTI research activities

The responsibility for research in the domain of transport and telematics systems is on national level at the Swiss federal roads authority. They are supported by the federal office for education and science.

The two professional associations VSS (Swiss Association of Road and Transportation Experts) and SVI (Swiss Association of Transportation Engineers) assist the Swiss federal roads authority in evaluating and processing research projects.

The funding of most national research projects is provided by the Swiss federal roads authority.

The following list of projects offers a short overview of the major research and implementation projects in TTI:

National level:

- Framework strategy of road traffic telematic 2020 and ITS Switzerland 2012, Swiss federal roads authority
- SNS-CH: Traffic management for alpinecrossing heavy goods vehicle, Swiss federal roads authority
- GEWI-TIC: Evaluation and implementation of a communication and management system, Viasuisse, Swiss federal roads authority
- Assessment of traffic information system in Switzerland, Swiss federal roads authority
- VSS2001/301: Indication of time lost instead of congestion length, VSS
- VSS2000/436: Standardised traffic information, VSS
- VSS2001/901: Qualittraffic; Specifications for collection, processing and distribution of traffic informations, VSS
- SVI 1999/326: Impact of Personal Travel Assistents, SVI

International level:

- SERTI (Southern European Road Telematics Implementation)
- CORVETTE (Coordination and validation of the deployment of advanced transport telematic systems in the alpine area)
- TRIDENT (Transport intermodality data sharing and exchange networks)

3 Key issues for TTI implementation

3.1 Drivers and trends

3.1.1 Institutional (public and private)

1. Legal regulation: The legal regulations concerning traffic information and traffic management are the basis to finance further services.
2. Strategy of road traffic telematic implementation: The strategy contains ten guidelines to reach the political scopes in traffic information and management.
3. Public-private partnership: The limited resources of the public and private sector and the user requirements force the co-operation.

3.1.2 Technological (data acquisition and service delivery)

1. Data Warehouse: Several studies and projects show the need and the architecture of an (inter-)national data warehouse for traffic information and management.
2. Standardisation: Since some years standardisation on national and European level is growing. There is great need of standardisation for integrated services.
3. Websites: Quite a few organisations (public and private) are using Internet as platform for TTI services. Combinations of Internet and mobile communication facilitate pre-trip and on-trip information services.

3.2 Key obstacles to overcome

1. Demand paradox: High user expectations in terms of service contents (competing with other media) contrast with a very low willingness to pay (competing with free public service provision).
2. Information reliability: High quality standards need to be met in order to ensure TTI services do not provide “outdated” or “wrong” information, as this would have very negative repercussions on the demand.
3. Lack of multi- and inter-modal information: For a seamless TTI delivery, information from all modes must be integrated in a common data warehouse.
4. Urban problems: Services on inter-urban network reached a high level. To integrate urban networks a great effort is still to be made.

3.3 Major potentials to use

The high level of mobile phone ownership allows a great market of personalised multi- and inter-modal traveller and traffic information (pre-trip / on-trip).

4 Annex

4.1 Key actors in TTI development

[Selective list of key stakeholders or “agents of change” in TTI development. This can be both individuals and institutions that meet the criteria indicated below. Make a summary assessment - beyond the individual level - of why you think these are the key actors in your country.]

- direct involvement in TTI implementation decisions, formally and informally, at any stage of the implementation process
 - good understanding and expertise of technical, institutional, financial or business aspects in the context of TTI implementation with an emphasis on practitioners
- 1 institution Swiss federal roads authority ASTRA
 name / position Andreas Gantenbein / Head of division
 involvement Responsible for the strategy in road traffic telematics
 address Bundesamt für Strassen (ASTRA)
 Worblentalstrasse 68, Ittigen
 CH-3003 Bern

 phone +41 31 322 94 37
 fax +41 31 323 23 03
 e-mail andreas.gantenbein@astra.admin.ch
 - 2 institution Viasuisse
 name / position Mark Bögli / Managing Director
 involvement National traffic information centre
 address Zentralstrasse 60 (Kongresshaus)
 CH-2502 Biel-Bienne

 phone +41 32 329 99 99
 fax +41 32 329 99 98
 e-mail mb@viasuisse.ch
 - 3 institution Traffix
 name / position Jürg Fleischmann / Managing Director
 involvement Regional traffic information centre
 address Traffix Verkehrsradio
 Bäulerwisenstr. 3
 CH-8152 Glattbrugg

 phone +41 1 828 88 88
 fax +41 1 828 88 99
 e-mail fleischmann@traffix.ch
 - 4 institution Conference of Swiss Cantonal Police Chiefs
 name / position Fritz Brigger / Schaffhausen police chief
 involvement Chairman of the Conference of Swiss Cantonal Police Chiefs
 address Schaffhauser Polizei
 Beckenstube 1
 CH-8201 Schaffhausen

 phone +41 52 624 24 24
 fax 41 52 624 50 70
 e-mail Info@shpol.ch
 - 5 institution B+S Ingenieur AG
 name / position Walter Schaufelberger / Head of division
 involvement Responsible for SERTI / CORVETTE / TRIDENT projects

address Muristrasse 60
CH-3000 Bern 16
phone +41 31 356 80 03
fax +41 31 356 80 81
e-mail walter.schaufelberger@bs-ing.ch

6 institution VSS Fachkommission 9: Traffic telematics
name / position Matthias Rapp / Chairman
involvement Co-ordination of standardisation
address Rapp Trans AG
Hochstrasse 100
CH-4018 Basel
phone +41 61 335 78 51
fax +41 61 335 77 00
e-mail matthias.rapp@rapp.ch

4.2 Sources and references

- 1 Swiss federal roads authority, www.astra.admin.ch
- 2 Swiss federal roads authority, www.verkehrsdaten.ch
- 3 Swiss federal roads authority, www.truckinfo.ch

United Kingdom

1 Institutional framework for TTI development

1.1 Legal and public policy context

Central Government

- The approach taken by the UK Government and its Agencies in respect of transport information using transport telematics is essentially permissive. This means that the primary purpose of the main legislation is enabling rather than controlling; encouraging rather than restrictive. This approach is evident both as regards information for drivers and in respect of information for the user of collective transport.

