ICT cloud-based platform and mobility services available, universal and safe for all users

D2.2 Use cases, incentives-based model concept and common specifications for the pilots

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Abstract: This document is the final contribution to D2.2 focused on:(i) the definition of the MoveUs incentive model and the specification of its first two pillars: setting the Energy Efficient mobility rules and the incentives package; (ii) the specification of the use cases & the identification of common specifications from the three pilots: Madrid, Genoa and Tampere.

HISTORY

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FINAL	22/07/2014	Final Version	ATOS

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List of Abreviations

<Abbreviation>	<Explanation>
ACK	Acknowledgement
ADIMOT	Adaptive Multi-algorithmic Optimization Technique
App	Application
ATOS	ATOS SPAIN
BT	Bluetooth
BTFix	Fix Bluetooth Reader
CDG	Municipality of Genoa
CF	Carbon Footprint
CO2	Carbon Dioxide
D	Deliverable
EC	Energy Consumption
EMT	Empresa Municipal de Transportes de Madrid
ESS	Exploitation Support System
GHG	Green House Gas
HOV	High Occupancy Vehicle
ID	Identification
IT	Information Technology
ITS	Intelligent Transport System
KPI	Key Performance Indicators
LOS	Level of Service
LTC	Local Traffic Controller
LTZ	Limited Traffic Zone
MAC	Media Access Control
MAD	Ayuntamiento de Madrid
MJP	Multimodal Journey Planner

NACK	Negative acknowledgement
N/A	Not applicable
OBU	On Board Unit
PC	Personal Computer
POI	Point of Interest
PT	Public Transport
QRY	Quaeryon
RSU	Road Side Unit
RT	Real Time
SICE	Sociedad Ibérica de Construcciones Eléctricas, S.A.
SOF	Softeco Sismat Srl
TECNALIA	Tecnalia Research and Innovation
TmaxG	Maximum Time of Green
TRE	Tampereen Kaupunki
TUT	Tampere University of Technology
TWG	Time to Green
UML	Unified Modelling Language
UTC	Urban Traffic Control
WP	Work Package

Executive Summary

The goals of MoveUs lie in designing and developing intelligent and personalized transport and travel information services that would radically change European users' mobility habits towards energy efficient and less pollutant transport choices. The objective is to achieve reductions in carbon emissions and energy consumptions by facilitating the individuals to adopt what could be defined eco-mobility styles, which encompasses **new mobility behaviours such as modal shifts and substitutions and/or suppression of trips.**

The **role of incentives** to eco-mobility **is under investigation** in many projects and countries; it is likely that **a mix between prices, financial and social incentives** can represent that "nudge" strong enough to make the driver reducing of a significant percentage the mileage in urban environment or to shift to other modes. The MoveUs incentive model is built on four basic pillars**:**

- **MoveUs Rules (or Measures):** help the adoption of eco-mobility behaviours and, if met, permit to gain the incentives;
- **MoveUs Incentives package**: for example free and/or extended access to Limited Traffic Zones, parking lots reserved for private cars, and also incentives which aren't directly related to money – what we call "social incentives";
- **Measurement of the true mobility behaviours giving feedback to citizens**: checking if a rule is met or not in order to assign the incentives;
- **Distribution of incentives to MoveUs users**: methodology and processes to receive and to spend the incentives.

In this document the first two pillars, Rules and Incentives are described in Chapter 2. The second two pillars of the model will be developed in task T6.1 and described in deliverable D6.1.

A set of smart mobility services will be deployed in three smart-city pilots placed in Madrid, Tampere and Genoa, focusing directly on users and offered through smartphone-based applications. Those services will be supported by a cloud-based platform that can be sourced by huge amounts of data, what can be called "Big Data", including information from many different -and local- systems, mobility infrastructures, even crowd source information from the different possible test sites.

The description of the use cases considered in MoveUs for those three pilots sites (Madrid, Genoa, Tampere) have been described in Chapter 3 of this deliverable, together with a representation of common functionalities to the three pilot sites as identified in a preliminary functional analysis of the use cases.

In detail functional specification of the services from the three pilot sites will be developed in task T3.3, and reported in deliverable D3.3.

1 Introduction

This Deliverable D2.2 is the second deliverable expected for **WP2 – User requirements and current infrastructures.**

The **objectives** of WP2 are:

- To identify the currently deployed mobile technologies, devices, networking infrastructures and platforms with a special emphasis in the piloting cities
- To identify stakeholders and end-users' needs and requirements in order to define the necessary features and functions of the MoveUs platform and its associated services
- To create and analyse an initial set of potential MoveUs services usage scenarios, and identify those with highest priority that could serve as reference implementations in the living labs and city pilots.
- To provide more detailed specifications for the city pilots, clearly identifying the similarities and differences between them.
- To define energy-efficiency mobility rules and packages of incentives related to them
- To identify the information sources and sinks in cities, focusing especially in the pilot test cities, and assess the quality of the data available in terms of accuracy, usefulness, reliability, latency, etc.

To achieve these objectives, **WP2 is divided in five tasks**, as follows:

- **T2.1**: Analysis of mobile technologies, devices, networking infrastructures and platforms, and description of current interaction modes with the user
- **T2.2**: Mobility requirements: Including infrastructure requirements, public transport management requirements and final users' requirements
- **T2.3**: Identification of mobility and users' information sources and sinks for each piloting city
- **T2.4**: Incentives-based model concept
- **T2.5**: Use cases and common specifications for the pilots

This Deliverable describes the outcomes of the Tasks 2.4 and 2.5 as follows:

Task and Key Objectives	Reference
Task 2.4: description of methodology on Rules & Incentives, giving a general mapping of measures and incentives to reduce carbon footprint and energy consumptions, including also those not strictly related to MoveUs service. Review of projects and studies and summary of surveys and interviews in pilot cities	Chapter 2
Task 2.5: technical description of the use cases considered in the pilot sites (Madrid, Genoa and Tampere), identifying the actors and their related functions, and identification of common specifications for all of them.	Chapter 3
Conclusions	Chapter 4

Table 1 Reference Chapters

2 Chapter 2: Incentives-based model concept

2.1 Introduction

Providing information for obtaining a more sustainable environmental footprint is not enough. It would leave travellers without a compelling proposition to adjust their behaviours and choices. It may be enough to "understand" but surely not to "reduce" the footprint generated in transports and the energy consumptions.

Policy analyses have shown that the sustainability of transport in terms of energy efficiency and GHG emissions can only be achieved by a mix of technical and behavioural changes i.e. technological measures alone will not solve the environmental problems in particular of GHG emissions and energy consumptions. The focus of policy action has been strong in the technology side, as proven for example with the recent review of the Fuel Quality Directive and adoption of European Regulation to tackle emissions from new passenger cars and vans.

Many solutions have been identified and studied for reducing transport's GHG emissions and energy consumptions; they can be generally divided into two main groups, as said above:

1. **Technical measures**: alternative fuels, powertrain, new operational models, modal splits, etc.
2. **Policy measures**: regulations, economic instruments, infrastructures policies, demand management, information to drivers, etc.

In the last group a special role is played by information to drivers: travel planning, public transport information, multi-modal journey planners, information for fleet operators, general awareness campaigns i.e. on CO2 labelling and on carbon footprinting and driver training **(eco-driving).**

Also eco-driving, despite being seen a quick win solution to carbon and energy reduction as it achieves personal cost savings, is not enough since it was shown[7]that the reduction can be in the range 5% to 25% according to the original driving style of the driver, with an average of 10%. But these are "short term" results; in fact, in a "long term" base, the positive effects are reduced because the driver slowly shifts back to the original driving style and because the saving is spent in more mileage.

Therefore, if an individual wants to achieve strong reduction in carbon emissions and energy consumptions, he needs to adopt what could be defined eco-mobility styles, which encompasses **new mobility behaviours such as modal shifts and substitutions and/or suppression of trips. Tangible incentives** play a fundamental role in stimulating those changes in human behaviours.

The effects of prices is evident on the responsiveness of demand in transport; price effects often take some years to build up fully, due to the time scale of forming and breaking habits, and making changes in life style.

On the contrary, the **role of incentives** to eco-mobility **is under investigation** in many projects and countries; it is likely that **a mix between prices, financial and social incentives** can represent that "nudge" [8] strong enough to make the driver reducing of a significant percentage the mileage in urban environment or to shift to other modes.

Useless to say, a commuter giving up a round trip per week achieves a reduction of 20% in externalities generation and energy consumptions, a very high percentage.

The MoveUs incentive model will be built on these four basic pillars**:**

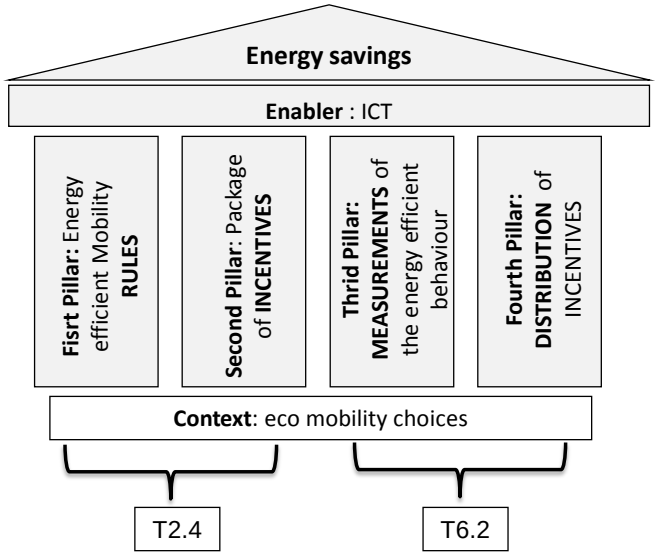

Figure 1 Incentive Model based on four pillars

- **Setting the MoveUs rules**; for example, in the case of a metropolitan area, that would require to define a target of reduction on energy consumptions and GHG emissions related to transport and consequently a set of measures to be taken, such as setting daily mileage limits, limiting on-off peak mileages, discouraging short trips by car, penalizing trips done where effective alternatives are present, etc.;
- **Setting the MoveUs Incentives package**; for example discounts on tickets and fares, on local taxation, on city services, free and/or extended access to Limited Traffic Zones, parking lots reserved for private cars and freight vehicles, discounted insurance; particular attention will be paid to involve businesses in the process, to help the sustainability of services and to improve the culture on energy-saving travel behaviours; such businesses could be green service-providers beyond mobility, discounts for alterations/improvements at home (for installing a more energy-efficient heating system, electricity, other..) and also incentives which aren't directly related to money – what we call "social incentives";
- **Measuring the true mobility behaviours giving feedback to citizens**; this would be done by the MoveUs platform that

  - gathers geo-referenced data from individual smartphones
  - calculates and certifies scoring according to compliance to mobility behaviour rules
  - sends feedbacks to MoveUs users and stakeholders
  - assesses the impact of changed behaviour on energy consumption.
- **Distributing incentives to MoveUs users**; distribution can be based on a "push" and/or "pull" mechanism, in the first case, incentives are automatically sent to MoveUs smartphones, in the latter only upon users' requests.

In this Chapter 2 we are describing the first two pillars, Rules and Incentives.

2.2 Methodology

Eco-mobility behaviours can be achieved mainly in two ways:

- **Reducing driving** and/or
- **Using alternative modes** (i.e. from private vehicle to public transportation, or to a higher Euro class)

The term *Rule* shall be understood in a broad sense including:

- a *Law* or *Regulation* that, if not met, will lead to a penalty; they are issued by central and local government and public administrations;
- a *Suggested Behaviour* or *Action* that, if not met, does not have any legal consequence; in the worst case, user suffers a limited financial consequence, such as a discount not obtained (i.e. pay-as-you-drive insurances); they are issued by the same organizations as above plus private entities and stakeholders (i.e. environmental communities)

From now on we shall use as synonyms the words *Rule* and *Measure*, which is a term more diffused in the ITS and Transport industry[9].

The methodology consists in:

1. **Mapping the measures** that help the **adoption of eco-mobility behaviours** and
2. Identifying those **measures** that are **based or could be linked to incentives.**

The mapping will be done at two levels:

1. **Making a review of projects and studies** addressing rules and incentives; it will be a desk analysis supported by some interviews in the pilot cities
2. **Making analyses, surveys and interviews in pilot cities** to organizations and stakeholders indicated below

In sections 2.3 and 2.4 are listed a few measures than can help the pilot cities to identify those most appropriate to energy consumptions and carbon footprint reductions, either because are already implemented or because will be implemented in the time frame of MoveUs.

At the same time, cities will evaluate those measures in terms of **Travel Impact, Benefits, Equity, Geographic Area** and **Organizations and Stakeholders** involved, as follows:

3. **Travel Impact:**
   i. Reduction of total traffic
   ii. Reduction of peak period traffic
   iii. Shift peak to off-peak periods
   iv. Shift vehicle travel to alternatives modes
   v. Improvement of access, reduction of the need to travel
   vi. Increase of public transport
   vii. Increase of cycling
   viii. Increase of walking
   ix. Increase of car/bike sharing
   x. Increase of car-pooling
   xi. Increase of teleworking
   xii. Reduction of freight traffic

4. **Benefits:**
   i. Congestion Reduction
   ii. Road & Parking Savings
   iii. Consumer Savings
   iv. Transport Choice
   v. Road Safety
   vi. Environmental Protection
   vii. Efficient Land Use
   viii. Community Livability
   ix. Energy Savings
   x. Carbon Footprint Reduction

5. **Equity:**
   i. Treats everybody equally
   ii. Individuals bear the costs they impose
   iii. Progressive with respect to income
   iv. Benefits transportation disadvantaged
   v. Improves basic mobility

6. **Geographic Area:**
   i. Large urban region
   ii. High-density, urban
   iii. Medium-density, urban/suburban
   iv. City center
   v. Low-density, rural
   vi. Mall/Commercial center
   vii. Residential neighborhood
   viii. Resort/recreation area

7. **Organizations/Stakeholders:**
   i. National Government
   ii. Regional Government
   iii. Municipal/local government
   iv. Business Associations
   v. Consumer/Citizen Associations
   vi. Environmental Associations

vii. Motorist Associations
viii. Freight Operators Associations
ix. Individual Business
x. Neighborhood association
xi. Campus

Then the cities will identified, for each measure, possible Incentive Package assisted by a few examples listed in section 2.5.

2.3 Rules for reducing driving

This paragraph describes measures that can be taken for reducing driving, with or without incentives.

2.3.1 Commuter Financial Incentives

These measures can be implemented to encourage the use of more efficient commute modes.

They include several types of measures:

- **Employee Parking Pricing**: companies start charging their private parking lots or cancel existing subsidies for off-premises parking
- **Parking Cash Out**: companies offer commuters, who use alternative modes, a certain amount of money equivalent to the companies' cost of parking
- **Travel subsidies**: a financial payment given to employees to use alternative modes
- **Company travel reimbursement**: reimbursement of the costs of alternative modes instead of vehicle mileage
- **Public Transport benefits**: free or discounted transit fares provided to employees traveling by public transport.

These measures create neutral incentives; in fact, the incentives are equivalent to cost savings.

In short term, the companies' savings could be small but in a medium long term the parking area could be assigned to other activities such as additional office space or warehouses or public parking, or could be even sold.

These incentives have strong impact on reducing congestion since the trips are done during peak-hours.

These measures are implemented within the company usually with the active participation of trade unions.

Stakeholders involved are: employers, employees, trade unions, environmental associations, local public administration and public transport.

2.3.2 Road pricing

This paragraph describes a few mechanisms of charging drivers for driving in a particular area or road or lane.

Another definition is *Value Pricing* meaning that drivers can benefit from reduced congestion or better roadways.

Typical measures are:

- **Area pricing:** tolls paid if driving in a particular area;
- **Cordon pricing:** tolls paid entering (one time or more during the day) into a particular area defined by a perimeter (cordon);
- **Congestion pricing:** variable tolls applied in roadways and/or areas usually higher during peak hours
- **Road toll**: price to be paid driving in particular roads
- **HOV toll:** High Occupancy Vehicle lanes made available to other vehicle if they pay a toll
- **Mobility credits**: driving is allowed within a defined budget of mobility

These measures are implemented by infrastructure owners, under control of national / regional / local governments.

Stakeholders involved are: governments, drivers and transport associations, consumers associations, ITS providers, infrastructure owners.

2.3.3 Distance-Based pricing

Various are costs and fees which can be based on mileage; converting fixed costs into distance-based charges gives drivers new opportunities to save money by reducing their trips.

They include several types of measures:

- **Pay As You Drive Insurance**: insurances make the drivers pay according to the travel behaviour and mileages
- **Distance-based registration fees and purchase taxes**: vehicle licensing fees and taxes are proportional to the vehicle mileage
- **Distance-based leasing and renting fees**: the leasing and renting costs are calculated according to the vehicle mileage
- **Distance/Weight fees**: road use charging based both on mileage and weight of the vehicle; it is particularly interesting for urban logistics
- **Distance/emission fees**: licensing and taxes are calculated according to mileage and emissions' class of vehicles.

These measures are implemented by local administrations, infrastructure owners, insurance companies and national / regional / local governments.

Stakeholders involved are: insurance companies, governments, insurance regulators, drivers and transport associations, consumers associations, ITS providers, infrastructure owners.

2.3.4 Parking pricing

Parking pricing means that drivers pay directly for using parking facilities.

This measure can be used not only as a transport demand management measure but also to both reduce driving and to use alternative modes.

The effect of this measure is in direct proportion to the cost and in indirect proportion to discounts or subsidies.

Parking pricing can provide huge revenues; part of them could be transformed into incentives to commuters not to use private cars and shift to carpooling or public transport or cycling/walking.

Implementation is usually done by infrastructure owners.

Stakeholders involved are: infrastructure owners, local administrations, individual and associated businesses, enforcement organizations, neighborhood groups, citizens, technology providers.

2.3.5 Teleworking

The development of IT applications (office automation) and communication infrastructures have enabled the possibility to work almost anywhere in the world.

Teleworking, which means to perform a working duty without being at working place, is one of the most effective measures to reduce energy consumptions and congestion.

One example, already mentioned in the Introduction, is exhaustive: a commuter giving up a round trip per week achieves a reduction of 20% in externalities generation and energy consumptions, a very high percentage difficult to be achieved by other measures.

For the purpose of this task, cities should map initiatives of teleworking both in public administration and in private companies, who are also the primary actors with the cooperation of trade unions.

Stakeholders involved are: public administrations, private companies, trade unions, environmental associations, transportation agencies.

2.3.6 Fuel and Carbon taxes

Fuel taxes are taxes based on the quantity of fuel while Carbon taxes are taxes based on carbon content on fossil fuel, and therefore on carbon dioxide emissions.

They are an effective Energy and Emissions reduction strategy since help reduce vehicle travel and provide revenues that, if being *revenue neutral*, could be used to reduce other taxes to citizens, or provide rebates, or finally to finance public transportation.

Fuel and Carbon taxes are usually implemented at national and regional level; local governments and administrations have modest tax options; for this reason it could be difficult to transform part of them into local incentives.

Stakeholders involved are: governments and public administrations, motorist organizations, oil industry, freight operators, environmental and consumer organizations.

2.4 Rules for using alternative modes

2.4.1 High Occupancy Vehicle (HOV) Priority

HOV priority refers to strategies giving priorities to vehicles occupied by more than one person, such as transit bus and car pooling.

These measures include:

- **HOV lanes (streets, highways)**: lanes open only to HOV
- **HOV toll lanes (highways, bridges, tunnels)**: toll gates open only to HOV
- **HOV parking**: preferred parking spaces or parking fees discount to HOV
- **HOV street lights:** intersection giving priority to HOV (mainly buses)
- **HOV programs:** special incentives given to HOV commuters (see above Commuters Financial Incentives)

These measures provide savings in travel time and operating costs and increase travel schedule reliability.

Implementation of HOV lanes and HOV toll lanes are difficult since requires adding new road capacity or attributing to HOV existing capacity.

It is rather easier to implement HOV parking facilities and HOV programs.

Stakeholders involved are: infrastructure operators, department of transportation, local authorities, enforcement bodies, technology providers.

Those tools represent way-finding improvements providing guidance for shifting from private vehicle usage to walking, cycling and public transportation.

The planners can include signs, maps, guidebooks, website and electronic devices that provide information on travel options, such as accesses, routes, fares, schedules, etc.

Journey planners could be given as gift to citizens, tourists, or as welcome kits to employees, since the advantages to use these tools are evident:

- Increase use of alternative modes reducing private vehicles' usage
- Allow travel costs reduction
- Improve road safety
- Improve the knowledge of the territory
- Reinforce the sense of community
- Enable the implementation of advertising and marketing campaigns
- Reduce stress and increase physical exercise.

The role of incentives associated to journey planners is still under study and it is one of the main goals of MoveUs.

Implementation of journey planners can be virtually done by any organization.

Stakeholders involved are: local planners, facility managers, single and associated businesses, infrastructure operators, transport operators.

2.4.2 Road Space Reallocation

It refers to measures aiming at providing more space for walking, cycling and public transportation reducing that devoted to vehicle traffic.

In fact, automobile transportation requires several times as much road per passenger-mile than other modes, so drivers impose far more congestion per person than using other modes.

These measures include:

- **Limited Traffic Zones:** area where vehicle are not allowed at all or only during limited period of time (i.e. access for residents)
- **Bike lanes:** lanes reserved to bicycles
- **Bus lanes:** lanes reserved to buses
- **Sidewalk improvements:** more and larger sidewalks
- **Traffic calming zones:** zones where the speed is limited (by regulations and/or physical obstacles); reducing traffic speeds has a double folded effect: it allows fuel cost savings and improves walking and cycling conditions. Other positive effects are: increasing safety, reducing air and noise pollutions, reducing number of trips.
- **Freight vehicle lanes:** lanes reserved only for urban logistics.

Implementation is done by local authorities and infrastructure owners in the framework of urban mobility and traffic plans.

Stakeholders involved are: infrastructure operators, department of transportation, local authorities, enforcement bodies, technology providers, consumer associations, neighborhood associations.

2.4.3 Public Transport Incentives

Public Transport encouragement can be achieved by various measures, such as improving service (quality and schedules), reducing fares, improving the user experience.

An ever increasing role is played by third parties, mainly businesses, participating to public programs very often in the Smart City frameworks.

In details, possible measures are:

- **Improving the service:** frequency, comfort, cleanness, speed, Internet, etc.
- **Improving stops and stations**: comfort, Internet, bathrooms, waiting areas, etc.
- **Reducing the cost**: lower fares in off-peak travel times, discounts offered by retail chains and shops
- **Facilitating payments**: smart cards systems, mobile wallet, SMS, etc.
- **Organizing Park & Ride facilities**
- **Improving the access**: by bike, walking, etc.
- **Participating to Commuter Incentives Programs** (see above)

Road Pricing, Parking Pricing and Distance-based Pricing are measures generating interesting revenues that could be partially invested into incentives for public transportation, such as subsidies or investments as above.

Implementation is usually done by public transport operators and local administrations.

Stakeholders involved are: transport operators, local administrations, individual and associated businesses, citizens.

2.4.4 Walking & Cycling Incentives

Walking & Cycling represents a very important *soft mobility* since permits to achieve strong energy savings and cost reductions.

There are a few measures in this category:

- **Improving bicycle parking lots**: above all nearby train/bus stations
- **Improving bike lanes and Limited Traffic Zones**: see above par. 2.4.3
- **Offering public and private bike sharing services**
- **Facilitating walking**: children to schools, indoor and outdoor pathways, etc.
- **Encouraging commuting by bike:** i.e. employers providing bicycles or reimbursing employee cycling mileage expenses

Implementation is usually done by community groups with a strong participation of local administrations, employers, and individual businesses.

Stakeholders involved are: public agencies, non-profit organizations, employers and consumer associations, schools, bike sharing operators.

2.5 Identification of Incentives

The table below illustrates some possible Incentive Package; see sections 2.3 and 2.4 for definitions and explanations.

Measures (numbering refers to # of paragraph where they are defined)	Incentives description	Entity issuing Incentives	Beneficiaries
2.3.1 Commuter Financial Incentives	• Start charging parking (negative Incentive) • Offer money to use alternative modes • Reimburse the travel costs if not done with private cars	• Employers	Commuters
	• Offer subsidies to use alternative modes	• Local Administrations	Commuters
	• Offer discounted tickets	• Public Transport Operators	Commuters
2.3.2 Road	• Adopt Road Pricing	• Local	All (citizens,

Pricing	measures (negative Incentive) • Reverse part of revenues to incentive alternative modes	Administrations • Infrastructure Operators	commuters, tourists, …)
2.3.3 Distance-Based Pricing	• Adopt Distance-Based Pricing measures (negative Incentive) • Reverse part of revenues to incentive alternative modes	• Local Administrations • Infrastructure Operators	All (citizens, commuters, tourists, …)
	• Offer Pay As You Drive policies • Offer money to not use car	• Insurances	Car owners
2.3.4 Parking Pricing	• Adopt Parking Pricing measures (negative Incentive) • Reverse part of revenues to incentive alternative modes	• Local Administrations • Infrastructure Operators	All (citizens, commuters, tourists, …)
2.3.5 Teleworking	• Adopt teleworking in the company • Offer money to stay at home • Offer Technology (PCs, mobile phones, connections) to work at home	• Employers	Commuters
2.3.6 Fuel & Carbon Taxes	• Increase Fuel & Carbon Taxes (negative Incentive) • Reverse part of taxes to incentive alternative modes	• Central/Local Administrations	All (citizens, commuters, tourists, …)
2.4.1 High Occupancy Vehicle (HOV) Priority	• Adopt HOV measures (negative Incentive) • Reverse part of revenues to incentive alternative modes	• Local Administrations • Infrastructure Operators	All (citizens, commuters, tourists, …)
2.4.2 Multi-Modal journey planners	• Make the journey planner available for free or at very low cost	• Any Organization	All (citizens, commuters, tourists, …)
	• Link trips to marketing campaigns: deals, discounts	• Businesses	All (citizens, commuters, tourists, …)
2.4.3 Road Space	• Adopt Road Space Reallocation measures	• Local Administrations	All (citizens, commuters,

Reallocation	(negative Incentive)	• Infrastructure owners	tourists, …)
2.4.4 Public Transport Incentives	• Offer discounted tickets	• Local Administrations • Businesses • Employers	All (citizens, commuters, tourists, …)
	• Improve the service	• Transport Operators	All (citizens, commuters, tourists, …)
	• Link to Commuter Incentives Programs	• Businesses	All (citizens, commuters, tourists, …)
2.4.5 Walking & Cycling Incentives	• Adopt Walking & Cycling Encouragement measures	• Local Administrations • Infrastructure owners	All (citizens, commuters, tourists, …)
	• Encourage the development of car/bike sharing services	• Local Administrations	Businesses
	• Link to Commuter Incentives Programs	• Businesses	All (citizens, commuters, tourists, …)
	• Adopt education programs at school	• Schools	Parents

Table 2 Examples of Incentive Packages

2.6 Review of projects and studies

This section describes **some reference projects** in each type of incentives described in the previous paragraphs; the lists, **which are not exhaustive**, represents a **good summary** of what is currently implemented worldwide.

2.6.1 Commuter Financial Incentives

Project	Incentives description	Entity issuing Incentives	Beneficiaries
Congestion Management Program	Financial incentives to reduce driving (limited to four employers)	Alameda County	Employees

Commuter Check Programs	Subsidized transit benefits	Various Employers	San Francisco Bay Area employees
Spitsmijden	Financial incentives between € 2 and € 7 per day	Dutch DOT	Selected travelers avoiding driving at peak hours
UK Company Tax Reform	Removal of discounted taxes on business mileage	British treasury	Citizens driving second hand cars (high mileage)
Intel and Google (and others) Corporations	Free transit passes	Intel and Google (and others)	Intel and Google and others employees
CH2M Hill	$ 40/month to employees if they walked, bicycled, carpooled or took transit to work	CH2M Hill	CH2M Hill Employees
Mobility Mixx	Personal mobility budget offered to employees	Various (see www.mobilitymixx.nl)	Registered users

Table 3 Commuter Financial Incentives projects

Comment: It is rather diffused among big enterprises in USA and Europe; incentives are given in the form of reimbursement of bus tickets or parking cash out since it permits to reduce the parking space; the role of local administrations is minimum.

2.6.2 Road Pricing

Project	(negative) Incentives description	Entity issuing (negative) Incentives	Beneficiaries
Oregon Road User Fee Pilot Program	Charging motorists for driving in congested conditions	State of Oregon (USA)	All Drivers
London Congestion Charging	Charging drivers entering the city center	City of London	All Drivers
Area C	Charging drivers entering the city center	City of Milan	All Drivers (residents have a limited free entrance)
Stockholm Congestion	Charging drivers entering the city center	City of Stockholm	All Drivers

Pricing			
Other congestion charging schemes	Charging drivers entering the city center	Singapore, Trondheim, Melbourne, Toronto	All Drivers
Credit based congestion charging	Charging drivers exceeding the monthly mobility budget	City of Austin	All Drivers

Table 4 Road Pricing incentives projects

Comment: It involves negative incentives; there are various applications in USA and Europe in the form or area and cordon pricing. All projects have a high impact on traffic reduction; the role of local administrations is crucial.

2.6.3 Distance-Based Pricing

Project	Incentives description	Entity issuing Incentives	Beneficiaries
Pay as you drive insurance	Discounts on insurance policies	Various insurance companies in Europe, mainly in Italy and UK	Insurance clients
Dutch national pricing (pilot)	Charging drivers in proportion to mileage (pay as you drive)	Dutch DOT	All Drivers
Swiss heavy Vehicle Fee	Charging trucks based on gross weight, mileage and emissions	Swiss Government	Trucks drivers
German tolls for trucks	Charging trucks based on axles, mileage and emissions	German Government	Trucks drivers

Table 5 Distance-Based Pricing incentives projects

Comment: It involves negative incentives; positive incentives can be found in the field of Usage Based Insurance, like Pay-As-You-Drive insurance; currently there 2,5 million car equipped with On Board Units in Europe and 2,0 millions in USA; the incentives are based on discounts and on fees per mileage.

2.6.4 Parking Pricing

It involves negative incentives; Parking Pricing measures are currently developed worldwide; they represent a powerful demand management system if pricing is correctly defined and long parking is penalized.

Revenues are mostly invested in public services, among them public transportation, but not exclusively to PT nor converted into incentives.

2.6.5 Teleworking

Project	Incentives description	Entity issuing Incentives	Beneficiaries
Commuter Challenge Program	Various incentive to promote teleworking: technology, telecommunications, etc.	Two-dozen Puget Sound area employers	Puget Sound Area commuters
First Interstate Bank	Some equipment is provided by the bank, and business-related telephone calls are reimbursed.	First Interstate Bank	First Interstate Bank employees
Smart Work Centers	Telepresence Rooms provided by Tata and Cisco in USA, UK and India	None: telepresence is rent on an hourly basis	Interested customers
Various employers worldwide	Various incentive to promote teleworking: technology, telecommunications, etc.	Various employers	Employees

Table 6 Teleworking incentives projects

Comment: It is rather diffused among big enterprises in USA and Europe and business communities; incentives are given in the form of contribution to costs of technologies and telecommunications; the role of local administrations seems minimum.

2.6.6 Fuel and Carbon taxes

It involves negative incentives; Fuel and Carbon taxes are currently developed worldwide and represent one of the most important revenue for States; no projects have been found where national or local taxes are expressly given back to citizens as incentives to change mobility behaviours.

2.6.7 High Occupancy Vehicle (HOV) Priority

Project	Incentives description	Entity issuing Incentives	Beneficiaries
US HOV lanes	Permission to drive HOV lanes in passengers are 2+	Various local US infrastructure owners & administrations	Buses, carpools, vanpools, motorcycles
Bus priority lanes	Green lights to buses approaching junctions	Various local infrastructure owners & administrations	Buses

HOV Calculator	Free of charge calculator enabling users to evaluate costs and time savings using carpooling	Virginia DOT	Commuters

Table 7 HOV incentives projects

Comment: This combination is rather diffused in USA, a few examples can be found also in Europe; it is implemented basically in extra-urban environments; in the city centers almost all projects involve only public transportation.

2.6.8 Multi-Modal journey planners

There are many applications mainly dedicated to trip planning based on Park&Ride facilities and public transportation. None of them has the variety of services foreseen in MoveUs and, above all, none of them is linked to incentive management.

2.6.9 Road Space Reallocation

Project	(negative) Incentives description	Entity issuing (negative) Incentives	Beneficiaries
Zurich Transit Speedup Program	Speed up tram and buses at junctions through dedicated lanes and smart green light control	City of Zurich	PT passengers
QuickRide Houston HOV lanes	Subsidized transit benefits	City of Houston	Car pool people
Program in Oxford	Various measures to disincentivize the use of private cars: reserved lanes, bus priorities, limited traffic zones, etc.	City of Oxford	Everybody but car drivers
Improve width of sidewalks	Shifting street space to pedestrians	Many cities have implemented this measure	Pedestrians, shoppers, tourists
Build "home zone"	Designate some residential parts of the cities al limited traffic zones	Many cities have implemented this measure	Pedestrians, shoppers, tourists, residents.
"Low speed zones" (Traffic Calming)	Designate some streets as pedestrians zones, where cars must drive at a very low speed	Many cities have implemented this measure	Pedestrians, shoppers, tourists, residents.

Table 8 Road Space Reallocation incentives projects

Comment: It involves negative incentives; it is a kind of measures applied in many cities worldwide, and the role of local public administration is crucial for their success; a strong reduction in vehicle usage is reported for almost all projects.

2.6.10 Public Transport Incentives

Since the incentives to public transport are widely diffused, we considered only some measures as a reference

Project	Incentives description	Entity issuing Incentives	Beneficiaries
Commute Trip Reduction **(see par 2.6.1)**	Financial incentives, bus tickets, telework, bike parking, connector buses, etc.	Microsoft	Microsoft Employees located in the Puget Sound area
Connected Bus	It is a technology to be installed in buses to achieve better control of the bus and to provide advanced services to passengers (Internet, ticketing, trip information, etc.)	Cisco	Bus passengers
Smart Ticketing (smart card)	Providing integrated fare systems make public transport more easy to be used	Many cities	PT passengers

Table 9 Public Transport incentives projects

2.6.11 Walking & Cycling Incentives

Project	Incentives description	Entity issuing Incentives	Beneficiaries
Employee Bicycle Travel Reimbursement	0,25 €/km reimbursement	City of Paris	Commuters cycling to worksites
Employer funded commuter bikes	New bicycles free to employees	Various employers	Commuters cycling to worksites
Tax free bike schemes	Tax free bike schemes for employees, paid by employers through payroll	Various Employers	Commuters cycling to worksites

Bicycle Commuting Contest	Contests designed to encourage individuals to bicycle to work and schools; various prizes for winners.	Various public administrations	Bikers
Bike to work week campaign	Periodic weeks dedicated to bikers, aiming at encouraging individuals to bicycle to work and schools; traffic calming measures and coupons.	Various public administrations	Bikers
Bike sharing	Bicycles rented at very low price or even free for some short periods	Various public administrations	Bikers

Table 10 Walking and Cycling incentives projects

Comment: In this combination, both enterprises and public authorities have important roles: the first funding bike programs for employees, the latter providing bike sharing very often free of charge for short periods. The initiative of the City of Paris, still at the beginning, is remarkable giving monetary incentives to bikers.

2.7 Surveys and Interviews in pilot cities

2.7.1 Selection of measures in the pilot cities to both incentivize the use of alternative transport modes and the reduction of driving

The tables in this section include a selection of measures either already put in place in the cities or implemented as pilot measures to both incentivize the use of alternative transport modes and incentivize the reduction of driving.

2.3.1 Commuter Financial Incentives	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Employee Parking Pricing at public service company	Public service company	Employees
Genoa	[1] Ecopoint Programme (2007) [2] Electric motorcycle incentives (Electra project - 2013_2016)	Municipality of Genoa	All (citizens, commuters, tourists, …)
Tampere	Public transport benefit - Commuter benefit ticket (Työsuhdelippu). Tax authorities	All users of such incentives are listed openly at:	Employees

	consider that over 300 euro commuter benefits are to be taxed.	http://joukkoliikenne.tampere.fi/fi/matkustaminen/liput/tyosuhdelippu/mekin-kaytamme-tyosuhdelippua.html	

Table 11 Commuter Financial incentives in the pilot cities

Comment: No enterprises have put in place such measures; there are examples of incentives issued by public authorities such as discounted Park&Ride and PT tickets to commuters, facilitation on the use of electric vehicles.

2.3.2 Road Pricing	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Adopt Road Pricing measures in urban highways in Madrid: M12, R2, R3, R4 and R5	Regional Government of Madrid	All (citizens, commuters, tourists, …)
Genoa	[3] Integrated access control scheme [4] Mobility credits	Municipality of Genoa	All (citizens, commuters, tourists, …)
Tampere	No ongoing incentive-scheme to take into account road pricing[1].	-	-

Table 12 Road Pricing incentives in the pilot cities

Comment: No road pricing schemes are present except in extra-urban roads in Madrid and in the highways surrounding Genoa, which are used as ring roads.

2.3.3 Distance-based Pricing	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Pay as you drive insurance	Vehicle insurance operators	Private Car drivers
Genoa	[5] Pay as you drive insurance [6] Driving authorization according to emission class of	Municipality of Genoa	All (citizens, commuters,

[1]The Transport Ministry's working group reported in December 2013 that a tax proportional to road use would implement transport and environment policies better than current fixed taxes on motoring, although collection costs would be many times higher. The focus of transport policy should be on solving capacity problems by managing demand rather than by building new infrastructure. However, it argued that buses and lorries should be exempted from road use charges on the grounds that the rise in costs could not be offset by cutting other heavy vehicle road taxes, which were already close to the minimum set in the EU's vignette directive. For private cars the report looked at the implications of fixed and regional kilometer charges but did not consider market or other methods for responding to varying local congestion. Before the adoption of any system, it proposed broad trials to establish the technical viability of taxing road use, its enforceability and the protection of privacy.

	vehicles (fine-negative incentive)		tourists, …)
Tampere	N/A	N/A	N/A

Table 13 Distance Based Pricing incentives in the pilot cities

Comment: Usage Based Insurance is rather diffused in Genoa and Madrid; in Genoa vehicles are authorized according to the emission class.

2.3.4 Parking Pricing	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Adopt Parking Pricing measures in resident zones in Madrid	Madrid City Council - department of mobility	Private drivers (incl. commuters, citizen, tourists). Free parking only for residents registered in the city
Genoa	BLUAREA park pricing scheme	Municipality of Genoa	All (citizens, commuters, tourists, …)
Tampere	Employee Parking Pricing (start charging) in some organizations.	TUT	[2]

Table 14 Parking Pricing incentives in the pilot cities

Comment: Implemented in all three cities as a negative incentive.

2.3.5 Teleworking	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Teleworking in big private companies like Microsoft Spain, Telefonica, ATOS, etc.	Private company	Employees
Genoa	Only based on individual permissions	IST (S. Martino Hospital)	IST Employees
Tampere	Not popular. Some companies do have this though (Siemens favors teleworking part time. Employees should not telework more than three days per week. More info	Joiku Spot, http://www.joiku.com	Employees.

[2]Often-encountered scenario: companies offer free parking for employees (negative incentive)

	available at: http://www.uta.fi/yky/tutkimus/socru/space/Managing%20telework.pdf)		

Table 15 Teleworking incentives in the pilot cities

Comment: It is implemented only in big companies in Madrid; in Genoa it is allowed only in some companies in special cases; not popular in Tampere even if present in some big companies.

2.3.6 Fuel & Carbon Taxes	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Road tax	Madrid City Council - department of mobility	All citizen
Genoa	N/A	N/A	N/A
Tampere	Finland introduced the world's first carbon tax in 1990, initially with exemptions for specific sectors. Manly changes were later introduced, such as a border tax on imported electricity. Natural gas has a reduced tax rate, while peat was exempted between 2005 and 2010. In 2010, Finland's price on carbon was €20 per tonne of CO2.	Government + public administrations.	All citizen

Table 16 Fuel & Carbon Taxes incentives in the pilot cities

Comment: Fuel taxes are diffused; only Finland introduced a carbon tax in 1990; the various fuels are taxed differently according to the usage and not on carbon content.

2.4.1 High Occupancy Vehicle (HOV) Priority	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Use of HOV lane for buses and vehicles with 2+ occupants	DGT- General Directorate of Traffic (Spain)	Buses, vehicles with 2+ occupants
Genoa	• Bus lane control • Traffic lights - priority to buses	Municipality of Genoa	All (citizens, commuters,

	• Car pooling		tourists, …)
Tampere	Existing Smart Traffic Prioritization Service: Possibility to adjust traffic light prioritization upon request (from the OBU of a vehicle) for e.g. delayed buses, and to prioritize from the backend e.g. during special events (concerts)	Public Administration	All (citizens, commuters, tourists, …)

Table 17 High Occupancy Vehicle Priority incentives in the pilot cities

Comment: HOV measures are put in place in Madrid for buses and vehicles with 2+ passengers; in Genoa and Tampere prioritization of buses at junctions.

2.4.2 Multi-Modal Journey Planners	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Make journey planners available for free at different public transport web sites: Public transport in general	Regional Government of Madrid - Transport area, public transport operators	All (citizens, commuters and tourists)
Genoa	Intermodal Infomobility platform (tool capable to calculate the environmental personal footprint caused by a certain choice of route and transport mode)	Any Organization	All (citizens, commuters, tourists, …)
Tampere	Online standalone journey planners exist for free, for buses and cycling. No integrated journey planner exists yet.	Public administration	All citizens. A 2013 survey measured the continuously increasing level of customer satisfaction in association with these services. Survey available at: http://URN.fi/URN:NBN:fi:tty-201312191526

Table 18 Multimodal Journey Planners in the pilot cities

Comment: Local authorities made available these tools with different functionalities: in Madrid for public transport, in Genoa infomobility platform

calculating the environmental impact of some trip choices, in Tampere for buses and cycling only.

