OptiCities, a project for an efficient urban mobility, through the development of innovative ITS and public / private cooperation

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Abstract

OPTICITIES is a FP7 project started on 1st of nov 2013. OPTICITIES’ strategy focuses on the optimisation of transport networks through the development of public/private partnerships and the experimentation of innovative ITS services. OPTICITIES delivers significant innovation breakthroughs:

• New governance scheme between public and private stakeholders through a contractual architecture fostering data quality and implementing data access policy;
• European standard for urban multimodal Dataset including interfaces with information services;
• Decision support tools based on predictive data for proactive transport management and Multimodal Traffic Control Systems connecting road traffic and public transport data in cities;
• Multimodal real-time urban navigator interfaced with in-car navigation systems as a first world trial;
• Urban freight navigator to support drivers and fleet operators in optimising their deliveries.

Keywords: Urban Mobility, modal shift, ITS, interoperability, continuity of service, multimodality, urban freight.

Résumé

OPTICITIES est un projet du 7ème PCRD lancé le 01/11/2013 qui vise à optimiser la mobilité urbaine au travers de coopérations public/privé et l’expérimentation d’outils ITS de haut niveau. OPTICITIES prévoie des ruptures importantes avec le développement :

• D’un nouveau schéma de gouvernance entre acteurs publics et privés avec une architecture contractuelle pour l’amélioration de la qualité des données et le déploiement d’une politique d’accès aux données;
• D’un standard Européen pour le set de données multimodal urbain et les interfaces avec les services d’information;
• D’outils d’aide à la décision utilisant les données prédictives à 1H pour une gestion proactive du trafic et outils de gestion temps reel multimodale utilisant des données de traffic routier et transport public;
• D’un navigateur multimodal temps reel urbain et ses interfaces avec les systèmes embarqués dans les véhicules, une 1ère mondiale;
• D’un navigateur de fre urbain pour aider les conducteurs et les opérateurs de flottes à optimiser les livraisons en ville.

Mots-clé: Intéropérabilité, report modal, ITS, continuité de service, multimodalité, fret urbain.
1. Concept and objectives

1.1. Urban mobility stakes within European conurbations

Mobility stakes are increasingly important in today’s fast-growing urban centres all over the world, but particularly in the European Union where 75% of inhabitants live in urban areas. The 21st century is indeed the century of cities, where we also find the bulk of economic development and innovation potential.

The challenges that cities face can be considered as a five dimensions prism:

- **Accessibility**: thousands of private cars enter European conurbations every day (hundreds of thousands per day), with the saturation phenomenon also extending to several public transport lines.
- **The Environment**: transport generates 30% of CO2 and micro particles emissions of which 95% come from cars and lorries, thereby creating real problems in terms of public health.
- **Quality of life in urban centres** (accidents, noise, traffic congestion): with a need for modal shift from private cars to public transport, soft modes and “shared car” uses. In most cities around 50% of car journeys cover distances of less than 3 km, leaving room for improvement.
- **Urban freight** is a specific stake, particularly with the boom of urban deliveries and lack of coordination among the freight operators. Stakeholders could share the infrastructure and parking space if availability is better managed.
- **Public space management**: all these stakes (sometimes contradictory) must be managed within the limited public space which is to be shared among different transport modes and other land uses.

After forty years of massive investments **connecting infrastructures networks** has become a priority to ensure urban population growth and economic development. This was introduced in **transport public policies** through the concepts of **inter-modality**, **multimodality** and **co-modality**. Moreover in the 1990s information and communication technologies applied in the transport fields allowed the deployment of network management systems and user information services.

Conclusions drawn from these previous investments are rather positive but still modest in light of the modal shift objectives as in 10 years. **Long term objectives require strong and coordinated actions.** These plans should gather a large range of cooperating stakeholders from every transport mode at local or regional level to emphasize the effects on the network and users.

At the same time **environmental and financial constraints** have hugely limited the capacity to build new transport infrastructure. Thus **a new logic based on a service approach** and on the **optimisation of existing infrastructure** has emerged to meet the increasing mobility demand.

On the **technological and societal model fields** two major developments will considerably influence mobility policies and the role of public and private stakeholders: **free access to geo-localisation** (thanks to GPS and Galileo technologies) and the **large dissemination of mobile internet through smartphones** providing European citizens with a range of new services.
1.2. Intelligent Transport Systems (ITS): an answer to urban mobility issues and OPTICITIES approach

OPTICITIES partners advocate for a smart urban mobility strategy which intends to tackle European cities’ mobility challenges. This strategy includes three key components:

- **Optimisation of transport networks based on the development of ITS services.** They will be supported by integrated multimodal information and transport control tools with increased cooperation between road, public transports, soft and new modes systems and services.