Driver Information

- The primary legislation governing development of TTI systems for drivers in the UK is [the Road Traffic \(Driver Licensing and Information Systems\) Act 1989](#), under which a licence can be granted to system operators. The purpose of the Act is to enable system operators to install apparatus in the highway and to ensure that dynamic route guidance systems (i.e. systems which can provide turn-by-turn navigation routes according to prevailing traffic and road network conditions) do not prejudice road safety or good traffic management. Protection of the end user is covered by a large number of national and international laws and regulations dealing with the following areas:
 - vehicle construction and use standards
 - radio and telecommunications
 - consumer protection,
 - health and safety
 - traffic
 - data protection
- Safety issues are of prime concern to UK transport agencies and considerable effort is being devoted to them. The issues fall into two broad areas; firstly the inherent safety of the systems, which are directly related to such concerns as equipment reliability, and secondly the way such systems are used by drivers.
- The [British Standards Institution](#) published a Draft for Development in 1996 called a "Guide to in-vehicle information systems". This covers safety issues which should be addressed by manufacturers, suppliers and installers of in-vehicle systems. It also briefly covers the responsibilities of the driver. The Government has in place a checklist for the assessment of such systems. It also has in place Design Guidelines for in-vehicle information systems, which have effectively taken into account the advancement in technology since the draft for development was published in 1996. Research into Human-Machine Interface safety issues is continuing.
- Strategic roads (Trunk Roads and Motorways) are owned and controlled by central government (through the [Highways Agency](#)) or, in [Scotland](#), [Wales](#) and [Northern Ireland](#), by regional government. In London trunk roads are controlled by [Transport for London](#) (a

special tier of government), whilst motorways remain the responsibility of the Highways Agency. Apart from in Northern Ireland, all other roads are controlled by local highway authorities. A large amount of traffic data is collected and processed by central government or its Agencies, under the auspices of various projects, for example, the [Regional Traffic Control Centres](#)

- The Highways Agency's vision is to deliver reliable trunk roads and motorways as part of an integrated transport system and to support sustainable development. It has specific objectives to "develop (its) role as network operator by implementing traffic management, network control and other measures aimed at making best use of the existing infrastructure and facilitating integration with other transport modes" and "to take action to reduce congestion and increase the reliability of journey times"¹⁹⁰. Not only are these objectives reflected in solely English projects but also in collaborative European projects with other agencies.
- One example of this is the EC supported STREETWISE (Seamless TRavel Environment for the Western ISles of Europe) Euro-Regional Project, where the Highways Agency is working alongside its counterparts in Wales, Scotland, Northern Ireland and the Republic of Ireland). STREETWISE aims to provide seamless and effective travel information on the Trans-European Road Network (TERN) between the Republic of Ireland, Northern Ireland, Scotland, Wales and England. ITS services in these Countries have evolved at different rates, due the varying size of the countries involved and the particular problems in each network. There is currently little data interchange between these systems and also with urban systems, so an unconnected patchwork of separate services is in danger of evolving across the various countries.
- The STREETWISE project aims to integrate this patchwork of services on the TERN. It will do this through the improved collection and exchange of high quality information between national and local authorities as part of a harmonised European approach. The key objective is to provide seamless services to travellers.
- The Highways Agency is also participating in the CENTRICO Euro-Regional project concentrating on improved data exchange and information provision between England and mainland Europe.

Information for users of Collective Transport

- The structure of the railway industry and its operations are governed by the Railways Act 1994 and the Transport Act 2000. The former Act set up the independent Office of the Rail Regulator and the Office of Passenger Rail Franchising, the latter being superseded in the Transport Act 2000 by the Strategic Rail Authority. Under the Railways Act 1994 the (privately-owned) rail companies are together, through their Association (of Train Operating Companies), required to provide a National Rail Enquiry Service. The performance of this is monitored by the Rail Regulator who can impose penalties on the rail industry for poor performance of this service.
- The Strategic Rail Authority operates under Directions and Guidance from the Secretary of State for Transport (and from his equivalent in Scotland and the Mayor of London for London services). It has responsibility for steering forward investment projects aimed at opening up bottlenecks and expanding network capacity: these may in-

¹⁹⁰ Highways Agency website: <http://www.highways.gov.uk>

clude projects which also enable the provision of TTI. As the organisation directly responsible for letting and managing the passenger rail franchises it seeks to secure passenger benefits in franchise agreements with Train Operating Companies, and these may include delivery of TTI systems.

- The Government also currently owns London Underground Ltd. the operator of the London Underground system, which has historically pursued a policy of investing in real-time information at stations. London Underground Ltd.'s website at www.thetube.com provides real-time information.
- Until recently there has been no legal requirement for operators of other modes to provide an enquiry service. However, Sections 139-141 of the Transport Act 2000 place a duty on local transport authorities to consider what bus service information should be made available to the public and how it should be presented. In the light of this they can require operators to make information available in a way which is acceptable to them. This means it is within local authority power to require a uniformity of service information from all the bus operators in their area. Central Government has played a key role in the delivery of uniform bus information through spearheading the **traveline** phone enquiry service (see Section 2.1 below). Although the establishment of **traveline** preceded the Transport Act 2000, it is still being developed and provides an important context for delivery of local authorities' responsibilities. Several other systems and protocols necessary for **traveline's** delivery have also been developed under Government initiatives, with central Government providing both financial contributions and the policy framework (through Transport Direct, again see Section 2.1 below) to enable TTI systems for collective transport to become a reality.

The Regions

Scotland and Northern Ireland have separate legislative frameworks from the rest of the United Kingdom. Unless specifically reserved to remain under UK jurisdiction these are devolved to individual countries. For instance, in Scotland transport matters that are reserved for national United Kingdom jurisdiction include railways, transport safety and regulation, while those that are devolved to the Scottish Parliament include the Scottish road network, bus policy and ports and harbours.