2.4.3 Road Space Reallocation	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	• LTZ • Bus lanes • Bike lanes	Madrid City Council - department of mobility	All (citizens, commuters and tourists)
Genoa	• LTZ • bike lines • bus /car sharing lanes • traffic calming zones	Municipality of Genoa	All (citizens, commuters, tourists, …)
Tampere	N/A	N/A	N/A

Table 19 Road Space Reallocation incentives in the pilot cities

Comment: Beside Tampere, all types of these measures exist in Madrid and Genoa.

2.4.4 Public Transport Incentives	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	• Improvement of the public bus service: Free WiFi onboard and improvement of comfort for bus travellers • Offer promotional tickets: The bus-bus ticket enables the user to take buses in from two different lanes during one hour after ticket	Public bus operator - EMT	• Public bus travellers • All (citizens, commuters and tourists)
	• Offer discounted tickets: Travel card coupon (for citizens) and Tourist travel pass (for tourists) • Organization of Park & Ride facilities in some train stations	Regional government of Madrid - Transport area, public transport operators	All (citizens, commuters and tourists)
Genoa	Several measures: Clean high mobility corridors - Belt payment system, mobile facilities to pay bus ticket, improving service speed, more reserved bus lanes, more services as Drinbus, more	AMT (Public Transport Operator)	All (citizens, commuters, tourists, …)

	bike lanes, organizing park & ride facilities, bike/car sharing, etc.)		
Tampere	Improvements are continuously brought to public transport services.	Public administration. Supported by a community of developers working on the open data provided: http://wiki.itsfactory.fi/index.php/ITS_Factory_Developer_Wiki	

Table 20 Public Transport incentives in the pilot cities

Comment: All types of these measures exist in the three cities.

2.4.5 Walking & Cycling Incentives	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	• Adopt Walking & Cycling Encouragement measures: Space in the City Council web portal devoted to promoting walking and cycling in Madrid • Public Bike hiring system	Madrid City Council - department of mobility	All (citizens, commuters, tourists, …)
Genoa	"environmental zones", the cycling urban plan, LTZ, walking facilities, public walking and cycling events	Municipality of Genoa	All (citizens, commuters, tourists, …)
Tampere	N/A	N/A	N/A

Table 21 Walking & Cycling incentives in the pilot cities

Comment: there are no incentives for cycling except some promotion initiatives in Madrid (bike sharing) and Genoa, even if in Genoa bicycles are difficult to be used; walking is facilitated by the creation of "environmental zones".

2.4.6 Shared Mobility	Incentives description	Entity issuing Incentives	Beneficiaries
Madrid	Encourage the operation of shared mobility options in Madrid: Car-sharing	Madrid City Council - department of mobility	All (citizens, commuters, tourists, …)
Genoa	N/A	N/A	N/A
Tampere	N/A	N/A	N/A

Table 22 Shared Mobility incentives in the pilot cities

Comment: Car-sharing systems are implemented only in Madrid

2.7.2 Evaluation of impact of measures

The evaluation of the impact of the measures collected in the tables has been done considering the feedback provided by experts in transportation contacted by partners that include colleagues, clients, stakeholders, etc. at national and local level.

The valuation of the measures is based on the experiences closed to the evaluator, and frequently it is subjective, based on personal perceptions, because there are not studies done upon which the valuation of measures could be based.

2.7.2.1 Evaluation of Travel Impact

LEGENDA: **3 = very positive impact** **0 = no or uncertain impact** **- 3 = very negative impact**	**Commuter Financial Incentives**			**Road Pricing**			**Distance-Based Pricing**		
	Madrid	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**
Reduces total traffic	1	**3**	2	0	**3**	0	1	**3**	0
Reduces peak period traffic	0	2	0	1	2	0	1	**3**	0
Shifts peak to off-peak periods	0	1	0	1	2	0	1	0	0
Shifts vehicle travel to alternatives modes	1	**3**	1	1	2	0	1	1	0
Improves access, reduces the need to travel	0	1	0	0	1	0	0	0	0
Increases public transport	1	2	1	1	**3**	0	1	0	0
Increases cycling	0	1	0	0	2	0	1	0	0
Increases walking	0	1	0	0	1	0	1	0	0
Increases car/bike sharing	0	2	0	0	**3**	0	1	0	0
Increases car-pooling	0	1	0	1	0	0	1	0	0
Increases teleworking	0	1	0	0	0	0	0	0	0
Reduces freight traffic	0	1	0	0	**3**	0	0	**3**	0

Table 23 Evaluation of measures in terms of Travel Impact (Table 1)

LEGENDA: 3 = very positive impact 0 = no or uncertain impact - 3 = very negative impact	Parking Pricing			Teleworking			Fuel & Carbon Taxes		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Reduces total traffic	2	**3**	1	2	**3**	1	0	**3**	1
Reduces peak period traffic	0	2	0	0	**3**	2	0	2	0
Shifts peak to off-peak periods	0	1	0	1	2	2	0	0	0
Shifts vehicle travel to alternatives modes	2	**3**	2	0	0	0	0	**3**	1
Improves access, reduces the need to travel	0	1	0	**3**	2	**3**	0	1	0
Increases public transport	2	**3**	2	-1	1	0	0	**3**	0
Increases cycling	0	2	2	0	0	0	0	1	1
Increases walking	0	1	2	0	2	0	0	1	1
Increases car/bike sharing	0	2	**3**	0	0	0	0	**3**	1
Increases car-pooling	0	2	**3**	0	0	0	0	**3**	1
Increases teleworking	0	2	**3**	**3**	**3**	**3**	0	0	1
Reduces freight traffic	0	**3**	0	0	0	0	0	2	1

Table 24 Evaluation of measures in terms of Travel Impact (Table 2)

LEGENDA: 3 = very positive impact 0 = no or uncertain impact - 3 = very negative impact	HOV Priority			Multimodal Journey Planner			Road Space Reallocation		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Reduces total traffic	0	**3**	2	1	2	2	1	2	0
Reduces peak period traffic	**3**	2	1	0	2	1	1	**3**	0
Shifts peak to off-peak periods	0	1	2	0	2	1	0	**3**	0
Shifts vehicle travel to	0	**3**	1	1	**3**	1	1	**3**	0

alternatives modes									
Improves access, reduces the need to travel	0	0	0	0	1	0	0	**3**	0
Increases public transport	0	**3**	1	1	**3**	1	1	**3**	0
Increases cycling	0	0	0	1	1	2	1	**3**	0
Increases walking	0	0	0	1	1	0	1	2	0
Increases car/bike sharing	0	1	0	1	0	0	0	**3**	0
Increases car-pooling	**3**	**3**	0	0	**3**	0	0	**3**	0
Increases teleworking	0	0	0	0	0	0	0	0	0
Reduces freight traffic	0	2	0	0	0	0	1	**3**	0

Table 25 Evaluation of measures in terms of Travel Impact (Table 3)

LEGENDA: 3 = very positive impact 0 = no or uncertain impact - 3 = very negative impact	Public Transport Incentives			Walking & Cycling Incentives			Shared Mobility		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Reduces total traffic	1	**3**	2	1	**3**	0	1		
Reduces peak period traffic	0	**3**	0	1	2	0	1		
Shifts peak to off-peak periods	0	2	1	1	1	0	1		
Shifts vehicle travel to alternatives modes	0	**3**	2	1	**3**	0	0		
Improves access, reduces the need to travel	0	2	0	0	**3**	0	0		
Increases public transport	2	**3**	2	0	2	0	0		
Increases cycling	0	2	0	**3**	**3**	0	0		
Increases walking	0	2	0	**3**	**3**	0	0		
Increases car/bike sharing	0	**3**	0	**3**	**3**	0	0		
Increases car-pooling	0	0	0	0	0	0	**3**		
Increases teleworking	0	0	0	0	0	0	0		

Reduces freight traffic	1	0	0	0	0	0	0		

Table 26 Evaluation of measures in terms of Travel Impact (Table 4)

2.7.2.2 Evaluation of Benefits

LEGENDA: **3 = very positive impact** **0 = no or uncertain impact** **- 3 = very negative impact**	**Commuter Financial Incentives**			**Road Pricing**			**Distance-Based Pricing**		
	Madrid	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**
Congestion Reduction	0	**3**	1	**3**	**3**	0	0	**3**	0
Road & Parking Savings	1	**3**	1	-3	0	0	0	1	0
Consumer Savings	1	**3**	1	-3	-3	0	2	2	0
Transport Choice	-2	**3**	1	2	**3**	0	2	1	0
Road Safety	0	2	0	0	1	0	0	1	0
Environmental Protection	0	2	1	-3	**3**	0	-2	**3**	0
Efficient Land Use	0	2	0	0	**3**	0	0	1	0
Community Livability	0	2	1	0	**3**	0	0	1	0
Energy Savings	0	2	0	0	**3**	0	1	2	0
Carbon Footprint Reduction	1	2	0	0	**3**	0	1	2	0

Table 27 Evaluation of measures in terms of Benefits (Table 1)

LEGENDA: 3 = very positive impact 0 = no or uncertain impact - 3 = very negative impact	Parking Pricing			Teleworking			Fuel & Carbon Taxes		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Congestion Reduction	1	**3**	2	1	**3**	**3**	0	**3**	1
Road & Parking Savings	1	-3	0	**3**	**3**	**3**	0	1	1
Consumer Savings	-3	**3**	-2	2	**3**	**3**	-1	-1	-2
Transport Choice	1	**3**	2	0	0	**3**	0	**3**	1
Road Safety	0	1	0	1	**3**	**3**	0	1	0
Environmental Protection	-2	1	**3**	2	**3**	**3**	0	**3**	1
Efficient Land Use	1	2	0	2	1	0	0	1	0
Community Livability	0	2	**3**	2	**3**	**3**	0	2	1
Energy Savings	1	1	0	2	**3**	0	0	2	0
Carbon Footprint Reduction	1	**3**	0	2	**3**	0	0	**3**	0

Table 28 Evaluation of measures in terms of Benefits (Table 2)

LEGENDA: 3 = very positive impact 0 = no or uncertain impact - 3 = very negative impact	HOV Priority			Multimodal Journey Planner			Road Space Reallocation		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Congestion Reduction	**3**	**3**	2	1	2	2	1	2	0
Road & Parking Savings	**3**	1	2	0	2	1	2	1	0
Consumer Savings	0	2	1	1	2	1	0	1	0
Transport Choice	1	1	1	2	**3**	1	-2	**3**	0
Road Safety	1	1	1	0	2	1	2	2	0
Environmental Protection	1	2	2	0	2	2	2	2	0
Efficient Land Use	0	2	0	0	**3**	0	1	**3**	0

Community Livability	0	2	2	0	2	2	2	2	0
Energy Savings	1	**3**	0	1	**3**	0	0	2	0
Carbon Footprint Reduction	1	**3**	0	0	**3**	0	0	2	0

Table 29 Evaluation of measures in terms of Benefits (Table 3)

LEGENDA: **3 = very positive impact** **0 = no or uncertain impact** **- 3 = very negative impact**	**Public Transport Incentives**			**Walking & Cycling Incentives**			**Shared Mobility**		
	Madrid	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**
Congestion Reduction	1	**3**	1	**3**	**3**	0	1		
Road & Parking Savings	0	**3**	1	**3**	1	0	1		
Consumer Savings	1	**3**	0	**3**	2	0	**3**		
Transport Choice	0	**3**	1	0	2	0	1		
Road Safety	0	**3**	0	0	1	0	0		
Environmental Protection	1	**3**	2	**3**	1	0	1		
Efficient Land Use	1	**3**	0	**3**	1	0	1		
Community Livability	1	**3**	2	**3**	**3**	0	1		
Energy Savings	1	**3**	0	**3**	**3**	0	1		
Carbon Footprint Reduction	1	**3**	0	**3**	**3**	0	1		

Table 30 Evaluation of measures in terms of Benefits (Table 4)

2.7.2.3 Evaluation of Equity

LEGENDA: **3 = very positive impact** **0 = no or uncertain impact** **- 3 = very negative impact**	**Commuter Financial Incentives**			**Road Pricing**			**Distance-Based Pricing**		
	Madrid	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**

Treats everybody equally	-3	2	1	**3**	-3	0	**3**	1	0
Individuals bear the costs they impose	0	2	1	2	-3	0	2	-1	0
Progressive with respect to income[3]	0	1	0	-3	-1	0	**3**	1	0
Benefits transportation disadvantaged	0	0	0	0	2	0	0	2	0
Improves basic mobility	1	2	1	2	1	0	2	1	0

Table 31 Evaluation of measures in terms of Equity (Table 1)

LEGENDA: **3 = very positive impact** **0 = no or uncertain impact** **- 3 = very negative impact**	**Parking Pricing**			**Teleworking**			**Fuel & Carbon Taxes**		
	Madrid	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**
Treats everybody equally	-3	-1	**3**	0	**3**	0	-2	-1	**3**
Individuals bear the costs they impose	**3**	1	**3**	0	0	**3**	-2	-1	1
Progressive with respect to income	-3	-1	0	0	0	0	-2	-2	0
Benefits transportation disadvantaged	0	1	0	-1	0	0	0	1	0
Improves basic mobility	2	1	**3**	1	**3**	**3**	0	1	0

Table 32 Evaluation of measures in terms of Equity (Table 2)

LEGENDA: **3 = very positive impact** **0 = no or uncertain impact** **- 3 = very negative impact**	**HOV Priority**	**Multimodal Journey Planner**	**Road Space Reallocation**

[3] "Progressive with respect to income"; if the score is from 0 to +3, it means that a specific measure increases the equity between poor and wealthy people; it is much more beneficial for poor people; for example distance based pricing is very beneficial for lower-income persons who otherwise could not afford the cost of vehicle insurance;The opposite is a score from -3 to 0: it means that a specific measure increases the inequality between poor and wealthy people; it is much more detrimental for poor people; for example fuel taxes.

	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Treats everybody equally	-3	2	0	2	2	**3**	-1	1	0
Individuals bear the costs they impose	-3	0	2	0	1	0	-1	0	0
Progressive with respect to income	**3**	0	0	0	0	0	-2	0	0
Benefits transportation disadvantaged	0	1	0	2	0	0	-1	1	0
Improves basic mobility	0	1	2	**3**	2	0	-2	**3**	0

Table 33 Evaluation of measures in terms of Equity (Table 3)

LEGENDA: 3 = very positive impact 0 = no or uncertain impact - 3 = very negative impact	Public Transport Incentives			Walking & Cycling Incentives			Shared Mobility		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Treats everybody equally	-2	2	**3**	**3**	2	0	**3**		
Individuals bear the costs they impose	2	0	0	-3	0	0	-3		
Progressive with respect to income	-2	2	0	**3**	0	0	**3**		
Benefits transportation disadvantaged	**3**	1	0	0	1	0	0		
Improves basic mobility	2	**3**	2	**3**	1	0	2		

Table 34 Evaluation of measures in terms of Equity (Table 4)

2.7.2.4 Geographic Area

LEGENDA: 3 = very appropriate 0 = not appropriate	Commuter Financial Incentives	Road Pricing	Distance-Based Pricing

	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Large urban region	**3**	**3**	**3**	**3**	0	0	**3**	2	0
High-density, urban	**3**	**3**	**3**	**3**	**3**	**3**	**3**	0	**3**
Medium-density, urban/suburban	2	2	**3**	1	1	**3**	1	1	**3**
City center	**3**	1	0	1	**3**	0	1	0	0
Low-density, rural	0	0	0	0	0	0	1	0	0
Mall/Commercial center	0	**3**	**3**	0	0	0	1	0	0
Residential neighborhood	1	1	0	0	1	0	1	0	0
Resort/recreation area	0	0	0	1	0	**3**	1	0	**3**

Table 35 Evaluation of measures in terms of Geographic Area (Table 1)

LEGENDA: 3 = very appropriate 0 = not appropriate	Parking Pricing			Teleworking			Fuel & Carbon Taxes		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Large urban region	**3**	0	**3**	**3**	**3**	**3**	**3**	2	**3**
High-density, urban	**3**	**3**	**3**	**3**	**3**	**3**	**3**	0	**3**
Medium-density, urban/suburban	1	1	**3**	**3**	2	**3**	**3**	0	**3**
City center	**3**	**3**	**3**	**3**	**3**	**3**	**3**	0	0
Low-density, rural	0	0	0	**3**	1	**3**	0	0	0
Mall/Commercial center	**3**	0	**3**	0	0	**3**	1	1	**3**
Residential neighborhood	0	2	0	1	0	**3**	1	0	**3**
Resort/recreation area	**3**	1	**3**	0	1	0	1	0	**3**

Table 36 Evaluation of measures in terms of Geographic Area (Table 2)

LEGENDA: 3 = very appropriate 0 = not appropriate	HOV Priority			Multimodal Journey Planner			Road Space Reallocation		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Large urban region	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
High-density, urban	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Medium-density, urban/suburban	0	**3**	**3**	2	2	**3**	2	1	**3**
City center	0	**3**	0	**3**	**3**	0	**3**	**3**	0
Low-density, rural	0	1	0	1	1	0	0	0	0
Mall/Commercial center	**3**	**3**	**3**	1	**3**	**3**	0	1	**3**
Residential neighborhood	0	2	0	1	1	**3**	1	**3**	**3**
Resort/recreation area	1	2	**3**	0	**3**	**3**	0	2	0

Table 37 Evaluation of measures in terms of Geographic Area (Table 3)

LEGENDA: 3 = very appropriate 0 = not appropriate	Public Transport Incentives			Walking & Cycling Incentives			Shared Mobility		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
Large urban region	**3**	**3**	**3**	**3**	0	**3**	**3**		
High-density, urban	**3**	**3**	**3**	**3**	**3**	**3**	**3**		
Medium-density, urban/suburban	2	2	**3**	**3**	1	**3**	1		
City center	**3**	**3**	0	**3**	**3**	**3**	1		
Low-density, rural	1	1	0	**3**	0	0	2		
Mall/Commercial center	1	**3**	**3**	0	1	0	**3**		
Residential neighborhood	2	2	**3**	**3**	**3**	**3**	**3**		

Resort/recreation area	1	2	**3**	**3**	**3**	**3**	**3**		

Table 38 Evaluation of measures in terms of Geographic Area (Table 4)

2.7.2.5 Organizations/Stakeholders involved

LEGENDA: 3 = very appropriate 0 = not appropriate	Commuter Financial Incentives			Road Pricing			Distance-Based Pricing		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
National Government	1	0	0	**3**	0	**3**	0	**3**	**3**
Regional Government	1	**3**	0	**3**	2	**3**	0	2	**3**
Municipal/local government	2	**3**	**3**	**3**	**3**	**3**	0	**3**	**3**
Business Associations	**3**	2	**3**	2	0	0	0	2	0
Consumer/Citizen Associations	**3**	1	0	0	2	0	0	2	0
Environmental Associations	2	**3**	0	0	**3**	0	0	2	0
Motorist Associations	0	1	0	0	2	**3**	1	2	**3**
Freight Operators Associations	0	0	0	0	**3**	0	0	2	0
Individual Business	**3**	2	**3**	1	0	0	**3**	**3**	0
Neighborhood association	2	2	0	0	2	0	0	0	0
Campus	2	**3**	0	0	1	0	0	0	0

Table 39 Evaluation of measures in terms of Organizations/Stakeholders (Table 1)

LEGENDA: 3 = very appropriate 0 = not appropriate	Parking Pricing			Teleworking			Fuel & Carbon Taxes		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
National Government	**3**	0	0	**3**	**3**	0	**3**	**3**	**3**

Regional Government	**3**	0	0	**3**	**3**	0	**3**	1	0
Municipal/local government	**3**	**3**	0	**3**	**3**	0	**3**	1	0
Business Associations	2	**3**	**3**	**3**	1	**3**	0	1	0
Consumer/Citizen Associations	1	**3**	0	2	1	**3**	1	2	0
Environmental Associations	0	2	0	**3**	**3**	0	2	**3**	**3**
Motorist Associations	0	2	0	0	0	0	0	**3**	0
Freight Operators Associations	1	2	0	0	0	0	0	**3**	0
Individual Business	0	2	**3**	**3**	**3**	**3**	0	0	0
Neighborhood association	0	**3**	0	1	0	0	0	0	0
Campus	0	2	**3**	**3**	**3**	**3**	0	0	0

Table 40 Evaluation of measures in terms of Organizations/Stakeholders (Table 2)

LEGENDA: **3 = very appropriate** **0 = not appropriate**	**HOV Priority**			**Multimodal Journey Planner**			**Road Space Reallocation**		
	Madrid	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**	**Madrid**	**Genoa**	**Tampere**
National Government	**3**	0	0	1	**3**	0	0	0	0
Regional Government	**3**	**3**	0	2	**3**	0	1	2	0
Municipal/local government	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Business Associations	0	0	0	1	**3**	0	2	0	0
Consumer/Citizen Associations	0	1	0	**3**	2	0	**3**	**3**	0
Environmental Associations	0	1	0	2	2	0	1	1	0
Motorist Associations	0	1	0	0	**3**	0	1	2	0
Freight Operators Associations	0	**3**	0	0	**3**	0	2	**3**	**3**
Individual Business	0	0	0	0	2	0	2	0	0
Neighborhood association	0	0	0	1	0	0	**3**	**3**	0
Campus	0	0	0	1	2	0	0	1	0

Table 41 Evaluation of measures in terms of Organizations/Stakeholders (Table 3)

LEGENDA: 3 = very appropriate 0 = not appropriate	Public Transport Incentives			Walking & Cycling Incentives			Shared Mobility		
	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere	Madrid	Genoa	Tampere
National Government	1	0	0	**3**	0	0	0		
Regional Government	2	**3**	0	**3**	**3**	0	0		
Municipal/local government	**3**	**3**	**3**	**3**	**3**	**3**	1		
Business Associations	2	**3**	0	1	1	**3**	0		
Consumer/Citizen Associations	2	**3**	0	**3**	**3**	0	1		
Environmental Associations	2	0	0	**3**	**3**	**3**	0		
Motorist Associations	0	**3**	0	0	1	0	0		
Freight Operators Associations	0	2	0	0	0	0	0		
Individual Business	1	2	0	1	1	**3**	**3**		
Neighborhood association	2	2	0	1	**3**	0	0		
Campus	2	2	0	0	**3**	0	0		

Table 42 Evaluation of measures in terms of Organizations/Stakeholders (Table 4)

3 Chapter 3: Use cases description

This Chapter 3 is aimed at describing the different use cases considered in the three pilot sites of MoveUs project, as well as the use cases related with the management of incentives.

A use case is a list of steps defining interactions between a role (known in Unified Modeling Language (UML) as an "actor") and a system, to achieve a goal. The actor can be a human or an external system[10].

UML Use Case Diagrams have been used in MoveUs to specify the interaction of the users and the different external systems involved in the use cases and MoveUs system.

The Unified Modelling Language (UML)is a standardized general-purpose modeling language[11] in the field of object-oriented software engineering. It has been used in Task T2.5 for the specification of the use cases so asto help visualize their structure and design.

The use cases considered in MoveUs are specified by the following three elements:

1. UML sequence diagrams[12], are interaction diagrams used to describe an interaction by focusing on the sequence of messages that are exchanged, along with their corresponding occurrence specifications on the lifelines (named elements each representing one **individual participant** -or interacting entity- in the interaction).
2. UML use cases diagrams[13], are used to describe the set of actions (use cases) that the systems (also called subjects)involved in the provision of the mobility services should perform in collaboration with the **external users** of the system (also called actors).

   Each use case diagram provides some observable and valuable result to the actors of the system.

   The use case diagrams can be considered as twofold: they are both behaviour diagrams, because they describe behaviour of the system, and they are also structure diagrams.

3. Use cases description table, are used to textually support the description and specification of the UML sequence diagrams.

In the following sections, the use cases considered at each pilot site of MoveUs project (Madrid, Genoa and Tampere) and the incentives management use cases will be described, following the aforementioned diagrams and tables.

The following description of the Use Cases is provided to explain the interactions between the functional modules and actors that operate in the MoveUs system.

It is to note the description of the functionalities at end user level that trigger or are behind these interactions, is an activity specifically addressed in Task3.3 of WP3. The result of such analysis may further refine or introduce additional features at end-user applicative level that are not defined nor described in the Use Cases definition present in this document.

Furthermore, the definition of the MoveUs Data Model is an activity to be developed in Task 3.1 of WP3 that follows the use cases definition provided here; , also the data structures, therefore, the data structures, types and features introduced in the present description have to be considered as indicative and subject to amendments in the formal MoveUs technical specification.

3.1 Madrid use cases description

Madrid Pilot comprises 4 Use Cases described in the following sub-sections from 3.1.1 to 3.3.4.

Use cases in Madrid pilot
MAD_UC1. Vehicle prioritization
MAD_UC2a. Smart Routing
MAD_UC2b. Smart Crossing
MAD_UC3. Eco-efficient routing use case

Table 43 Overview of MoveUs use cases for Madrid pilot

3.1.1 Use case 1: SMART PRIORITIZATION OF VEHICLES

3.1.1.1 UML Sequence diagram

The following UML sequence diagram shows the behaviour of the Use case 1 in an on-trip phase.

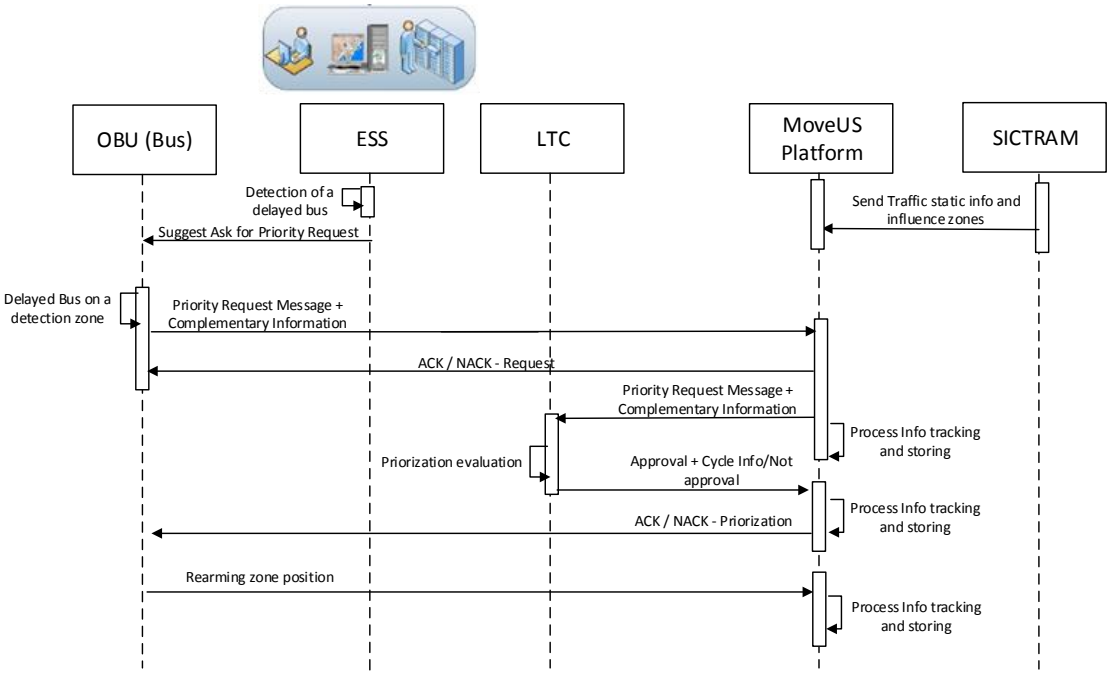

Figure 2 Madrid use case 1_UML Sequence diagram: on-trip phase

3.1.1.2 UML Use Case diagram

In Figure 3 two actors have been identified in this service: the ESS system and the SICTRAM system.

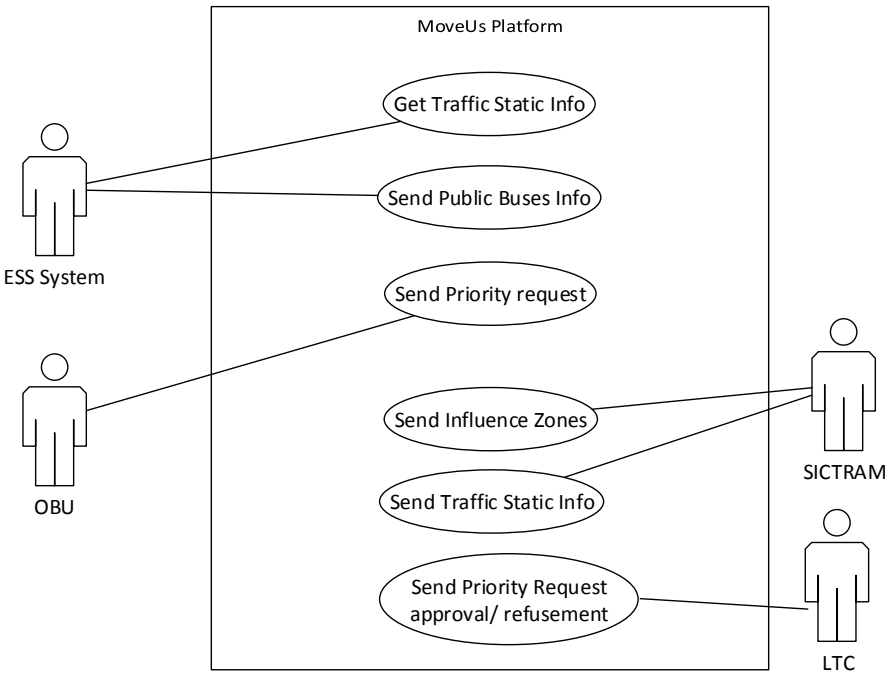

Figure 3 Madrid use case 1_UML use case diagram

3.1.1.3 Descriptive table of the use case 1

This table provides with textual description of the use case diagram included in previous section.

Use Case ID:	**MAD_UC1**
Use Case Name:	Smart Prioritization for Vehicles
Created By:	SICE-MAD-EMT
Date Last Updated:	03/07/2014
Actors:	• ESS system • OBU of the bus • SICTRAM System • MoveUs Platform
Description:	This service is expected to give priority to specific vehicles (public buses) on intersections controlled by traffic lights from the Urban Traffic Control System operating in Madrid, so as to optimize the time of travel and the travel efficiency of those modes of transport. The traffic controllers will activate the micro-regulation action at the crossing (local action) whenever a request for priority is received and the traffic conditions allow for it.
Preconditions:	• To establish and define different areas of influence around each crossing; influence zones will be defined per each possible trajectory in the crossing, for which the starting and ending points of the influence zone will be defined and identified. • The ESS system should have pre-configured the information of the location and topology of the crossings with the priority functionality implemented. The OBU of the bus will have also access to that information available in the ESS system. • MoveUs system should have pre-configured information about the topology of each crossing capable of providing with the prioritization service located in each bus line route, identification and geo-positioning of influence zone per direction and possible trajectory and relation with the specific local traffic controller (LTC); • Static and Real Time information from public buses (ESS system) and traffic infrastructure (SICTRAM system), must be uploaded to the MoveUs platform. • Authentication procedures for content providers and users must be

	deployed (request and info reliability).
Post conditions:	• Data protection procedures on registered and stored data must be activated. • Information related to the priority process will be tracked and stored for statistical use in MoveUs, what will be done in an anonymous way.
Frequency of Use:	When the ESS system detects that a specific bus is delayed in its route and decides to inform the delayed bus, suggesting it to request of a priority in the upcoming crossing.
Normal Course of Events	**PREVIOUS STAGE TO THE SERVICE PROVISION** **0.- Local Traffic Controller → MoveUsS→ ESS system** ESS system must be subscribed to a MoveUs service so as to get all the relevant information about the LTCs implemented with the Prioritization Functionality. When a new LTC with Prioritization functionality implemented is installed in the road infrastructure, this information will be updated in MoveUs platform that will also update this information to the ESS system. The updated information will include the topology of the overall crossing (geo-location of the LTC, influence zones, possible movements, etc.) **CLOSE TO REAL-TIME SERVICE PROVISION STAGE** **1.- OBU ←→ ESS system → MoveUs** ESS system detects that a specific bus is delayed in its route and decides to inform the delayed bus, and to suggest it to make a request of priority in the upcoming crossing. When the delayed bus is at the detection zone, it sends a priority request message to MoveUs platform, including complementary information like the bus identification code, the bus line, direction and delay; Afterwards, the bus awaits for the reception of a message from MoveUs containing an ACK or a NACK to the priority request. **ON REAL-TIME SERVICE PROVISION STAGE (within a LTC influence area)** **2.- MoveUs →Local Traffic Controller (LTC) (Bus at the detection zone)** MoveUs directly re-sends the priority request message along with the relevant additional information needed to the specific LTC that controls the next traffic light in the bus route; this step is time critic for the

	correct provision of the service. **3.- LTC → MoveUs → ESS system → OBU** The LTC receives the priority request from MoveUs and assesses the possibility to provide with the priority to the specific bus trajectory. Afterwards, the LTC will trigger the actions necessary to provide the delayed bus with priority in the crossing, only in the case such prioritization action is possible, and will send an ACK (or an NACK message) to MoveUs, depending of the approval (or not) of the priority request. Further information might be also included in the ACK message from the LTC to MoveUs if needed, like cycle duration and cycle state, etc. MoveUs will direct the ACK or NACK message to the OBU of the bus that requested the priority. **4.- OBU → MoveUs → LTC (Bus in the Re-arming Zone)** When the bus is at the re-arming zone, the OBU will inform MoveUs platform with a message. Afterwards, MoveUs will send such information message to the LTC so that it can finish the priority service operation in the crossing and go back to normal operation.
Alternative Courses:	This service might be extended to other specific vehicles like ambulances, emergency vehicles, etc. in a post-project phase. In the case that there are more than one priority requests at a time at the same crossing, MoveUs platform will decide the order of priority of the requests based on (i) the delay of the buses and (ii) the frequency of the bus line, following the criteria established by the public bus operator (the final user).
Exceptions:	
Includes:	
Special Requirements:	Terms of use need to be accepted (need to contain the basic policy to provide the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	
Notes and Issues:	

Table 44 Madrid use case 1: Descriptive table

3.1.2 Use case 2a: SMART ROUTING FOR PEDESTRIANS

3.1.2.1 UML Sequence diagram

Two sequence diagrams are included in this section, the first one related to a phase preliminary to the provision of the service to the user and the second one related to the phase when the service is provided to the user on-trip.

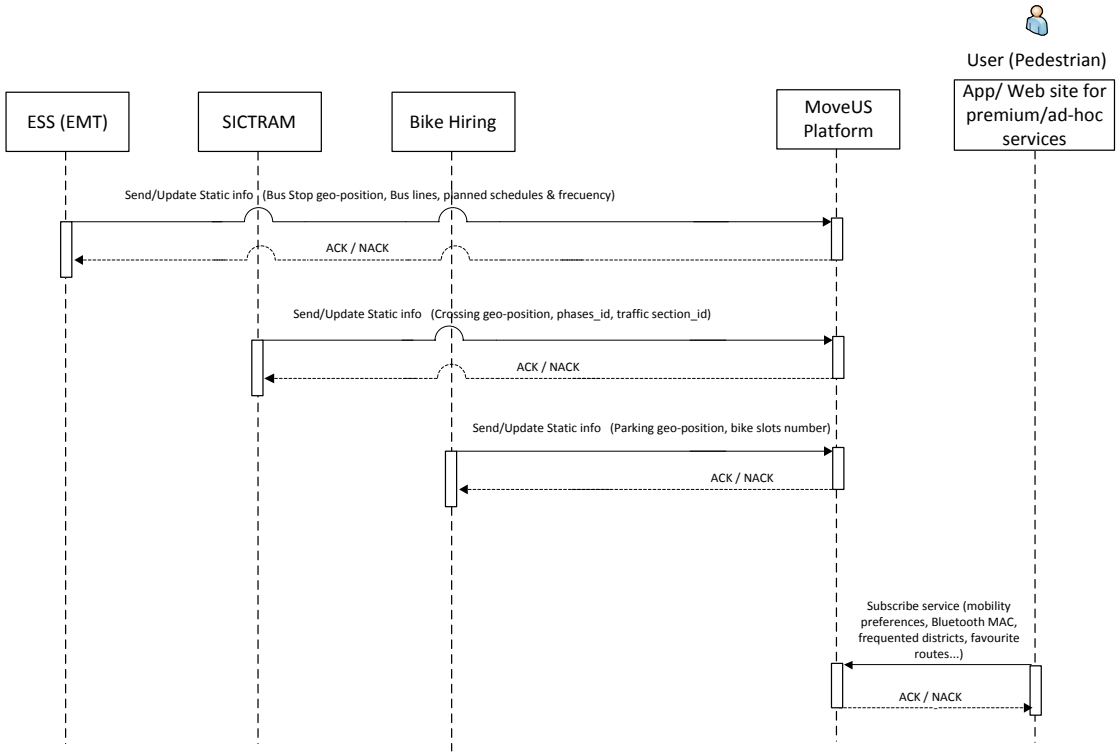

Figure 4 Madrid use case 2a_UML Sequence diagram: pre-trip phase

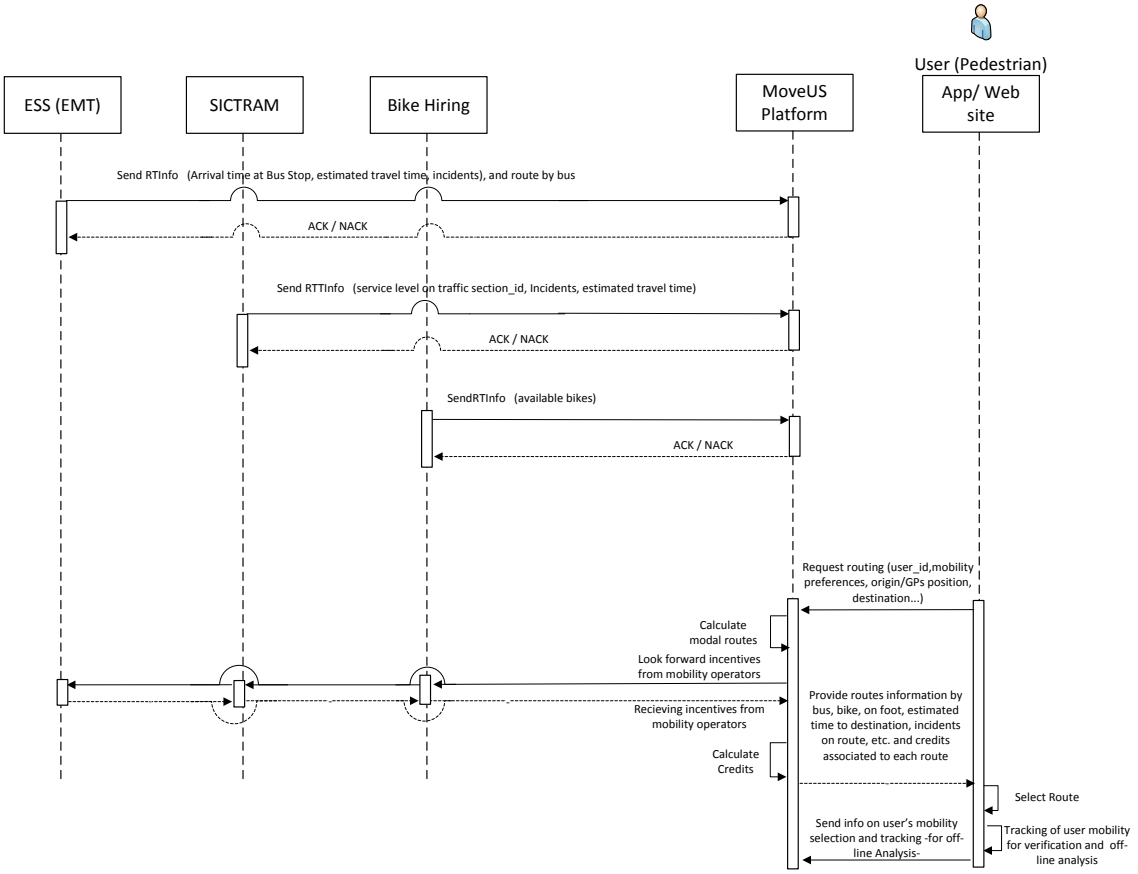

Figure 5 Madrid use case 2a_UML Sequence diagram: on-trip phase

3.1.2.2 UML Use Case diagrams

The following use case diagrams include interaction between the MoveUs system and all the external systems and users involved in the use case.