- **Integration of passenger transport and urban freight approaches,** public space in urban areas been a scarce resource to be shared between freight and people.

- **Development of an innovation policy in partnership with the private sector.** Giving companies the opportunity to develop innovative services for individuals and professionals supports the development of economic models independent from public funding, thus creating value.

This approach considers all modes of transport and builds alternatives to make modal shift credible, fostering cooperation among all parties involved in urban mobility.

1.3. Urban mobility: technical and contractual challenges

ITS services are always made up of roughly three main components: data collection, data processing and services provision (networks operations, traffic management services, information services).

Data mobility collection is a key prerequisite for the implementation of any ITS service: mobility management relies on high quality data and completeness among modes and areas. At the same time data collection is certainly the most expensive component of the information processing chain.

Thus it is absolutely necessary to gather all data sources, combine and assess them to allow any operators processing and delivering high quality services. Divided by modes or by organisation individual mobility databases are weaker than if combined. If combined this data will allow all actors to extend considerably the efficiency and the consistency of their operations in the global framework.

Moreover today mobility standards have been developed or are under development addressing one transport individually. This certainly meets requirements for each mode. However for the user who is in turn a pedestrian, a car driver, a public transport user or a cyclist it doesn’t answer the need of modal combinations.

Therefore each provider aiming to develop an information service in a city has to compile a specific dataset. Not only this task is costly but it also creates discrepancies from one provider to another.

As required by the EC Multimodal Information Services guideline, the development and implementation of a new standard is needed at conurbations’ level. This would allow the setting up of Multimodal Dataset in European cities. A standardised Urban Mobility Portal would support the connexion of the Multimodal Dataset with services and tools such as decision support tools, traveller and freight information services.

This approach combines private and public actors in an optimised framework as described in the following diagram.
2. OPTICITIES vision: towards a smart urban mobility strategy

The OPTICITIES vision is to optimise urban mobility from a user perspective, serving urban mobility public policy and triggering autonomous information services business models.

Thus OPTICITIES develops a vision of optimised urban mobility at the focal point of user needs, urban mobility public policy, and business models of service providers.

In this vision European cities consolidate all data available at local level and provide it through a standardised gateway. A cooperative partnership between private and public stakeholders supports this approach. This Multimodal Dataset is made up of all transport mode data, thus consolidating any available format, standard and timescale (historical, real time, predictive).

European cities provide the Multimodal Urban Dataset content via a standardised interface: the Urban Mobility Portal. Following contractual agreement any service providers and industry would be able to plug in and deliver services which consistency with urban public mobility policies would be ensured.

Services providers and the industry together with public authorities will thus implement very high level mobility services. This would contribute to optimising the urban mobility system as a whole and seeking sustainable business models not depending solely on public funds.
3. OPTICITIES project’s Objectives, Outputs, Main activities

3.1. General objectives of the project

The European Commission’s call for FP7 project represents a unique opportunity to meet the presented stakes. OPTICITIES will associate major cities, groups and SMEs at the forefront in these fields in Europe to develop:

- **Genuine multimodal solutions.** For once ITS solutions will not be a juxtaposition of mono-modal approaches exclusively focused on public transport. Multimodal solutions will be based on reliable data for every mode and combination, with optimised end-user HMI, and will involved the car industry as well as Public transport and soft modes actors.

- **A contractual framework on data access and exchange policy allowing enlarged access to high quality data.** This policy aims to amplify the development of information services by centralising (or accessing local databases) and disseminating all private and public data available at the scale of the agglomeration, in line with urban mobility public policies.

- **European interoperability of urban mobility data and mobility solutions.** Based on open ITS system the standards developed in OPTICITIES will provide cost effective and seamless multimodal services.

- **Enhance network operators’ supervision capacity and management efficiency** thus allowing for smart and adapted decision making processes.

- **Develop, try out and assess high-level innovative multimodal information and transport management services.** These services will target transport managers, travellers and freight transport users or fleet managers.

- **Enhance users’ accessibility to mobility services** through the display of coherent and highly reliable multimodal information.