Driver Information

- Regional Authorities in Scotland, Wales and Northern Ireland have taken a pro-active role in developing telematics systems, generally on a partnership basis with the private sector. For example, recent innovations in Wales are the new information line, website and associated WAP services providing real-time updates for motorists run by [Mantais Cymru](http://MantaisCymru), the South Wales Traffic Management and Information Centre. Drivers in Scotland are provided with up to the minute information about road traffic conditions by Scotland's National Driver Information and Control System, NADICS.

Information for users of Collective Transport

- The regional authorities in Scotland, Wales and Northern Ireland are responsible for overall policy and leadership of implementation regarding the **traveline** phone enquiry service in those regions, and may choose to have financing regimes which differ slightly

from the English model. In Wales the **traveline** service has a local-language version, whilst in Scotland the **traveline** service covers air services as well as other modes.

- In London, bus services are regulated by Transport for London (TfL), an agency of the regional government there, and TfL is the provider of various TTI initiatives for collective transport, most notably Countdown, a large scheme to provide real-time information at bus stops.

Local Government

Driver Information

- Local (City and County) authorities have also been active in telematics demonstration projects. Examples include the [ROMANSE](#) project in Hampshire and the [Integrated Travel Information Centre](#) (ITIC) in Bristol.

Information for users of Collective Transport

- As stated above, local authorities are now responsible for securing the provision of public transport information, and may choose to supply this themselves or share the provision with public transport operators to provide it. Local authorities are increasingly entering into quality partnerships with bus operators to improve the provision of bus services on certain corridors, and often these include delivery of TTI services.
- Local authorities play a significant role in the delivery of the **traveline** service.
- Wider partnerships between various organisations include the [INTEGRATE](#) partnership in Greater Manchester, the biggest such arrangement in the country, which is designed to deliver a range of improvements to multi-modal travel, including improvements involving electronic travel information.
- Although information on bus service disruptions through traffic conditions or other problems is very incomplete at present, the government would like to see the extension of this to provide a national system, covering all of England, Scotland and Wales. There are a number of local, mostly urban, schemes in existence, many of which have developed as pilot projects. However, the government is now allocating finance to local authorities to progress the extension of existing schemes, while at the same time a Real-Time Information Group has been established by local authorities and bus operators, with the support of central government through the [DTLR](#) (Department of Transport, Local Government and the Regions).
- This Group is aiming to deliver a national specification which can be 'bought into' by partners at various levels in different areas, depending upon the particular business case existing in each area. It is accepted that in the UK progress on delivering real-time information to passengers can only be achieved through voluntary partnerships between local authorities and bus operators, as the public transport operators are private companies. The general model (although this is not universal) is for bus operators to finance the on-bus equipment, as they see a business case for themselves in doing so, whilst local authorities provide the on-street equipment. Development of national coverage requires the establishment of national communications protocols to avoid buses and coaches having to be equipped with multiple pieces of communications equipment to serve different areas of a region. The costs and the mechanism for funding the communications systems required to extend towards national coverage are currently being investigated.

- In some areas, e.g. Merseyside, regional authorities specify the level of rail services in franchises and may take a close involvement in TTI services delivered as part of the franchise. Local authorities also directly operate certain urban rail services in Glasgow and Tyne & Wear.

1.2 Role of the private sector

Driver Information

- A variety of private sector initiatives are being encouraged by government in the UK on the basis that competition will deliver the most economic and efficient service, as is the philosophy in many other areas of UK industry. It remains to be seen whether circumstances generate what amounts to a regional monopoly, which is what has happened in some areas in the collective transport sector following deregulation. With the limited experience available in the UK, there does appear to be a measure of competition but because of the high start-up costs and uncertainty about the costs and impact, the effect is limited.
- What appears to be an emerging trend is for particular information providers to target a specific market segment e.g. trucks, vehicle theft, etc. and to concentrate on selling to that sector.
- The quality and accuracy of transport information in the UK is the responsibility of the publisher and protection to the end user is provided through legislation designed to protect the purchaser of goods and services. The supplier is required to ensure that such goods and services are fit for the purpose they were intended for. The service provider cannot issue disclaimers which reduce the end user or customer's rights in law.
- Commercial services are governed by the Broadcasting Acts 1990 and 1996 and by the 1989 Act mentioned above.
- The following are active in the provision of TTI services:
 - **Private contractors:** Two companies are pre-eminent; [Trafficmaster plc](#) and [ITIS Holdings plc](#) (see Section 2.1)
 - **Motoring organisations:** Historically the automobile clubs have been providers of information, primarily to their members but also to the general public. As early as 1900, the automobile clubs were warning their members of the existence of police speed controls. The provision of static information on suitable routes, roadworks, etc. has been an important service. Real time information is increasingly important and the principal organisations concerned are actively seeking a major role, usually in partnership with public sector agencies, in the provision of information services. Since approximately half of all car drivers are members of one of the two principal organisations, a high proportion of drivers are potentially involved.
 - **Broadcasters:** Both public and independent broadcasters provide traffic and travel information. The information usually concerns the main roads and although not generally real time, is usually reasonably up to date. However, there have been a number of well documented examples of information not being accurate because of the delay in a broadcast. Information provided also tends to be selective depending on the time available to broadcast and the information supplied to the broadcaster.

- **Telecommunication providers:** Telecoms agencies have so far not been involved in the data collection, processing or publishing stages of transport information services. They are simply providers of data transmission facilities, usually by radio or hard wired systems.
- **Vehicle manufacturers:** Partnerships are being formed between vehicle manufacturers and service providers to deliver telematics service which include travel and traffic information. For instance, in May 2001, ITIS and [Toyota \(GB\)](#) announced the first commercial RDS-TMC service in the UK. This is now in place, licensed under the 1989 Act, and ITIS is supplying traffic information content to a selected number of Toyota models via RDS-TMC (Radio Data System - Traffic Message Channel). Ford Europe is collaborating with Vodafone to deliver a service with a direct link to the 24/7 Ford Telematics Operator services, offering route information and Automatic retrieval of local traffic information. Another example of manufacturer involvement is Jaguar, which is a partner in the [REGIONAL](#) (RoutE Guidance systems: Optimal NAvigation via the use of Landmarks) research project to develop predictive models and guidelines on how landmarks can best be represented within the driver interface (display and voice) to navigation systems.