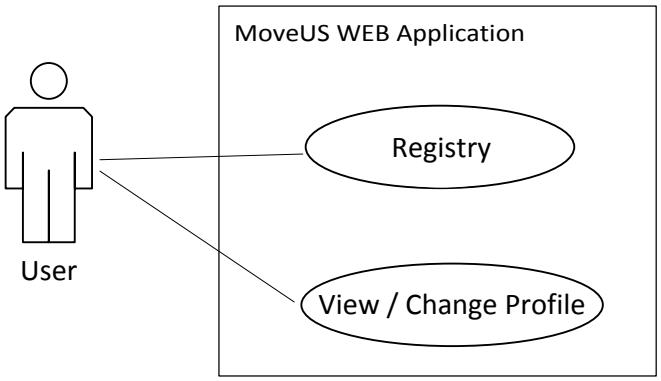

Figure 6 Madrid use case 2a_User-MoveUs web application UML diagram

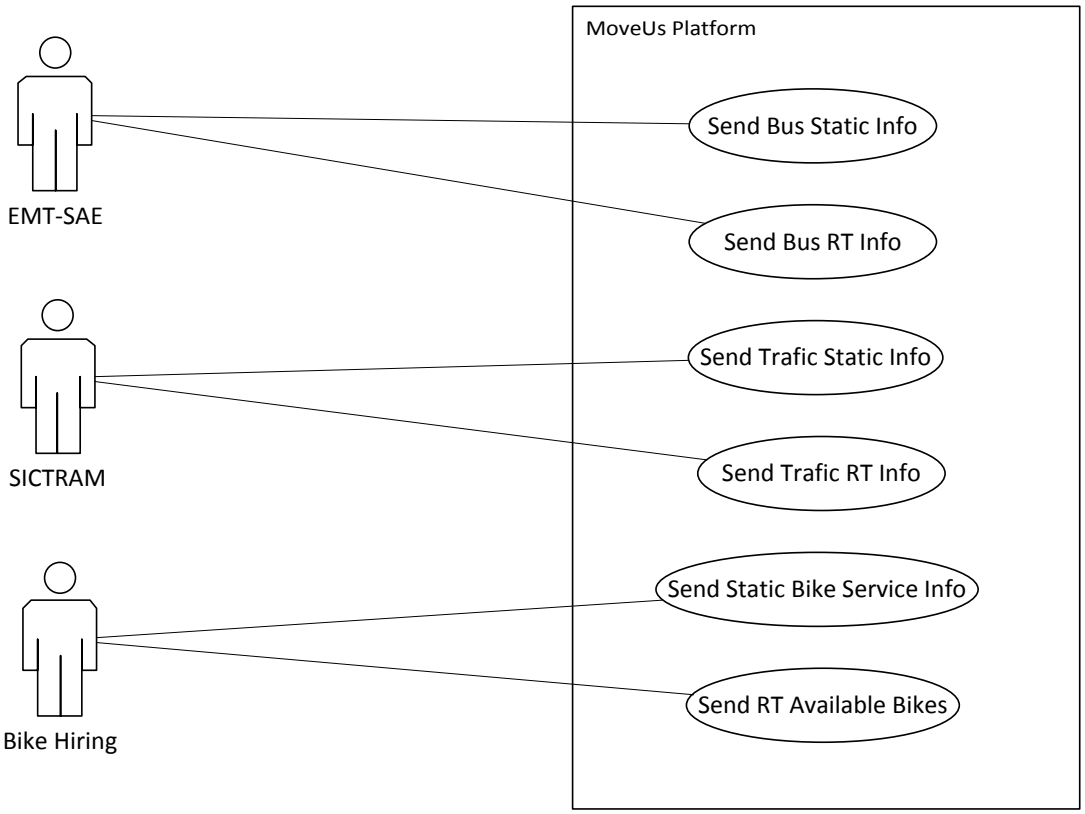

Figure 7 Madrid use case 2a_ Information sources-MoveUs platform UML diagram

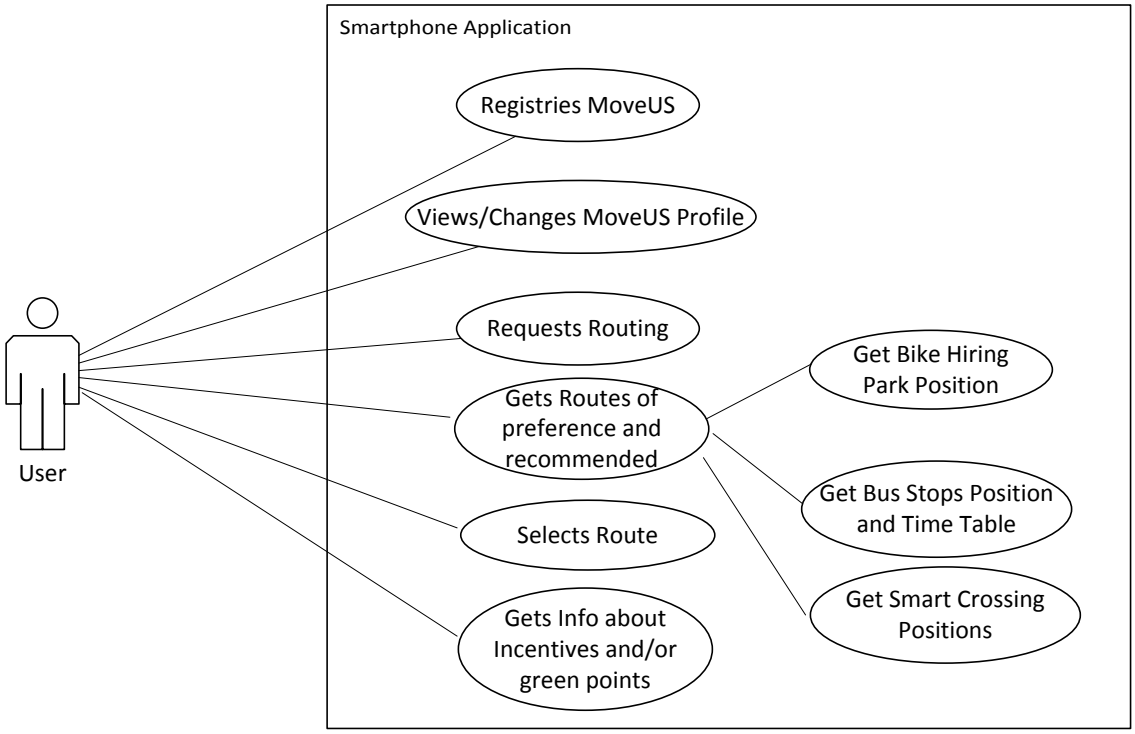

Figure 8 Madrid use case 2a_User-Smartphone application UML diagram

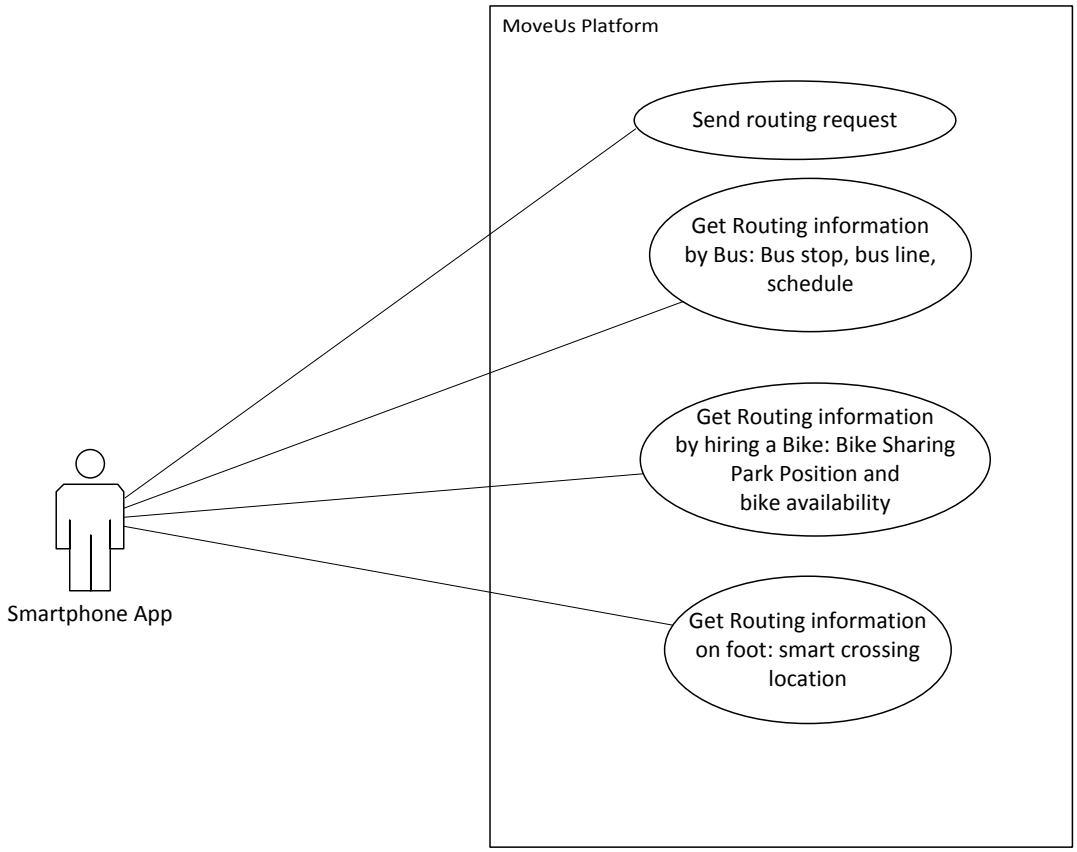

Figure 9 Madrid use case 2a_Smartphone application-MoveUs platform_1 UML diagram

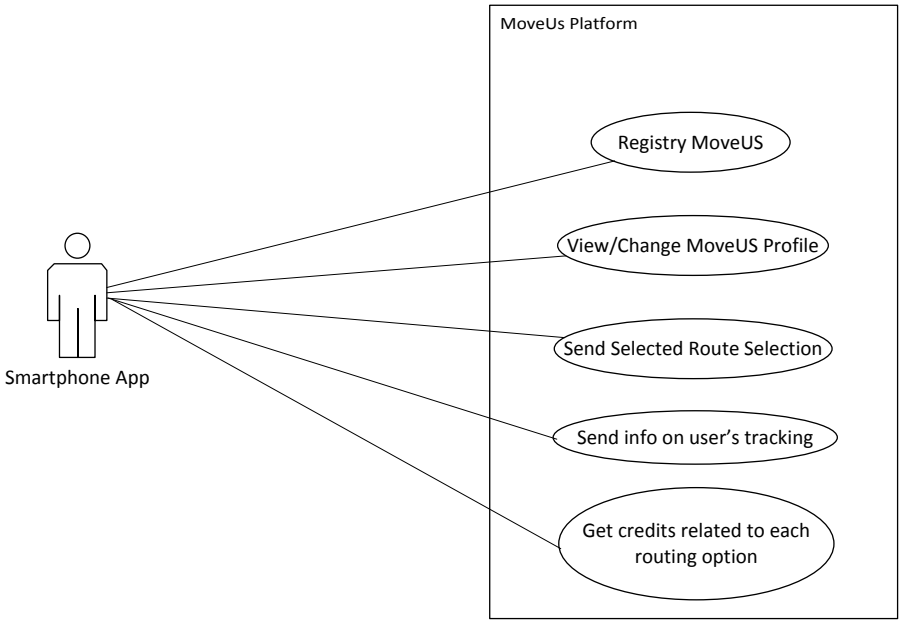

Figure 10 Madrid use case 2a_Smartphone application-MoveUs platform_2 UML diagram

3.1.2.3 Descriptive table of the use case 2a

This table provides with textual description of the use case diagrams included in previous section.

Use Case ID:	MAD_UC2a
Use Case Name:	Smart Routing for pedestrian
Created By:	SICE-MAD-EMT
Date Last Updated:	04/07/2014
Actors:	• ESS system • SICTRAM System • Bike Hiring System • MoveUs Platform • Smartphone Devices • Pedestrians
Description:	This service aims to provide pedestrians with the smartest route between their actual position and a selected destination. People subscribe to a specific service that using user's current co-ordinates, his/her mobility preferences and the destination chosen, is able to show the smartest way to reach it. Within the smartest options that this service offers, users can choose how they want to move: public transport, bike sharing or on foot. Once selected, the application will display the smartest way and will guide the user to achieve the target point. The route proposed will include user's preferences and incentives (exchangeable into a number of credits) related to the route choices.
Preconditions:	• To provide the smartest route according to pedestrian´s favourite preferences; the pedestrian must be registered in MoveUs Platform and log in through the mobile application. • To guide the user in his route and to provide with real time warnings about mobility incidents, route tracking option must be enabled by the user. • Static and Real Time information from actors: ESS, SICTRAM, Bike Hiring System must be uploaded to the MoveUs platform. • Authentication procedures for content providers and users must be

	deployed (request and info reliability).
Post conditions:	• Data protection procedures on personal data registered (stored) must be activated. • Information related to the mobility option chosen by the user will be tracked for verification so as to provide the user with the related credits and/ or other type of incentive, and to offer better mobility options in the future. • The information tracked will be also stored for statistical use in MoveUs platform, what will be done in an anonymous way, if possible.
Frequency of Use:	Upon user request (for the service); Upon change in data trigger (static data)
Normal Course of Events (real-time provision stage)	**0.- User → MoveUs platform** User registers (indicating username and password) and subscribes to the service by filling in an initial survey adding its own mobility preferences. **1.- User (Personal device) →MoveUs platform→User** When the user starts the application and logs in, the location of the user is automatically detected by the GPS embedded in the mobile phone and sent to MoveUs platform. If previously configured by the user, the application will automatically: - show the available information about different modes of transport available (i.e. location of nearby bike hiring facilities, location of nearby bus stops and bus lines, etc.). **2.- User (Personal device)→ MoveUs platform** The user selects its destination, and types it into the application; the application sends the start and destination information to MoveUs platform so as to get the mobility information needed to route the user according to his/her mobility preferences, and also to provide the user with any kind of incentive and/or number of credits related to the transport mode offered to the user. **3.- MoveUs platform → User (Personal device)** According to user preferences and position, the MoveUs platform sends to the user's mobile application the possible ways of arriving to the selected point along with possible incentives (credits, etc.) related to those ways. The routes offered by the application will be as much eco-efficient as possible. **4.- User (Personal device) → MoveUs Platform** The user selects the route to follow and the application will guide the user to his/her destination following the route by using a GIS based

	map; in addition, the application will send to MoveUs platform the route that has been selected by the user. If tracking has been enabled by the user, the application will track the route followed by the user for verification and updating of credits gained by his mobility choice.
Alternative Courses:	Different Smart routes could be provided, for example: Fastest, Cheapest, Lowest carbon footprint, Lowest energy consumption, with minimum intermodal changes, etc.
Exceptions:	
Includes:	
Special Requirements:	Terms of use need to be accepted by the user (need to contain the basic policy for the provision of the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	To provide with different routes, some engines might be provided as a service like Carbon footprint calculator, Energy consumption calculator, route calculator and estimated travel time calculator on each transport mode, Incentives/credits calculator, etc…...
Notes and Issues:	

Table 45 Madrid use case 2a: Descriptive table

3.1.3 Use case 2b: SMART CROSSING FOR PEDESTRIANS

Two sequence diagrams are included in this section, the first one related to a phase preliminary to the provision of the service to the user and the second one related to the phase when the service is provided to the user on-trip.

3.1.3.1 UML Sequence diagrams

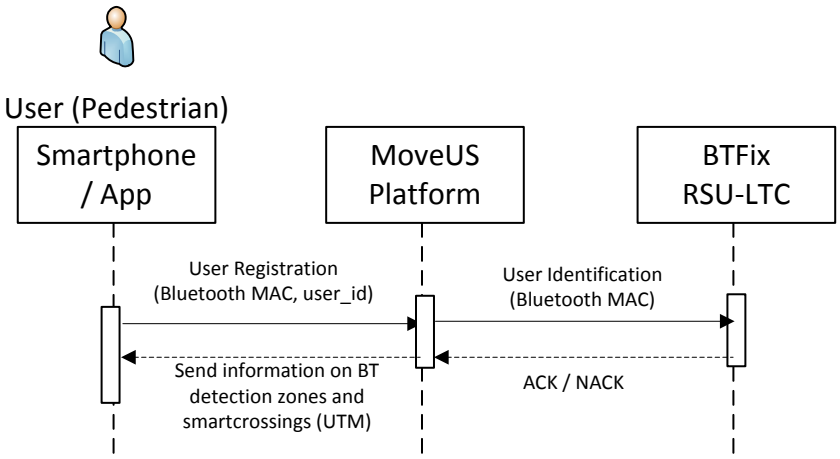

Figure 11 Madrid use case 2b_UML Sequence diagram: pre-trip phase

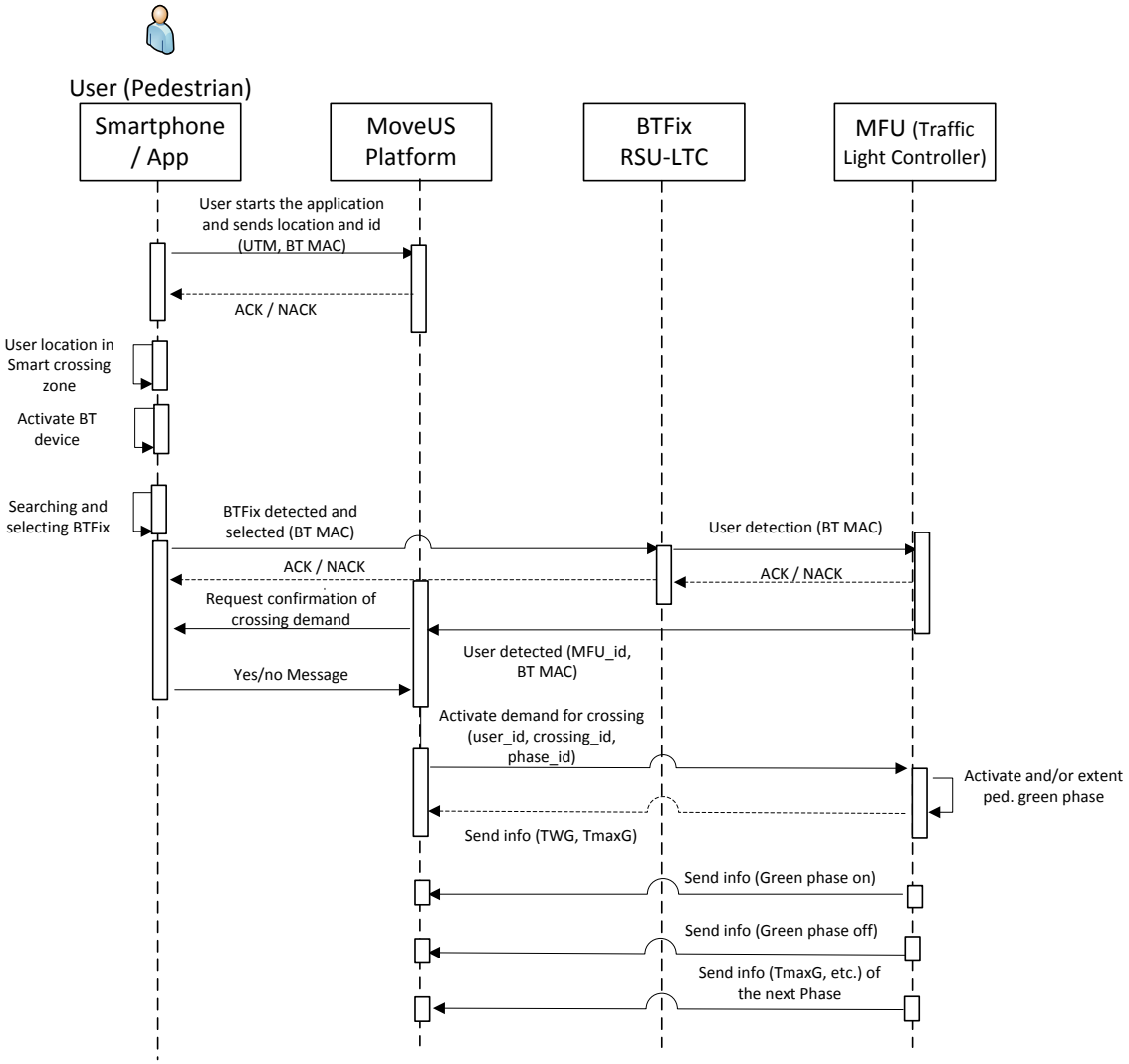

Figure 12 Madrid use case 2a_UML Sequence diagram: on-trip phase

3.1.3.2 Use Case diagrams

The following use case diagrams include interaction between the MoveUs system and all the external systems and users involved in the use case.

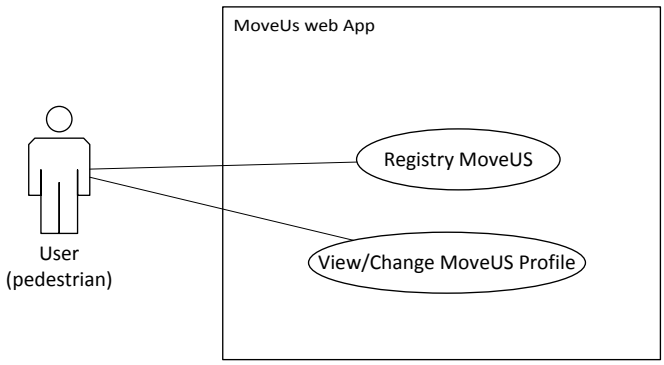

Figure 13 Madrid use case 2b_User-MoveUs web application UML diagram

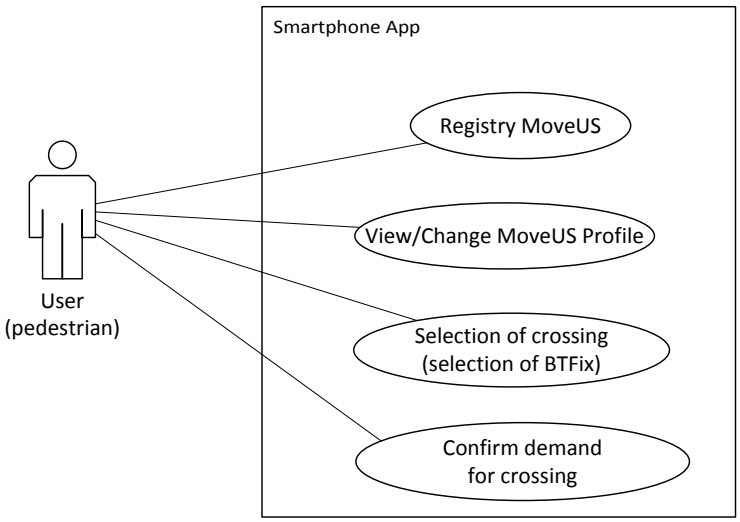

Figure 14 Madrid use case 2b_User-Smartphone application UML diagram

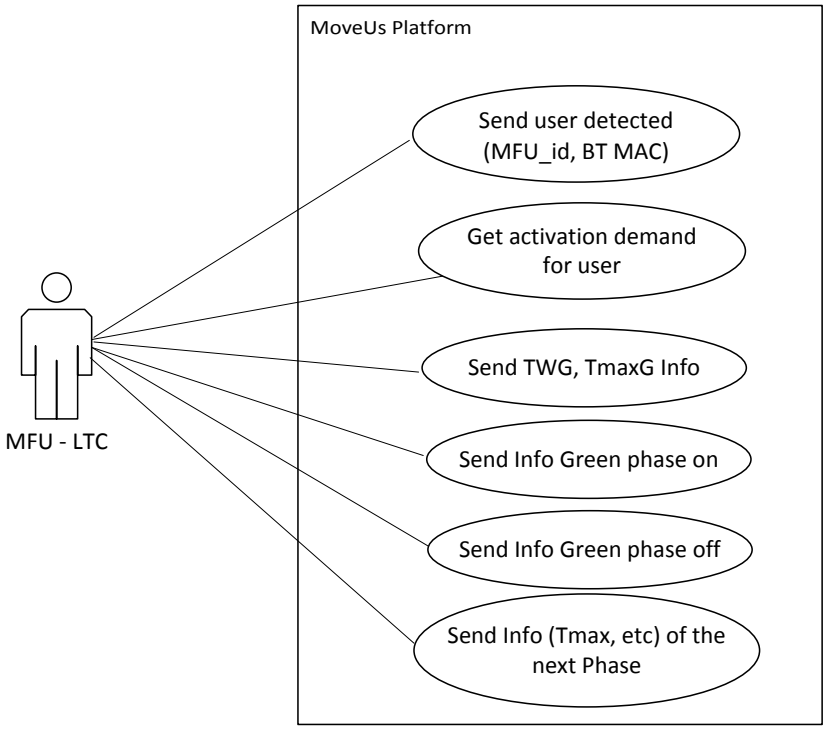

Figure 15 Madrid use case 2b_LTC -MoveUs platform UML diagram

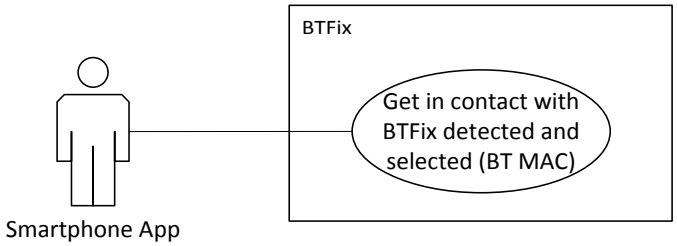

Figure 16 Madrid use case 2b_Smartphone application-BTFix UML diagram

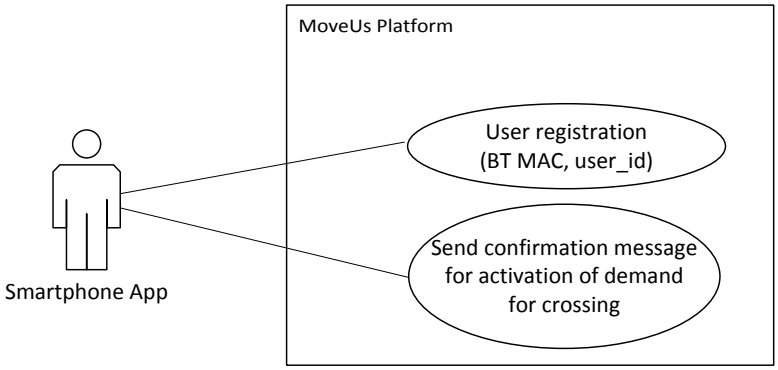

Figure 17 Madrid use case 2b_Smartphone application-MoveUs platform UML diagram

3.1.3.3 Descriptive table of the use case 2b

This table provides with textual description of the use case diagrams included in previous section.

Use Case ID:	**MAD_UC2b**
Use Case Name:	Smart Crossing for pedestrian
Created By:	SICE-MAD
Date Last Updated:	01/07/2014
Actors:	• Pedestrian • Smartphone Devices • MoveUs Platform • Bluetooth reader (BTFix) • Local Traffic Controller (MFU)
Description:	This service aims to provide the smartest crossing options to the pedestrians, whether using special crossing points – SafeCross – or by applying a reaffirmation of a crossing demand. People can subscribe to a specific service that will allow the smartest way (the smartest the crossing the smartest the way) for a predefined route. It also offers the option to reaffirm a crossing demand in those points with a Bluetooth technology locally implemented. In the user's route, this service will support the user to cross safely in those crossings which use a camera to detect pedestrian crossing and that extends the green time until it has crossed safely or until a maximum pre-programmed time is exceeded. Likewise, this service can be used to directly reaffirm a crossing demand from the pedestrian.
Preconditions:	• To register (indicating username and password) the personal device in the MoveUs platform and share its MAC address. • Topology information of the smart crossing (smartcrossing detection area, pedestrian detection area, MAC_id of the BT readers in each smartcrossing, etc.) and static information of the traffic light (green phase times) must be previously uploaded in the MoveUs platform for the provision of the service, in order to enable MoveUs to uploading the smart crossing information geo-referenced in a map of the city in the user's personal device. • ITS System that controls traffic must be registered in MoveUs. • The BTFix located in the road side unit (RSU) of each smart crossing

	must have the MAC_ids of the BT readers located in the smartcrossing and the MAC_id, username and password of the registered user uploaded and updated, so as to be able to provide with the service. • The way to invoke machine-understandable services must be uploaded and available through MoveUs platform. • Authentication procedures for content providers and users must be deployed (request and info reliability).
Post conditions:	• Data protection procedures on personal data registered (stored) must be activated. • Information related to the smart crossing process will be tracked and stored for statistical use in MoveUs platform, what will be done in anonymous way.
Frequency of Use:	On User request (for service); On change data trigger (static data)
Normal Course of Events (real-time provision stage):	**0.- Personal device ←→ MoveUs platform** The user register to this service by connecting MoveUs through his/her personal device; MoveUs platform locates the user through the GPS of the personal device, obtains the MAC address and requests that the user indicates a username and a password; afterwards, the smartcrossing application is installed into the personal device and all the smart crossing information of the city where the user is located is automatically uploaded to the device (in text format, and if possible supported by a map). **1.- Personal device → MoveUs platform.** The user logs in and starts the application in the smartphone; it sends its coordinates to MoveUs, and then the service is ready to be used. **2.- Bluetooth connection: Personal device → Bluetooth receptor** When the GPS system of a personal device detects that it is entering the detection area of a determined smartcrossing – it automatically activates the personal device's Bluetooth that will search the -already known by the mobile app- MACs of the BT readers (BTFix receptors) located in such smartcrossing. When the personal device finds and establishes communication with the receptor(s), the application requests the user to confirm which crossing he is set out. **3.- Personal device → LTC** Once the crossing direction has been confirmed by the user through his personal device, the latter establishes communication with the LTC and sends the device MAC_id and the crossing direction. **4.- LTC →MoveUs Platform** The LTC will forward to MoveUs the information message(s) received from the BT receptor, and MoveUs will confirm if the MAC belongs to a

	registered user or not, before continuing with the service. **5.- MoveUs Platform → Personal device → MoveUs Platform → LTC** Once MoveUs has received the information and has validated the user, it will send a message back to the personal device requesting the user to confirm its intention of crossing. The answer is sent back to the platform that will subsequently send a demand for crossing to the LTC. The LTC will activate, if suitable, the pedestrian green phase, and will inform MoveUs of the green/red phases' state in the real time. **6.- MoveUs Platform → Personal device** After receiving the confirmation of crossing, MoveUs can send to the user the information available of the smart and safe crossing, including the info of the next phase. **SafeCross system** For those crossing which have a specific safe crossing system like SafeCross: **7.- SafeCross system (camera) → Local Traffic Controller (LTC)** The camera sends an analogic signal to the LTC when it detects a pedestrian crossing. When necessary, the LTC will extend the green phase until the pedestrian has crossed safely or until a maximum pre-programmed time is exceeded. **8.- LTC → MoveUs** Once the user has crossed, the LTC will forward the available information related to the phase of the pedestrian crossing to MoveUs, like the time of the crossing, etc..
Alternative Courses:	Specific SafeCross System route. Only SafeCross would be provided with to the user in his route.
Exceptions:	
Includes:	
Special Requirements:	Terms of use need to be accepted by the user (need to contain the basic policy for the provision of the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	
Notes and Issues:	

Table 46 Madrid use case 2b: Descriptive table

3.1.4 Use case 3: ECO-EFFICIENT ROUTE PLANNING AND TRAFFIC PREDICTION

3.1.4.1 UML Sequence diagram

Two sequence diagrams are included in this section, the first one related to a phase preliminary to the provision of the service to the user and the second one related to the phase when the service is provided to the user on-trip.

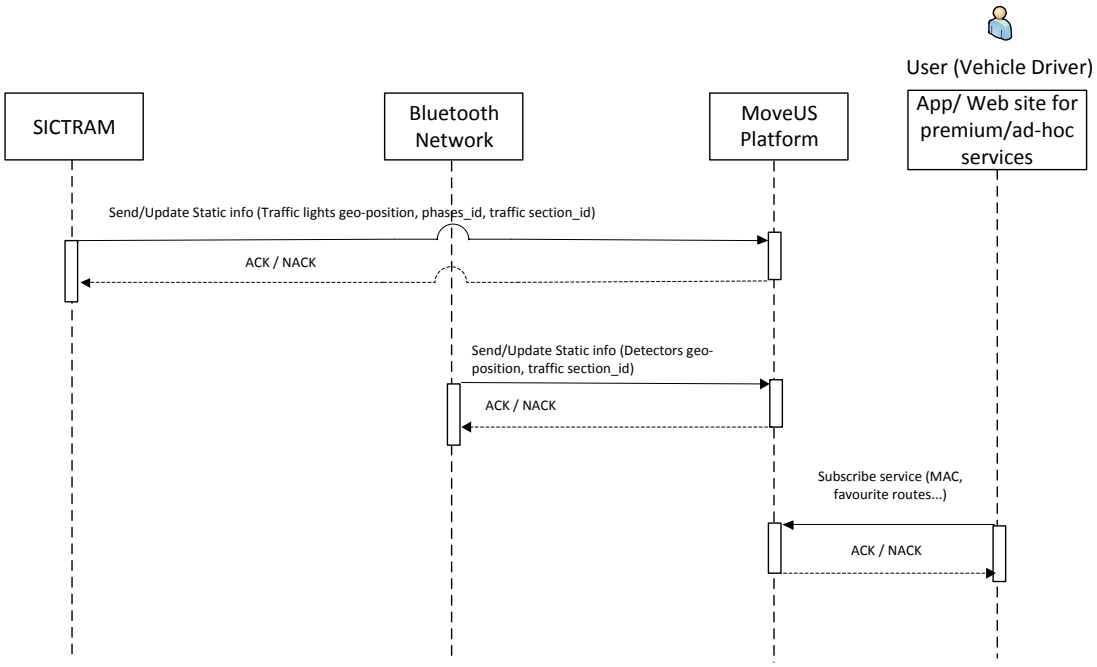

Figure 18 Madrid use case 3_UML Sequence diagram: pre-trip phase

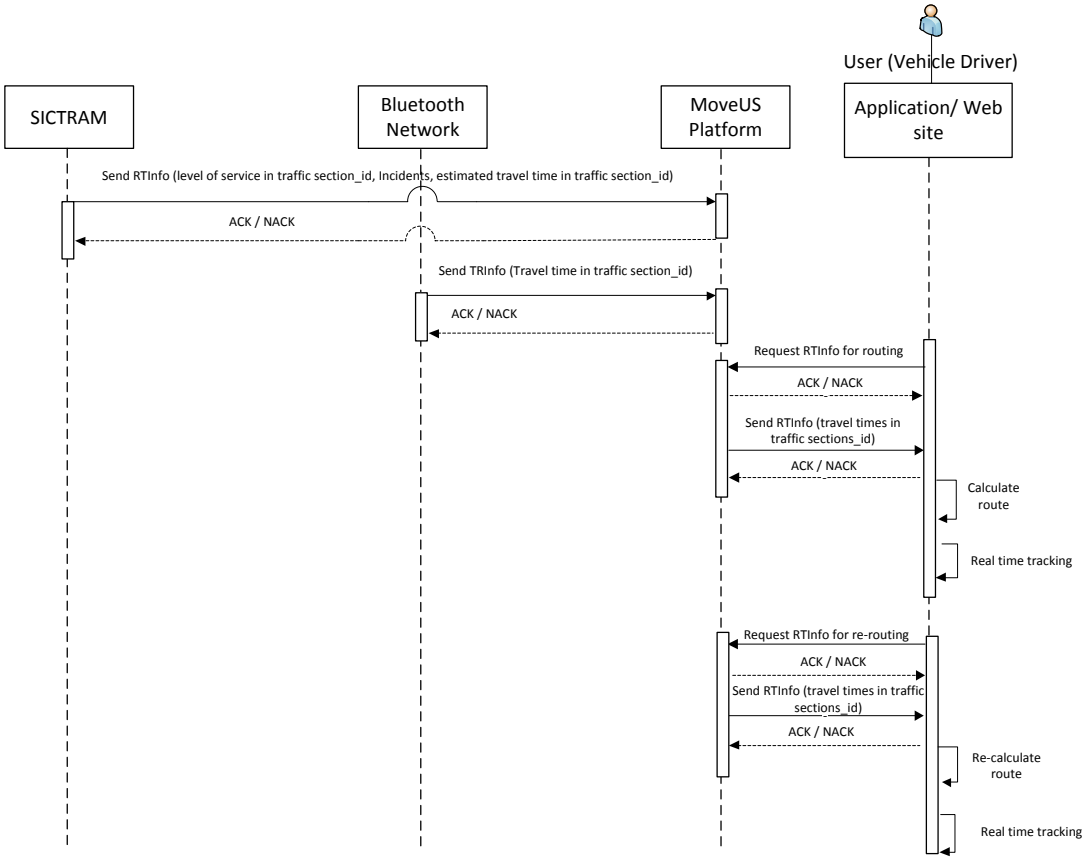

Figure 19 Madrid use case 3_UML Sequence diagram: on-trip phase

3.1.4.2 Use Case diagrams

The following use case diagrams include interaction between the MoveUs system and all the external systems and users involved in the use case.

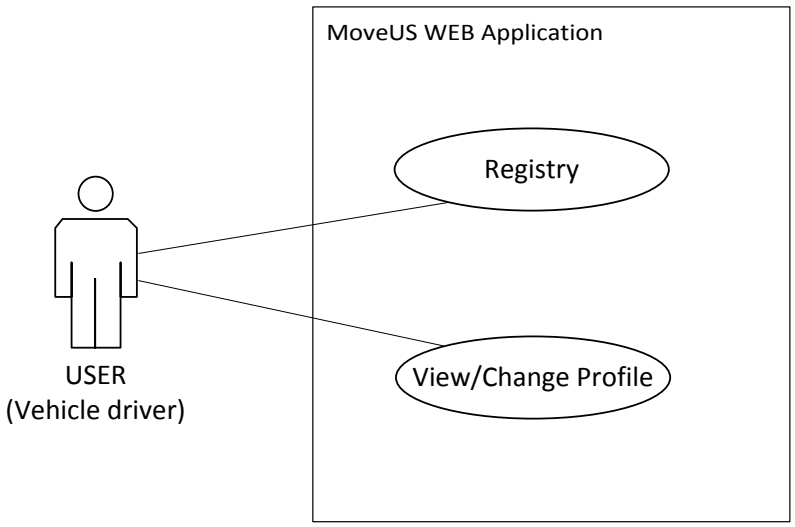

Figure 20 Madrid use case 3_User-MoveUs web application UML diagram

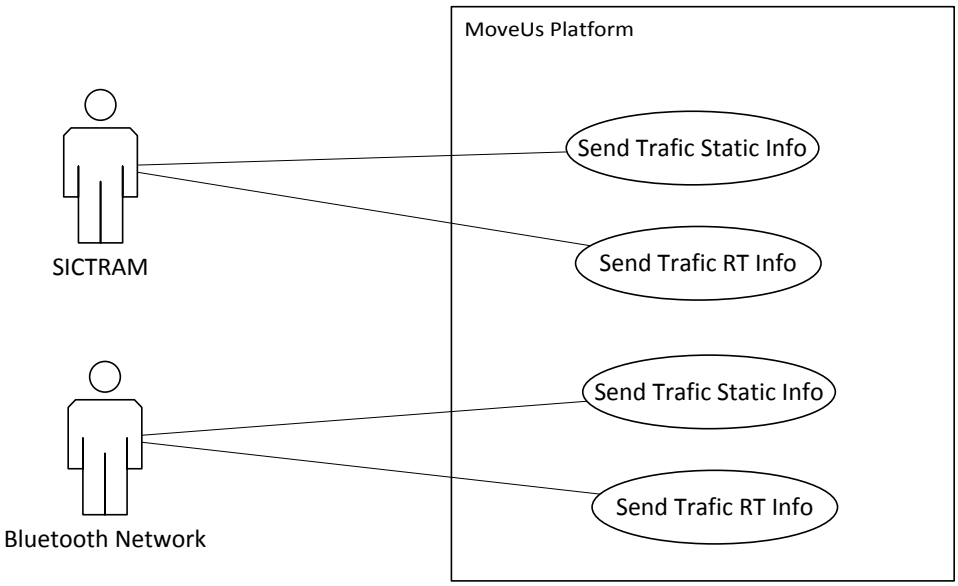

Figure 21 Madrid use case 3_Information sources-MoveUs platform UML diagram

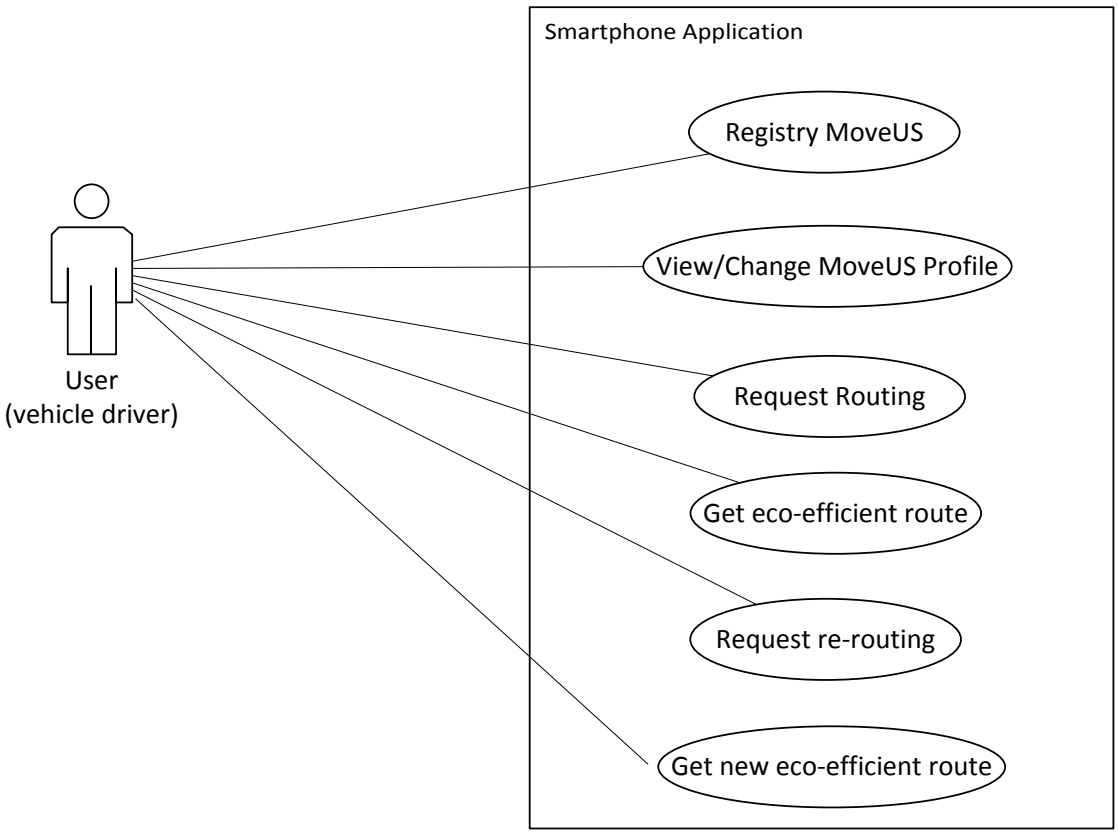

Figure 22 Madrid use case 3_User-Smartphone application UML diagram

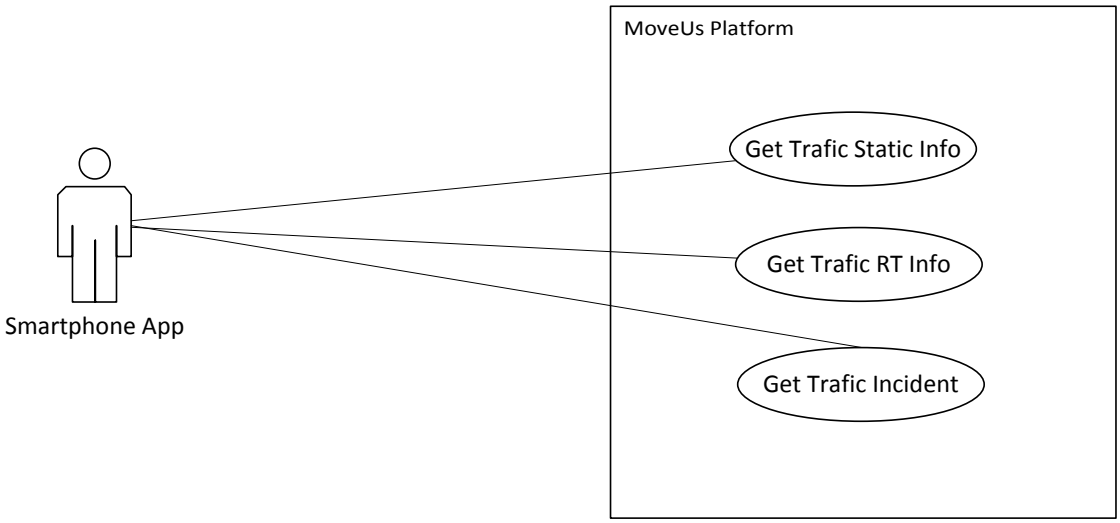

Figure 23 Madrid use case 3_Smartphone application-MoveUs platform_1 UML diagram

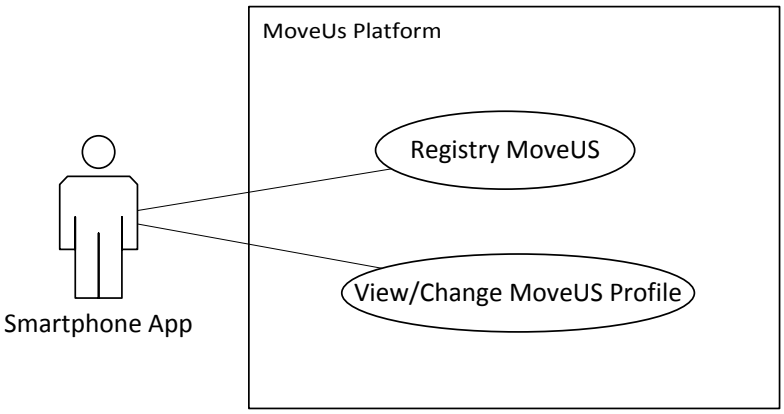

Figure 24 Madrid use case 3_Smartphone application-MoveUs platform_2 UML diagram

3.1.4.3 Descriptive table of the use case 3

This table provides with textual description of the use case diagrams included in previous section.