3.2. Main activities and innovations

![Figure 3: OPTICITIES main activities](image-url)
To meet these objectives, OPTICITIES brings together public transport authorities, laboratories and private companies, through the following major breakthroughs in terms of innovation:

- **Development of a contractual architecture between private and public actors for data access, data exchange and service provision.** Public authorities’ requirements, fair-minded access to data and autonomous business models will be investigated.

- **Consolidation of multiple sources of urban mobility data** from all modes (network topology; theoretical, real and predictive schedules). **Definition of a European standard** for this Multimodal Urban Dataset and its interfaces between public authorities, network managers and service providers. Based on existing standards (Transmodel, SIRI, Netex, IFOPT, Datex II) this newly defined standard will be implemented and tested in every city of the consortium. Trials will notably address the standardised interfaces with several services’ providers. The work will be undertaken by renowned experts in the field of standardisation and will involve major national actors to reach an agreement on this standard.

- **Provision of real-time information for all modes, available anytime, anywhere:** the multimodal urban navigator. This smartphone application includes users’ advice on all available mobility solutions, their effectiveness regarding time, money and CO2 emissions. This implies guiding users before and during their trips to facilitate combination of modes and modal shift. Introduction of real-time and mobile navigation functionality will support incentives to new mobility habits and travelling behaviours. Provision of information will help in assisting, reassuring and encouraging users with new mobility usages. Targeting all kind of potential users the service will provide also information to people with reduced mobility.

- **Service continuity** between in-vehicle navigation system and the multimodal urban navigator. Thanks to cooperation between the automotive industry operators, public authorities and service providers, this solution, based on cooperative systems, will propose a seamless travel management solution for the users.

- **Optimisation of urban networks exploitation** through the development of traffic prediction tools and their integration into traffic management systems. This will allow anticipated predictive travel times across modes and proactive management of traffic lights, based on 1 hour traffic forecast. Congestion situations will be delayed and even sometimes avoided. The gained space will be reallocated to sustainable modes (cycling facilities, sidewalk widening, bus lanes, bicycle parking).

- **Integrated multimodal management**, through the development of Multimodal Traffic Control System connecting road traffic and public transport data, allowing better allocation of means to support mobility demand. This work includes the combination of data set from multiple public transport operators in large cities. The experiment which will be conducted in Madrid with real time information would be a first trial at this scale.

- **Optimisation of urban freight management.** Combination and processing of real-time data will allow delivery of dedicated information services to help truck drivers and fleet operators optimising their delivery rounds. The objective is to minimise unnecessary travels and connections. Truck-related traffic congestions are generated by dysfunctional delivery practices or inadequate sharing of space (double parking, illegal use of deliveries bays).

- **Promoting a participative approach with users.** Users will be involved in the design and testing phases of the services, especially the urban navigator. **Web 2.0 solutions** will be tested to offer new mobility solutions such as car-pooling and car sharing, seeking for autonomous business models. **Web 2.0 solutions** should also be integrated to upgrade information provision through social networks.

- **Robust evidences-based assessment of the solutions developed within the project.** Evaluation will be integrated along the project development process, notably involving more than 200 users in the participating cities allowing reliable users’ feedback.
3.3. Outputs of OPTICITIES project

The main OPTICITIES output will be:

- **A standard for an Urban Multimodal Dataset and the interface** with services providers through an **Urban Mobility Portal** built upon OPTICITIES partners experience and involving major public and private stakeholders in different EU Member States.

- **Innovating tools and services** for traffic managers, travellers and freight operators.

- **Implementation Guidelines** for public authorities (cities, conurbations) and services providers. All guidelines will be consolidated in the OPTICITIES Transferability Handbook.

- **A strong dissemination plan**, managed by EUROCITIES the most important European Cities network, **(more than 140 cities involved)**, involving UITP the largest public transport operators network in the world, involving all major networks and actors at European and national levels in the field of ITS and urban mobility. The dissemination activities will allow to deploy OPTICITIES outputs on a European scale.