Information for users of Collective Transport

- The private sector is the provider of nearly all collective transport services in the UK. As already mentioned the rail operating companies fund the statutory National Rail Enquiry Service. The delivery of real-time information in the rail industry is progressing rapidly and RTI for many stations is now available on the Internet.
- There is a significant concentration of ownership of rail operating franchises amongst a small number of companies that are also active in the provision of bus or coach services. Therefore there is the beginning of a trend for the provision of integrated bus and rail information through TTI services¹⁹¹. This is apparent through the provision of information in rail TTI services of several connecting bus and airport coach services, and the development of certain integrated bus / rail ticketing schemes. Future integration of real-time information in the bus and rail industries may also emerge as a result of this common ownership.
- Rail companies have also developed commercial websites to sell tickets for all rail companies' services ([gjump](#) and [thetrainline](#)). In addition the majority of the privately-owned UK bus industry is active in **traveline**, with many bus operators, and particularly the large private-sector groups, playing a leading role in regional **traveline** consortia.
- Delivery of real-time information to much of the national scheduled express coach network is beginning to emerge through ITIS delivering this to the main operator (National Express Ltd.) in return for ITIS using [National Express](#) coaches as 'floating cars' to collect traffic data for its new national RDS-TMC service.

¹⁹¹ In addition to the **traveline** service, which has developed irrespective of common ownership of bus and rail operations.

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

Details of nine projects are described in Appendix 1. This is not an exhaustive list of UK innovation but represents a cross-section of the current state-of-the-art in TTI service implementation in the UK. The nine projects, shown in alphabetical order, are as follows:

- [ITIS RDS-TMC service](#)
- [Kizoom](#)
- [PTI Best Practice](#)
- [ROMANSE](#)
- [Star-Trak Real-Time Information System](#)
- [TrafficMaster](#)
- [Transport Direct](#)
- [Travel Information Highway](#) (TIH)
- [traveline_](#)

2.2 TTI research activities

Several organisations in the UK are at the leading edge in innovative research into TTI services. Examples of university-based research include:

- **ITS for Sustainable Distribution:** Wolverhampton University is working on the [Intelligent Commercial Vehicle Operation](#) project, which aims to develop new TTI solutions for sustainable distribution. The project is investigating and developing a common framework for information flow and messaging architecture for the identification, positioning, supervising and management of transport assets within integrated transport systems. This will be achieved by demonstrating a variety of information flow analysis and scenario modelling techniques.
- **Network Strategy Performance of VMS:** The Southampton University Transportation Research Group (TRG) conducted original research into the network strategy performance of variable message signs in and around Southampton as part of the ROMANSE project. VMS strategies have been developed using off-line simulation modelling and an evaluation of the signs was undertaken using detailed travel diary surveys. The objectives of the new research are to progress the strategy development and investigate the impact of VMS messages on drivers, through the collection and analysis of SCOOT detector data and the daily records of the ROMANSE control room.
- A comprehensive worldwide review of Traveller Information Systems Research relevant to Transport Direct was carried out by a team from TRG, University of Southampton. This review covered over 200 reports, papers and other articles addressing research in the U.K., North America, Europe and Australasia, cataloguing them as the Transport Direct Research Compendium. A report then drew on the material within the Compendium to discuss a broad range of issues that impinge upon the aims of Transport Direct, divided into 13 distinct topic areas.

3 Key issues for TTI implementation

3.1 Drivers and Trends

3.1.1 Institutional

Government is keen to tackle road congestion and to make public transport more attractive to travellers. Hence government is promoting initiatives such as Transport Direct, to aid multi-modal route planning, ticket purchase and real-time information, and is taking an active role in the development of smartcards standards and initiatives, in order to promote modern and integrated transport for everyone. The European Union also published a statement of principles on Human Machine Interfaces in December 1999. Over a two-year period member states were requested firstly to bring awareness of these principles to industry and then to monitor and report the extent of success in obtaining voluntary co-operation from industry in adhering to them. This exercise was completed in December 2001: results have not yet been made available.

3.1.2 Technological

- Huge growth in the mobile communications sector
- Advances in electronic and communications technologies. For example, the development over the last 5 years of the GSM network, where a number of new services are emerging, notably digital radio broadcasting and two-way communications by satellite
- Increasing use of IT by consumers has led to higher expectations and demand for accurate and timely traffic and travel information
- An increasing number of automotive manufacturers are planning to fit TTI equipment into new vehicles

3.2 Key Obstacles to Overcome

- There is a lack of a clear national government framework or strategy for ITS in the UK.
- The public and private sector roles need to be identified and agreed upon, including resolving any ambiguity as to the future direction of existing programmes such as UTMC, Transport Direct and Travel Information Highway
- The ITS domains at national and local level need to be defined
- There is not yet a methodology for determining benefit and risk profiles for investment in ITS
- The assessment of the benefits of ITS is now rather out of date (TRL study, 1995)
- The legislation and standards applicable to ITS need to be reviewed
- The mechanisms for achieving appropriate practical co-ordination between initiatives and projects need to be put in place
- There are no regularly updated market analysis studies for ITS in the UK

3.3 Major Potentials to Use

Full integration of multimodal travel information through the various elements of Transport Direct and through projects associated with it (e.g. the Travel Information Highway) could lead to significant time-shift and modal-shift on longer journeys and also faster journey times

The major single barrier to bus use in the UK is unreliability, and traffic congestion is a major cause of this. The use of ITS and GPS to effect bus priority, to provide the data to reschedule bus services according to historic traffic patterns, and then to allow dynamic scheduling, could lead to significant improvements in bus-service reliability.

4 Annex

4.1 Key actors in TTI development

- direct involvement in TTI implementation decisions, formally and informally, at any stage of the implementation process
- good understanding and expertise of technical, institutional, financial or business aspects in the context of TTI implementation with an emphasis on practitioners

Note that these actors are a selective list. Particularly for private-sector companies they represent a sample of the key institutions, deliberately made small so as not to give unbalanced representation in particular sectors. There will be other companies who are also of significant importance.