Use Case ID:	**MAD_UC3**
Use Case Name:	Eco-efficient Route Planning and Traffic prediction
Created By:	SICE-MAD
Date Last Updated:	04/07/2014
Actors:	• SICTRAM System

	• Bluetooth Network • MoveUs Platform • Smartphone Devices • User - Private vehicle driver
Description:	This service is aimed at providing drivers with on-trip eco-routing and re-routing options, along with privileged mobility information like on-trip advanced traffic information and automatic incident warning . This service may be considered as a privileged service; it may be offered to travelers that better fit to the city council mobility strategies - to be defined by the City Council-. This service may be offered also as an incentive to reward and/or foster eco-friendly mobility patterns.
Preconditions:	• To provide with eco-efficient route planning based on traffic prediction, the user must be registered in MoveUs Platform and log in through the mobile application. • Static and Real Time information from actors: SICTRAM and Bluetooth Network must be uploaded to the MoveUs platform. Authentication procedures for content providers and users must be deployed (request and info reliability).
Post conditions:	• Data protection procedures on personal data registered (stored) must be activated. • Information related to the route chosen by the user will be tracked for verification and stored for statistical use in MoveUs platform so as to provide the user with the related credits and/ or other type of incentive, and to offer better mobility options in the future, which will be done in an anonymous way, if possible.
Frequency of Use:	Upon user request (for the service); Upon change in data trigger (static data, events like traffic incident/accidents);
Normal Course of Events (previous stage to real-time provision of the service)	**1a.- SICTRAM system ←→ MoveUs Platform** Traffic variables Intensity and Occupancy are continually measured by the detectors and sent to SICTRAM system that calculates the level of service (LOS) of the different road sections of the street network. Those LOS per section and time are sent and uploaded into MoveUs platform. **1b.- Bluetooth detectors network ←→ MoveUs Platform** Bluetooth detectors continually detect the MAC of Bluetooth devices located in their detection coverage area, and differentiate and filter the MACs from hands-free and in-vehicle Bluetooth devices out of pedestrian Bluetooth devices. Based on the information obtained from the in-vehicle Bluetooth devices (location and time of detection), times of travel are calculated for the different road sections covered by the Bluetooth detectors network. Those times of travel per section and time are sent and uploaded into MoveUs platform.

	2.- User → MoveUs platform User registers (indicating username and password) and subscribes to the application service by filling in an initial survey adding his mobility preference (by car).
Normal Course of Events (real-time provision stage):	**3.- User → MoveUs platform** The user (driver) starts the app in his/her smartphone, and is validated by MoveUs Platform, that obtains his/her location through the GPS of the smartphone. The user then selects its destination, and types it into the application. **4.- Mobile application → MoveUs Platform → Mobile application → User** The application connects to MoveUs platform so as to get the eco-efficient route, along with traffic information and mobility incidents that may affect the route provided. The driver is then provided with the eco-efficient route that will be displayed over a GIS map and with advanced traffic information of interest, like zones with access restriction, zone with speed limitations, etc **5.- Mobile application → MoveUs Platform | Mobile Application → User** The application also tracks the user along the route so that, in case of a traffic event that would modify to a certain extent -to be defined- the time of travel of the route offered to the subscribed user, it will automatically send to the user a warning about the traffic incident detected and will offer an alternative route to the user on-trip, following the steps 3.- to 5.- and taking the current location as the new starting point.
Alternative Courses:	Different smart routes could be provided, for example: Fastest, Lowest carbon footprint, Lowest energy consumption.
Exceptions:	
Includes:	
Special Requirements:	Terms of use need to be accepted by the user (need to contain the basic policy for the provision of the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	
Notes and Issues:	

Table 47 Madrid use case 3: Descriptive table

3.2 Genoa use cases description

Genoa Pilot comprises 2 Use Cases described in the following sub-sections from 3.2.1 to 3.2.2.

Use cases in Genoa pilot
GEN_UC1. Personal multi-modal journey planner with energy calculator, incentives & rewards management and electronic wallet functionalities MoveUs.
GEN_UC2. Integration of crowd sourced data into the Genoa traffic supervisor

Table 48 Overview of MoveUs use cases for Genoa pilot

3.2.1 Use case 1: Personal multi-modal journey planner with energy calculator, incentives & rewards management and electronic wallet functionalities MoveUs

The set of use cases, defined for the respective functionalities of the service that are fully described in Deliverable D2.1 can be seen as parts of a unique, integrated service whose main functionality is the Trip Planning service.

The following diagram depicts the links and interactions between the functional components involved in this service. The meaning of each link or association is described in the description tables associated to each sequence diagram.

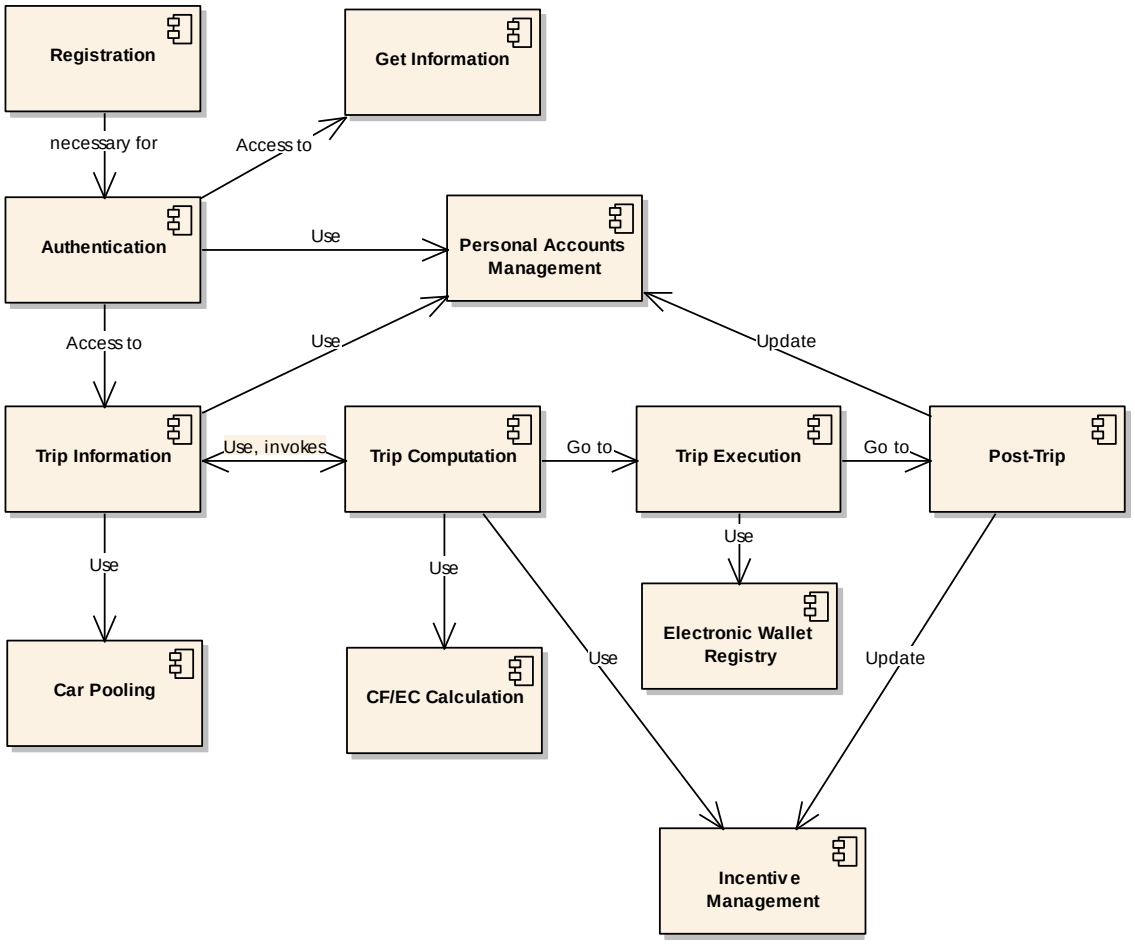

Figure 25 Genoa Service 1 - Associations between the functional components

3.2.1.1 UML Sequence diagrams and descriptive tables of use case 1 per function

3.2.1.1.1 Registration

In order to use the services based on a personal profile and personal historical data the end user needs to register to the service.

After the registration, a MoveUs Personal Account will be available for the user including:

- personal information on mobility
- personal information on environmental footprint
- personal information on usual purchases or interests
- preferences like Enable/Disable "push" notifications and real-time tracking

The personal user account will be associated with the Incentives data as well as with the historical information on Mobility.

Part of the data composing the user account can be modified by using the same procedure described below (except for the first creation of the user name and activation of the account via a confirmation email).

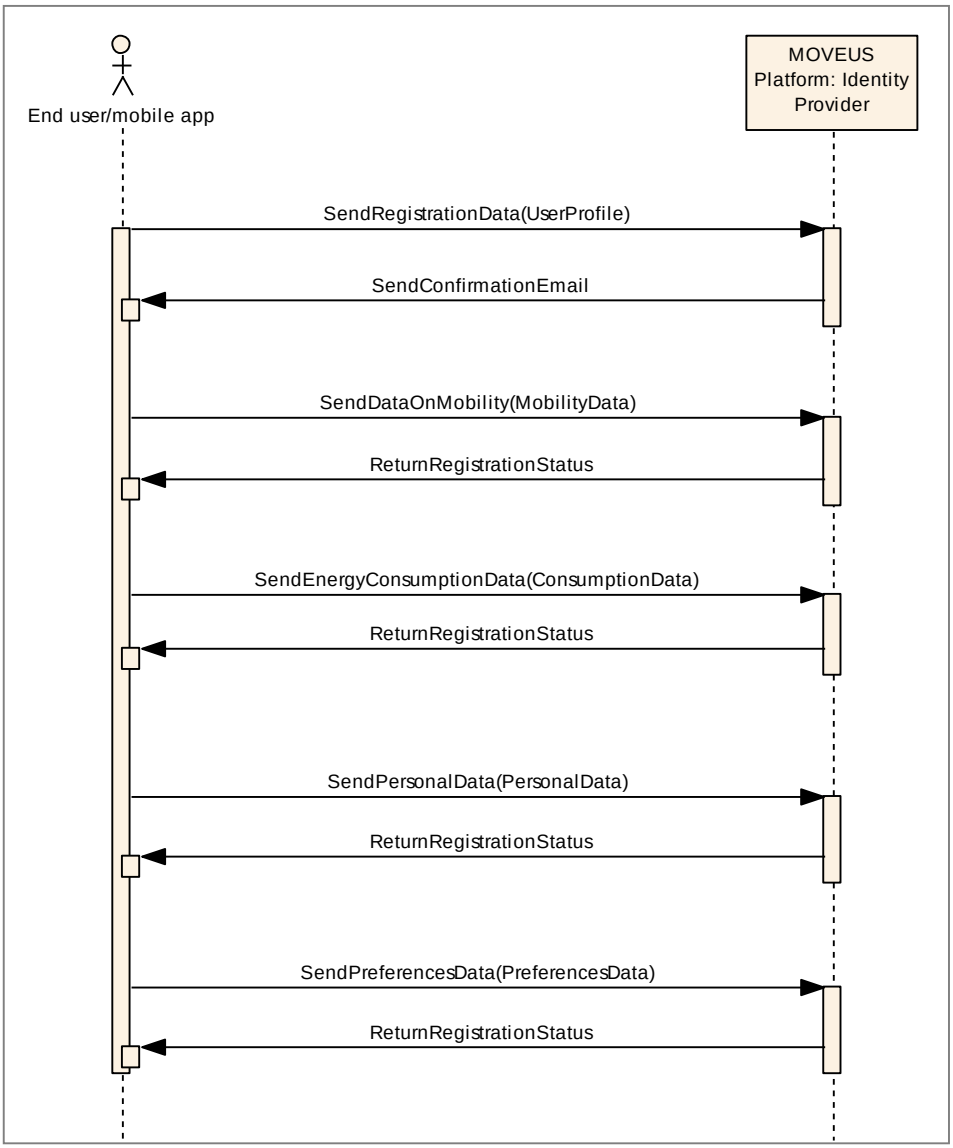

Figure 26 Genoa Service 1 - Registration

Use Case ID:	**GEN_UC1: SD_SVC01_REGIST_01**
Use Case Name:	Service 1 - Registration
Created By:	Softeco Sismat
Date Last Updated:	17/04/2014
Actors:	• End user / web app

	• MoveUs Platform: Identity provider: A centralized service for retrieving and making operations on personal, historical, incentives-based and other mobility-related information for a specified user. These includes: User/Password check for login, retrieval and update of personal information, retrieval and update of historical data etc.
Description:	Registration to the service
Preconditions:	The end user is not registered
Post conditions:	The profile of the user is stored and the registration give access to all MoveUs services
Frequency of Use:	Once, normally

Normal Course of Events	**End user / web app <-> MoveUs Platform : Identity Provider**
	• Via a specific function of the mobile app (or dedicated web site) the End User enters a username, a password and an email address to start the registration.
	• This data is sent to the MoveUs Platform : Identity Provider
	• A confirmation email is sent to the end user to check the email address and to continue in the registration process. The email includes a link that is used to access the registration of personal information on mobility including:
	  - Vehicles used (engine, power, fuel, etc.)
	  - Usual trips (origin, destination, time of the day, calendar)
	  - Preferences in term of mobility modes
	• The personal information on mobility is sent to / stored into the MoveUs Platform: Identity Provider
	• The end user enter the personal information on environmental footprint including Maximum amount of carbon footprint (monthly, yearly) and Maximum amount of energy consumption (monthly, yearly)
	• The personal information on environmental footprint/energy consumption is sent to / stored into the MoveUs Platform: Identity Provider
	• The end user enter Additional personal information
	• The Additional personal information is sent to / stored into the MoveUs Platform: Identity Provider
	• The user indicates other personal preferences, for example about the possibility to Enable/Disable "push" notifications and real-time tracking
	• The user preferences are sent to / stored into the MoveUs Platform: Identity Provider

Alternative Courses:	none
Special Requirements:	none
Assumptions:	none

Notes and Issues:	none

Table 49 Genoa use case 1: Registration descriptive table

3.2.1.1.2 Login

The registered user has to log into the system in order to use the services that makes use of personal profile information and personal historical data.

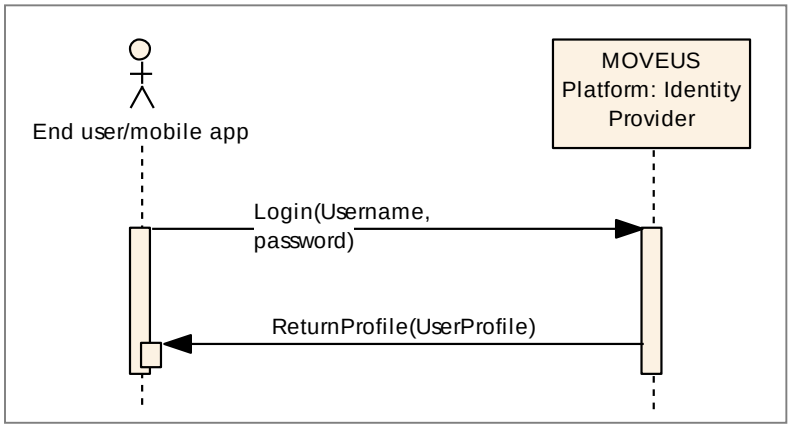

Figure 27 Genoa Service 1 – Login/Authentication

Use Case ID:	**GEN_UC1: SD_SVC1_LOGIN_01**
Use Case Name:	Service 1 – Login
Created By:	Softeco Sismat
Date Last Updated:	28/03/2014
Actors:	• End user/mobile app • MoveUs Platform: Identity Provider
Description:	Login into the system
Preconditions:	The user must be registered
Post conditions:	The user is logged into the system
Frequency of Use:	On demand
Normal Course of Events	**A) Login** **End user <-> MoveUs Platform: Identity Provider**

	The end user provides the username and password to the MoveUs Platform: Identity Provider and get access to the system
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 50 Genoa use case 1: Login descriptive table

3.2.1.1.3 Get information

The "Get Information" service is a Location based service that provides geographical indications and detailed information relevant for the domain of traffic and mobility.

User can check information on:

- Public Transport Timetable
- Traffic Events
- Weather and Environment
- Availability of incentives, coupons, vouchers, deals
- Personal accounts

The service is available after authentication.

The information management is partially achieved with the local e-miXer platform retrieving at regular intervals the necessary data from the external systems. The data is stored into the internal cache and the responses to the users' requests are provided by the e-miXer platform itself without causing any unnecessary overload to the external systems.

The user requests are monitored and stored for "Learn from use" purposes.

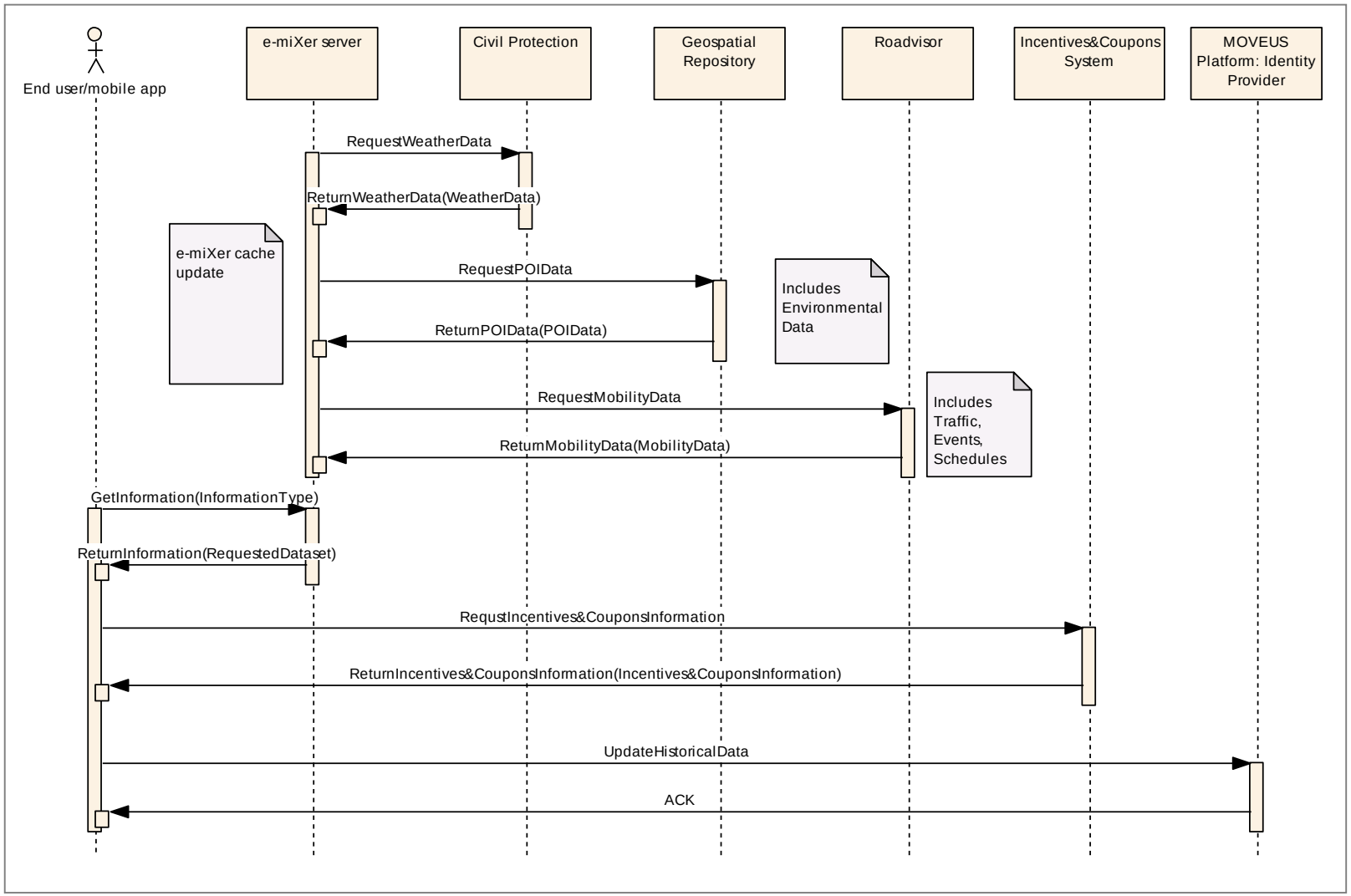
End user/mobile app
e-miXer server
Civil Protection
Geospatial Repository
Roadvisor
Incentives&Coupons System
MOVEUS Platform: Identity Provider
RequestWeatherData
ReturnWeatherData(WeatherData)
e-miXer cache update
RequestPOIData
Includes Environmental Data
ReturnPOIData(POIData)
RequestMobilityData
Includes Traffic, Events, Schedules
ReturnMobilityData(MobilityData)
GetInformation(InformationType)
ReturnInformation(RequestedDataset)
RequstIncentives&CouponsInformation
ReturnIncentives&CouponsInformation(Incentives&CouponsInformation)
UpdateHistoricalData
ACK

Figure 28 Genoa Service 1 - Get Information

Use Case ID:	GEN_UC1: SD_SVC1_GETINFO
Use Case Name:	Service 1 – Get Information
Created By:	Softeco Sismat
Date Last Updated:	17/04/2014
Actors:	• End user/mobile app • e-miXer server: The local (Genoa) node acting as the centralized data/service provider/interface • Geospatial Repository: A local repository of geospatial data • Civil Protection: The node where local weather information is stored • Roadvisor: The local Traffic supervision system • Incentives & Coupons system: A repository of the available Incentives and Coupons offerings
Description:	Get Location Based Information on mobility and traffic
Preconditions:	• The user must be registered and logged into the system • The system knows the user preferences and other parameters from previous use
Post conditions:	• The user receives the requested information • The system automatically learn from the service usage
Frequency of Use:	On demand
Normal Course of Events	**A) Request of information** **End user <-> e-miXer Server** 1. Using the dedicated function, the end user formulates a request of information. Depending on the request either the e-miXer server or the Incentives&coupons System is contacted and in both cases the response obtained is returned back to the end user **2.** The personal historical data is updated for statistical purposes (e.g. most requested information) **B) Update of cached data:** **e-miXer server <-> Geospatial Repository** **e-miXer server <-> Civil Protection** **e-miXer server <-> Roadvisor** At regular, pre-defined time intervals the e-miXer server formulates the following requests to the respective local nodes in order to update the cached data that is stored to meet the users' requests: 1. The POI data (Includes Environmental Data) is retrieved from the

	Geospatial repository 2. The Mobility Data (Includes Traffic, Events, Schedules) is retrieved from the Roadvisor 3. The Weather Data is retrieved from the Civil protection
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	The mobile app could implement a function for using the received information as a start/end point of a Trip Planning. The trip planning function can then be linked to the present functionality and the trip request can be automatically filled in by using the information received.

Table 51 Genoa use case 1: Get Information descriptive table

3.2.1.1.4 Trip planning

The description of the trip planning is operated by defining four key phases of the process. This is needed to better identify and describe the interactions between the actors occurring at each phase. The phases are:

1. **Trip Information**: this is the trip request phase where the user indicates/selects the data composing the trip request. Personal preferences and historical data are used as a support for this phase. At this stage the user can:
   a. Re-use previously planned trips
   b. Check for Car-Pooling offerings for his trip
   c. Change/indicate all necessary trip request data
   d. Obtain a list of Multimodal Route solutions each indicating the transport modes, Energy Consumption, Incentives Options and other information associated to the route.
   e. Select a specific route
2. **Trip Computation**: By selecting a route the trip is calculated and the user obtains the trip data including detailed information (e.g. step-by-step instructions).
3. **Trip Execution**: the trip execution is confirmed
4. **Post-Trip:** in this phase the necessary updates to the historical data and incentives are carried out.

The single phases are described more in details in the description tables.

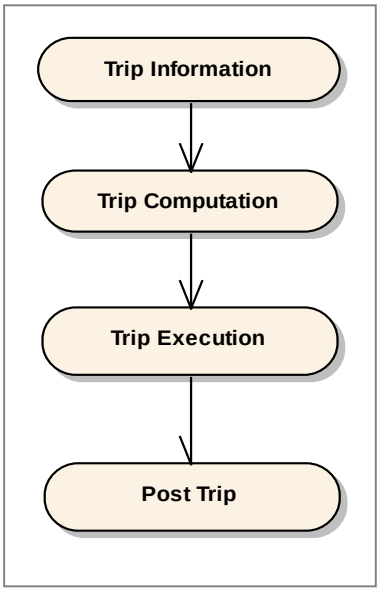

Figure 29 Genoa Service 1 - The four phases of the Trip Planning process

An additional remark can be added about the computation of the trip: in order to expose a unique interface to the client (end user mobile app) it is foreseen to use a centralized node called MoveUs Platform: Trip Planner connected to the Journey Planner calculator. This enables the connection of different Journey Planners calculators without changing the interface to the end user mobile app.

Two options are currently presented for the trip planning calculation:

1. Use of a Local Trip Planner
2. Use of a Centralized Trip Planner (MoveUs Platform: Trip Planner Calculation)

3.2.1.1.4.1 Trip information

The **Trip Information** phase is composed by the following steps:

A. The end user app retrieves suggestions about the trip (e.g. most frequently requested trips)
B. The end user can change/indicate the start/end locations, preferences and additional criteria for the Route Request. As support for resolving addresses and other locations, a Geocoder is used. [4].
C. The system checks for the availability of Car Pooling/sharing Options for the requested trip.
D. A Route Request is formulated with the selected parameters in order to obtain a list of multimodal Routes. This information is retrieved by invoking the Trip Planner via the common Trip Planner Interface.

[4]Depending on the technological needs and constraints the geocoding operations may be executed by the mobile app itself

E. The information about the Journey Solutions includes Means of transport, restrictions, special services (retrieved from the trip planner system) plus incentives information (retrieved from the Incentives service) and Energy Consumption info (retrieved from the EC system)
F. The use can then select a specific Route

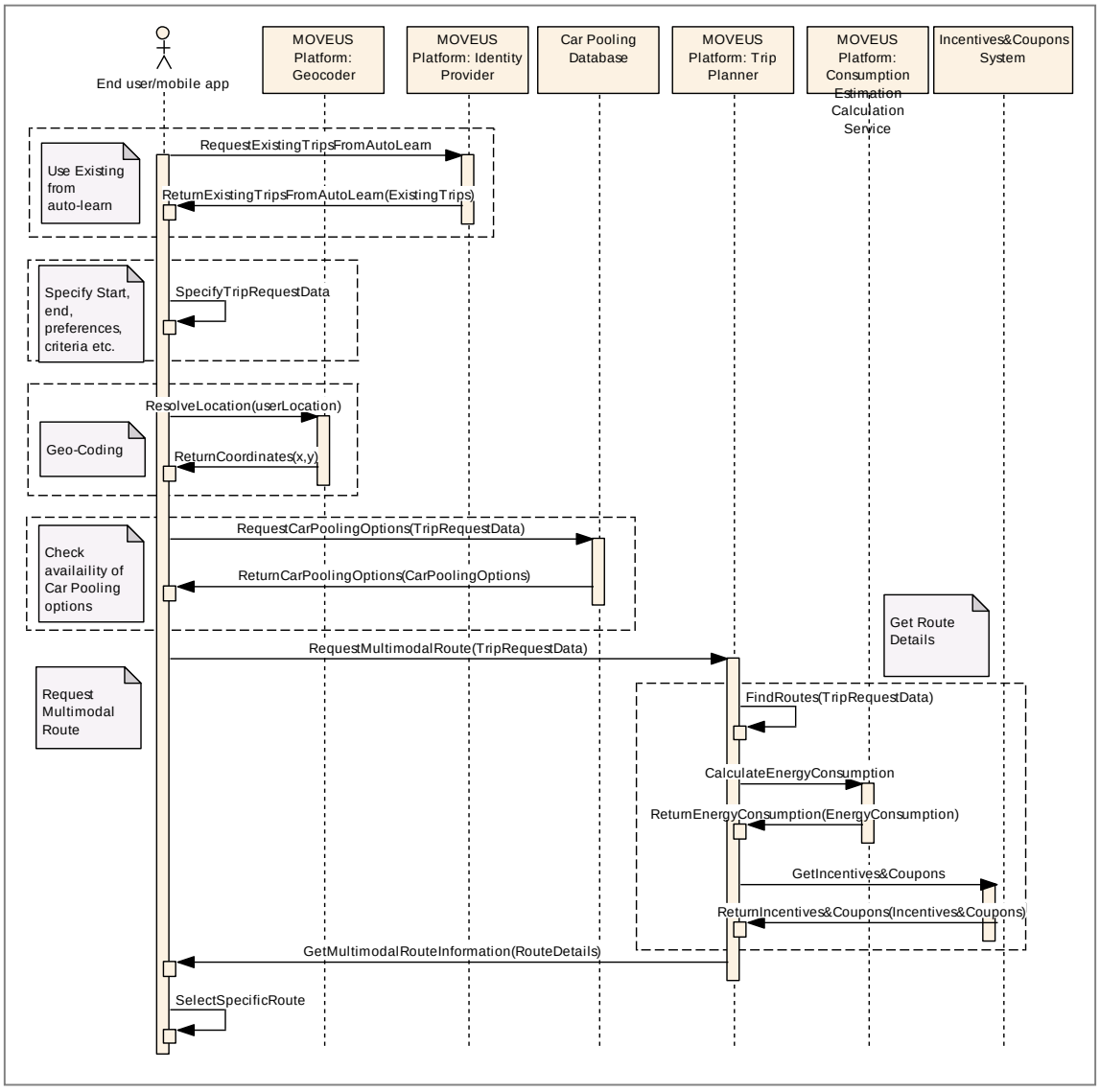

Figure 30 Genoa Service 1 - Trip Information

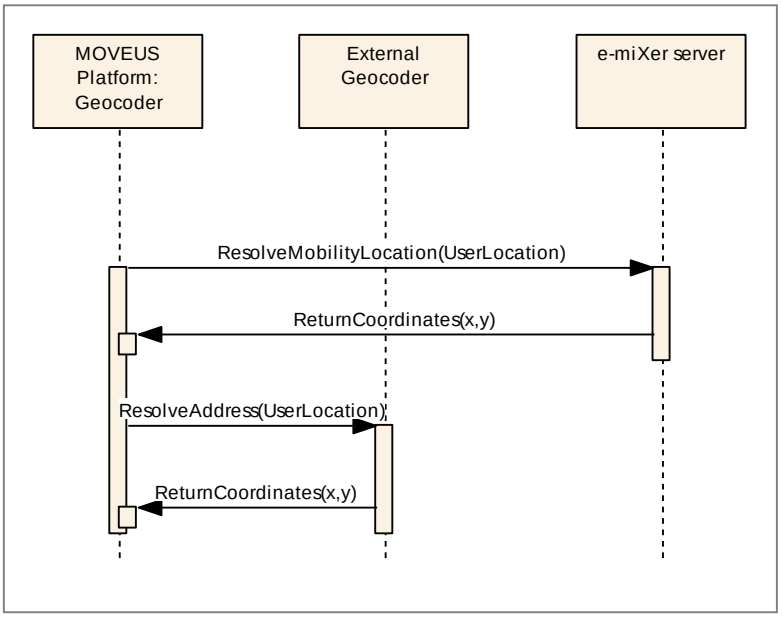

Figure 31 Genoa Service 1 - Trip Information – Detail on Geocoder

Use Case ID:	**GEN_UC1: SD_SVC1_TRIPINFO**
Use Case Name:	Service 1 – Trip Information
Created By:	Softeco Sismat
Date Last Updated:	18/04/2014
Actors:	• End user/mobile app • MoveUs Platform: Geocoder. A centralized interface for Geocoding operations • MoveUs Platform: Identity Provider • e-miXer server • External Geocoder: A geocoding service offered by an external provider and suitable for geo-coding of addresses or locations not supported by the local geocoding provider • Car Pooling Database: The system where the trip data indicated by the users as a Car Polling offering are stored • MoveUs Platform: Trip Planner • MoveUs Platform: Consumption Estimation Calculation Service: A service that provides facilities for calculating the energy consumption based on the specified trip data • Incentives&Coupons system

Description:	Initial stage of a trip planning with: - formulation of the request based on preferences and historical data; - Identification of Route solutions; - Selection of a Route;
Preconditions:	• The user must be registered and logged in the system. • In order to geo-code locations specifically managed by the local systems ("Mobility Locations") the relevant data is regularly retrieved from the remote systems and cached into the local central repository (e-miXer Platform) • The system (MoveUs Platform: Identity Provider) knows user preferences and other parameters from the registration and previous usage of the service.
Post conditions:	• The user receives information about the requested trip and is able to confirm the trip calculation • The specified locations are geo-coded • The system automatically learn from the service usage
Frequency of Use:	On demand
Normal Course of Events	**A) Use Existing from Auto-Learn:** • **End User/mobile app <-> MoveUs Platform: Identity Provider** 1. In order to support the user in his trip request the mobile app automatically ask the MoveUs Platform: Identity Provider about suggestions for a new trip (e.g. most frequently requested trips, preferred modes of transport etc.). 2. The end user receives in the mobile app all the suggestions about the trip data **B) Specification of Trip Request Data** • **End User/mobile app [Specify Trip Request Data]** The user specifies all data composing the request for a trip either starting from the suggestion (point A) or with a new trip. To support this phase a Geocoding system is available. **C) Geocoding** • **End User/mobile app <-> MoveUs Platform: Geocoder <-> e-miXer server** **End User/mobile app <-> MoveUs Platform: Geocoder <-> external Geocoder** (diagram in Figure 30) 1. The MoveUs platform: Geocoder detects the type of start/end/via point 2. If the point is a generic address or, in general, a location not managed by the e-miXer server, an external Geocoder is invoked. A set of coordinates is returned to the platform.

	3. If the point is a Mobility location managed by the e-miXer platform (e.g. a Parking point, a Bus stop, etc.), the e-miXer platform is invoked to geocode the location. A set of coordinates is returned to the platform from e-miXer **D) Check availability of carpooling options** • **End User/mobile app -> Car Pooling Database -> end user/mobile app** Car Pooling options of interest for the Requested Trip are searched into the Car Pooling Database. Car pooling information can be used as a starting point to consider travelling together with other people with a private Car. It is not foreseen to have a specific "Car Pooling" mode of transport to be indicated in the Journey Planner Service. Instead, the normal "Car" mode is used. The agreement between the users on Car Polling options is achieved outside of the MoveUs system. **E) Request Moltimodal Route** • **MoveUs Platform: Trip Planner [Find Routes]** • **MoveUs Platform: Trip Planner <-> MoveUs Platform: Consumption Estimation Calculation Service** • **MoveUs Platform: Trip Planner <-> Incentives&Coupons** 1. A Route Request is formulated with the selected parameters in order to obtain a list of multimodal Routes. This information is retrieved by invoking the Trip Planner via the common Trip Planner Interface. The result is a list of route solutions, obtained from an intermediate[5] Trip Planning Computation to be achieved following one of the two proposed solutions as in 3.2.1.1.4.2 or 3.2.1.1.4.3) 2. The information about the Journey Solutions is obtained including Means of transport, restrictions, special services (retrieved from the trip planner system) plus information on available incentives (retrieved from the Incentives service) and Energy Consumption info (retrieved from the EC system). Separate requests are then formulated by the MoveUs Platform: Trip Planner to the respective components/actors. **F) Select Specific Route** • **End User/mobile app [Select Specific Route]** Once obtained the list of Route Solutions the user can select a specific Route
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none

[5]Depending on the Trip Planning algorithms and technological solutions a preliminary listof trip/route solutions can be obtained without the need of calculating/obtaining the details of every trip/route. The details can then be requested and retrieved at a second stage. In other cases the list of trip solutions is returned together with the full details of each trip.