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<td>USERS</td>
<td><em>Having all the city transport solutions in my pocket</em></td>
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<td><em>Providing me with smart solution in case of incident or changes in my plans</em></td>
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<td><em>Ensuring a seamless information whatever the transport modes</em></td>
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<td><em>Providing with the best route for my deliveries and getting informing in case of incidents or traffic jams</em></td>
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<td>Optimise traffic management</td>
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<td>Increase car occupancy rate in cities</td>
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<td>SERVICES PROVIDERS</td>
<td>Autonomous business models</td>
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<td>From proprietary systems to open systems (i.e. technical standards and contractual framework)</td>
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<td>EUROPEAN CITIES</td>
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<th>OPTICITIES</th>
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<td>Multimodal Urban Navigator: real time information; pretrip and ontrip routing advices</td>
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<td>Urban Multimodal Dataset providing complete and high quality data</td>
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<td>OPTICITIES Tutorial sessions</td>
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Figure 4: OPTICITIES responses to urban mobility needs

4. OPTICITIES key characteristics

4.1. Experimentation-based approach, a city-led project

The challenge is to achieve the **realisation of a set of innovative services** in the field of Intelligent Transport Systems. OPTICITIES is **led by Cities** and supported by a **strong partnership with major private stakeholders**.

The objective is to fulfil four requirements:

- **Meeting user needs.** OPTICITIES is a project guided by both user needs and needs of public policies on urban mobility. This holistic approach requires the public management authorities. **More than 200 users** will be involved in the services design process and in the planned experimentations.

- **Obtaining deployable results in a 5 years period maximum.** Integration of road network operators, public transport and urban services in the project, together with research institutes and private companies ensure this interplay between innovations and needs. Solutions could then be developed and tested in the medium term, with a perennial economic model.
• **Taking into account existing and foreseen economic models.** Decision Support Tool contractual frameworks are long period schemes and innovations thus need to be directly supported by cities and local industrial partners. OPTICITIES results will be pooled and the project’s deployment guidelines will provide an efficient tool for an enlarged dissemination of the results towards European cities. The provision of standardised **Urban Multimodal Dataset** and **Urban Mobility Portal** for each participating city will enable the emergence of new economic models involving multiple service providers in capacity of selling their services to users. This is particularly accurate for traveller and freight information services.

• **Public space management.** ITS deployment in urban areas occurs in a restricted public space managed at best by cities. The general interest not being a sum of individual interests, as shown in recurring situations of traffic congestion in European cities and worldwide, the public authorities are leading players in urban mobility context.

The **Grand Lyon** has thus naturally positioned itself as **OPTICITIES coordinator** being the lead editor of the EC Multimodal Information Services Guidelines, member of the ITS advisory group and in charge of the largest urban ITS programme in France.

4.2. **OPTICITIES: addressing various European cities typology**

Members of OPTICITIES consortium cover a consistent European spectrum. Partners include conurbations of different sizes (6.5, 2.6, 1.7, 1.2, 0.6 million inhabitants), from founding members of the European Union and new member States. The level of Intelligent Transport Systems deployment and infrastructure covered is also largely diversified. Major ITS actors from 7 Member States are involved in their respective domains.

EUROCITIES the most important European Cities network gathering more than 140 cities in Europe, supported by UITP the world largest PT operators network, will ensure widest large dissemination of project’s results. The project is already supported by important nation and ERTICO ITS Europe.

4.3. **A horizontal approach**

OPTICITIES covers the **entire mobility information chain**: from data collection, data processing to service provision, for the benefit of all users and customers. This includes network managers and operators, individual users, professional users and freight operators. The approach is clearly oriented towards a **cooperative organisations and systems**.

OPTICITIES approach is particularly remarkable because it deals in parallel with both the issues of **movement of people and freight**, which has not been dealt with in this way beforehand.

The OPTICITIES consortium involves a large range of public and private stakeholders representing almost all urban transport means. The approach built by the representative group avoids dogmatic positions and supports coherent and innovative perspectives.

4.4. **A public-private shared vision**

Driven by urban mobility **public policies implementers**, OPTICITIES addresses at the same time technological innovation, **new governance models** between public and private stakeholders. OPTICITIES seeks autonomous business models for traveller and freight services. Organisational context will be analysed to define recommendations for the highest efficiency of the tools that will be developed within the project.

Public sector partners are advocating for a **strong multimodal approach**. This contributes to their overview of public space management and urban mobility accessibility. To ensure it, they are willing to provide mobility data in a standardised way. They also intend to **strengthen their network management capacity** through the delivery of high level services towards their operators and networks’ users.

The private sector is bringing its **innovative abilities**. It will develop and test new solutions based on the multimodal urban data set.
Universities and their associated research institutes are mobilised to develop services in close relation with private stakeholders and to evaluate their environmental and socio-economic impacts.