1	Institution	Department of Transport, Local Government and the Regions
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- 5 Institution Greater Manchester PTE
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- 8 Institution Kizoom Ltd
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4.2 Sources and references

Websites are all referred to in text and on profile sheets below: the main ones are included here as one list

- | | | |
|----|--|---|
| 1 | INTEGRATE partnership | http://www.gmppte.com/brochure/integrat/main.htm |
| 2 | Integrated Travel Information Centre | http://www.mobiservice.org.uk/bristol_info.htm |
| 3 | Intelligent Commercial Vehicle Operation | http://ccub.wlv.ac.uk/~e9902529/~e9902529/fretintro.htm |
| 4 | ITIS Holdings plc | http://www.itisholdings.com/ |
| 5 | ITIS's RDS-TMC service | http://www.rds-tmc.co.uk/ |
| 6 | JourneyWeb | http://www.journeyweb.org/ |
| 7 | Kizoom | http://www.kizoom.com/products/nutshell.html |
| 8 | Mantais Cymru | http://www.traffic-wales.com/home.html |
| 9 | Matisse | http://www.mattisse.org.uk/ |
| 10 | NADICS | http://www.nadics.org.uk/ |
| 11 | NavTrak | http://www.navtrak.com/ |
| 12 | Network Strategy Performance of VMS | http://www.trg.soton.ac.uk/prime/modules/iim_1.htm |
| 13 | Northern Ireland - Department of Regional Development | http://www.drdni.gov.uk/ |
| 14 | QMISS | http://www.qmiss.org.uk/ |
| 15 | Real-time M25 Traffic Trial | http://www.highways.gov.uk/m25rt/ |
| 16 | Real-time Train Information | http://www.nationalrail.co.uk/departures/fs_departures.htm |
| 17 | REGIONAL project | http://www.lboro.ac.uk/research/husat/proj7_vehicle_driver.html |
| 18 | Regional Traffic Control Centres | http://www.highways.gov.uk/roads/projects/tcc/index.htm |
| 19 | Road Traffic (Driver Licensing and Information Systems) Act 1989 | http://www.hmso.gov.uk/acts/acts1989/Ukpga_19890022_en_1.htm |
| 20 | ROMANSE | http://www.romanse.org.uk/ |
| 21 | Star-Trak | http://212.126.193.75/htm/engl/publikationen/docs/Startrak2000.pdf |
| 22 | TrafficLink | http://www.trafficlink.co.uk/ |
| 23 | TrafficMap trial | http://www.trafficmap.org.uk/ |
| 24 | TrafficMaster plc | http://www.trafficmaster.co.uk/ |
| 25 | Transport Direct | http://www.dtlr.gov.uk/itwp/transdirect/index.htm |
| 26 | Transport for London - Street Management | http://www.streetmanagement.org.uk/ |
| 27 | TransXChange | http://www.transxchange.dtlr.gov.uk/ |
| 28 | Travel Information Highway | http://www.tih.org.uk/ |
| 29 | Travel Websites accreditation System | http://www.iolt.org.uk/accreditation/accredit.htm |
| 30 | Welsh Assembly - Transport Department | http://www.wales.gov.uk/subitransport/index.htm |

Annex

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3 Briefing documents for authors

3.1 Outline for national TTI implementation status report

Summary briefing

The profiles aim at the identification of the state-of-the-art in the development and implementation of Traffic and Traveler Information services (TTI) in the respective country. The objective is to prepare a brief overview that should also facilitate the collection of more detailed information on specific TTI services whenever this is considered to be necessary in the course of the project. The country profiles should therefore focus on the following general topics:

- *Identify the main actors involved in TTI development and implementation, both from the public and the private sector, and present their respective contributions and affiliations*
- *Highlight current TTI development trends regarding the type of services created, structure of the information chain, service availability, contents and technologies*
- *Pre-select TTI implementation reference cases that will serve to identify good practice for further analysis*

Principal reference for the identification of relevant issues and services is the Commission Recommendation on the development of a legal and business framework for the participation of the private sector in deploying TTI services [C(2001) 1102 final – see the excerpt attached or full version in all official EC languages at <http://europa.eu.int/eur-lex: document 301H0551>]

For each of the following sections only essential information should be provided. The specific points in each section are intended to give guidance for considering issues and are neither complete nor need all be addressed if not important for the respective country.

It should be borne in mind that the reader might not be familiar with the institutional context of country and/or region. Therefore, corresponding explanations should be incorporated where necessary (e.g. acronyms).

1 Institutional framework for TTI development

[Description of the main conditions and dynamics in the public and private sector that currently influence the deployment of TTI services. Make a summary statement on the status of implementation of the Commission Recommendation.]

1.1 Legal and public policy context

- Ownership of traffic data and data collection equipment, exchange of public and private data, interconnection of transport databases (interadministrative), usage and requirements of proprietary traffic and travel data (cf. Commission Recommendation)
- Regulation of the information chain: data acquisition, data fusion, information supply, information transmission, marketing and support (cf. Commission Recommendation)
- Enabling framework, incentives and/or restrictions for TTI service deployment, framework for public-private partnerships, legal position of TTI service providers, (cf. Commission Recommendation)
- Relevance of TTI as a policy issue (national, regional, local) in different sectoral policies regarding e.g. public information procurement, e-government, traffic and mobility man-

agement, public transport promotion, social inclusiveness, data protection and security, etc.

- Role of public authorities and institutions involved in TTI development: regional and national government, city or regional transport authorities, infrastructure owners and managers, transport operators and regulators (bus, coach, metro, rail, ferries), TTI service provider

1.2 Role of the private sector

- Role of private and commercial companies in relation to TTI development: Road infrastructure owners and managers, transport operators (bus, coach, metro, rail, ferries), other branches and companies active in TTI development and service delivery
- Value added services: forms of private sector activity in the TTI information chain
- Integration of information service contents, payment, booking and other options for transaction, including not transport-related services (e.g. Infotainment)
- Partnerships and cooperations with the public sector in relation to TTI development, revenue sharing

2 TTI service implementation and research

2.1 State-of-the-art of TTI service implementation

[Select relevant TTI services according to the three basic criteria indicated below. Assess why you think these are the important and characteristic services in your country. Attach a short description of each service based on the template “TTI services” you received.]