Notes and Issues:	none

Table 52 Genoa use case 1: Trip information descriptive table

3.2.1.1.4.2 Trip Calculation - First Configuration

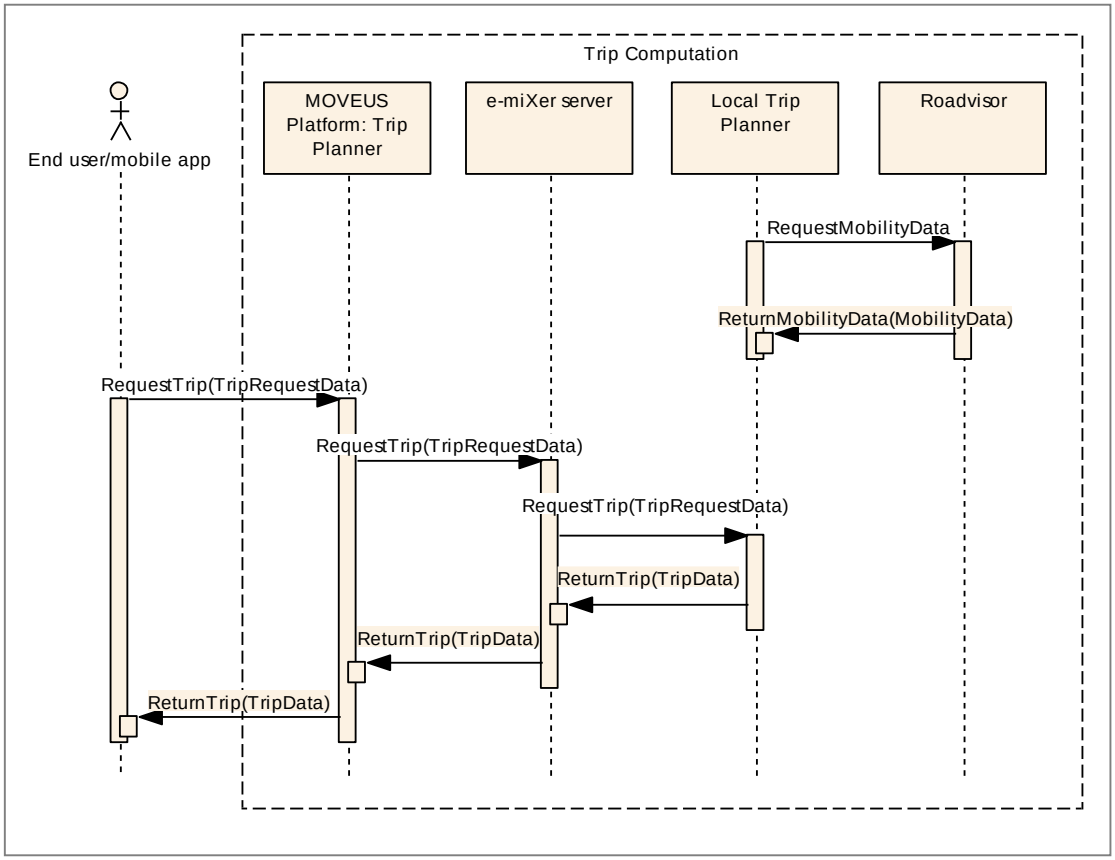

Figure 32 Genoa Service 1 - Trip Computation – First Configuration

Use Case ID:	GEN_UC1: SD_SVC1_TRIPCOMP_01
Use Case Name:	Service 1 – Trip Computation 01
Created By:	Softeco Sismat
Date Last Updated:	18/04/2014
Actors:	• End user/mobile app • MoveUs Platform: Trip Planner: A centralized interface able to support requests/responses related to the trip planning. • e-miXer server • Local Trip Planner: A Trip Planner operating only in the local context

	(Genoa) • Roadvisor
Description:	Trip Planning supported by a local Trip Planner Service (accessible through the e-miXer server)
Preconditions:	The user has completed the Trip Information Phase.
Post conditions:	The requested trip is calculated
Frequency of Use:	On demand as part of the entire Trip Planning Process
Normal Course of Events	**A) Trip Calculation / execution** • **End User/mobile app -> MoveUs Platform: Trip Planner -> e-miXer server -> Local Trip Planner -> e-miXer server -> MoveUs Platform: Trip Planner -> End User/mobile app** 1. A trip request, prepared during the Trip Information phase is sent from the end user app to the MoveUs Platform: Trip Planner Interface 2. The trip request is sent to the e-miXer server 3. The request is formatted to be consumed by the Local Trip Planner 4. The response is obtained from the Local Trip Planner and returned back to the end user/mobile app via the MoveUs Platform : Trip Planner **B) Update of Local Trip Planner Data** • **Local Trip Planner <-> Roadvisor** At regular, pre-defined time intervals the *Local Trip Planner* asks to and receives from the Roadvisor system the necessary updates on the relevant Mobility data needed for the trip calculation (e.g. bus stop and schedule, traffic information, environmental data etc.)
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	A choice has to be operated between this configuration and the following one

Table 53 Genoa use case 1: Trip computation_01 descriptive table

3.2.1.1.4.3 Trip Calculation - Second Configuration

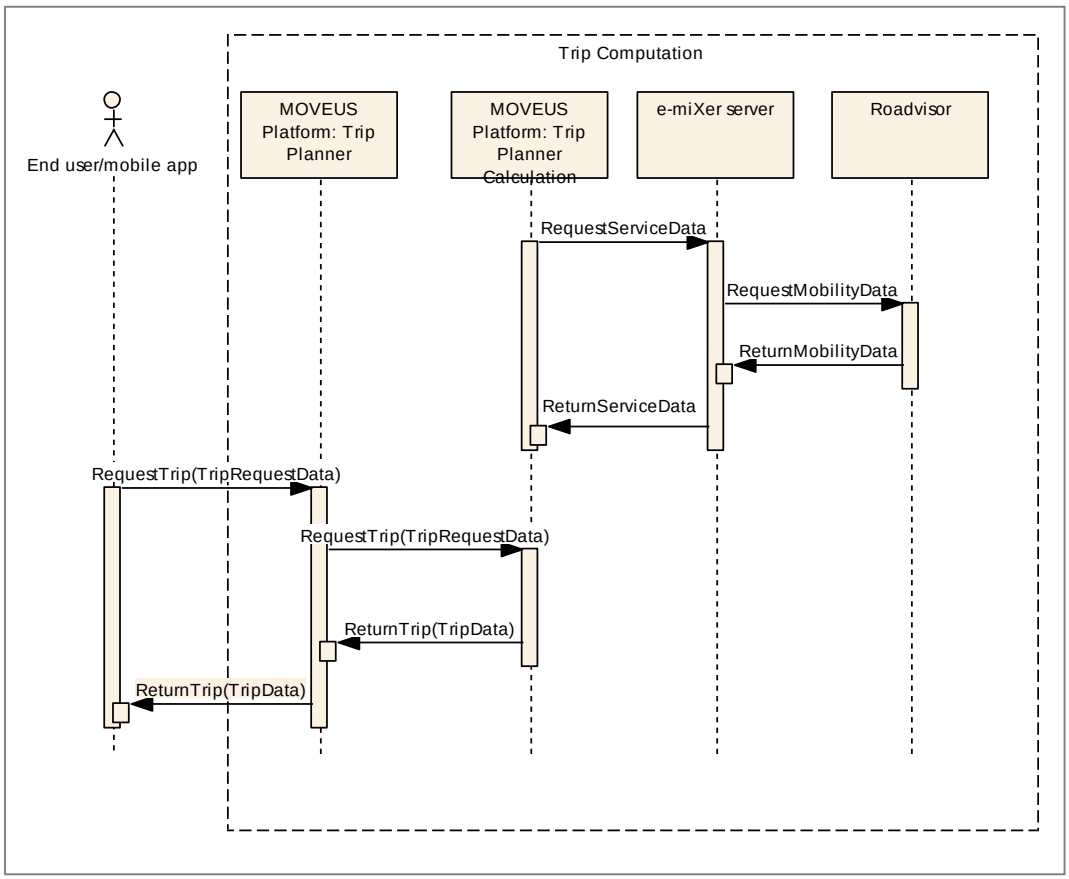

Figure 33 Genoa Service 1 - Trip Computation – Second Configuration

Use Case ID:	**GEN_UC1: SD_SVC1_TRIPCOMP_02**
Use Case Name:	Service 1 – Trip Computation 02
Created By:	Softeco Sismat
Date Last Updated:	18/04/2014
Actors:	• End user/mobile app • MoveUs Platform: Trip Planner • MoveUs Platform: Trip Planner Calculation: A centralized service able to calculate a Trip Plan • e-miXer server • Roadvisor
Description:	Trip Planning supported by a Centralized (MoveUs) Journey Planning Service

Preconditions:	The user has completed the Trip Information phase
Post conditions:	The requested trip is calculated
Frequency of Use:	On demand as part of the entire Trip Planning Process
Normal Course of Events	**A) Trip Calculation** • **End User/mobile app -> MoveUs Platform: Trip Planner -> MoveUs Platform: Trip Planner Calculation -> MoveUs Platform: Trip Planner Interface** 1. A trip request, prepared during the Trip Request Formulation phase is sent from the end user app to the MoveUs Platform: Trip Planner 2. The Trip Planning is calculated by the MoveUs Platform: Trip Planner Calculation 3. The data of the planned trip will be automatically used for the post-trip calculation phase. **B) Update of MoveUs Trip Planner Data** • **MoveUs Platform: Trip Planner Calculation -> e-miXer Server -> Roadvisor -> e-miXer Server -> Trip Planner Calculation** At regular, pre-defined time intervals the MoveUs Platform: Trip Planner Calculation asks to / receives from the e-miXer Server system the necessary updates on the relevant data needed for trip calculation (e.g. data like bus stop and schedule, traffic information, environmental data etc.). The e-miXer server gets updated data from the Roadvisor system and stores it in the internal cache.
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	A choice has to be operated between this configuration and the previous one

Table 54 Genoa use case 1: Trip computation_02 descriptive table

3.2.1.1.4.4 Trip Execution and Post-Trip Operations

In order to reliably confirm the update of the status of the incentives and of the user's historical data the confirmation of the trip execution is needed. This can be done by tracking the user or, if not possible, by another method of confirmation (automatic or semi-automatic). This step for service 1 in Genoa is intended to be the main operation composing the *Trip Execution* stage.

As a consequence of this operation, in the *Post-Trip phase*, the Personal data and Incentives status is updated.

A feedback on the journey can be also provided and treated for the objectives of Service 2 (see Section 3.2.2: Use case 2 description).

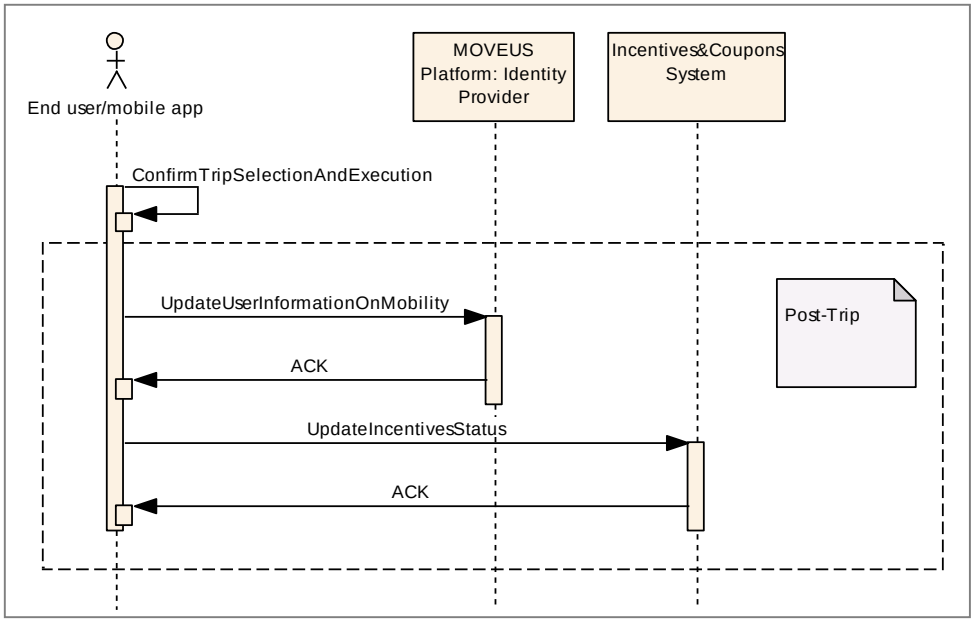

Figure 34 Genoa Service 1 - Trip Execution and Post-Trip Operations

Use Case ID:	**GEN_UC1: SD_SVC1_TRIPEXECPOST**
Use Case Name:	Service 1 – Trip Execution/Post-Trip
Created By:	Softeco Sismat
Date Last Updated:	22/04/2014
Actors:	• End user/mobile app • MoveUs Platform: Identity Provider • Incentives&coupons System
Description:	Confirmation of Trip Execution. In order to manage the situation where a tracking of the user is not possible (for example the user accepts his position to be tracked but a real time tracking is not possible) the mobile app should provide with a functionality to confirm the actual execution of the trip. After the trip execution the incentive status and personal (historical) data is updated.
Preconditions:	A trip has to be requested, calculated and a specific trip solution selected
Post conditions:	• The execution of the trip is confirmed • The personal information (mobility, environmental, incentive balance

	is updated)
Frequency of Use:	After the trip planning and selection of specific trip
Normal Course of Events	**A) Confirmation of Trip Execution** • **End User/mobile app** The confirmation is provided either in a manual or automatic way **B) Post Trip Operations** • **End User/mobile app <-> MoveUs Platform: Identity Provider** • **End User/mobile app <-> MoveUs Platform: Incentives & Coupons System** 1. Once the confirmation is provided, the historical information on Mobility (including execution of trips, energy consumption) is updated with the current data by invoking the MoveUs Platform: Identity Provider. 2. The status of the incentives retrieved during the Trip Request Formulation (stage A) is also updated by invoking the Incentives&Coupons System.
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 55 Genoa use case 1: Trip execution descriptive table

3.2.1.1.5 Personal Accounts Management

The personal accounts management function allow the visualization and editing (for the single entities for which this is applicable) of personal information and status of incentives, energy consumption, historical data etc.

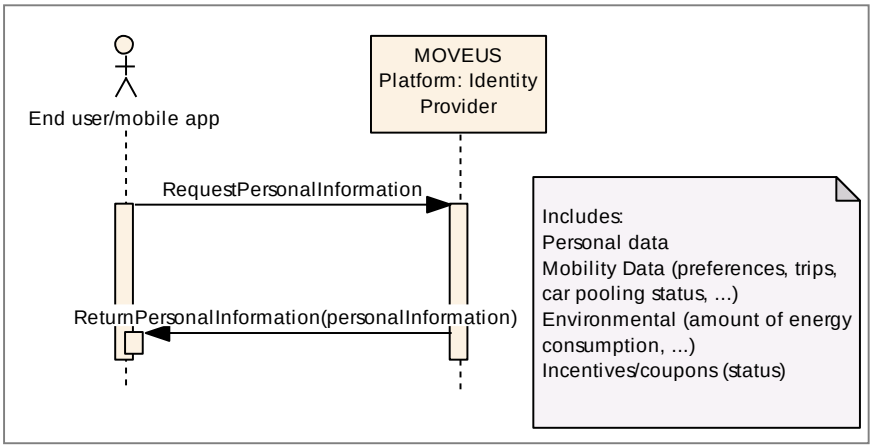

Figure 35 Genoa Service 1 – Personal Accounts Management

Use Case ID:	**GEN_UC1: SD_SVC1_ACCOUNTMNGM**
Use Case Name:	Service 1 – Personal Accounts Management
Created By:	Softeco Sismat
Date Last Updated:	18/04/2014
Actors:	• End user/mobile app • MoveUs Platform: Identity Provider • Actors from service 1 - Registration
Description:	Management of the personal Information and accounts
Preconditions:	• The user must be registered and have his personal information already stored in the system. • The user must be logged in the system.
Post conditions:	• The user receives information about his personal data • The user updates his personal information
Frequency of Use:	On demand
Normal Course of Events	**A) Personal Information Retrieval: End User/mobile app <-> MoveUsPlatform: Identity Provider** 1. The end user request his personal information to the MoveUs Platform: Identity Provider 2. The Personal Information is retrieved and displayed in the end user mobile app this includes: • Personal data • Mobility Data (preferences, trips, car pooling status, ...)

	• Environmental (amount of energy consumption, ...) • Incentives (status) (personal balance) A part of this data can be modified **B) Personal Information/accounts update** The course of events is as specified in the registration use case (see 3.2.1.1.1)
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 56 Genoa use case 1: Personal account management descriptive table

3.2.1.1.6 Car Pooling

The information about car-pooling options is integrated into the Trip Planning Service. With this additional functionality the end user can retrieve the information of the trips planned in the past and indicate which of them can be published as a Car Pooling offering.

The car pooling information is provided after trip calculation and the matching phase between the users is achieved with a direct contact/agreement out of the system.

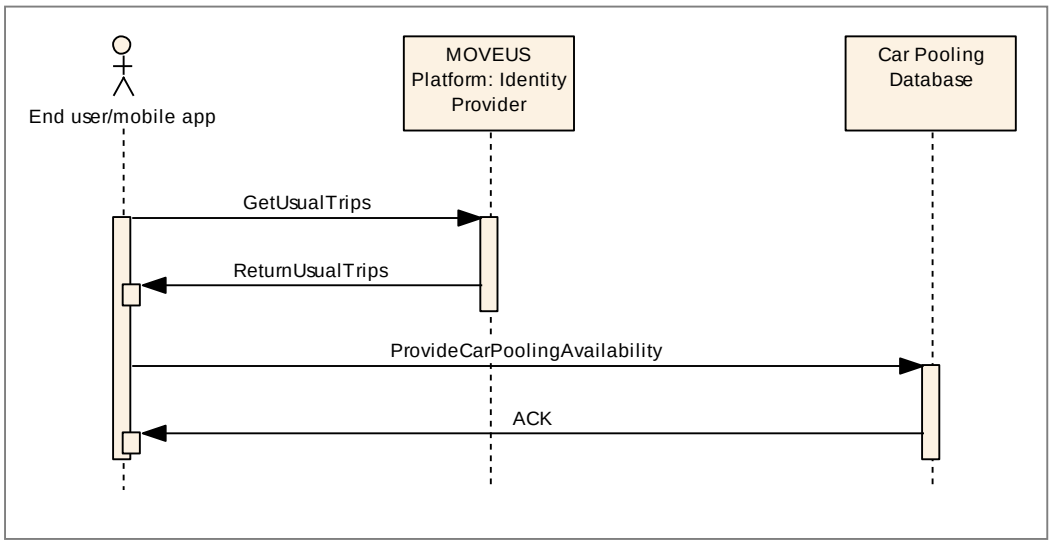

Figure 36 Genoa Service 1 – Car Pooling

Use Case ID:	GEN_UC1: SD_SVC1_CARPOOL
Use Case Name:	Service 1 – Car Pooling
Created By:	Softeco Sismat
Date Last Updated:	18/04/2014
Actors:	• End user/mobile app • MoveUsPlatform: Identity Provider • Car Pooling Database
Description:	Indication of Car Pooling Availability
Preconditions:	• The user must be registered and have his personal information already stored in the system. • The user must be logged in the system.
Post conditions:	The selected trip(s) are added to the Car Pooling Database and become visible to the other users as Car Pooling options after trip calculation.
Frequency of Use:	On demand
Normal Course of Events	**A) Search for past trips** **End user/mobile app <-> MoveUs Platform: Identity Provider** 1. The *end user* ask the MoveUs*Platform: Identity Provider* for past trips executed **B) Store/modify trips in Car Pooling Database** **End user/mobile app <-> Car Pooling Database** 1. The end user selects the trips that can be offered for the Car Pooling Service (this includes deletion of previously indicated trips) 2. The user indicates additional data that can be visible to other registered users as complementary information to the trip offering like: Availability as a driver or as a passenger, gender, age, Etc. 3. The Car Pooling Database is updated according to the user's indications NOTE: the agreement between the users is achieved with a first contact made possible by a MoveUs functionality that allows users to exchange an email. Then the next steps are achieved out of the MoveUs System.
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none

Notes and Issues:	none

Table 57 Genoa use case 1: Carpooling descriptive table

3.2.1.1.7 Electronic Wallet Registry

The service retrieves the available external Payment systems and gives the possibility of redirecting to them.

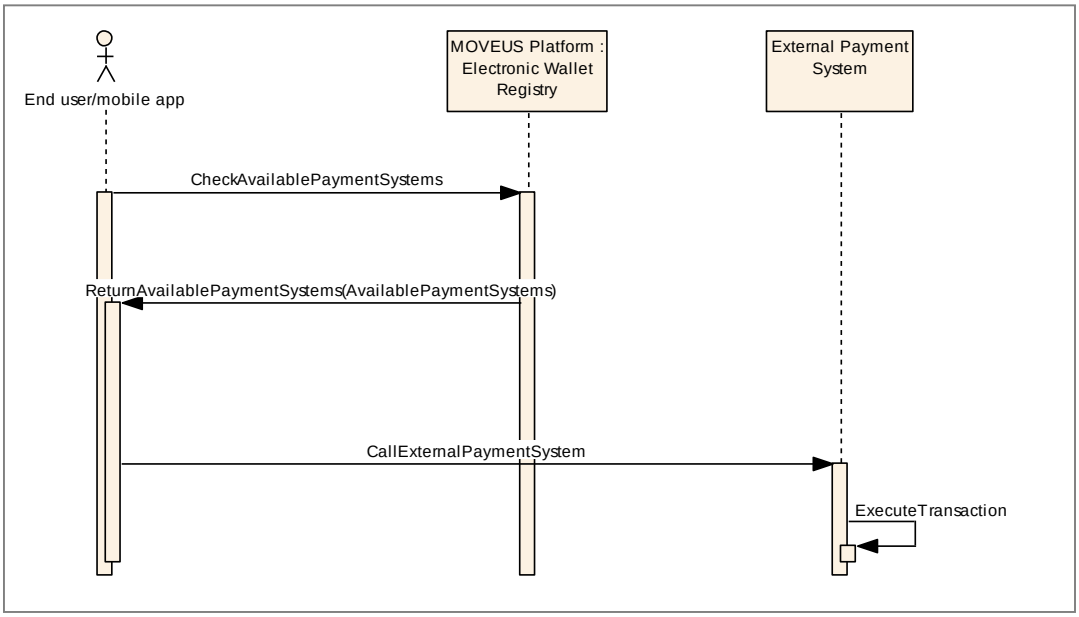

Figure 37 Genoa Service 1 – Electronic Wallet Service

Use Case ID:	GEN_UC1: SD_SVC1_EWALLET
Use Case Name:	Service 1 – Electronic Wallet Registry
Created By:	Softeco Sismat
Date Last Updated:	18/04/2014
Actors:	• End user/mobile app • MoveUsPlatform: Electronic Wallet Registry: A registry of the available external payment systems • External Payment System: A generic external payment system that is included into the MoveUs Platform: Electronic Wallet Registry
Description:	Retrieval of information about available Payment Systems

Preconditions:	• The user must be registered and have his personal information already stored in the system. • The user must be logged in the system.
Post conditions:	• The user receives information from the available Payment Systems relevant for the service • The user can be redirected to the External Payment System to use it
Frequency of Use:	On demand
Normal Course of Events	**A) Electronic Wallet Registry access** **End User/mobile app <-> MoveUs Platform: Electronic Wallet Registry** 1. The end user request the availability of payment systems by means of a dedicated function 2. The MoveUs Platform: Electronic Wallet Registry is queried. 3. The description and link to the external payment system is retrieved and rendered in the app. 4. The end user can access the External Payment System using the provided link.
Alternative Courses:	**B) Electronic Wallet Registry access** **End User/mobile app <->**MoveUs **Platform: Electronic Wallet Registry** 1. The information on available payment systems are automatically retrieved from the MoveUs Platform: Electronic Wallet Registry 2. The information is appropriately rendered during the phase of Trip Execution Confirmation (see 3.2.1.1.4.4) an additional facility. 3. The end user can access the external system by using the provided link.
Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 58 Genoa use case 1: Electronic Wallet Registry descriptive table

3.2.1.2 Use Case diagrams

The Following Use Case Diagrams give a different view of the operations depicted by the Sequence Diagrams by focusing on the relevant functions associated to each single actor.

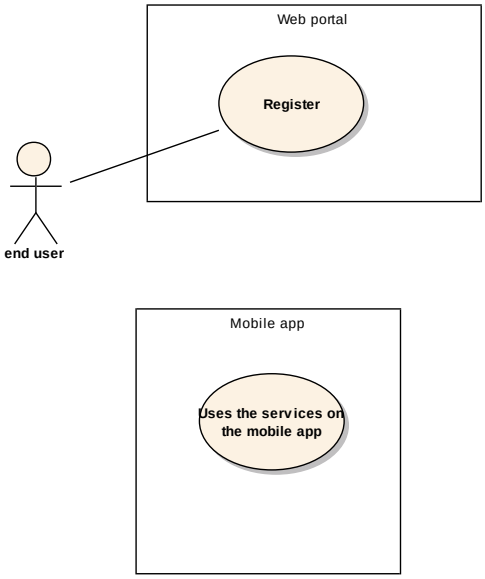

Figure 38 Genoa Service 1 – Use case diagram for the end user

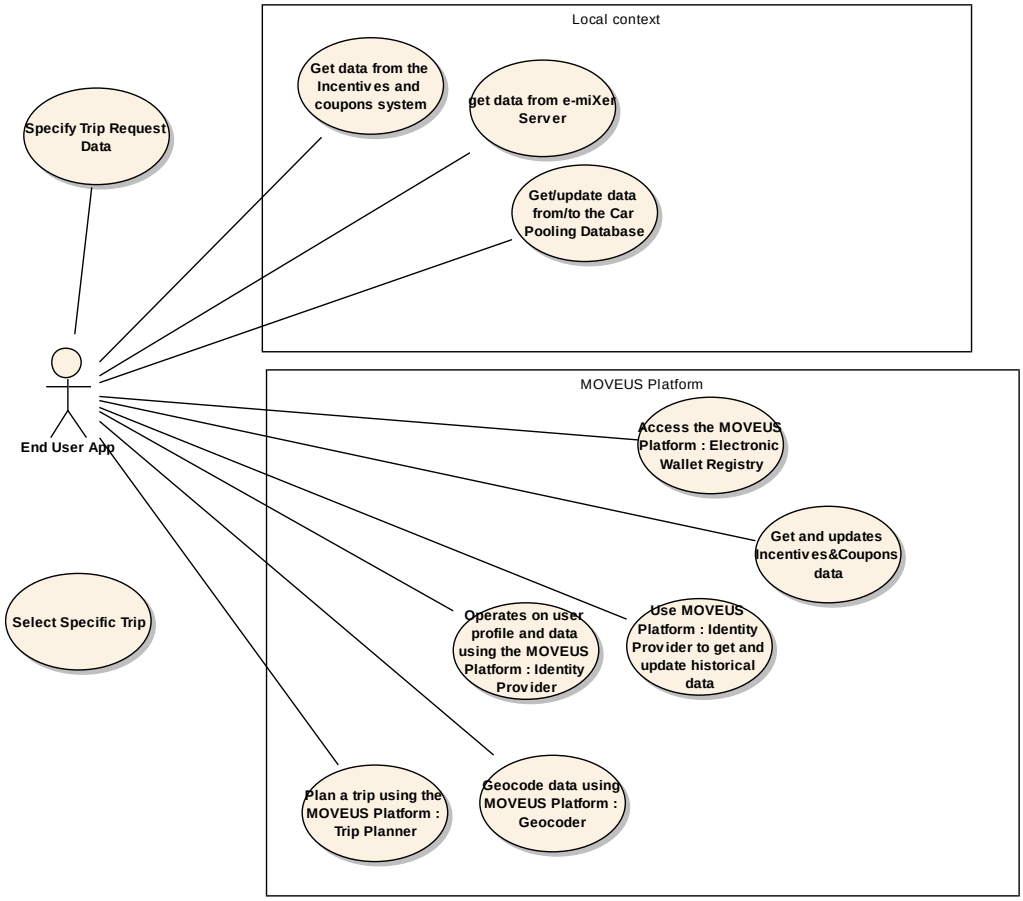

Figure 39 Genoa Service 1 – Use case diagram for the end user smartphone application

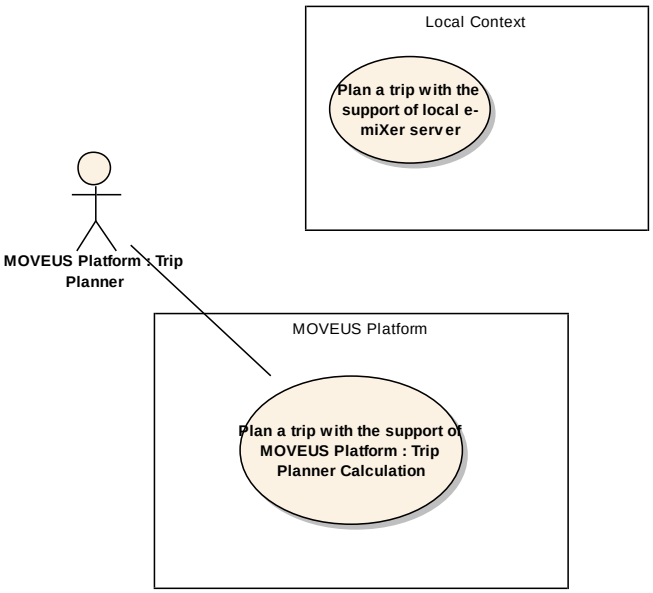

Figure 40 Genoa Service 1 – Use case diagram for the MoveUs Platform: Trip Planner

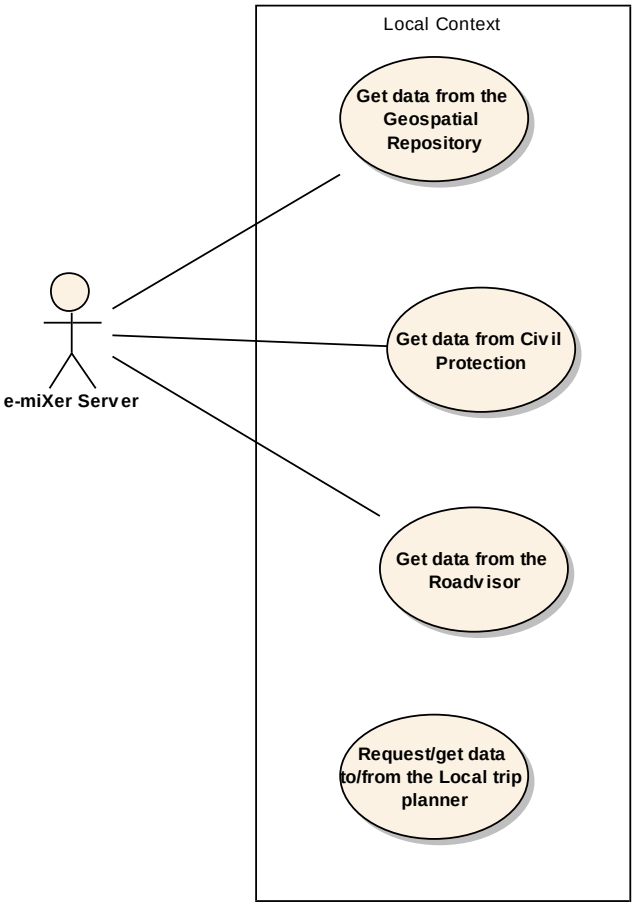

Figure 41 Genoa Service 1 – Use case diagram for the e-miXer Server

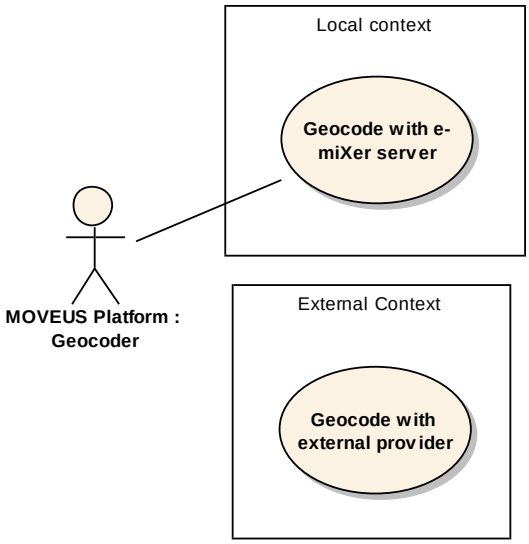

Figure 42 Genoa Service 1 – Use case diagram for the MoveUs Platform: Geocoder

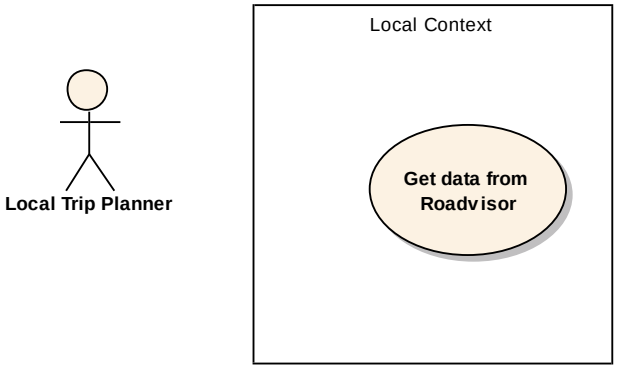

Figure 43 Genoa Service 1 – Use case diagram for the Local Trip Planner

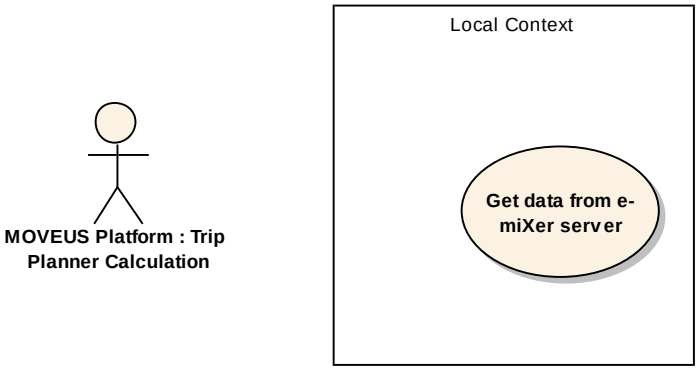

Figure 44 Genoa Service 1 – Use case diagram for the MoveUs Platform: Trip Planner calculation

3.2.2 Use case 2: Integration of crowd sourced data into the Genoa traffic supervisor

The Crowd sourced Traffic data collection is achieved by collecting the so-called "feedback data" by means of specific functionalities and services available for the end users.

The feedback can basically be of two types:

A. Feedback about the quality of Traffic Data already provided by the system (correctness, precision, timeliness, etc.)
B. Provision of new data on traffic

The feedback is integrated into the existing Traffic Supervisor after a validation and processing phase.

3.2.2.1 UML Sequence diagram

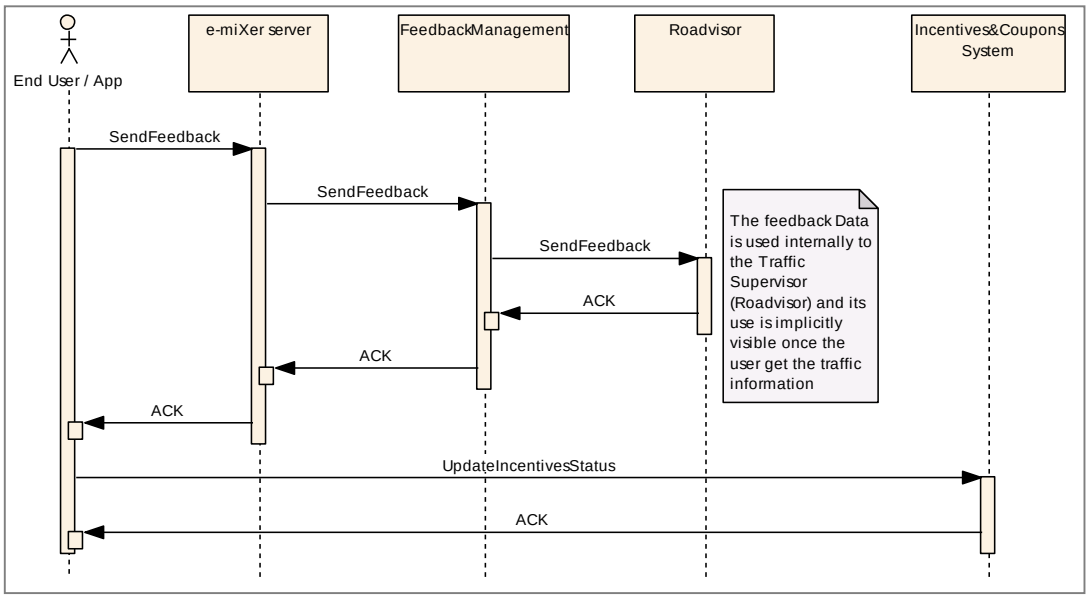

Figure 45 Genoa Service 2 – Sequence Diagram

3.2.2.2 Descriptive table of the use case 2

This table provides with textual description of the sequence diagram included in previous section.

Use Case ID:	GEN_UC2: SD_SVC2_CWDSRC_01
Use Case Name:	Crowdsourced data collection and use

Created By:	Softeco Sismat
Date Last Updated:	28/03/2014
Actors:	• End user/mobile app • e-miXer server: The local (Genoa) node acting as the centralized data/service provider/interface • Feedback management: The node where the feedback data provided by the user is validated and processed before being integrated into the Local Traffic Supervisor. The process of validation and computation of the feedback data can be automatic, semi-automatic or manual. • Roadvisor: The Local Traffic Supervision system • Incentives&Coupons System
Description:	Integration of crowded sources data (feedback provided by the user about traffic or other related information) into the MoveUs platform
Preconditions:	The user must be registered and logged into the system.
Post conditions:	The data provided by the end user is integrated into the local traffic supervisor to improve the quality of the traffic information
Frequency of Use:	On demand
Normal Course of Events	**A) Feedback Provision** **End User/mobile app <-> e-miXer server <-> Roadvisor** 1. The *end user*, through the mobile application, provides a feedback to the e-miXer server 2. The data is received and temporarily stored by the e-miXer server 3. The feedback management system validates and processes the feedback data (based on type, user profile, possible aggregation of similar data etc.) 4. The processed data is sent to the local traffic supervisor (Roadvisor) for integration with the existing one. The integration of feedback data is transparent is reflected in a quality-enhancement of the same traffic information already accessible by the users. **B) Incentives Status Update** **End User/mobile app <-> Incentives&Coupons System** If applicable, following the provision of a feedback, the status of the incentives is updates
Alternative Courses:	none

Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 59 Genoa use case 2: Descriptive table

3.2.2.3 Use case diagrams – Service 2

The Following Use Case Diagrams gives a different view of the operations depicted by the Sequence Diagrams by focusing on the relevant functions associated to each

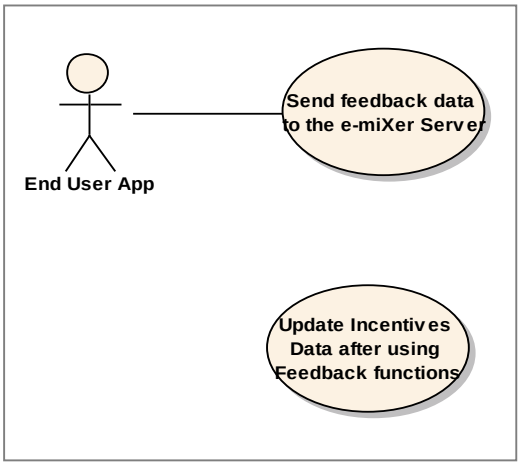

Figure 46 Genoa Service 2 – Use case diagram for the end user smartphone application

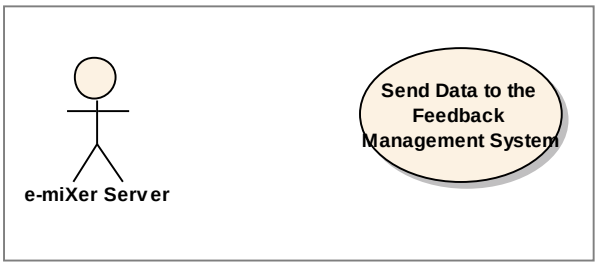

Figure 47 Genoa Service 2 – Use case diagram for the e-miXer Server

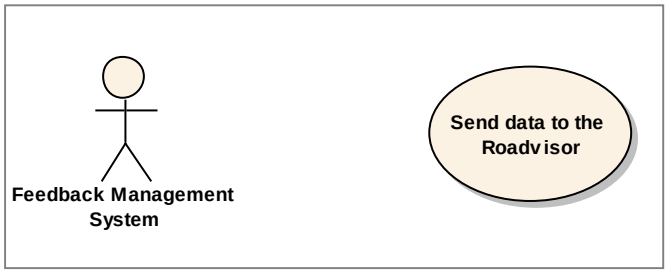

Figure 48 Genoa Service 2 – Use case diagram for the Feedback Management System

3.3 Tampere use cases description

This section will describe the Use Cases for Tampere pilot. The overall structure of the services to be developed in Tampere pilot is illustrated in the following figure:

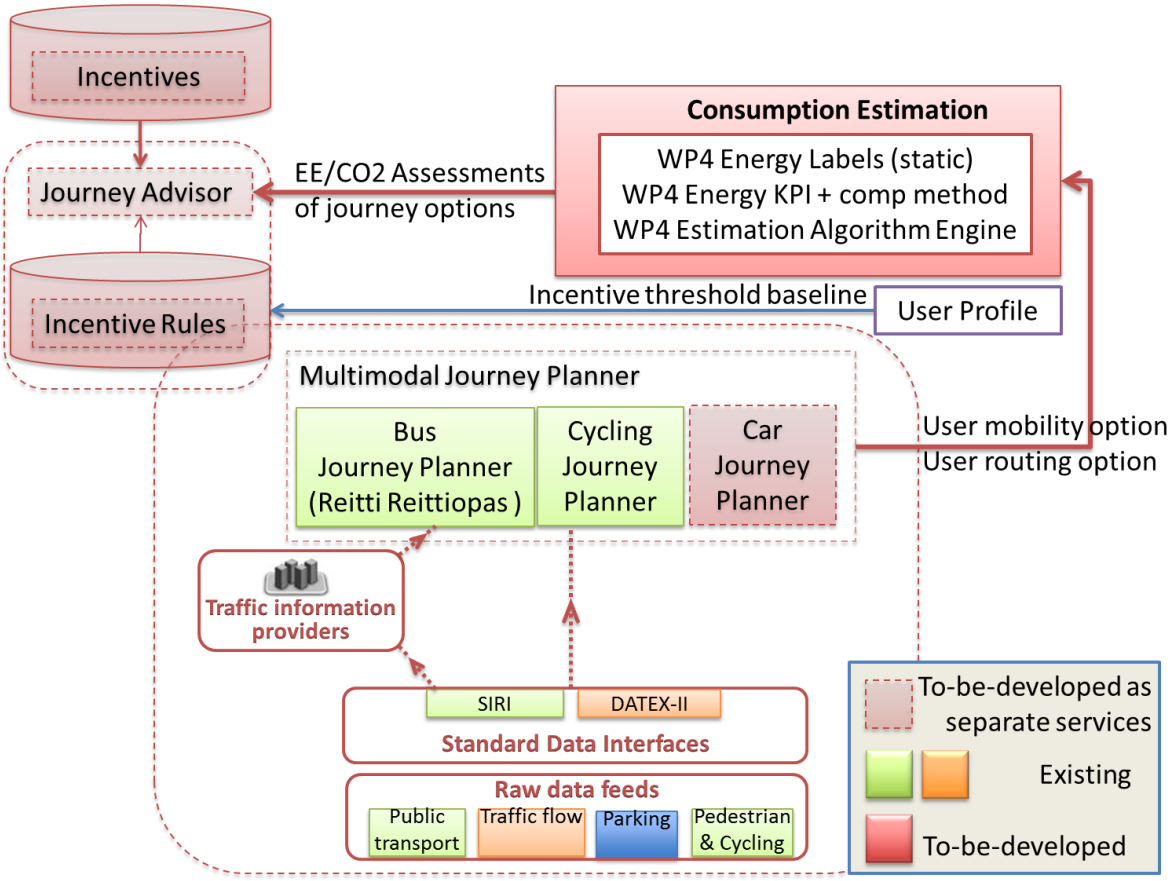

Figure 49 Overall structure of MoveUs services to be developed in Tampere pilot.