4.5. Strong impacts on urban mobility and economic development

The ambition of OPTICITIES is to support a shift of 6% of the modal share in the agglomerations by 2020. The changes in mobility habits and optimisation of networks’ management implied by the project would represent an annual gain of 1,500,000 tons of CO2 for the six cities of the project. This figure derives from climate plan change calculation of 1% modal shift for a 1.5 Minh city.

Optimisation of infrastructure use and modal shift would also help to reallocate public space from cars’ usages to other uses like soft modes, public transport, and urban amenities. OptiCities has an objective of 10% of decrease in car use that will generate a gain in around 3.6 millions square meters of public space within the 6 participating cities.

OPTICITIES will also contribute to strengthen the position of European companies on the ITS market. Availability of urban mobility data will give companies the opportunity to develop new services for urban mobility. Public authorities are positioned as a guarantor of the consistency of these services and of the quality of input data.

Increase in market size by additional EUR 211 million per year thanks to OPTICITIES approach: the increase of data quality, the data access policy and the standardised interfaces between urban data set and information services will deeply foster new business models not solely depending on public funds.

4.6. Achievable objectives

Led by public authorities the OPTICITIES consortium integrates three key approaches:

- **Effectiveness**: OPTICITIES will develop solutions with a deployment perspective of 3 to 5 years.
- **Scalability**: OPTICITIES will combine public, industrial and academic actors from different sectors looking forward to work on common grounds to develop solutions adjusted to each urban typology.
- **Transferability**: OPTICITIES covers a large typology of European cities and will develop and largely disseminate a set of recommendations to foster the deployment of the project results in European cities.
5. Impacts

Within OPTICITIES, relevant European stakeholders from industry, public authorities, public transport operators and associations, ICT companies, research organisations as well as other relevant value chain key players will jointly work on the development of innovative, sustainable and transferable solutions for an optimised urban mobility. Thus, OPTICITIES results are in line with the objectives and expected impacts of the Transport Work Programme 2013 and in particular its challenge 2 “Safe and seamless mobility” in the activity area 7.2.3 “Ensuring sustainable urban mobility” and the targeted topic SST.2013.3-1 “Managing integrated multimodal urban transport network”.

The implementation of OPTICITIES tools will lead to:

- A modal shift from exclusive car use to combination of modes and to more eco-friendly modes, through the use of high quality level OPTICITIES traveller information services: multimodal real time urban navigator, integration of in-car information systems with information services based on individual devices, and real time car pooling increasing the occupancy rate of car use. Travellers will be provided with a recommended home-to-destination Journey Plan by whatever mode of transport they intend to use. This will be updated according to live, planned and predicted traffic conditions on the network. Thus, they will then in the event of an issue on the network be able to modify their journey just before going to work or on route. This modal shift will decrease the environmental impacts of road traffic, and liberate public space occupied by private cars in European cities.

- Development of sustainable business models for information services, independent from public funds (e.g. 1€/month/user, for a service enabling an individual to avoid losing 1 or 2 hours per month because of unexpected transport conditions), through the increase of mobility data quality and completeness and through high level information services (urban navigator for travellers and hauliers).

- A decrease of congestion through the use of decision support tools developed within OPTICITIES (traffic management based on predictive information, integrated multimodal management, and enhanced soft mode priority).

- More efficient freight operation, with sustainable business models, avoiding lost of hundreds of hours per month for freight operators, and thus leading to a more fluid road traffic situation.

- Quality of life in urban centres: less traffic and public space reallocation leads to increase in road safety, less stress (noise, crowded roads/ vehicles), city attractiveness directly impacted by efficient transport network and users’ satisfaction.

- A better understanding of people behaviour that is a key aspect in defining transport policies supporting an effective modal shift from cars to alternative modes. Devices getting real time data will help analyse people’s behaviour, and thus, open new possibilities to address tailored transport policies based on real users’ needs. OPTICITIES will enable the delivery of data from real users, living and moving in real conditions, i.e. cities. This is a significant challenge but a unique opportunity at the same time.

- Interoperable information systems between the urban authorities, service providers and car industry through the set up of cooperation within the project at technical and contractual levels (multimodal data set standardisation, contractual arrangements for provision of public and private data): this contractual and technical interoperability will foster the implementation within a given city of various information services providers.

- Strong impact on urban mobility with an easy transferability of OPTICITIES results: OPTICITIES is a cities-led project which is focused on cities’ needs; in addition, the dissemination plan involves key actors at national and European levels, and is based on implementation guidelines developed during the project lifetime.