- *implementation*: services can be either already available to users, close to completion or planned for realization. In any case they should reflect the state-of-the-art and the array of application fields in the country
- *market prospects*: services should have the potential for becoming a lead application, or should be currently in possession of a substantial market share
- *TTI for public transport*: include at least one example of a TTI service for public transport. Otherwise add a statement on the implementation status of multi-modal TTI services.]
- *statistics on service impacts*: add information on TTI service use (e.g. percentage of inhabitants with access services, actual use of service, content levels) and service impacts (e.g. journey time savings, effects on congestion and mode choice) only when easily available

2.2 TTI research activities

[Summary of important recent and current research projects on TTI and their results. Assess why you think these are the important and characteristic research activities in your country.]

- date, commissioning and realizing institutions/partners
- subject, scope and methodology
- (expected) findings regarding conditions, demand, applications, organizational and business models, technologies, impacts, etc.

- relation to the above identified state-of-the-art in TTI service delivery

3 Key issues for TTI implementation

[Make brief statements on what you think the key issues for the future development and implementation of TTI services are in your country.]

3.1 Drivers and trends

3.1.1 Institutional (public and private) [Please rank]

1. ...
2. ...
3. ...

3.1.2 Technological (data acquisition and service delivery) [Please rank]

1. ...
2. ...
3. ...
- ...

3.2 Key obstacles to overcome

[Please rank]

1. ...
2. ...
3. ...

3.3 Major potentials to use

[Please rank]

1. ...
2. ...
3. ...
- ...

4 Annex

4.1 Key actors in TTI development

[Selective list of key stakeholders or “agents of change” in TTI development. This can be both individuals and institutions that meet the criteria indicated below. Make a summary assessment - beyond the individual level - of why you think these are the key actors in your country.]

- direct involvement in TTI implementation decisions, formally and informally, at any stage of the implementation process

- good understanding and expertise of technical, institutional, financial or business aspects in the context of TTI implementation with an emphasis on practitioners

1 institution

name / position

involvement *[why is this actor regarded a key actor?]*

address

phone

fax

e-mail

2 ...

...

4.2 Sources and references

[Attachment of relevant sources on TTI development in standard PC-file formats (PDF, RTF, etc.) in the language available and corresponding web-site reference list. Additionally, a literature reference list may be included]

web-site format : content provider. <http://www> . date

literature format : author(s)/editor(s). year. *title*. institution. place: editorial

1

2

...

3.2 Excerpt from Commission Recommendation C(2001) 1102 final

Comission Recommendation on the development of a legal and business framework for the participation of the private sector in deploying TTI services - C(2001) 1102 final

Full version in all official EC languages at:

http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/l_199/l_19920010724en00200022.pdf

1. Purpose and objective

Member States are invited to develop an appropriate legal and business framework for participation of the private sector in deploying telematics-based traffic and Travel information (TTI) services in Europe.

The objective of that framework is to encourage the commercial deployment of added value services offered to travellers, along with the improvement of existing and planned public travel information sources such as broadcast and internet travel news and telephone enquiry lines.

2. Facilitation of European TTI services

Member States are invited to work together for establishing European TTI services by participating in the work of the high level working party chaired by the Commission. The Member States should inform the Commission of any national initiatives, actions or intended measures in the area of TTI services and products.

3. Regulatory framework for TTI services

Member States should take steps to harmonise the requirements for TTI services at national, regional and local levels. To this end, Member States are invited to take the following actions:

- (a) to publish and make available the requirements and applicable laws and regulations relating to public safety, traffic safety, transport and traffic management, privacy and personal data with which TTI service providers need to comply in providing their services, at national, regional and local level;
- (b) to encourage the adoption of standard contracts and service level agreements by public authorities and public agencies for the supply of traffic and travel data of all modes of transport to commercial sector operators and users;
- (c) to encourage the public authorities and public agencies who operate on-line traffic detection and monitoring equipment to make the data available in real time to all TTI service providers on equal terms;
- (d) to promote public private partnerships in the provision of TTI services.

4. Proprietary traffic and travel data

In the interests of promoting the rapid development of European TTI services and products, and to encourage market competition and quality improvement in TTI services, Member States are invited to carry out the following actions:

- (a) wherever possible, to encourage public authorities and public agencies to allow private operators of TTI services to install and maintain their own traffic monitoring equipment on public roads, operated on a proprietary basis;
- (b) to develop, publish and make available, for the benefit of all TTI service operators, guide-

lines for safe installation, operation and maintenance of traffic monitoring equipment on public roads;

(c) to specify, publish and make available the requirements to be placed on TTI service providers to promptly notify the authorities of any data or information about emergencies and major traffic incidents they receive, in the interests of public safety;

(d) to adopt measures to ensure that public authorities and public agencies safeguard the commercial value of all proprietary traffic data and travel information supplied to them by private TTI service providers.

5. Observance of road infrastructure hierarchies and traffic management strategies

In the interests of ensuring that TTI products and services observe the recommended routes for through-traffic and discourage the use of unsuitable roads, Member States are invited to publish, with a view of informing TTI service providers and also the developers and publishers of navigation databases, the details of road hierarchies for through traffic for different classes of traffic as well as the existing local traffic management requirements and guidelines. Changes to the road hierarchies should be published promptly.