Tampere Pilot comprises 3 Use Cases described in the following sub-sections from 3.3.1 to 3.3.3

Use cases in Tampere pilot
1. TRE_UC1:Calculation of Multimodal Journey Options
2. TRE_UC2: Estimation of Consumption (CO2 and / or Energy) per Journey Option
3. TRE_UC3: User tailored incentive-based visualization of Journey Options
4. TRE_UC4: Location of Parking Places

Table 60 Overview of MoveUs use cases for Tampere pilot

3.3.1 Use case 1: Calculation of Multimodal Journey Options

3.3.1.1 UML Sequence diagram

The following UML sequence diagram has been defined for the calculation of multimodal journey options use case:

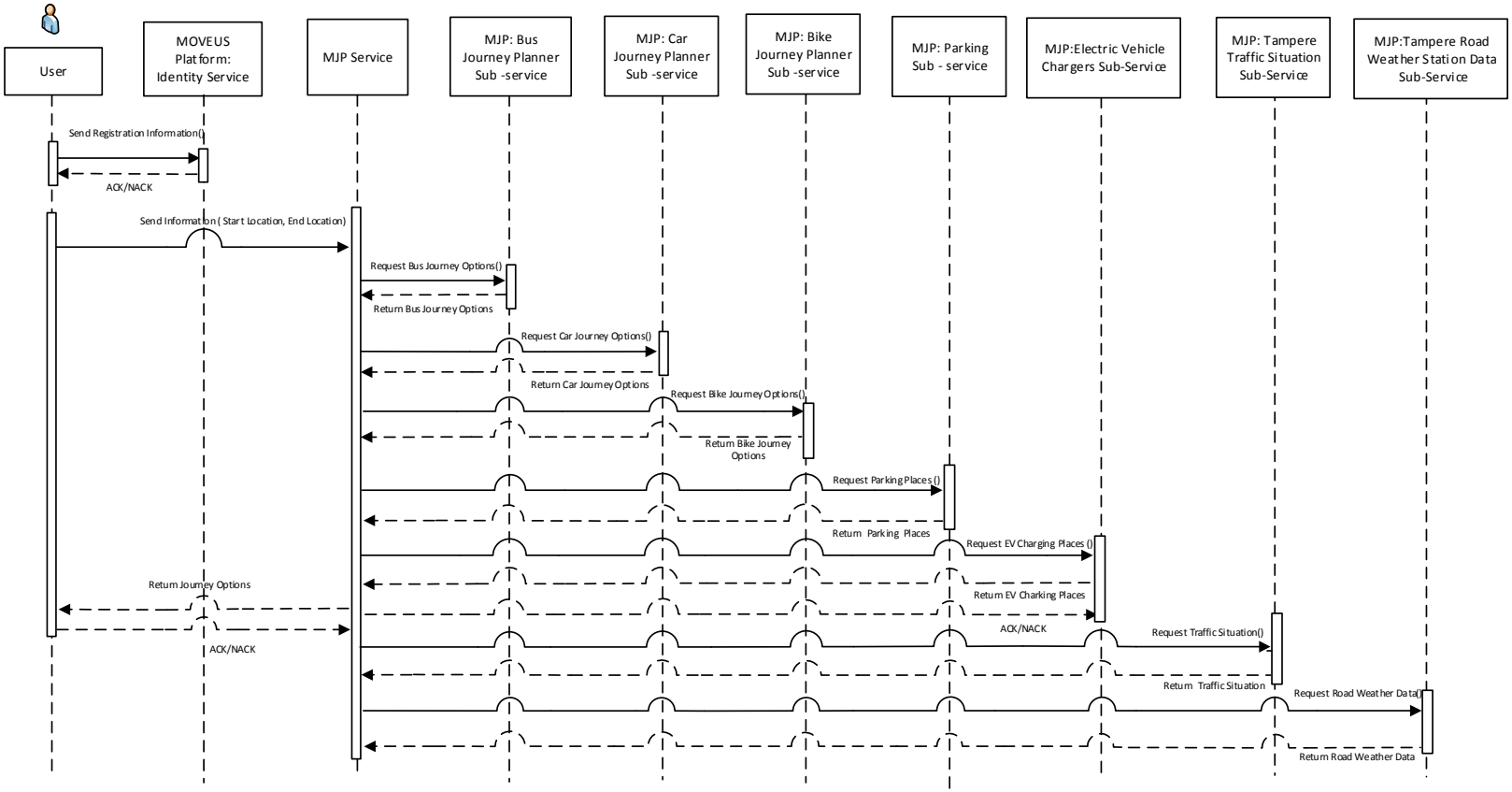

Figure 50 Tampere use case 1_UML Sequence diagram: On-trip phase

3.3.1.2 Descriptive table of the use case 1

This table provides with textual description of the use case diagram included in previous section.

Use Case ID:	**TRE_UC1**
Use Case Name:	User registration. Calculation of Multimodal Journey Option(s) –bike, bus and car– for predefined start/end coordinates, bike hiring stands at start coordinates and parking places for end coordinates and EV charging places.
Created By:	TUT
Date Last Updated:	26/06/2014
Actors:	• Final user: Entity defining End (Desired) Coordinates and (if needed, i.e. no GNSS data available/ no tracking permission given) Start (Current) coordinates. There are two types of final users: 1) users that want to remain anonymous and 2) users that provide their contact information(e.g. e-mail) to get incentives and more personalized service • MoveUs Platform: Identity Service • Tampere Multimodal Journey Planner Service • Tampere Bus Journey Planner Sub-service (HTTP GET from Tampere API: http://developer.publictransport.tampere.fi/pages/en/http-get-interface.php) • Tampere Cycling Journey Planner Sub-service (HTTP GET from Tampere API: http://developer.publictransport.tampere.fi/pages/en/http-get-interface.php) • Tampere Car Journey Planner Sub-Service (HTTP GET from Google Maps Directions API: https://developers.google.com/maps/documentation/directions/) • Tampere Parking Sub-service (HTTP GET from Tampere API: under development) • Tampere EV Charging places Sub-service (http://nobil.no/index.php/english) • Tampere Traffic Situation Sub-Service (HTTP GET from: http://infotripla.fi/digitraffic-beta/doku.php?id=trafficdisorders_en) • Tampere Road Weather Station Data Sub-Service (HTTP GET from:http://infotripla.fi/digitraffic-beta/doku.php?id=roadweather_en)

Description:	Computation of available Journey Option(s) - taking into consideration all available mobility and routing options (i.e. bike/bus/car), parking places for destination and charging places for EV. The user shall log into the MoveUs platform and act as described below.
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • Users must have a smartphone equipped with GNSS AND must give permission to have their location tracked OR users must predefine their start location
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Upon user request
Normal Course of Events	**1. User → MoveUs platform** • Enter MoveUs web site • Enter username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address. • Enter information on user **(→ 2)**: i. Name, address ii. Special roles (e.g. tourist, business) iii. Direct influencers of personal mobility choices (e.g. passion for biking / running, personal acceptance of car/bike sharing) iv. Indirect influencers of personal mobility choices (e.g. preference to commute to work / school in groups) v. Direct influencers of personal routing choices (e.g. aversion towards specific places in the city, parking places) vi. Habits (e.g. regular itineraries undertaken) vii. Particularities of personal vehicles the user is regularly driving (fuel needs, consumption, type of vehicle - electric etc.) **Remark**: information on user can be updated anytime as needed by user. **2. MoveUs Platform: Identity Service** • Store information about user (profile and a history of selected Journey Option(s)) **3. User→ Multimodal Journey Planner service (Tampere)** • Enter information on START LOCATION and END LOCATION (**→4**) **4. Multimodal Journey Planner service (Tampere)** • Computes Journey Option(s) based on the input information provided. Requests and aggregates information from the sub-services: Tampere Bus Journey Planner, Tampere Cycling Journey Planner, Tampere Car Journey Planner, Parking, Electric

	Vehicle Charging Places, Tampere Traffic Situation, Tampere Road Weather Station Data (→**5**) **5. Multimodal Journey Planner service (Tampere) → User** • Provide information on all available Journey Option(s) – bus, bike and car, parking places at destination, city bike stands.(→**6**) **6. User** • Selects one of the available Journey Option(s).(→**2**)
Alternative Courses:	none
Includes:	• Sub-Service Bus Journey Planner (Tampere) • Sub-Service Cycling Journey Planner (Tampere) • Sub-Service Car Journey Planner (Tampere) • Sub-Service Traffic Situation (Tampere) • Sub-Service Road weather station data (Tampere) • Parking places (Tampere) • Electric Vehicles charging places (Tampere)
Special Requirements:	Terms of use need to be accepted by the final users (need to contain the basic policy in order to provide the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	none
Notes and Issues:	• The Multimodal Journey Planner service (Tampere) is intended to be one of many possible implementations of an interface specifying: - Inputs: User Profile (optional), Start Location, End Location - Outputs: A list of Journey Option(s), integrating all possible mobility and routing options, parking places at destination, EV charging places and City Bike Stands. • The dependency on this (or other) implementations could be injected at runtime depending on the User Profile (and implicitly his/her location).

Table 61 Tampere use case 1: Descriptive table

3.3.2 Use case 2: Estimation of Consumption (CO2 and / or Energy) per Journey Option

3.3.2.1 UML Sequence diagram

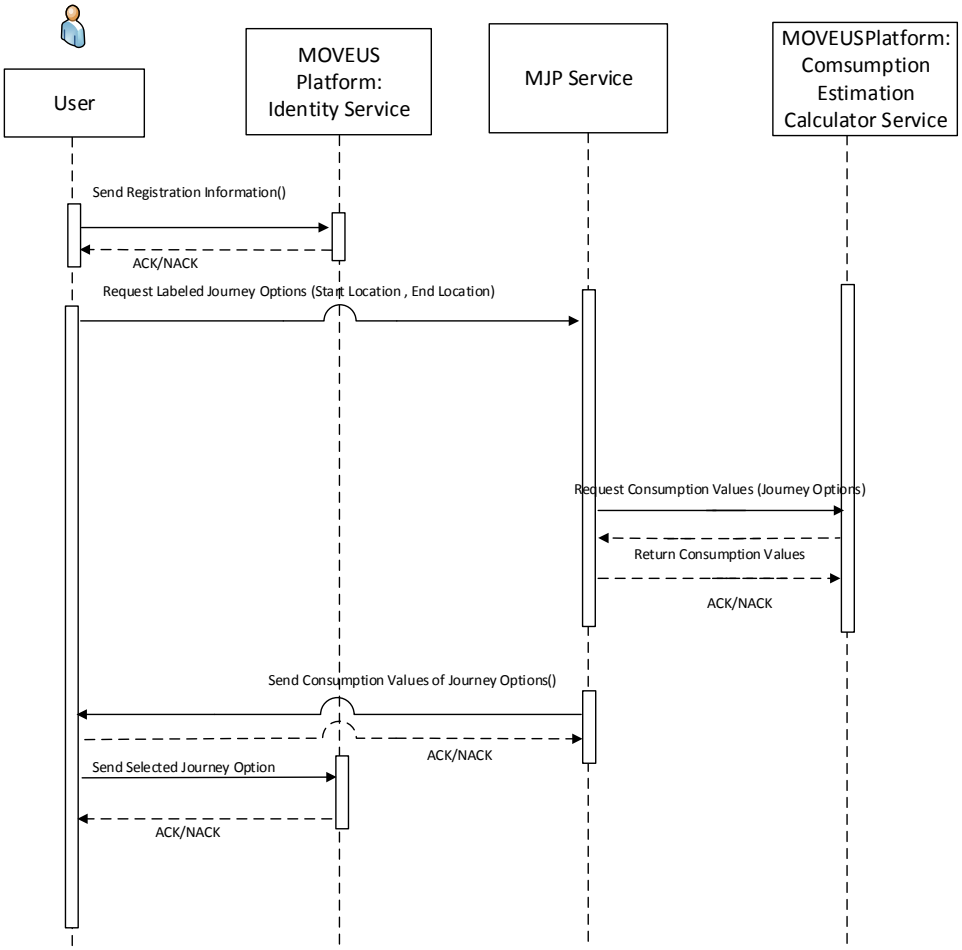

Figure 51 Tampere use case 2_UML Sequence diagram: on-trip phase

3.3.2.2 Descriptive table of the use case 2

This table provides with textual description of the use case diagram included in previous section.

Use Case ID:	**TRE_UC2**
Use Case Name:	Estimation of consumption (CO2 and /or Energy) per Journey Option
Created By:	TUT
Date Last Updated:	26/06/2014
Actors:	• Final user: Entity defining End (Desired) Coordinates and (if needed, i.e. no GNSS data available/ no tracking permission given) Start (Current) coordinates. There are two types of final users: 1) users that want to remain anonymous and 2) users that provide their contact information (e.g. e-mail) to get incentives and more personalized service

	• MoveUs Platform: Identity Service • Tampere Multimodal Journey Planner Service • MoveUs Platform: Consumption Estimation Calculator Service
Description:	Computation of energy/CO2 consumption associated to Journey Option(s), taking into consideration all available mobility and routing options.
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • Multimodal Journey Planner must be deployed. Journey Option(s) for a User, between a Start and an End Location, to be evaluated from the viewpoint of energy/CO2 consumption, must be pre-computed. • Identity service must be deployed.
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Real time
Normal Course of Events	**1. User → MoveUs platform** • Enter MoveUs web site • Enter username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address. • Enter information on user **(→ 2)**: - For anonymous users: i. Name - For identified users: i. Name, address ii. Special roles (e.g. tourist, business) iii. Direct influencers of personal mobility choices (e.g. passion for biking / running, personal acceptance of car/bike sharing) iv. Indirect influencers of personal mobility choices (e.g. preference to commute to work / school in groups) v. Direct influencers of personal routing choices (e.g. aversion towards specific places in the city, parking places) vi. Habits (e.g. regular itineraries undertaken) vii. Particularities of personal vehicles the user is regularly driving (fuel needs, consumption, type of vehicle - electric etc.) **Remark**: information on user can be updated anytime as needed by user. **2. User → Multimodal Journey Planner service (Tampere)** • Enters information on START LOCATION and END LOCATION • Requests Journey Option(s) and consumption labels associated to provided Start and End coordinates (i.e. the Journey Options consumption information)(**→3**) **3. Multimodal Journey Planner service (Tampere)** • Calculates Journey Option(s) associated to provided input Start and End coordinates (**→4**) **4. Multimodal Journey Planner service (Tampere)→ Consumption**

	Estimation Calculator service • Provides Journey Option(s) to label with consumption values • Requests Journey Option(s) consumption information (**→5**) **5. Consumption Estimation Calculator service** • Computes an estimation of consumption of energy/CO2 associated to input Journey Option(s) **→6**) **6. Consumption Estimation Calculator service →Multimodal Journey Planner service (Tampere)** • Provides Journey Option(s) consumption information (**→7**) **7. Multimodal Journey Planner service (Tampere) → User** • Provides Journey Option(s) consumption information (**→ 8**) **8. User** • Selects one Journey Option. .(**→ 9**) **9. MoveUs Platform: Identity Service** Stores information about user's selected Journey Option(s) and associated consumption (for development of long-term statistics/consumption history for the user)
Alternative Courses:	none
Special Requirements:	Terms of use need to be accepted by the final users (need to contain the basic policy in order to provide the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	none
Notes and Issues:	none

Table 62 Tampere use case 2: Descriptive table

3.3.3 Use case 3: User tailored incentive-based visualization of Journey Options

3.3.3.1 UML Sequence diagram

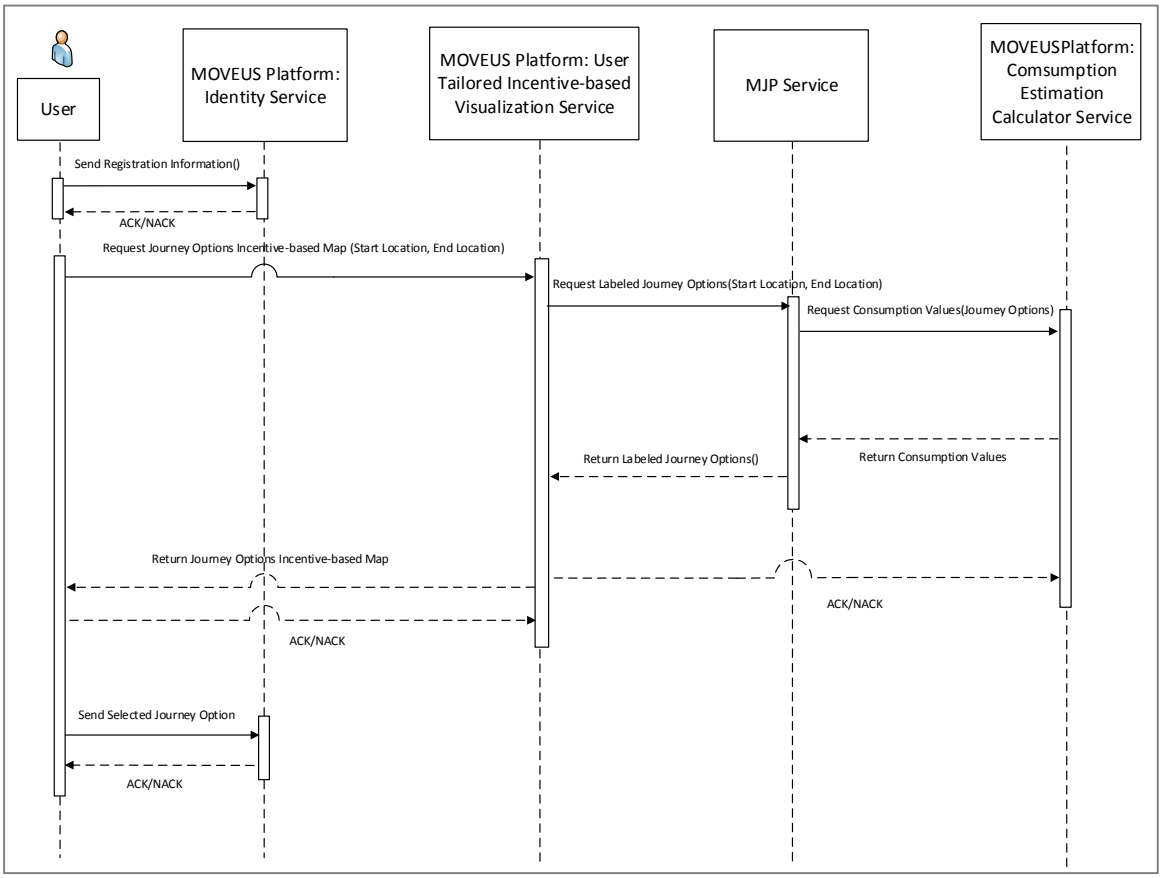

Figure 52 Tampere use case 3_UML Sequence diagram: on-trip phase

3.3.3.2 Descriptive table of the use case 3

This table provides with textual description of the use case diagram included in previous section.

Use Case ID:	**TRE_UC3**
Use Case Name:	Incentive-based visualization of Journey Options
Created By:	TUT
Date Last Updated:	26/06/2014
Actors:	Users: • Final user: Entity defining End (Desired) Coordinates and (if needed, i.e. no GNSS data available/ no tracking permission given) Start (Current) coordinates • MoveUs Platform: Identity Service • Tampere Multimodal Journey Planner Service • MoveUsPlatform: Consumption Estimation Calculator Service • Tampere User-tailored Incentive-based Visualization service

Description:	Translation of quantified energy/CO2 consumption values associated to Journey Options into visual codes associated to available incentives, history of the user, and consumption values.
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • Multimodal Journey Planner must be deployed. • Consumption Estimation Calculator must be deployed. Consumption (Energy/CO2) associated to Journey Option(s) between a Start and an End Location must be pre-computed. • INCENTIVE RULES database must be deployed • INCENTIVES database must be deployed
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Real time
Normal Course of Events	**1. User → MoveUs platform** • Enters MoveUs web site • Enters username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address. • Enters information on user **(→ 2)**: - Name, address - Special roles (e.g. tourist, business) - Direct influencers of personal mobility choices (e.g. passion for biking / running, personal acceptance of car/bike sharing) - Indirect influencers of personal mobility choices (e.g. preference to commute to work / school in groups) - Direct influencers of personal routing choices (e.g. aversion towards specific places in the city, parking places) - Habits (e.g. regular itineraries undertaken) - Particularities of personal vehicles the user is regularly driving (fuel needs, consumption, type of vehicle – electric,etc.) **Remark**: information on user can be updated anytime as needed by user. **2. User → MoveUs platform: User-tailored incentive-based visualization service** • Enters information on START LOCATION and END LOCATION • Requests Journey Options Incentive-based Map (i.e. a visual-friendly display of consumption labels associated to provided Start and End coordinates) (**→3**) **3. MoveUs Platform: User-tailored incentive-based visualization**

	service →Multimodal Journey Planner service (Tampere) • Requests Journey Option(s) Consumption Information associated to the provided input Start and End coordinates (**→4**) **4. Multimodal Journey Planner service (Tampere) → Consumption Estimation Calculator service** • Provides Journey Option(s) to be evaluated from the viewpoint of consumption (CO2/Energy) • Requests Journey Option(s) Consumption Information (**→5**) **5. MoveUs Platform: Consumption Estimation Calculator service** • Computes an estimation of consumption of energy/CO2 associated to input Journey Option(s) **(→6)** **6. MoveUs Platform: Consumption Estimation Calculator service → MoveUs Platform: User tailored incentive-based visualization service** • Provides quantification of the estimated amount of energy/CO2 associated to one/more Journey Option(s) (**→7**) **7. MoveUs Platform: User tailored incentive-based visualization service** • Identifies the optimal, most efficient journey option, from the viewpoint of CO2/Energy consumption • Identifies the difference (in energy/CO2 consumption values) between each of the other journey options and the optimal one, and translates this difference to a number / color code (**→8**) **8. MoveUs Platform: User tailored incentive-based visualization service → User** • Provides color codes to visualize the journey options on a map, by taking into account the user profile and the incentives available • Provides Journey Options Incentive-based Map (i.e. information on consumption associated to Journey Option(s) between Start and End coordinates/location and color codes associated to incentives.)(**→ 9**) **9. User** • Selects one of the available Journey Option(s) .(**→ 10**) **10. MoveUs Platform: Identity Service** • Stores information about user's selected Journey Option(s) and the incentives associated to the selection
Alternative Courses:	none
Special	Terms of use need to be accepted by the final users (need to contain the basic policy in order to provide the service, terms of use for initial

Requirements:	services, explanation of basic role set, etc.)
Assumptions:	none
Notes and Issues:	none

Table 63 Tampere use case 3: Descriptive table

3.3.4 Use case 4: Location of Parking Places

3.3.4.1 UML Sequence diagram

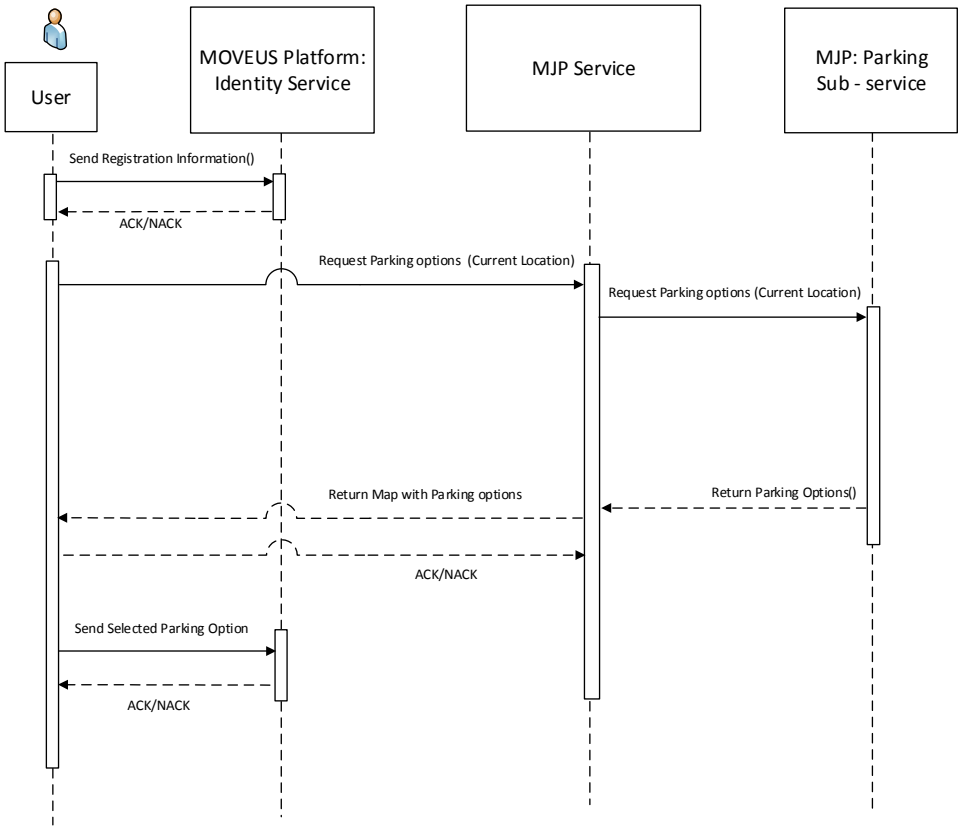

Figure 53 Tampere use case 4_UML Sequence diagram: on-trip phase

3.3.4.2 Descriptive table of the use case 4

This table provides with textual description of the use case diagram included in previous section.

Use Case ID:	**TRE_UC4**
Use Case Name:	Location of parking places at destination
Created By:	TUT/TRE
Date Last Updated:	26/06/2014
Actors:	Users: • Final user: Entity defining End (Desired) Coordinates and (if needed, i.e. no GNSS data available/ no tracking permission given) Start (Current) coordinates. There are two types of final users: 1) users that want to remain anonymous and 2) users that provide their contact information (e.g. e-mail) to get incentives and more personalized service • MoveUs Platform: Identity Service • Tampere Multimodal Journey Planner Service • Tampere Parking Sub-service (HTTP GET from Tampere API: under development)
Description:	Request to Parking sub-service for the location of Parking places close to the destination of the user.
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • Multimodal Journey Planner must be deployed.
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Real time
Normal Course of Events	**1. User → MoveUs platform** • Enters MoveUs web site • Enters username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address. • Enters information on user **(→ 2)**: - Name, address - Special roles (e.g. tourist, business) - Direct influencers of personal mobility choices (e.g. passion for biking / running, personal acceptance of car/bike sharing) - Indirect influencers of personal mobility choices (e.g. preference to commute to work / school in groups) - Direct influencers of personal routing choices (e.g. aversion towards specific places in the city, parking places) - Habits (e.g. regular itineraries undertaken)

	- Particularities of personal vehicles the user is regularly driving (fuel needs, consumption, type of vehicle - electric etc.) **Remark**: information on user can be updated anytime as needed by user. **2. User → Multimodal Journey Planner service (Tampere)** • Enters information on START LOCATION and END LOCATION • Requests Journey Option(s) and consumption labels associated to provided Start and End coordinates (i.e. the Journey Options consumption information)(→3) **3. Multimodal Journey Planner service (Tampere)** • Calculates Journey Option(s) associated to provided End coordinates (→4) **4. Multimodal Journey Planner service (Tampere)** • Computes Journey Option(s) based on the input information provided. Requests information from the sub-service: Parking (→5) **5. Multimodal Journey Planner service (Tampere) → User** • Provides information on all available Parking places(→6) **6. User** • Selects one of the available Parking Place(s).(→7) **7. MoveUs Platform: Identity Service** • Stores information about user's selected Parking Option(s).
Alternative Courses:	none
Special Requirements:	Terms of use need to be accepted by the final users (need to contain the basic policy in order to provide the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	none
Notes and Issues:	none

Table 64 Tampere use case 3: Descriptive table

3.3.5 Use cases diagrams

The following set of UML use case diagrams enable the specification of the two use cases considered in Tampere pilot, and described in the previous section.

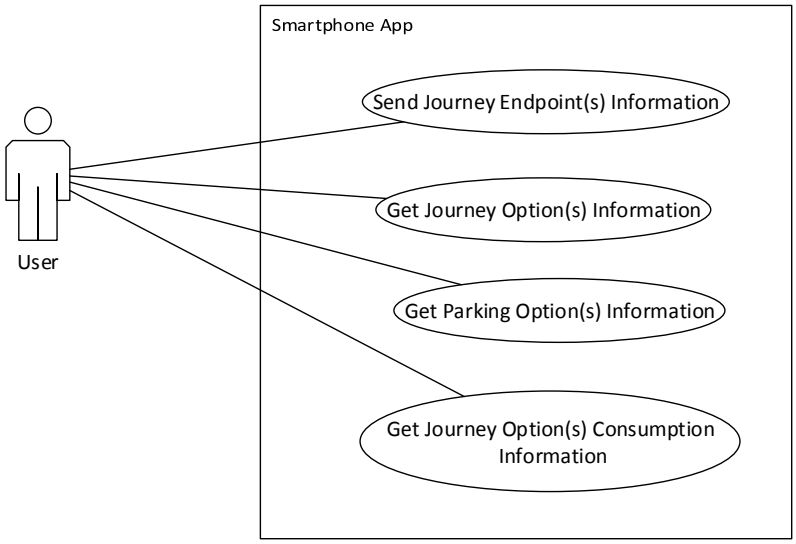

Figure 54 Tampere pilot_User-Smartphone Application UML diagram

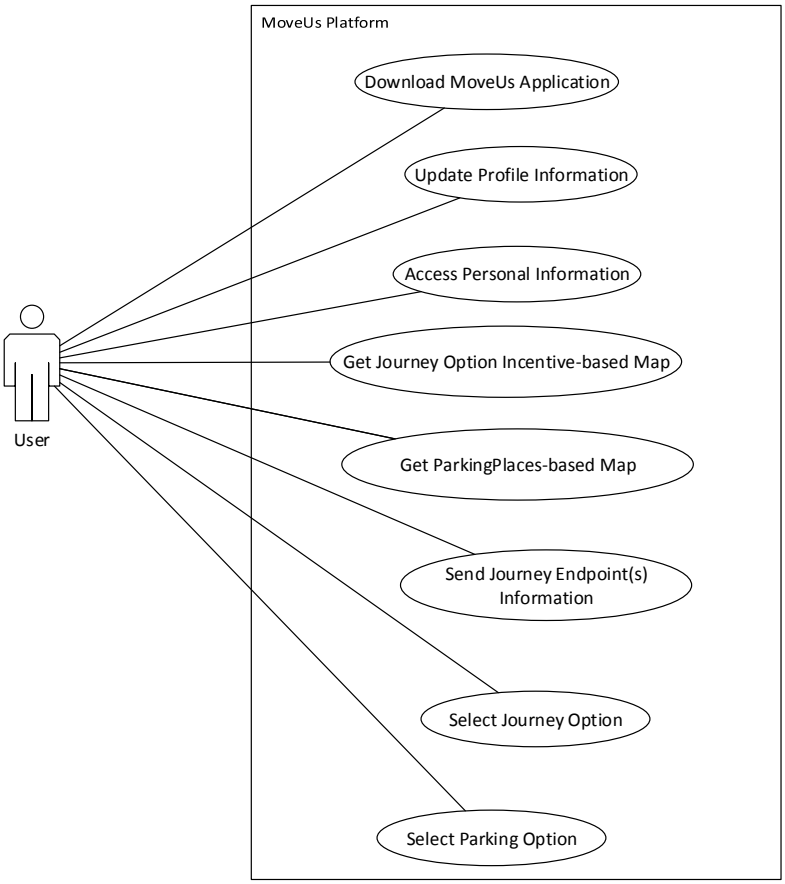

Figure 55 Tampere pilot_User-MoveUs Platform UML diagram

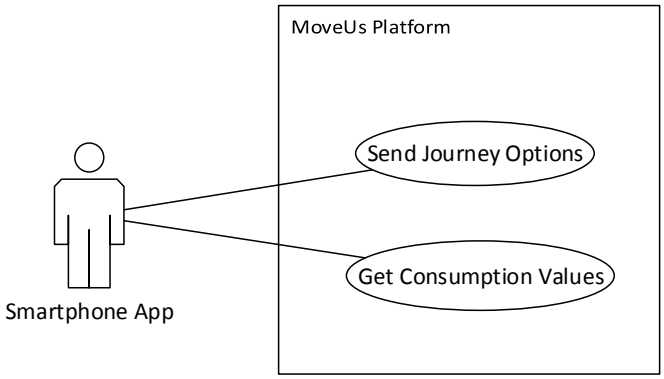

Figure 56 Tampere pilot_Smartphone Application-MoveUs Platform UML diagram

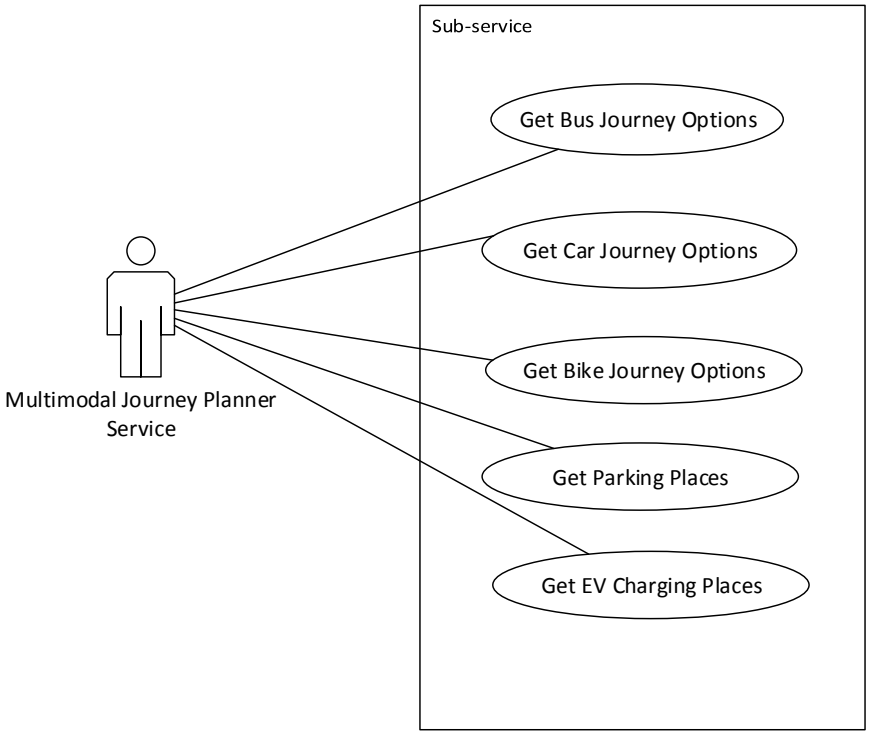

Figure 57 Tampere pilot_MJP service – subservices UML diagram

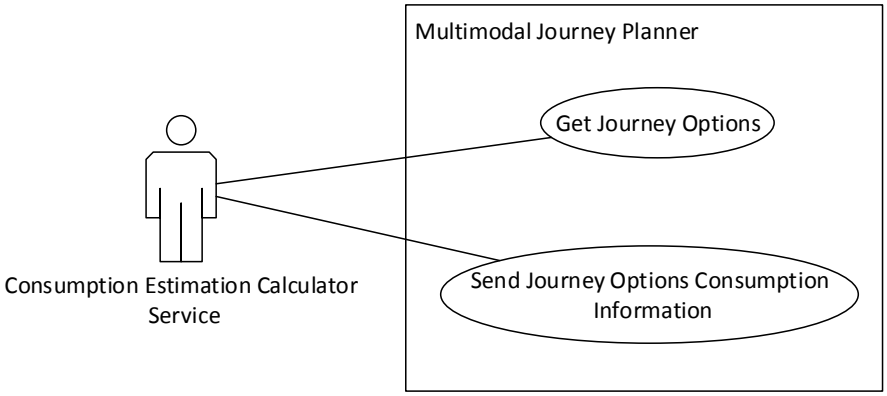

Figure 58 Tampere pilot_CEC service – Application UML diagram

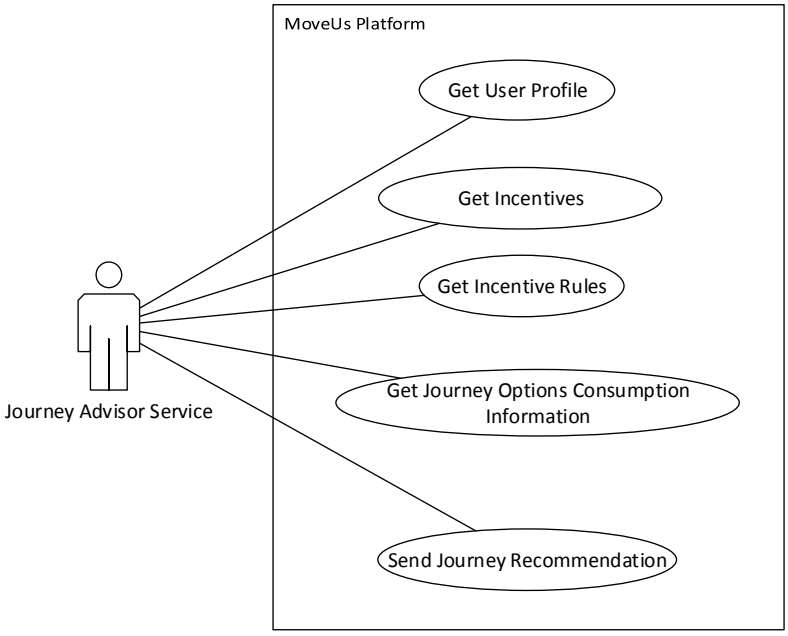

Figure 59 Tampere pilot_Journey Advisor Service – MoveUs platform UML diagram

3.4 Incentives, Coupons, Advertisement, Vouchers provision use cases description

Incentives play a fundamental role in stimulating changes towards new mobility behaviours such as modal shifts and substitutions and/or suppression of trips.

This section describes the use cases related to the management of incentives, coupons, advertisements and vouchers that can be applied and extended to the use cases already described in previous sections for the three pilot sites.

3.4.1 Definitions

- **Incentives**: set of material and virtual objects that help modifying the mobility behaviour to obtain a reduction of driving and/or use of alternative modes (i.e. from private vehicle to public transportation, or to a higher Euro class). Incentives can be also defined as the generic 'money' that can be spent to get benefits or coupons. Concretely this 'money' will be defined more specifically
- **Coupon:** a digital code that allow you to get discounts;
- **Voucher:** a digital code that corresponds to a purchase prepaid;
- **Advertisement:** a set of information and data that can be used to publish or link an advertisement.
- **Electronic Wallet Registry:** set of payments systems**.**

3.4.2 Users

- **Type 1 (UT1)**: Entity defining RULES
- **Type 2 (UT2)**: Entity providing INCENTIVES
- **Type 3 (UT3)**: Entity where INCENTIVES can be spent, entity providing awards (benefits that can be obtained with a certain amount of incentives)
- **Type 4 (UT4)**: Final users
- **Type 5 (UT5)**: Entity providing COUPONS. They can be:
- UT5_MoveUs: MoveUs Internal module usable by other entities to provide COUPONS
- UT5_EXT: External entities providing directly COUPONS via a MoveUs interface available for this purpose
- **Type 6 (UT6)**: Entity providing ADVERTISEMENTS
- UT6_MoveUs: MoveUs Internal module usable by other entities to provide ADVERTISEMENT
- UT6_EXT: External entities providing directly ADVERTISEMENT via a MoveUs interface available for this purpose

3.4.3 Types of incentives/currencies

Type	Unit of measure / Currency
Incentives that are calculated from Energy Efficient Behaviour	CREDIT
Incentives that can be spent in general at more UT3s associated to MoveUs	M_COIN (Moveus Coins)
Incentives that can be spent only at one specific UT3	B_COIN (Bonded Coin)

Table 65 Types of Incentives/currencies

3.4.4 Functional View

The functional view of the Incentives, Coupons, Advertisements, Vouchers is depicted in the following figure:

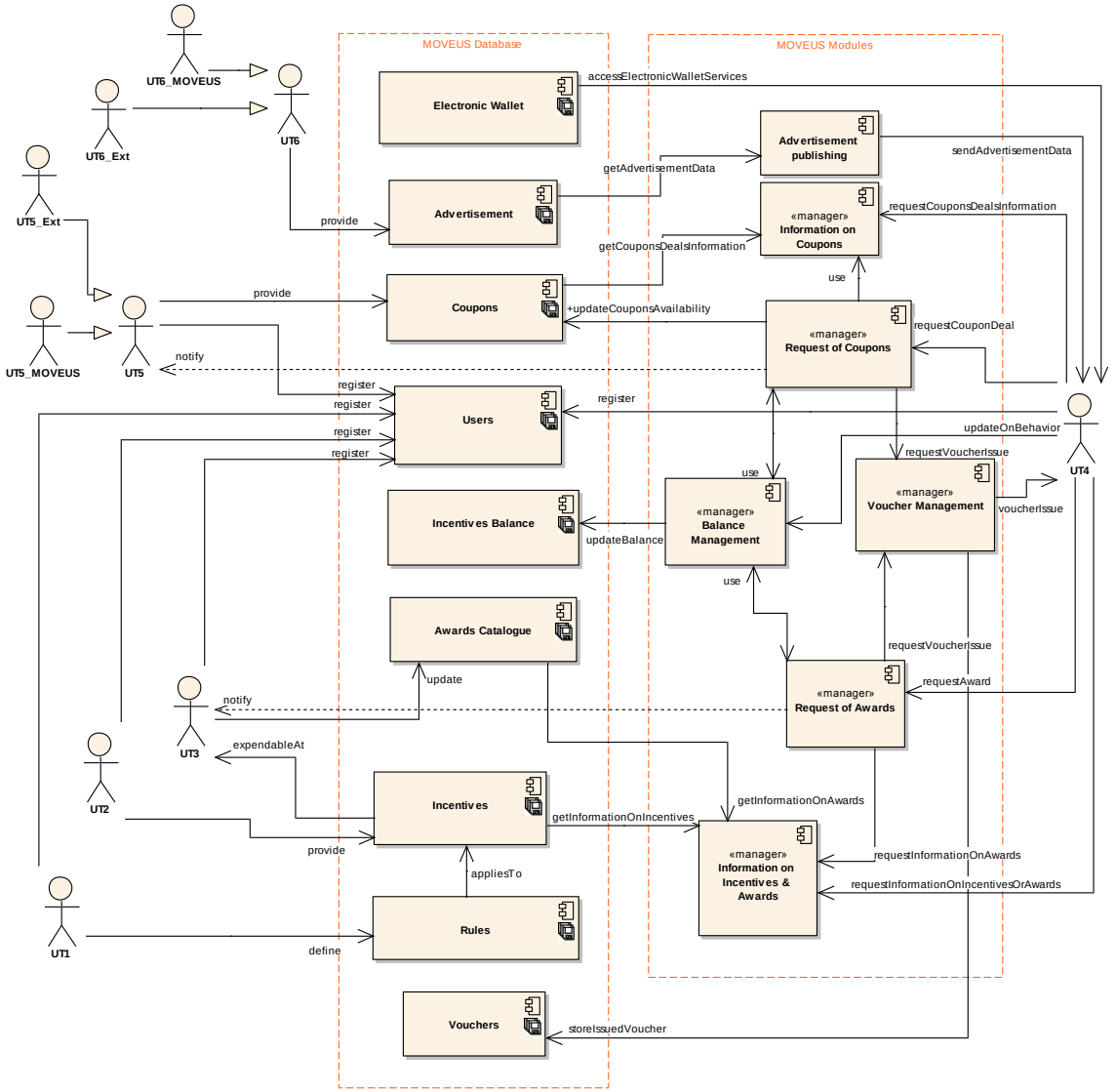

Figure 60 Incentives, Coupons, Advertisements, Vouchers Functional View

3.4.5 MoveUs Database (<<storage>>) – high level definition

Users:	Registry of users described by: • ID • User Type • Name • Etc. Plus User-specific attributes
Electronic Wallet	Information and URL of available payment services the user can be redirected to. Described by: • Description • URL • Etc.
Advertisement	Data on Advertisement. Described by: • Description • Url of the advertisement • Etc.
Coupons	Data on Coupons. Described by: • Description • Validity (Geographical, Dates) • Cost • Etc.
Incentives	Data on incentives. Described by: • Description • Type • Unit of measure • Etc.
User Balance	Amount of incentives units (credits and coins) gained by the users. Described by: • Incentive type • Total • Etc.
Awards Catalogue	Benefits, awards, rewards that can be obtained by giving a certain amount of credits or coins. Described by: • Description • Cost • Validity • Etc.
Rules	Data that define the measure/rule for each incentive. Described by: • Description • Validity (Dates, Geographic area etc.) • Beneficiaries (Type 4 users) • etc.
Vouchers	Contains the historical data on Issued Vouchers.

Table 66 Incentives, Coupons, Advertisements, Vouchers databases

3.4.6 MoveUs MODULES (<<manager>>)

Information on Coupons	Access the Coupons database
Information on Incentives & Awards	Access the Incentives database Access the Awards database
Advertisement publishing	Publishes an advertisement
Request of Coupons	Manage the request of a Coupon/Deal
Request of Awards	Manage the request of an Award
Voucher Issue	Issue a Voucher when a user request a Coupon/Deal or Award
Update Balance	Update the User Balance Database

Table 67 Incentives, Coupons, Advertisements, Vouchers modules

3.4.7 Incentives Management

The figure below gives a general picture of the Incentives Management Use Case, which comprises 5 sub Use Cases described in the following subsections.

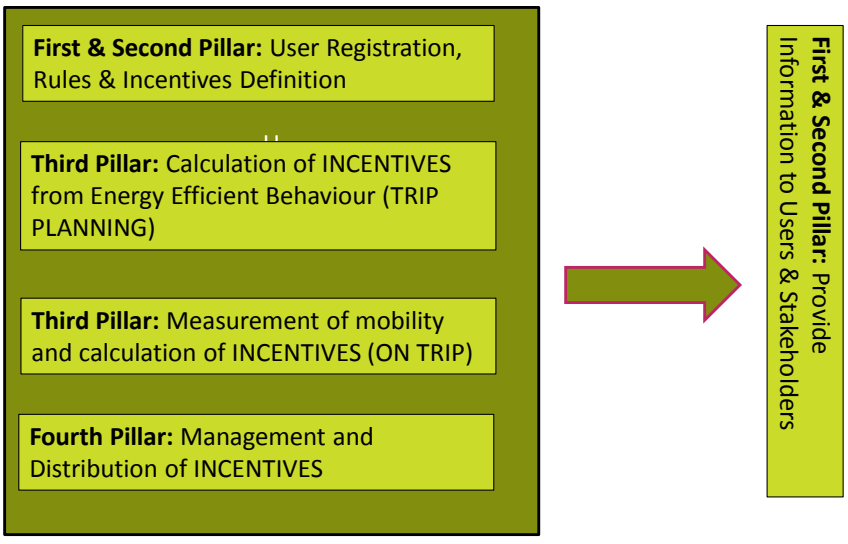

Figure 61 Use Case: Incentives Management general scheme

3.4.7.1 Incentives First & Second Pillar: User Registration, Rules & Incentives Definition

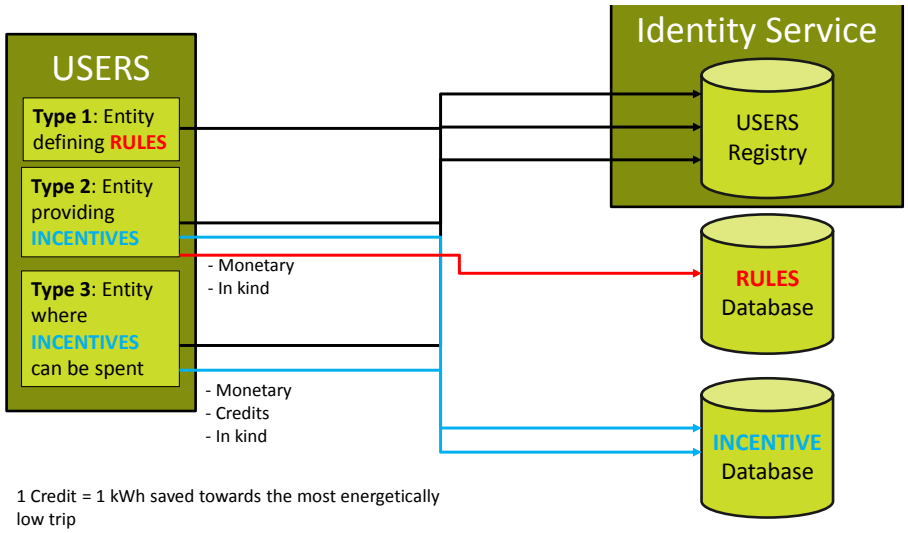

Figure 62 Incentives First & Second Pillar: User registration, rules & incentives definition

The following table provides with textual description of the above use case figure:

Use Case ID:	**INC_UC1**
Use Case Name:	Incentives First & Second Pillar: User Registration, Rules & Incentives Definition
Created By:	QRY
Date Last Updated:	22/03/2014
Actors:	• Users: ○ **Type 1**: Entity defining RULES ○ **Type 2**: Entity providing INCENTIVES ○ **Type 3**: Entity where INCENTIVES can be spent • MoveUs Platform: Identity Service **Remark**: Users Type 1, 2 and 3 can be coincident
Description:	This process aims at loading into the MoveUs platform: • the users profiles Type 1, Type 2 and Type 3 • the RULES/measures enabling the provision of INCENTIVES • the INCENTIVES and the conditions under which they can be spent The user shall log in into the MoveUs platform and act as described below

Preconditions:	Authentication procedures must be deployed (request and info reliability).
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Upon user request
Normal Course of Events	**1. User Type 1 → MoveUs platform** • Enters the MoveUs web site • Enters username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address. • Enters information on user Type 1 (→ 2): - Name, address, VAT - Type of activity (i.e. National Government, Regional Government, Municipal/local government, Business Associations, Consumer/Citizen Associations, Environmental Associations, Motorist Associations, Freight Operators Associations, Individual Business, Neighborhood association, Campus) - Target users Type 4: i. Citizens ii. Tourists iii. Business iv. Pedestrians v. Car drivers vi. …. • Enters information on RULES/measures enabling the provision of Incentives (→ 3): - Description - Validity: i. Dates ii. Geographic area - Beneficiaries (see target Type 4 users) **Remark**: information on user and RULES can be updated anytime as needed by user Type 1. **2. Identity Service** • Stores information about user Type 1 **3. MoveUs platform** • Stores RULES/measures enabling the provision of Incentives into Rules database **4. User Type 2 → MoveUs platform** • Enters the MoveUs web site • Enters username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address. • Enters information on user Type 2 (→ 5): - Name, address, VAT - Type of activity (i.e. National Government, Regional Government, Municipal/local government, Business Associations, Consumer/Citizen Associations, Environmental Associations, Motorist Associations, Freight Operators Associations, Individual Business, Neighborhood association, Campus) - Target users Type 4:

i. Citizens
ii. Tourists
iii. Business
iv. Pedestrians
v. Car drivers
vi. ……

- Enters information on INCENTIVES (→ 6):
  - Description
  - Type and Value:
    i. Monetary (i.e. 0,25/km cycling)
    ii. In kind (i.e. goods/services provided by the user Type 1 himself)
  - Validity:
    i. Dates
    ii. Geographic area
  - Beneficiaries (see target Type 4 users)

Remark: information on user and INCENTIVES can be updated anytime as needed by user Type 2.

5. Identity Service

- Stores information about user Type 2

6. MoveUs platform

- Stores information about INCENTIVES into INCENTIVE Database

7. User Type 3 → MoveUs platform

- Enters the MoveUs web site
- Enters username and password and start the registration; a preliminary email for confirmation will be sent to user to check email address.
- Enters information on user Type 3 (→ 8):
  - Name, address, VAT
  - Type of activity (i.e. National Government, Regional Government, Municipal/local government, Business Associations, Consumer/Citizen Associations, Environmental Associations, Motorist Associations, Freight Operators Associations, Individual Business, Neighborhood association, Campus)
  - Target users Type 4:
    i. Citizens
    ii. Tourists
    iii. Business
    iv. Pedestrians
    v. Car drivers
    vi. ……
- Enters information how to spend INCENTIVES in goods/services (→ 9):
  - Description
  - Conversion rate Credits vs Monetary/In kind
  - Type and Value:
    i. Goods
    ii. Services
    iii. Other
  - Validity:
    i. Dates
    ii. Geographic area
  - Beneficiaries (see target Type 4 users)

Remark: information on user and INCENTIVES can be updated anytime as needed by user Type 3.

8. MoveUs Platform

	• Stores information about user Type 3 **9. MoveUs platform** Stores information about INCENTIVES into INCENTIVE Database
Alternative Courses:	none
Special Requirements:	Terms of use need to be accepted by the users Type 1, Type 2 and Type 3 (need to contain the basic policy in order to provide the service, terms of use for initial services, explanation of basic role set, etc.)
Assumptions:	none
Notes and Issues:	none

Table 68 Incentives Management use case 1: Descriptive table

3.4.7.2 Incentives First & Second Pillar: Provide Information to Users & Stakeholders

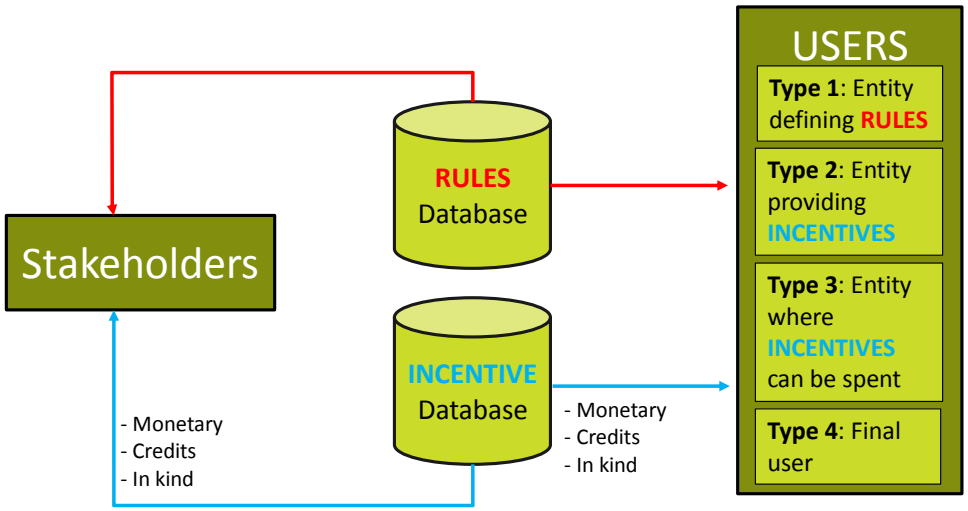

Figure 63 Incentives First and Second Pillar: provide information to users & stakeholders

The following table provides with textual description of the above use case figure:

Use Case ID:	**INC_UC2**
Use Case Name:	Incentive First & Second Pillar: Provide Information to Users & Stakeholders
Created By:	QRY

Date Last Updated:	22/03/2014
Actors:	• Users: ○ **Type 1**: Entity defining RULES ○ **Type 2**: Entity providing INCENTIVES ○ **Type 3**: Entity where INCENTIVES can be spent ○ **Type 4**: Final users • Stakeholders • MoveUs Platform **Remark**: Users Type 1, 2 and 3 and Stakeholders can be coincident
Description:	This process aims at providing Information on RULES and INCENTIVES to Users and Stakeholders The user shall log in into the MoveUs platform and act as described below
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • RULES Database must be deployed • INCENTIVE Database must be deployed
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Upon user request
Normal Course of Events	**1. User Type 1, 2, 3 and 4 → MoveUs platform** • Enters the MoveUs web site • Enters username and password **2. MoveUs Platform → user Type 1, 2, 3 and 4** • Provides Information on RULES and INCENTIVES • Provides Statistics on RULES and INCENTIVES according to login permissions - Balances - Quantities - Values - Beneficiaries • Adds/changes RULES and INCENTIVES if users are allowed to do it according to login permissions **3. Stakeholders → MoveUs platform** • Enters the MoveUs web site • Enters username and password **4. MoveUs platform → Stakeholders** • Provides Information on RULES and INCENTIVES • Provides Statistics on RULES and INCENTIVES according to login permissions - Balances

	- Quantities - Values - Beneficiaries
Alternative Courses:	None
Special Requirements:	None
Assumptions:	None
Notes and Issues:	None

Table 69 Incentives Management use case 2: Descriptive table

3.4.7.3 Incentives Third Pillar: Calculation of INCENTIVES from Energy Efficient Behaviour (TRIP PLANNING)

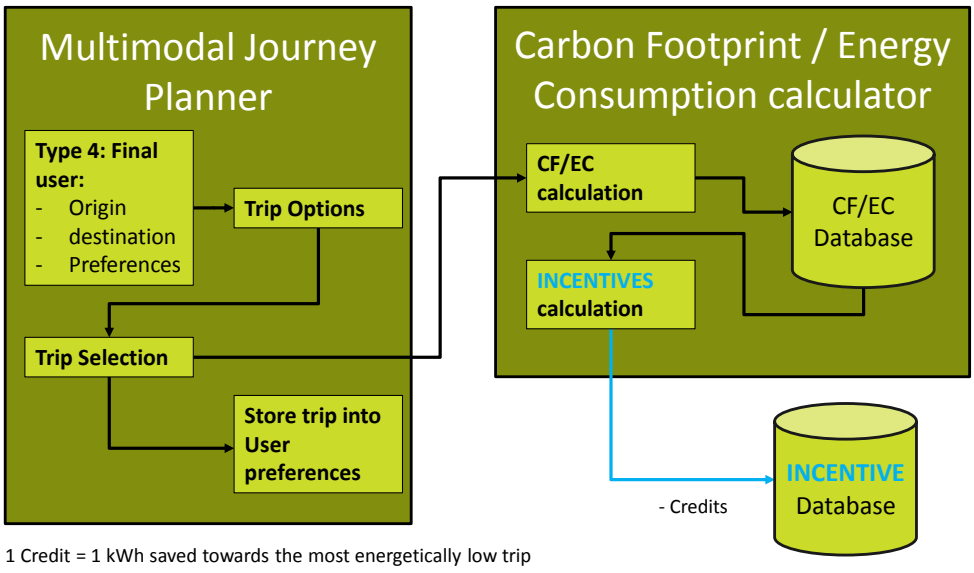

Figure 64 Incentives Third Pillar: Calculation of incentives form energy efficient behaviour (Trip Planning)

The following table provides with textual description of the above use case figure:

Use Case ID:	**INC_UC3.1**
Use Case Name:	Incentives Third Pillar: Calculation of INCENTIVES from Energy Efficient Behaviour (TRIP PLANNING)
Created By:	QRY
Date Last	22/03/2014

Updated:	

Actors:	• Users: Type 4 Final users
	• MoveUs Platform:
	  ○ Multimodal Journey Planner
	  ○ Carbon Footprint / Energy Consumption calculator

Description:	This process aims at calculating the INCENTIVES based on energy efficient behaviour according to the trip selection from Final user. The user shall log in into the MoveUs platform and act as described below
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • Carbon Footprint/Energy Consumption (CF/EC) Database must be deployed • INCENTIVE Database must be deployed • Multimodal Journey Planner must be deployed • Carbon Footprint/Energy Consumption (CF/EC) calculator must be deployed
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Upon user request
Normal Course of Events	**1. User Type 4 → Multimodal Journey Planner** • Enters the MoveUs web site (or APP) • Enters username and password • Selects usual trip or input origin and destination • Selects pre-set preferences **2. Multimodal Journey Planner → user Type 4** • Provides a selection of possible trips according to preferences **3. User Type 4 → Multimodal Journey Planner** • Selects trip **4. Multimodal Journey Planner** • Stores trip into User Type 4 preferences **5. Multimodal Journey Planner → CF/EC calculator** • Send Trip selection **6. CF/EC calculator** • Calculation of CF/EC per selected trip through CF/EC Database • Calculation of INCENTIVES as a difference between the CF/EC of the Trip selected and the CF/EC of the most energetically low trip (1 credit per each kWh saved) • Stores INCENTIVES into the INCENTIVES Database
Alternative Courses:	none

Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 70 Incentives Management use case 3.1: Descriptive table

3.4.7.4 Incentives Third Pillar: Measurement of mobility and calculation of INCENTIVES (ON TRIP)

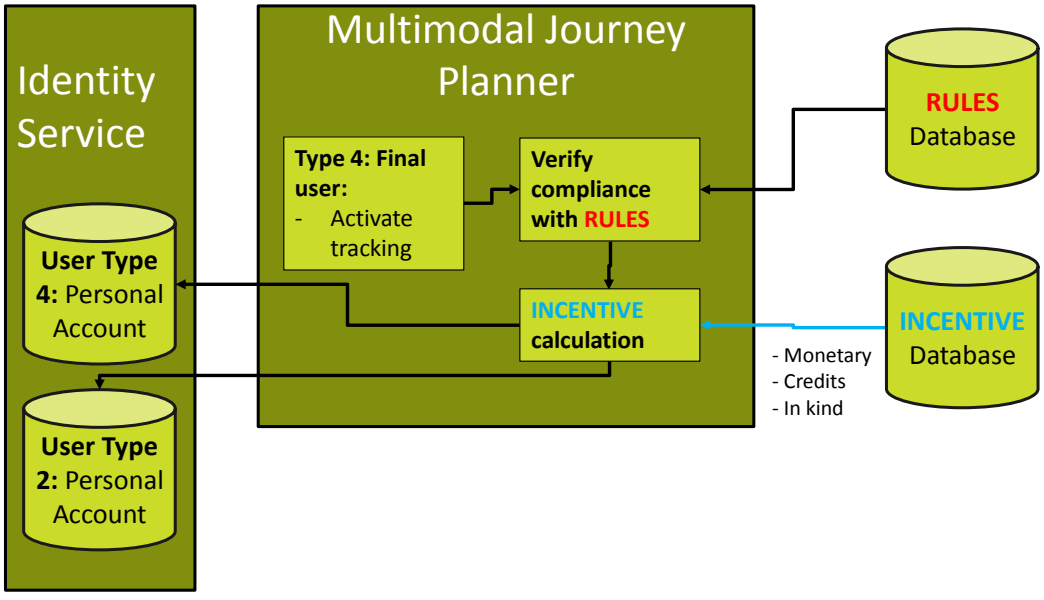

Figure 65 Incentives Third Pillar: Measurements of mobility and calculation of incentives (On trip)

The following table provides with textual description of the above use case figure:

Use Case ID:	**INC_UC3.2**
Use Case Name:	Incentives Third Pillar: Measurement of mobility and calculation of INCENTIVES (ON TRIP)
Created By:	QRY
Date Last Updated:	22/03/2014
Actors:	• Users: Type 4 Final users • Users: Type 2 Entity providing INCENTIVES

	• MoveUs Platform:
	  ○ Identity Service
	  ○ Multimodal Journey Planner

Description:	This process aims at measuring the mobility behaviour providing INCENTIVES to Final users. The user shall log in into the MoveUs platform and act as described below
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • RULES Database must be deployed • INCENTIVE Database must be deployed • Identity Service must be deployed • Journey Planner must be deployed • Users must have a smartphone equipped with GNSS • Users must have authorize MoveUs to track their mobility
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Real Time
Normal Course of Events	**1. User Type 4 → Multimodal Journey Planner** • Activates smartphone tracking • Sends positions, speeds, etc. **2. Multimodal Journey Planner** • Verifies compliance with RULES • Calculates INCENTIVES according to mobility behavior **3. Multimodal Journey Planner → Identity Service** • Stores INCENTIVES gained into User Type 4 Personal Account • Updates INCENTIVES usage to User Type 2 Personal Account
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 71 Incentives Management use case 3.2: Descriptive table

3.4.7.5 Incentives Fourth Pillar: Management and Distribution of INCENTIVES

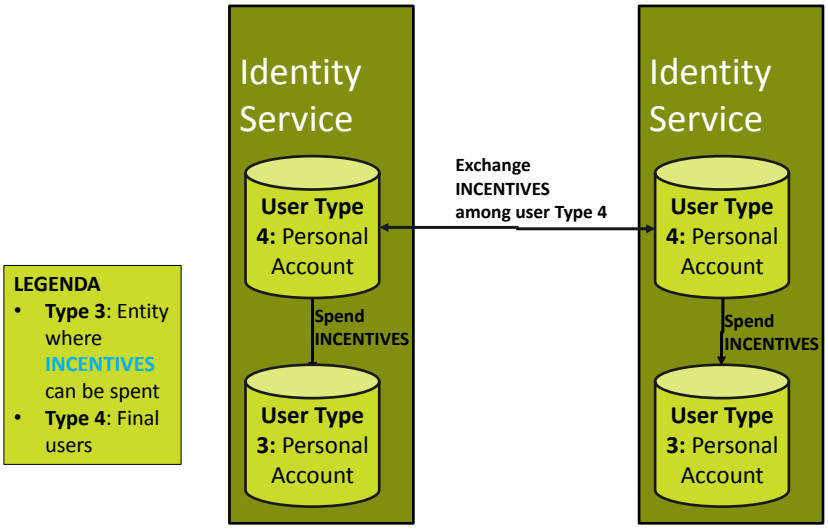

Figure 66 Incentives Fourth Pillar: Management and distribution of Incentives

The following table provides with textual description of the above use case figure:

Use Case ID:	**INC_UC4**
Use Case Name:	Incentives Fourth Pillar: Management and Distribution of INCENTIVES
Created By:	QRY
Date Last Updated:	22/03/2014
Actors:	• Users: **Type 4** Final users • Users: **Type 3** Entity where INCENTIVES can be spent • MoveUs Platform: Identity Service
Description:	This process aims at managing and distributing INCENTIVES. The user shall log in into the MoveUs platform and act as described below.
Preconditions:	• Authentication procedures must be deployed (request and info reliability). • Identity Service must be deployed
Post conditions:	Data protection procedures on data registered (stored) must be activated.
Frequency of Use:	Upon user request

Normal Course of Events	**1. User Type 4 → Identity Services** • Exchanges INCENTIVES among other Users Type 4 • Updates Users Type 4 Personal Accounts • Spends INCENTIVES at Users Type 3 • Updates Users Type 3 Personal Accounts
Alternative Courses:	none
Special Requirements:	none
Assumptions:	none
Notes and Issues:	none

Table 72 Incentives Management use case 4: Descriptive table

3.4.8 Coupons Management

a. Provision of Coupons

UT5 can provide the coupons either via a dedicated interface (UT5 external to MoveUs) or through a dedicated MoveUs service (UT5_MoveUs). This should help manage a variety of situations with internal/external providers.

b. Request of information on available Coupons

The User (the City service he/she uses) issues a request to the module Information on Coupons that retrieves the necessary data from the *Coupons* DB and returns it.

c. Request of Coupons

The User request goes to the *Request of Coupons* module. The module executes the following operations:

I. The details on the requested Coupon are retrieved from the *Coupons* DB including the amount of incentives necessary to get the Coupon. A tradeoff between the incentives and real money is also foreseen.
II. The User Balance is read to check if there is enough incentives to get the Coupon. In order to do this, the Balance management module gets access the Incentives Balance DB.
III. The User Balance is updated[6] by the Balance management module
IV. The availability of Coupons in Coupons DB is updated according to the previous operations.
V. A request of issuing a Voucher is sent to the Voucher Management module.
VI. The Voucher Management module creates and provides the voucher to the user.

[6] In the current description some functional details are omitted. For example before updating the User Balance, the end user service will likely ask a confirmation to the end user. Such details are left for a more complete functional description of the end user services (Task 3.3)

VII. The Vouchers DB is updated with a new set of data related to the voucher that has been issued. UT5 can access the database to check the details on Vouchers (e.g. check validity prior to assign a Deal).

VIII. The UT5 that provided the Coupon is notified about the Voucher issuing for the same type of Coupons.

3.4.9 Advertisement management

a. Provision of data on Advertisement

UT6 provides the data on advertisement

b. Advertisement publication

According to the policies decided at applicative level the end user app (generically, UT4) invokes or use as support the Advertisement publishing module that retrieves the necessary data. The data is sent to UT4 and formatted or used according again to the applicative policies.

3.4.10 Recap of Management of Incentives, Rules and Awards

a. Provision of Incentives

UT2 provides the **incentives** via a dedicated MoveUs interface or service

b. Provision of Rules

UT1 defines the **rules** (more than one rule is allowed) for the incentive.

To understand how the rules are structured at a high level, a rule is composed by:

- A general set of information: description, geographic validity, temporal validity etc.
- One or more "sub-rules" defining how the incentives are assigned to the final user according to his behaviour.

Currently, the reference model or template for implementing a sub-rule (also formally reflected into the Data Model) can be described as follows:

SUB RULE = *How many incentives are assigned for a given distance travelled, with a certain mode of transport and in a certain time slot*

c. Provision of Awards

UT3 can provide the awards (benefits) associated to one or more types of incentives via a dedicated MoveUs interface or service.

d. Collection of Incentives on user behaviour

UT4 can gain incentives according to the rules defined (see previous point b). According to the user behaviour, the end user service (for example the mobile app) invokes the *Balance Management* module to update (for example increase) the amount of Incentives.

e. Request of information on available Incentives

The end user app issues a request that goes to the module *Information on Incentives and Awards*. From here the necessary data from the *Incentives* DB are requested and returned.

f. Request of information on available Awards (Awards catalogue)

The end user issues a request that goes to the module *Information on Incentives and Awards* that get the necessary data from the *Awards* DB and returns it

g. Request of Awards

The User issues a request that goes to the *Request of Awards* module. The module executes the following operations:

I. The details on the requested Award are retrieved from the *Awards* DB. This includes the requested amount of incentives. A trade of between the requested incentives and money is also foreseen.
II. The User Balance is read to check if the Award can be actually obtained. To do this, the *Balance management* module makes access the *Incentives Balance* DB.
III. The User Balance is updated by the *Balance management* module
IV. The availability of Awards (*Awards* DB) is updated according to the previous operations.
V. A request of issuing a Voucher is sent to the *Voucher Management* module.
VI. The *Voucher Management* module creates and provides the voucher to the user.
VII. The *Vouchers* DB is updated with a new set of data related to the voucher that has been issued. UT5 can access the database to check the details on Vouchers (e.g. check validity prior to assign an award).
VIII. The UT3 that provided the Award is notified about the Voucher issuing.

3.4.11 MoveUs Incentives examples

3.4.11.1 Users

- **Type 1 (UT1)**: Entity defining RULES
- **Type 2 (UT2)**: Entity providing INCENTIVES
- **Type 3 (UT3)**: Entity where INCENTIVES can be spent, entity providing awards (benefits that can be obtained with a certain amount of incentives)
- **Type 4 (UT4)**: Final users

3.4.11.2 Monetary Incentives

		Example 1: the car insurance X provides 1.5 Euro per day to their car drivers living in the city YY if they do not use their car within the city Y limits in that day; the underpinning reason is the consequent reduction on accident risks that at the end shall be paid by the car insurance X; this money could be spent everywhere.	**Example 2**: the car insurance X provides 1.5 Euro per day to their car drivers living in the city YY if they do not use their car within the city Y limits in specific days defined by the Municipality Y; the underpinning reasons are (i) the consequent reduction on accident risks that at the end shall be paid by the car insurance X; (ii) the needs to reduce congestion and/or pollution in critical days; this money could be spent everywhere.	**Example 3**: the Bike User Association provides 0.05 Euro per minute (or km) of use of bike sharing in the city Y; the underpinning reason is that the Association wants to improve the number of bikers in the city Y; this money could be spent everywhere.
Users:	Registry of users described by: • ID • User Type • Name • Etc. Plus User-specific attributes	• **Type 1**: Car Insurance X • **Type 2**: Car Insurance X • **Type 3**: All MoveUs users registered as Type 3 • **Type 4**: car drivers insured by Car Insurance X living in the city Y	• **Type 1**: Municipality • **Type 2**: Car Insurance X • **Type 3**: All MoveUs users registered as Type 3 • **Type 4**: car drivers insured by Car Insurance X living in the city Y	• **Type 1**: Bike Association • **Type 2**: Bike Association • **Type 3**: All MoveUs users registered as Type 3 • **Type 4**: all bike sharing subscribers living in the city Y
Rules	Data that define the measure/rule for each incentive. Described by: • Description • Validity (Dates, Geographic	• The car engine must not be turned on during the day within the city Y limits	• The car engine must not be turned on during the day within the city Y limits	• Use the bike in the city Y

	area etc.) • Beneficiaries (Type 4 users) • etc.			
Incentives	Data on incentives. Described by: • Description • Type • Unit of measure • Etc.	• 1.5 Euro per Day without using the car within the city Y limits	• 1.5 Euro per Day without using the car within the city Y limits in days specified by the Municipality	• 0.05 Euro per minute (or km) of bike usage within the city Y limits.
Awards Catalogue	Benefits, awards, rewards that can be obtained by giving a certain amount of credits or coins. Described by: • Description • Cost • Validity • Etc.	• All products/services input by **Users Type 3**	• All products/services input by **Users Type 3**	• All products/services input by **Users Type 3**
User Balance	Amount of incentives units (credits and coins) gained by the users.	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives
Vouchers	Contains the historical data on Issued Vouchers.	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)

Table 73 Monetary Incentives: Descriptive table

3.4.11.3 In-kind Incentives

		Example 1:the car insurance X provides 1 bus ticket per day to their car drivers living in the city Y if they do not use their car within the city Y limits in that day; this ticket necessarily must be spent in the Public Transportation of city Y.	**Example 2**: the Bike User Association provides a discount of 1% for every 20 km of use (or 20 minutes) of bike sharing in the city Y; this discount can be obtained only at stores in city Y affiliated to the Association.	**Example 3**: the Bike User Association provides a free annual membership if the annual usage in city Y of bike sharing reaches 1000 km (or 1000 minutes).
Users:	Registry of users described by: • ID • User Type • Name • Etc. Plus User-specific attributes	• **Type 1**: Car Insurance X • **Type 2**: Car Insurance X • **Type 3**: Public Transportation of city Y • **Type 4**: car drivers insured by Car Insurance X living in the city Y	• **Type 1**: Bike Association • **Type 2**: Bike Association • **Type 3**: All stores in city Y affiliated to Bike Association • **Type 4**: all bike sharing subscribers living in the city Y	• **Type 1**: Bike Association • **Type 2**: Bike Association • **Type 3**: Bike Association • **Type 4**: all bike sharing subscribers living in the city Y
Rules	Data that define the measure/rule for each incentive. Described by: • Description • Validity (Dates , Geographic area etc.) • Beneficiaries (Type 4 users) • etc.	• The car engine must not be turned on during the day within the city YY limits	• Use the bike in the city Y	• Use the bike in the city Y

Incentives	Data on incentives. Described by: • Description • Type • Unit of measure • Etc.	• 1,5 euro per Day without using the car within the city YY limits	• A discount of 1% for every 20 km of use (or 20 minutes) of bike sharing in the city Y specified by the Municipality	• Free annual membership if the annual usage in city Y of bike sharing reaches 1000 km (or 1000 minutes).
Awards Catalogue	Benefits, awards, rewards that can be obtained by giving a certain amount of credits or coins. Described by: • Description • Cost • Validity • Etc.	• Bus tickets	• All products/services input by stores in city Y affiliated to Bike Association	• Free annual membership
User Balance	Amount of incentives units (credits and coins) gained by the users.	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives
Vouchers	Contains the historical data on Issued Vouchers.	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)

Table 74 In-kind Incentives: Descriptive table

3.4.11.4 Credits Incentives

Credits are incentives calculated from Energy Efficient Behaviour; the amount of credits will be calculated by the MoveUs platform according to Rules defined in WP4

		Example 1: the Retail Chain X gives 1 euro discount for each 100 credits gained in city Y by citizens of city Y registered in its Fidelity Program	**Example 2**: the Municipality Y gives to citizens 1 free entrance to its public museums for each 10.000 credits gained in city Y
Users:	Registry of users described by: • ID • User Type • Name • Etc. Plus User-specific attributes	• **Type 2**: Retail Chain X • **Type 3**: All stores of Retail Chain X in the city Y • **Type 4**: All citizens of city Y registered in the Fidelity Program of Retail Chain X	• **Type 2**: Municipality Y • **Type 3**: All public museums in the city Y • **Type 4**: All citizens of city Y
Rules	Data that define the measure/rule for each incentive. Described by: • Description • Validity (Dates, Geographic area etc.) • Beneficiaries (Type 4 users) • etc.	• Defined in WP4	• Defined in WP4
Incentives	Data on incentives. Described by: • Description • Type • Unit of measure • Etc.	• 1 euro discount for each 100 credits gained in city Y	• 1 free entrance for each 10.000 credits gained in city Y
Awards Catalogue	Benefits, awards, rewards that can be obtained by giving a certain amount of credits or coins. Described by:	• Catalog of the Fidelity Programs of Retail Chain X	• List of public museums in city Y

	• Description • Cost • Validity • Etc.		
User Balance	Amount of incentives units (credits and coins) gained by the users.	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives	• **User Type 4** checks periodically the balance until it reaches the value needed to cash in the incentives
Vouchers	Contains the historical data on Issued Vouchers.	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)	• **User Type 4** ask MoveUs to issue an electronic voucher to cash in the incentives • Then **User Type 4** uses the voucher at **User Type 3** premises (physical or virtual)

Table 75 Credit Incentives: Descriptive table

3.5 Common specifications of the pilots

This section is aimed at harmonizing all the descriptions of the use cases considered in the previous sections of this deliverable, so as to assure that all requisites have been covered by such descriptions.

In Section 3.5.1 different diagrams have been created so as to harmonize at a high level the functional blocks from the different use cases and pilots, and to align them with the description of the use cases.

Finally, preliminary mapping of the use cases in the functional diagrams have been carried out.

3.5.1 Harmonization of use cases

A set of diagrams and tables have been produced for the reviewing and harmonization of the use cases description:

- Functional blocks diagram: this diagram shows high level functionalities that are aligned with the requisites and capacities identified in task T2.2; detailed functionalities block diagrams will be further elaborated in WP3 and more aligned with the possible functional architecture of the MoveUs system.
- Integrated use cases diagrams: those diagrams integrated the different use cases/ pilots; based on the description of the use cases, different cases have been identified and aligned with the functional blocks, either in pre-trip and on-trip/post-trip phases, for the traffic control/capture and for the incentives management.

A preliminary mapping of functions related to the use cases have been taken into account by following a color code: Red for Madrid use cases, Green for Genoa use cases and Blue for Tampere use cases;

At the end of this section, a summary table of the preliminary function mapping has been included for the three pilot cities.

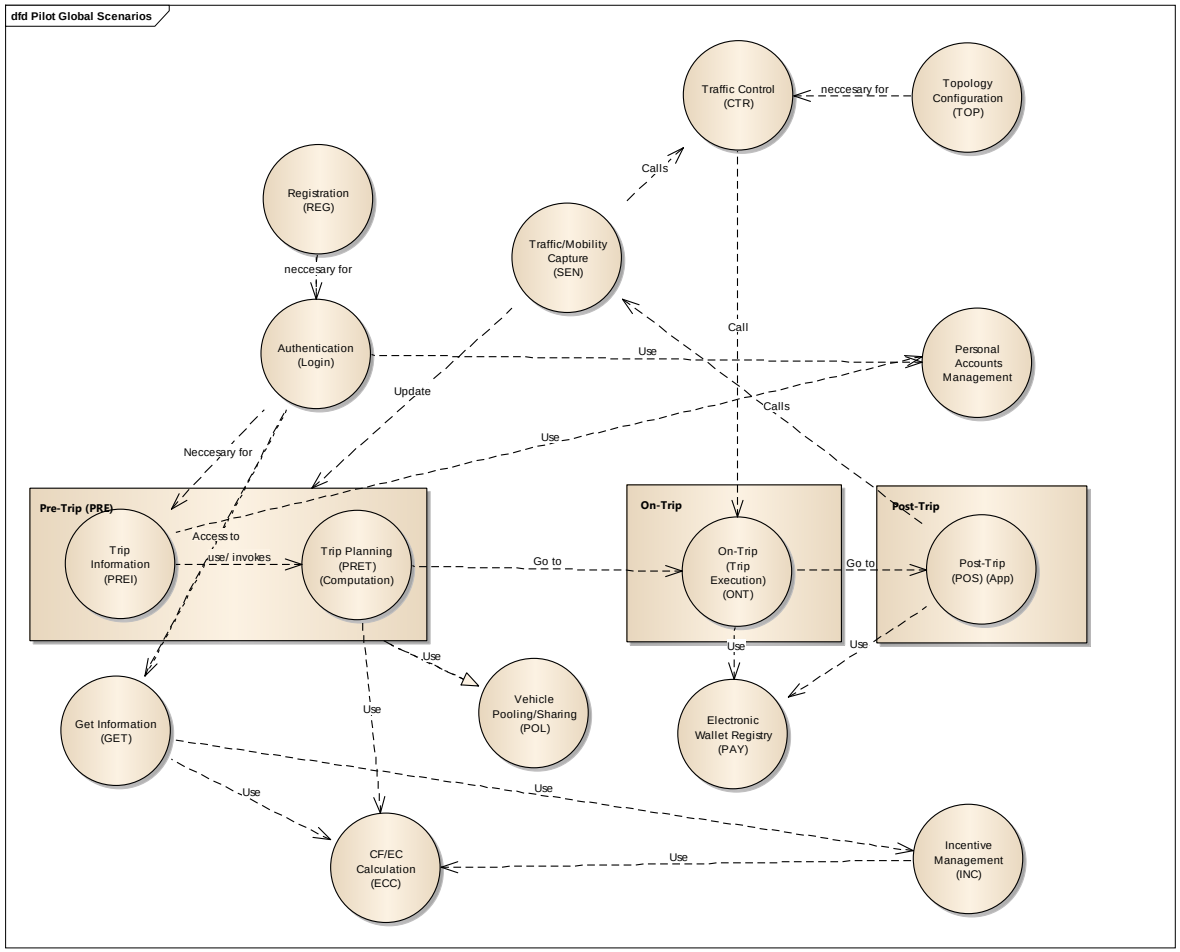

Figure 67 High level functional blocks diagram

Extending the High level functional blocks identified in section **¡Error! No se encuentra el origen de la referencia.**; several additional blocks are introduced here in order to cover specific issues of Madrid and Tampere pilots.

- Traffic/Mobility Capture (SEN). The Traffic/Mobility Data Capture Function allow the capture and storage of dynamic/real-time external information and measures (from different actors as field devices, operators or host vehicles).
- Topology Configuration (TOP). The Topology Configuration Function, allow the capture and storage of static information of the road network
- Traffic Control (CTR). The Traffic Control Function integrates a set of capabilities able to manage urban traffic by means of sending commands to field devices.

The next diagram maps the different pilot use-cases to predefined High-level functional blocks.