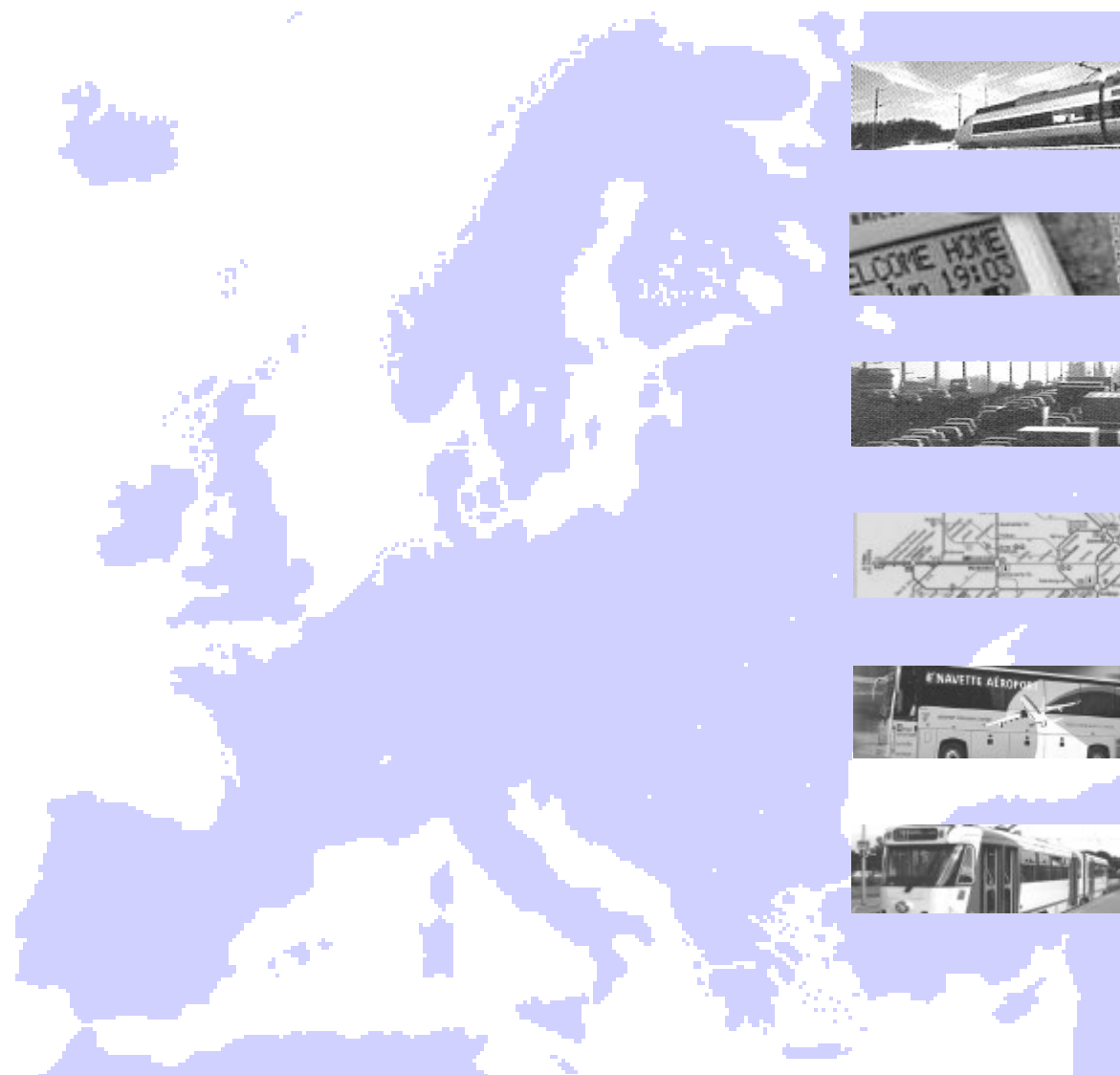
6. Facilitating TTI services

Member States are invited to ensure that TTI service providers have the freedom to develop and offer their services and products on a commercial basis. The only constraints to be imposed on them by public authorities and public agencies should be those relating to public safety, traffic safety, transport and traffic management and the protection of privacy and personal data as provided for by this Recommendation.

7. Reporting progress

Member States are invited to report progress in establishing the appropriate national framework for TTI services to the Commission within two years of the date of publication of this Recommendation in the Official Journal of the European Communities.

This Recommendation is addressed to the Member States.



& e-Europe

Traffic and Traveller Information Services for Europe

Thematic Network

Supported by Directorate General Information Society of the European Commission



What is the scope and objective of ATLANTIC?

ATLANTIC is a thematic network funded by the Directorate General Information Society of the European Commission.¹

ATLANTIC aims to enhance discussion and knowledge exchange between researchers in the field of Intelligent Transportation Systems (ITS) in the US, Canada and Europe.

Through the web-based ATLANTIC electronic Forum² and international meetings, key individuals involved in ITS research and development are participating in a common benchmarking initiative. This concerns the coverage, content and results of ITS programmes in the participating countries on both sides of the Atlantic.

ATLANTIC is also analysing the framework conditions required for a successful implementation of telematics-based Traffic and Traveller Information (TTI) services in the EU and Central and East European countries. The European Commission is defining a Community TTI policy, and ATLANTIC supports this through the collation and dissemination of current knowledge and good practice from leading examples of telematics-based TTI services.

**Enhance
transatlantic
discussion and
knowledge
exchange ...**

**... analyse the
conditions for a
successful
implementation of
TTI services**

¹ http://europa.eu.int/information_society

² <http://www.atlan-tic.net>

Towards a European TTI policy framework

In its recommendation of July 2001, the Commission invites all Member States to establish favourable legal and business frameworks for the participation of the private sector in deploying TTI services. In particular, it identifies the following key tasks:³

**Commission
Recommendation
on TTI (2001)**

- Provide and disseminate a regulatory framework for TTI services
- Adopt principles for access to public traffic data, the exchange of public and private data and the interconnection of transport databases (inter-administrative)
- Regulate the usage and requirements of proprietary traffic and travel data
- Ensure observance of road infrastructure hierarchies and traffic management strategies
- Create an enabling framework for public-private partnerships
- Facilitate TTI services and reduce constraints

³ <http://europa.eu.int/eur-lex>; Official Journal L 199/20

How does ATLANTIC relate to e-Europe?

Through its approach and focus, ATLANTIC represents an important contribution to the e-Europe 2002 initiative of the European Council and the European Commission by pursuing the overall objectives to accelerate the development of the information society in Europe, and to ensure its potential is available for everybody.

**TTI as an
integral part of the
information society**



In February 2002 the responsible EU ministers agreed to extend the e-Europe 2002 Action Plan to 2005, which has been confirmed at the Barcelona summit in March.

The development and implementation of TTI services addresses almost all the priority areas that have been identified for e-Europe:⁴

- Implement the new framework for the delivery of electronic communication services⁵
- Build up high-speed communication infrastructures
- Encourage applications for e-Commerce, especially in the business-to-consumer sector
- Ensure social inclusion
- Enhance public information procurement and e-Government
- Safeguard secure networks and data protection
- Improve mobile communications (3G networks, Galileo)

⁴ COM(2001) 140 final; COM(2002) 263 final

⁵ COM(2001) 372 final

Three basic goals of ATLANTIC within e-Europe:

● Generate a pool of expertise and know-how of good practice in TTI service implementation in cities and regions - Improve the understanding of regulative frameworks for the information chain, feasible business models, new technological concepts and organisational structures in enabling the delivery of good quality traffic and travel information, capable of supporting end-to-end trip planning across transport modes.

**Create a
knowledge basis**

● Help to establish consensus amongst public and private stakeholders on their respective roles in TTI service provision - Support operators and agencies to understand the modes of co-operation and collaboration to ensure effective TTI service provision - Help to set-up an appropriate financial, operational and institutional level of assessment (European, national, regional or local) for service quality and delivery.

**Support
consensus &
awareness**

● Provide input for European, national and local policy decisions, taking into account the specific interests and objectives of public and private actors in TTI service deployment.

**Provide
policy
assessment**

What are the respective activities of ATLANTIC?

ATLANTIC invites all principal actors and stakeholders in TTI service deployment to participate. It aims to facilitate the discussion and analysis of key issues between them, and to make the results and guidelines on good practice publicly available. Based on this philosophy, ATLANTIC has carried out several activities in parallel in order to achieve its objectives (Fig.2).:

- Experts from all 25 European countries have provided an overview of the state-of-the-art, current trends and obstacles in TTI service deployment in their respective countries.

- 20 reference cases with particularly positive results in terms of policy compliance, business efficiency and user benefits have been selected for a detailed study of their implementation frameworks and impacts. The results will also be disseminated via the European Local Transport Information System ELTIS.⁶

- Over 40 individual interviews have been held with selected practitioners from the public and the private sector in Europe, in order to obtain a detailed insight into crucial issues of TTI service implementation.

- Five focus group meetings have been held between April and December 2002 for the discussion of key topics in TTI service deployment. Each of these meetings involved 6-12 stakeholders from the public and the private sector from across Europe, concentrating on specific topics.

**Stakeholder
involvement**

**Information
collection
campaign**

**Good practice
case studies**

**Key-actor
interviews**

**Focus Group
meetings**

⁶ <http://www.eltis.org>

- Two web-based ATLANTIC discussion groups on TTI have been moderated, where experts and practitioners exchanged their views and insights on the topics identified.
- ATLANTIC has realised a major TTI services stakeholder Forum in parallel to the POLIS annual conference⁷, and has organised sessions and presentations at multiple international events such as the ITS world congresses, thus encouraging the discussion.

e-Forum debates

Conference presentations

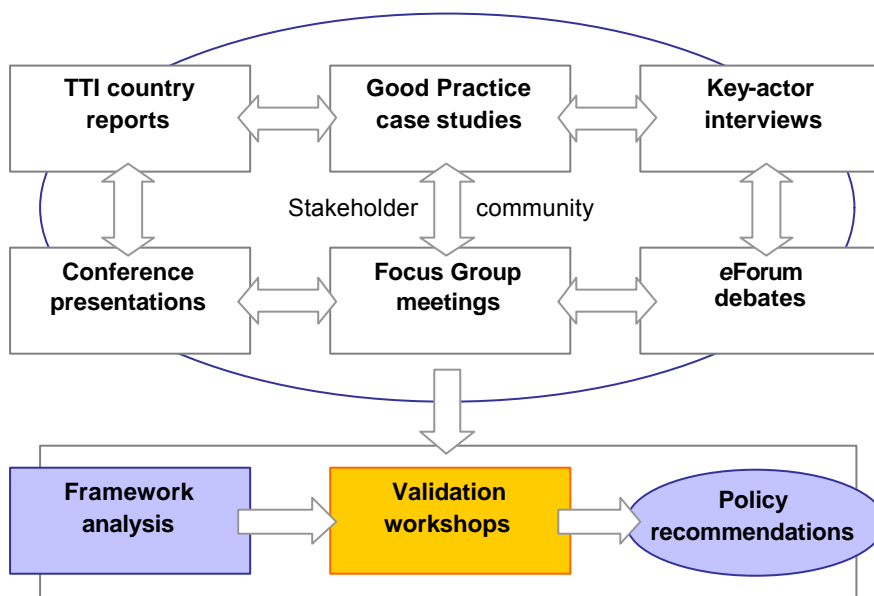


Fig.2: Worksteps within ATLANTIC: Creating practical knowledge for stakeholders and policy making

Through this process ATLANTIC will contribute to the formulation of policy recommendations and the development of sustainable telematics-based TTI services in cities and regions across Europe.

⁷ <http://www.polis-online.org>

Next steps within ATLANTIC

ATLANTIC has now entered the second major phase of the project, aiming to draw conclusions from the gathered knowledge, discussions and viewpoints.

Based on a cross-European and cross-sectoral analysis of framework conditions for TTI service implementation, the next important step will thus be to achieve a qualification and validation of the preliminary results through discussion with selected practitioners and experts.

For this purpose ATLANTIC is organising three final validation workshops, each with a specific thematic focus, inviting highly qualified stakeholders from the public and the private sector

- Workshop 1 - Framework conditions for TTI service implementation in accession countries, 25.4.2003 - Prague
- Workshop 2 - Framework conditions for TTI service implementation in Europe, 29.4.2003 – Brussels
- Workshop 3 - Guidelines for TTI service implementation in European Cities and Regions, 6.5.2003 - Brussels

3 Final validation workshops

Tentative schedule



Further questions about ATLANTIC?

For further information on TTI and e-Europe related activities of ATLANTIC, the current scheduling and thematic focus of events, as well as for comments and suggestions, please contact:

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