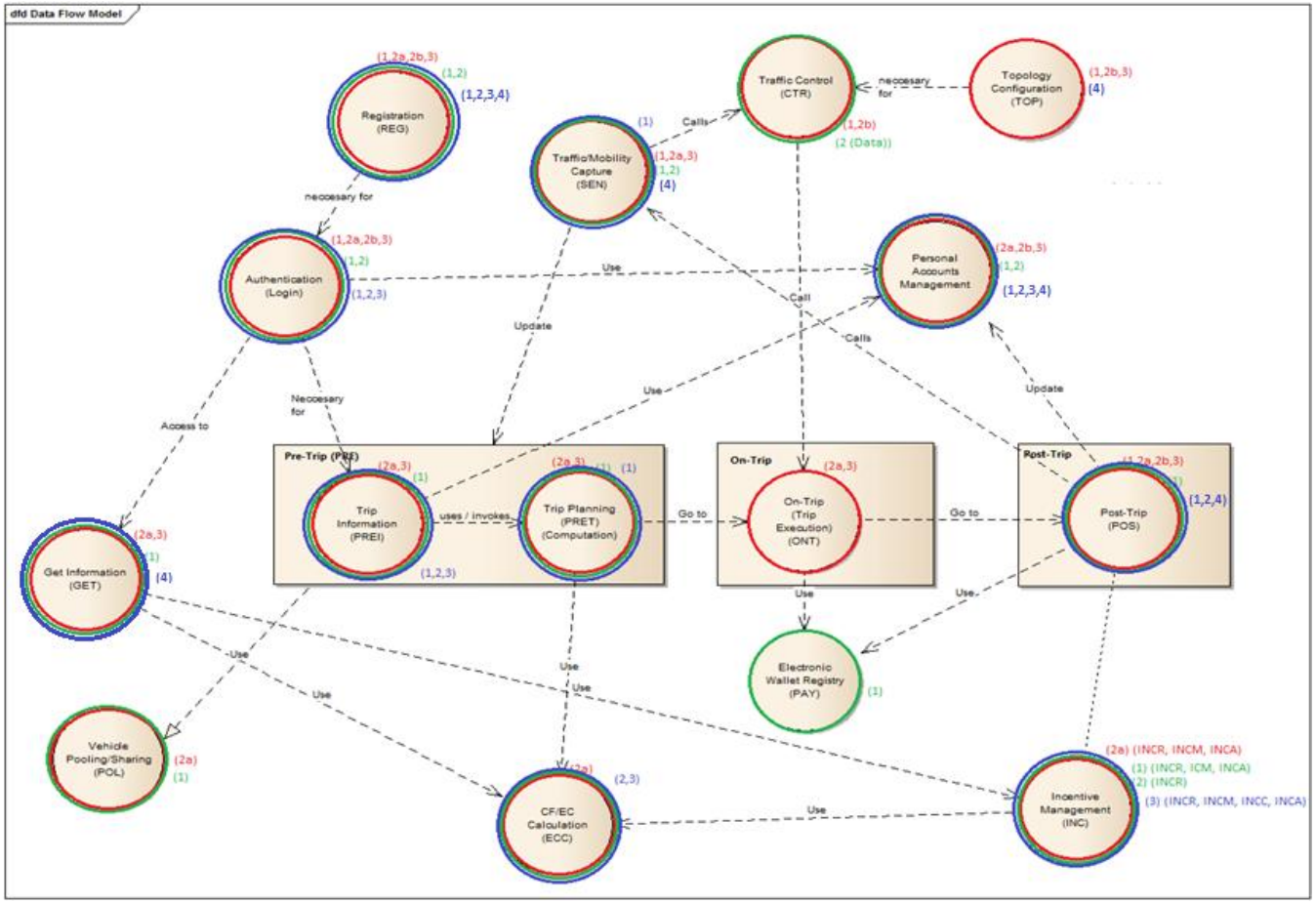

Figure 68 High level functional blocks diagram mapped for the three pilot sites

As mentioned before, the following diagrams identify different cases and align them with High-level functional blocks. Due the complexity of drawing and visualize such relations, information have been organized according to different issues.

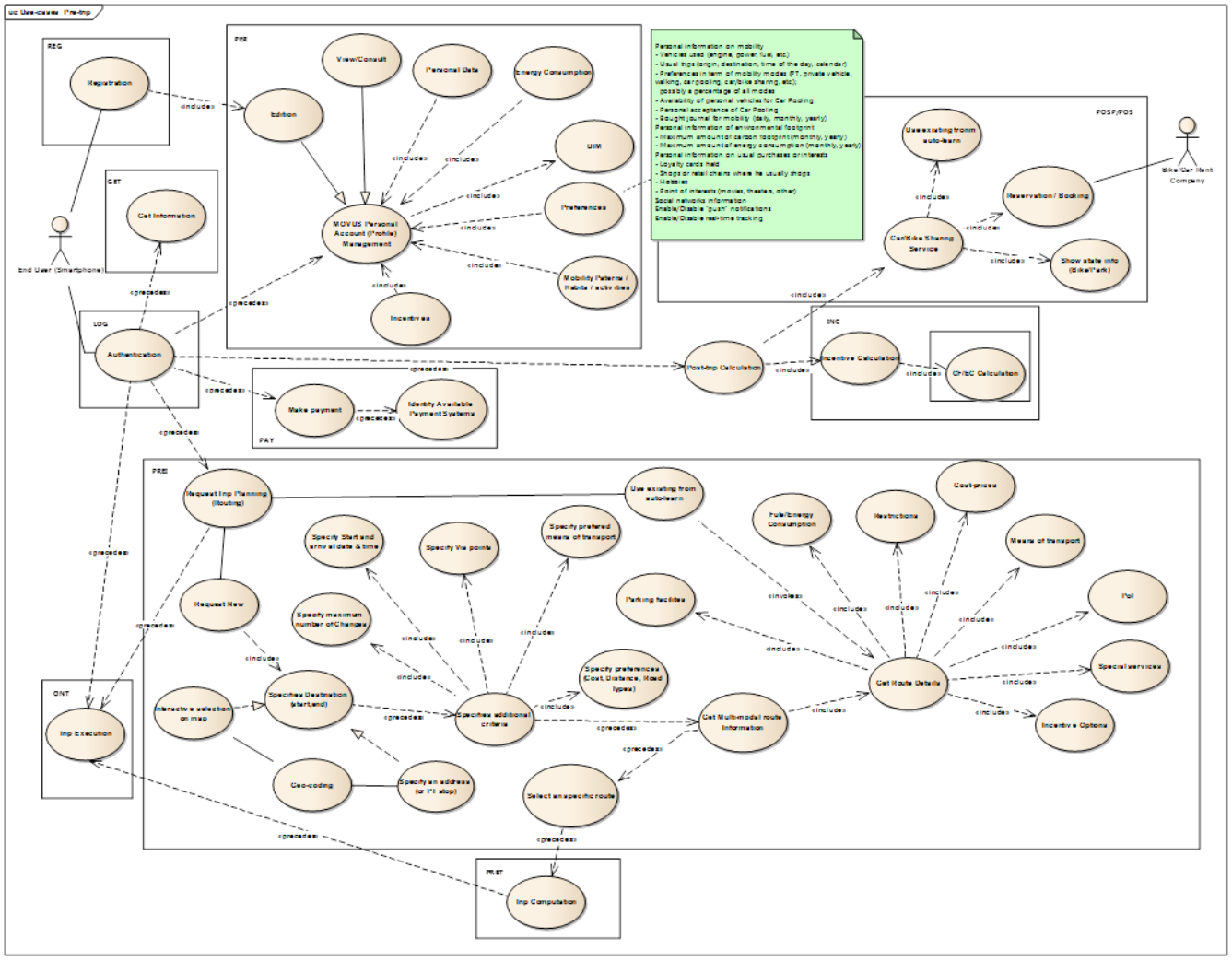

Figure 69 Use cases integrated diagram - pre-trip phase

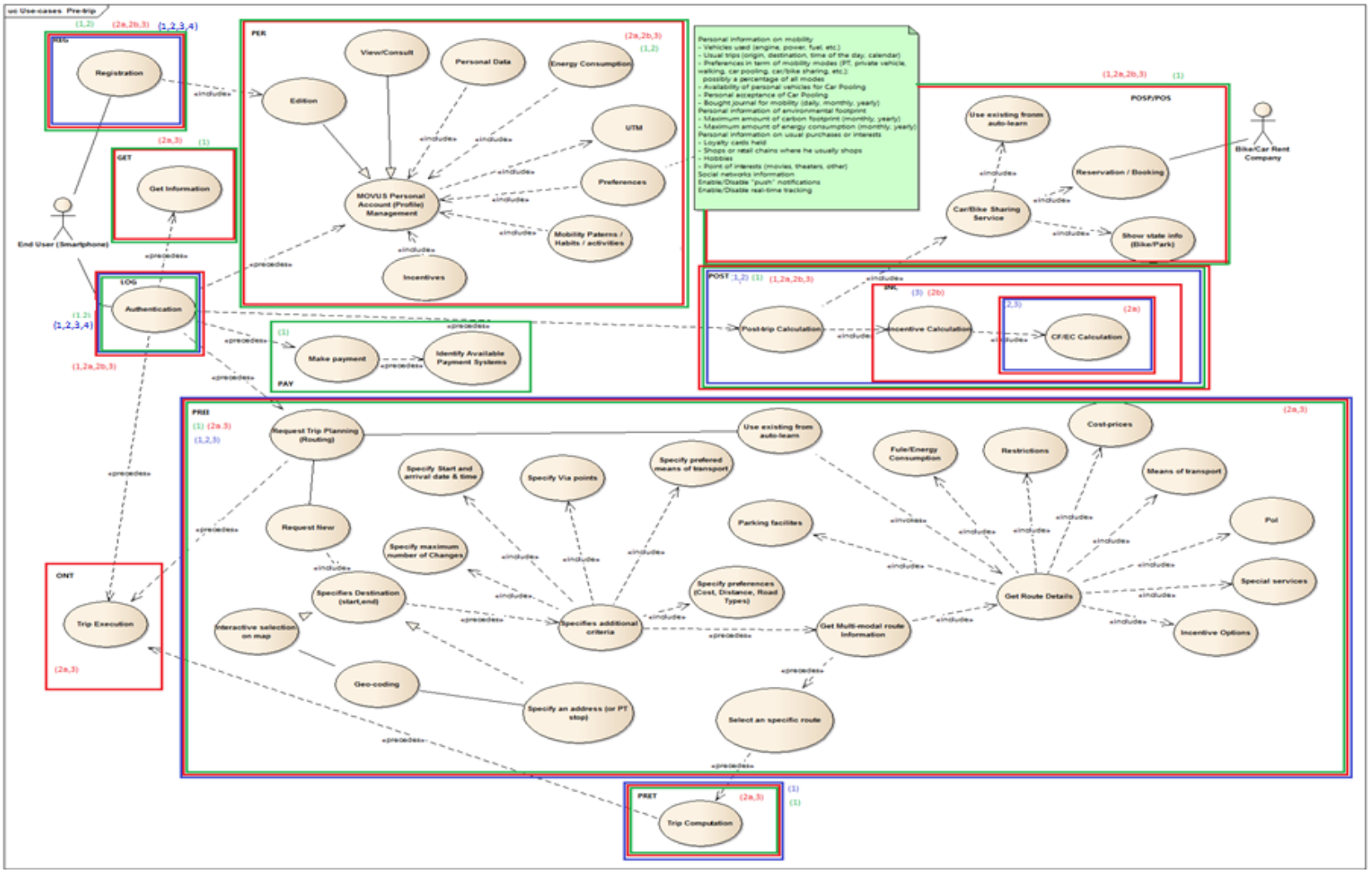

Figure 70 Use cases integrated diagram - pre-trip phase mapped for the three pilot sites_1

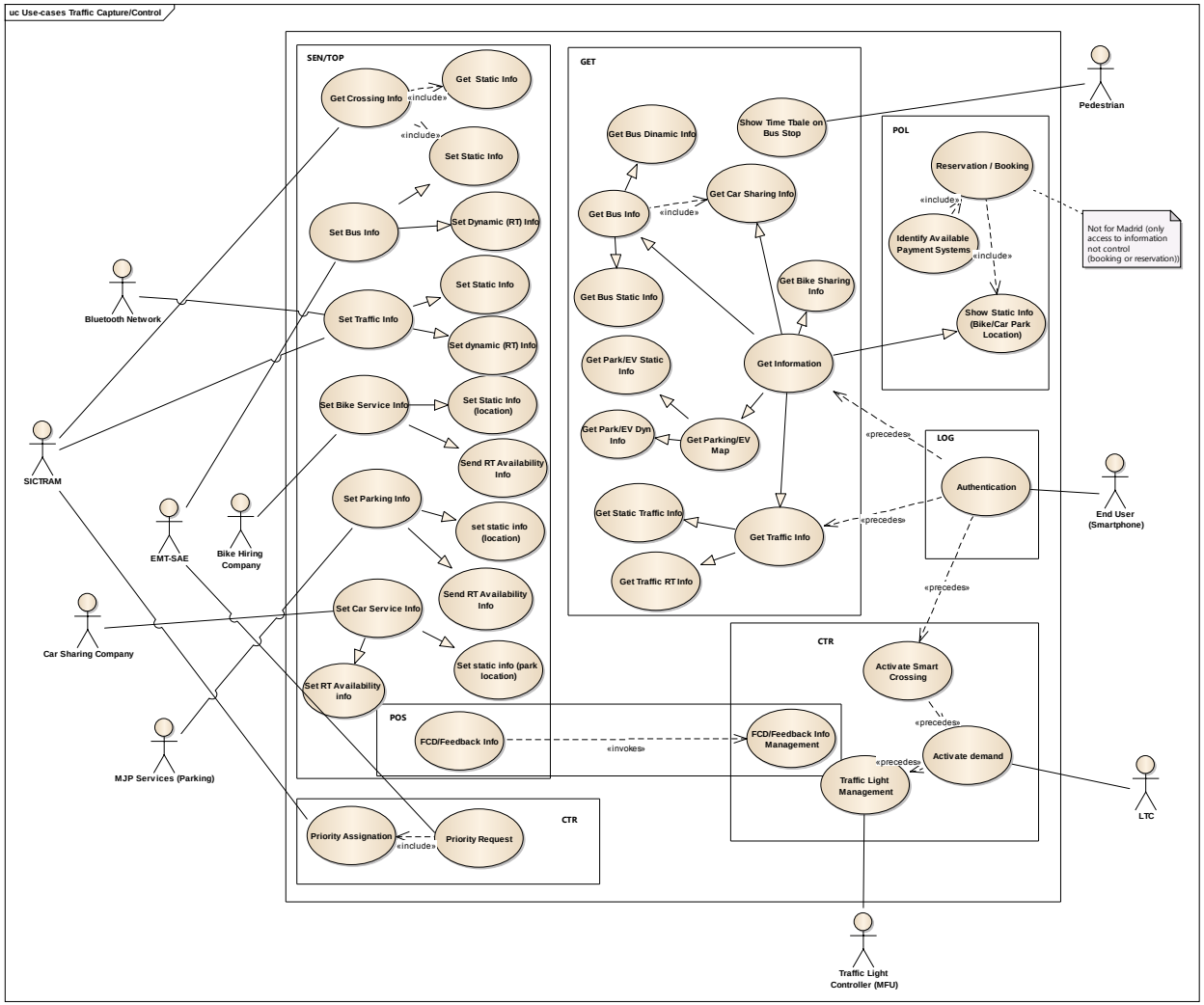

Figure 71 Use cases integrated diagram –traffic control/capture – only for Madrid use case and Tampere's parking use-case

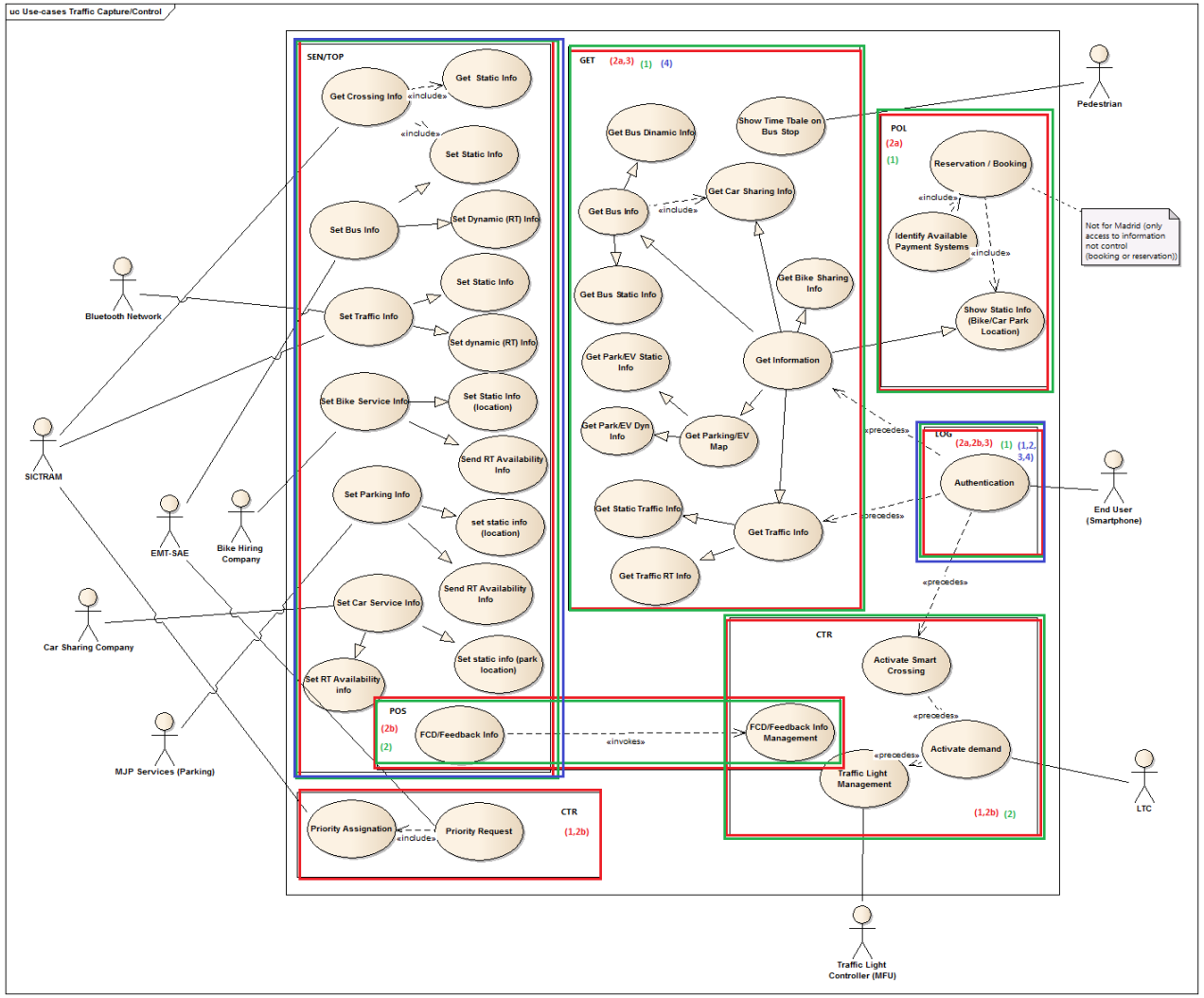

Figure 72 Use cases integrated diagram - pre-trip phase mapped for the three pilot sites_2

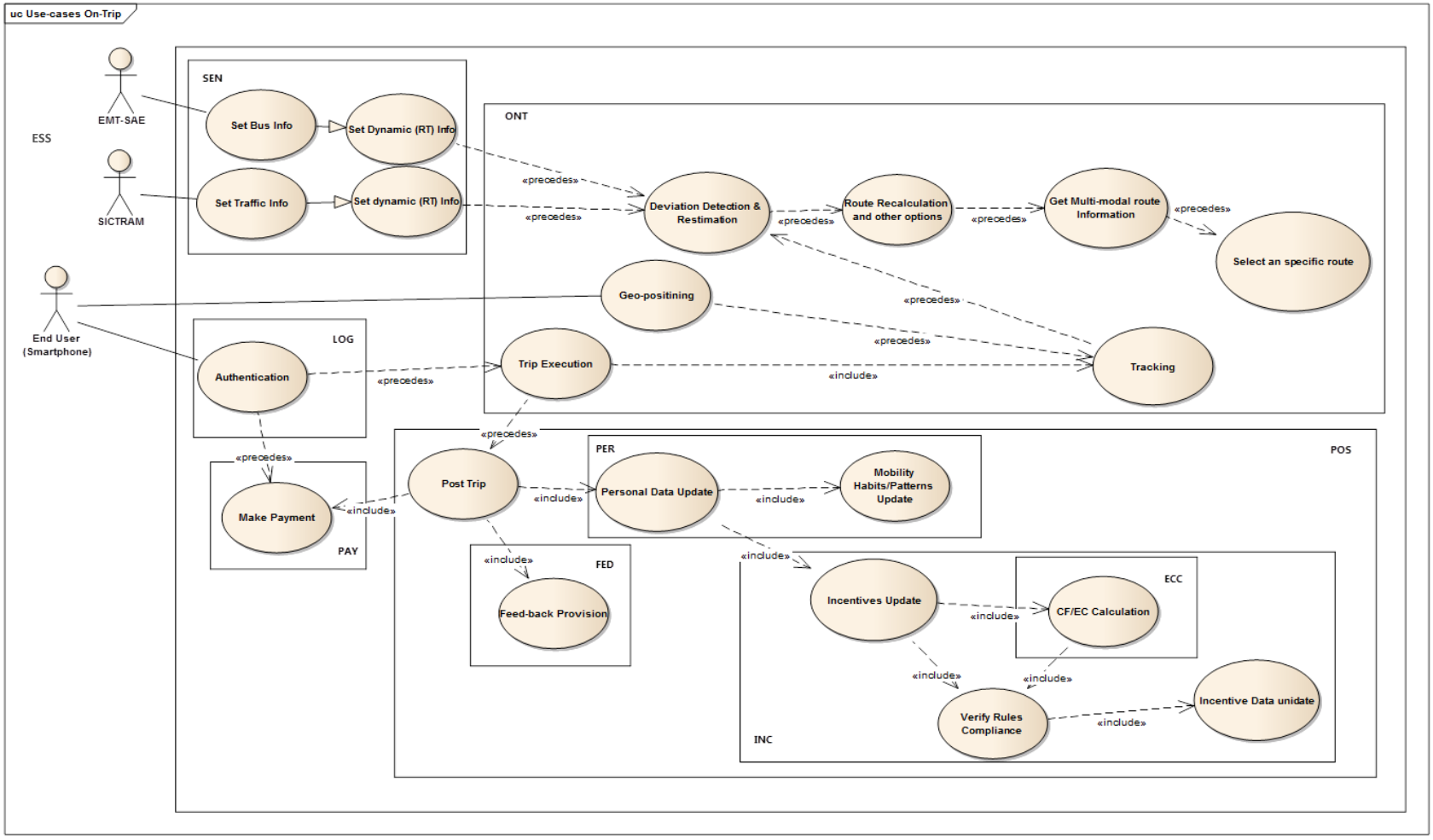

Figure 73 Use cases integrated diagram - on-trip/ post trip phases

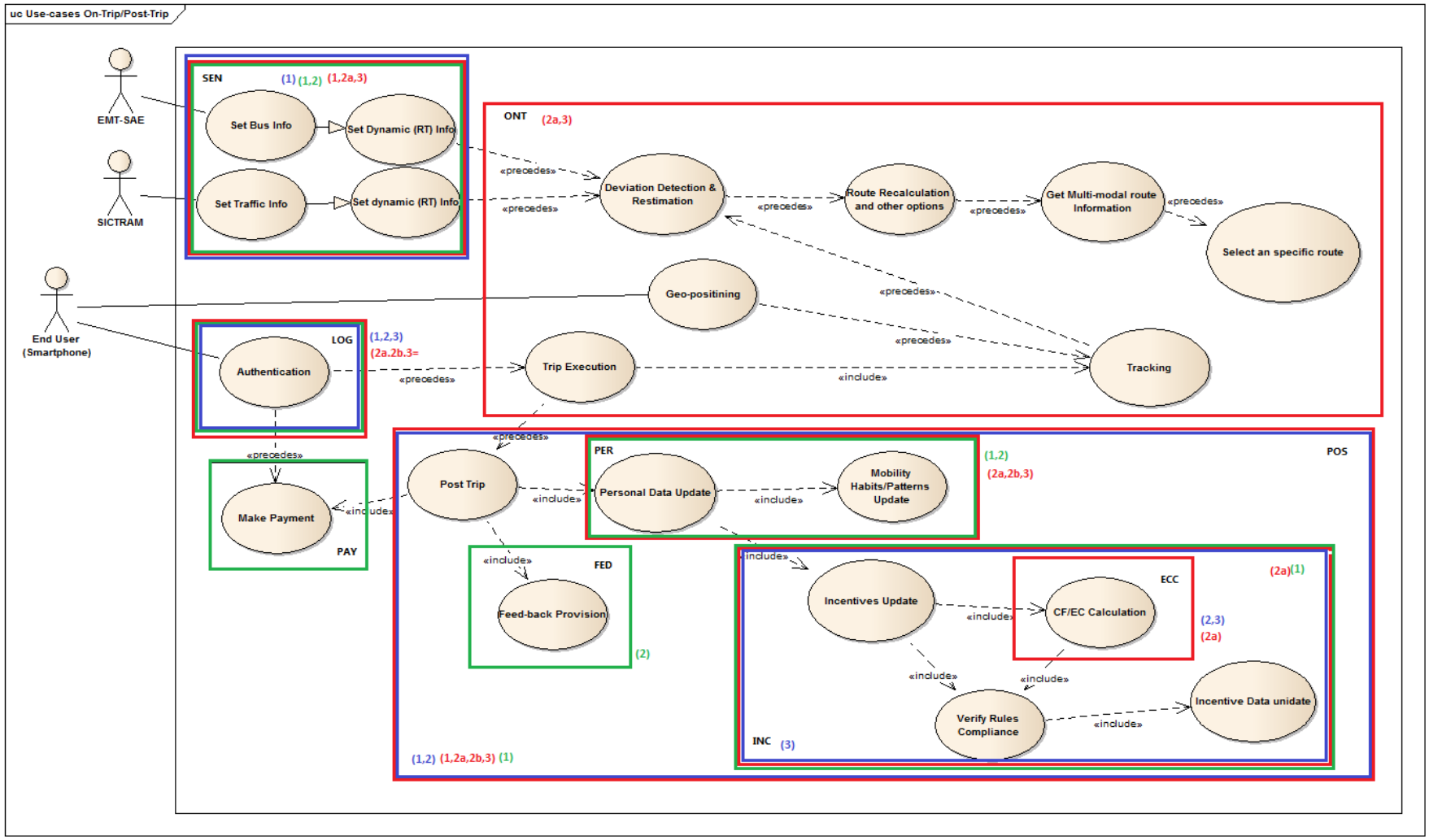

Figure 74 Use cases integrated diagram - on-trip/ post trip phases - mapped for the three pilots

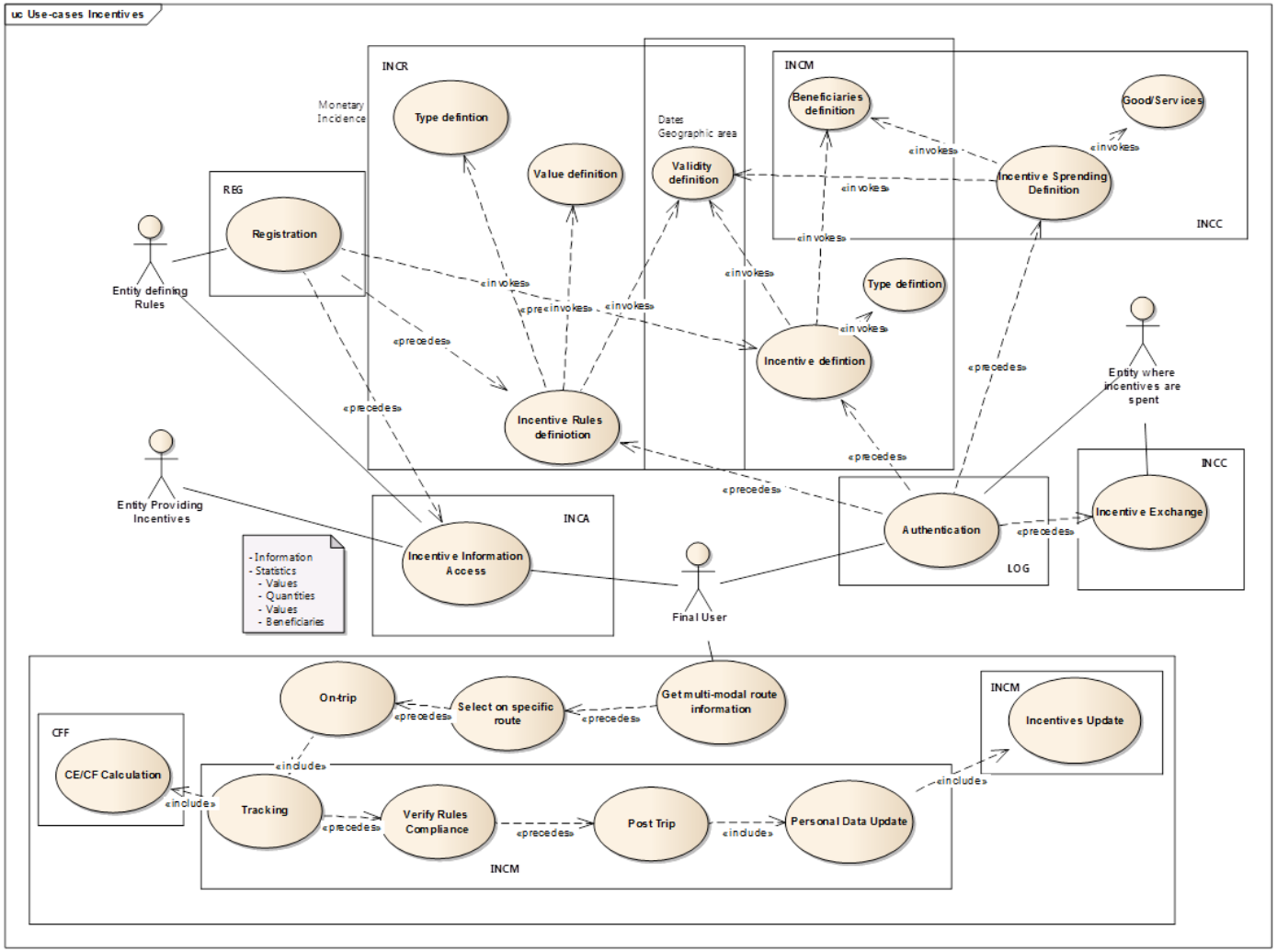

Figure 75 Incentives Management functional block diagram

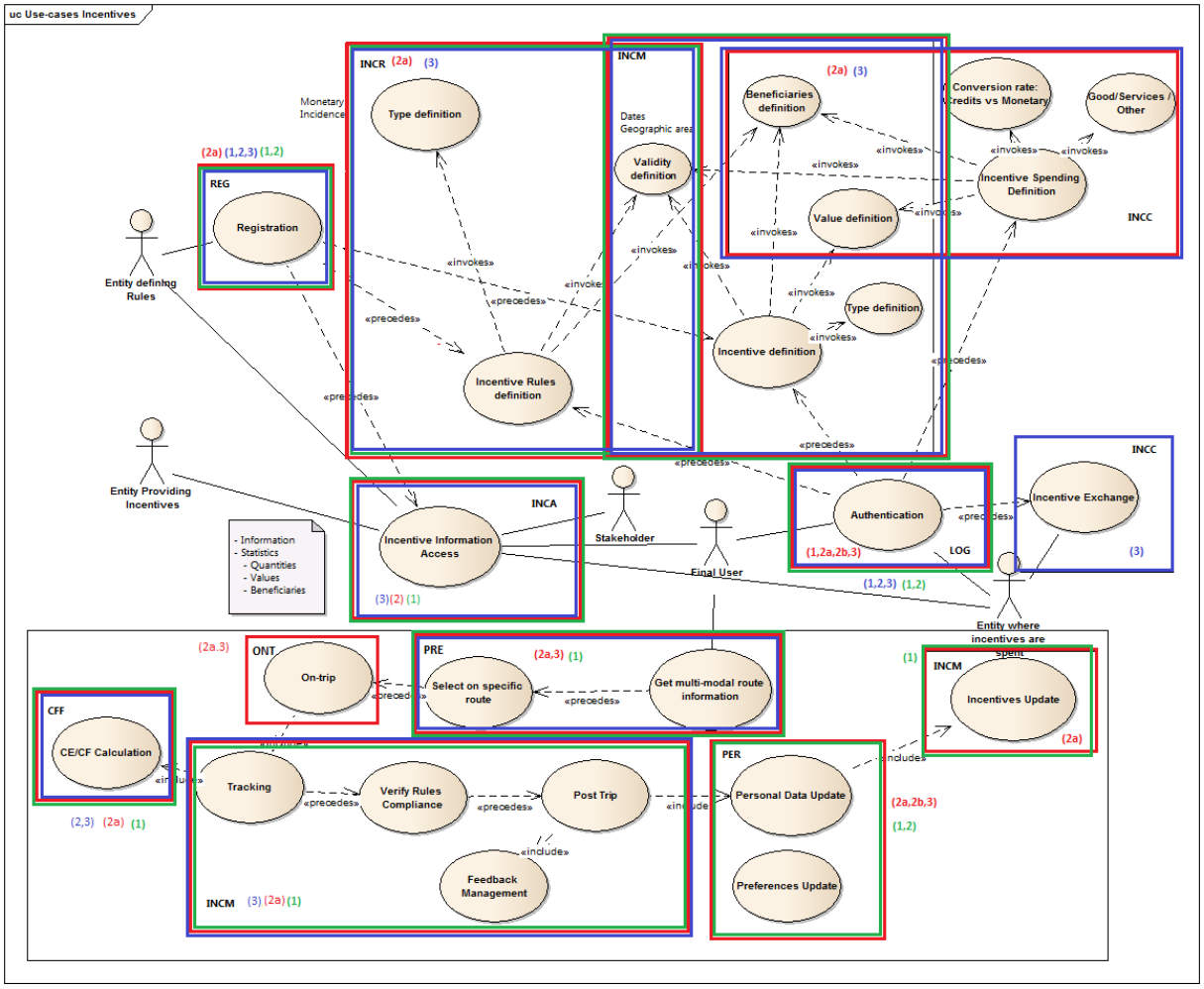

Figure 76 Incentives Management functional block diagram – mapped for the three pilots

3.5.1.1 Use cases preliminary mapping

The use cases from the three pilot cities have been mapped so as to identify common specifications, which have been reflected in the following functional diagram:

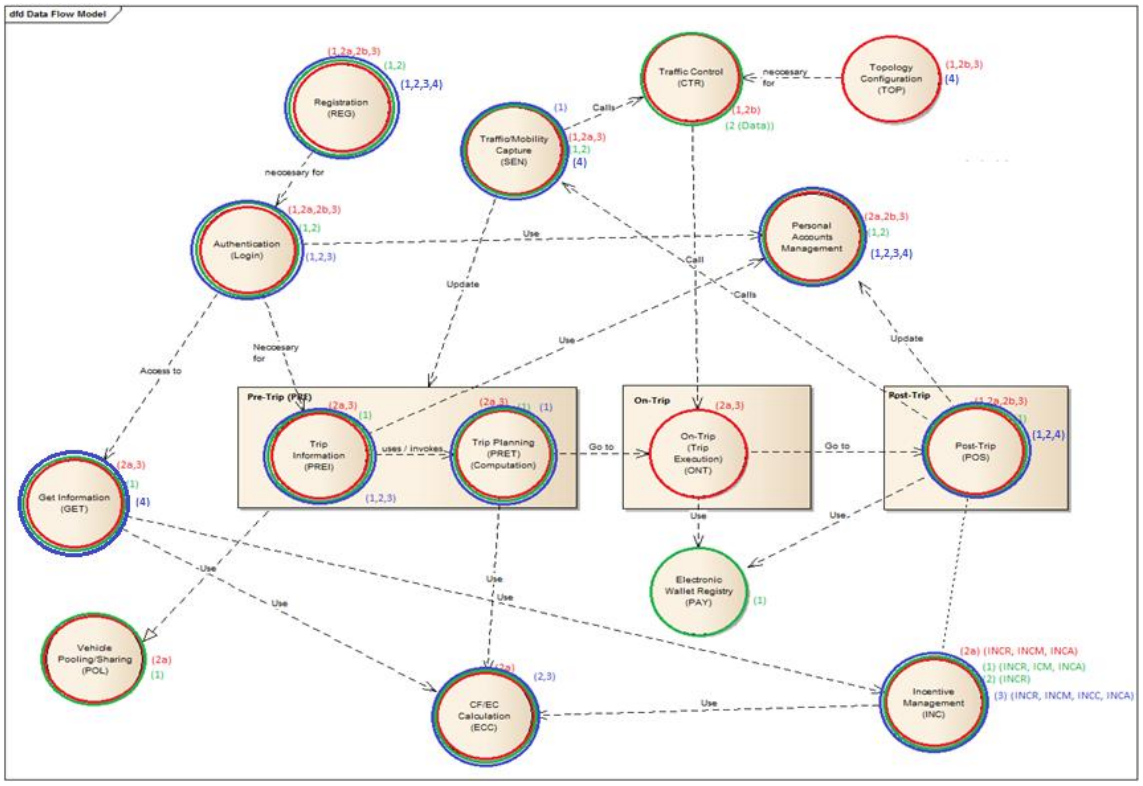

Figure 77 Functional diagram of MoveUs use cases

The following table summarizes the preliminary mapping of the use cases from the tree pilot cities Madrid, Genoa and Tampere:

			MADRID				GENOA		TAMPERE			
			UC1	**UC2a**	**UC2b**	**UC3**	**Serv.1**	**Serv.2**	**UC1**	**UC2**	**UC3**	**UC4**
			Smart Priorization of vehicles	Smart Routing for pedestrian	Smart Crossing for pedestrian	Eco-efficient Route Planning and Traffic Prediction	Personal multi-modal journey planner with energy calculator, incentives & rewards management and electronic wallet functionalities	Integration of crowd sourced data into the Genoa traffic supervisor	Calculation of Multimodal Journey Options	Estimation of Consumption (CO2 and / or Energy) per Journey Option	User tailored incentive-based visualization of Journey Options	Location of Parking Places
REG	**Registration**		X	X	X	X		X	X	X	X	X
LOG	**Login (Authentication)**		X	X	X	X	X	X	X	X	X	X
PER	**Personal Account Management**			X	X	X	X	X	X	X	X	X
	Edition											
	Personal Data			X		X	X	X	X	X	X	
	Preferences						X		X			X
	Patterns / Habits			X	X	X	X					
	UTM				X							
	View/Consult											
	Personal Data						X					
	Energy Consumption						X					
	Preferences						X					
	Patterns / Habits				X		X					
	Incentives						X					
	UTM				X							
	Personal Data Update											
	Mobility Habits Update						X		X	X	X	
	Energy Consumption						X			X		
PREI	**Pre-Trip. Request Trip Planning (Routing)**	Trip Information & Request		X		X	X		X	X	X	X

	Use existing from auto-learn			X			X					
	Request New			X		X	X		X	X		
	Specifies destination					X	X		X	X		
	Interactive selection on map						X				X	
	Incentive-based map											
	Parking/EV Map											X
	Geo-coding						X					
	Specify an address (or PT stop)						X		X	X	X	
	Specifies additional criteria						X		X	X	X	
	Specify maximum number of changes						X					
	Specify start and arrival date & time						X					
	Specify via points						X					
	Specify preferred means of transport						X			X	X	
	Specify preferences /cost, distance, road types)					X	X			x	X	
	Select an specific route			X			X			X	X	
	Select Parking Option (Interactive selection on map)											X
	Get multi-modal route information			X			X		X	X	X	
	Get route details			X		X	X					
	Parking facilities			X			X					
	Fuel/Energy consumption			X			X					
	Restrictions			X			X					
	Cost-prices			X			X					
	Means of transport			X			X					
	PoI (Points of interest)			X			X					

	Special services			X			X					
	Incentive options			X			X					
PRET		Trip Planning (Computation)		X		X	X		X			
GET	**Get Information**			X		X	X					
	Get car sharing Info			X			X					
	Get bus Info											
	Get Bus dynamic info			X			X					
	Gus bus static info			X			X					
	Get Traffic Info					X	X					
	Get Static Traffic info		X				X					
	Get Traffic real time info			X								
	Get crossing Info						X					
	Get weather info											
POL	**Car/Bike Pooling/Sharing**			X			X					
	Reservation / Booking											
	Identify available payment systems											
	Get static info (Bike/Car park location)			X			X					
	Get availability info			X								
ONT	**On-Trip**	Trip Execution		X		X						
	Deviation detection & re-estimation					X						
	Route recalculation and other options					X						
	Get Multi-modal route information			X								
	Select an specific route			X		X						
	Geo-positioning					X						
	Trip execution											
	Tracking			X								
PAY	**Electronic Wallet Registry**						X					
	Make payment						X					
	Identify available payment systems						X					

POS	**Post-Trip (includes FED)**	Post-Trip	X	X	X	X	X	X	X	X		
	Incentive calculation			X			X					
	Personal Data Update (PRE)			X			X		X	X		
	Feed-back provision							X				
	FCD Info provision (position, vel)					X	X					
	Other feedback information							X				
INCM	**Incentive Management**	Rules management		X			X	X			X	
	Rules definition											
	Type definition											
	Validity definition											
	Incentive definition											
	Type definition											
	Value definition											
	Beneficiaries definition											
	Validity definition											
	Incentives Calculation / Update			X			X	X				
	Verify rules compliance											
	Incentive Data Update											
	CF/EF Calculation			X			X					
		Incentive management		X			X				X	
INCC		Incentive consumption									X	
	Incentive Exchange											
	Conversion rate: Credits vs Monetary											
	Good/Services/other											
	Beneficiaries definition											
	Value definition											
INCA		Incentive access		X			X				X	

SEN	Traffic / Mobility Capture		X	X		X	X	X	X			
	Set Crossing dynamic info				X							
	Set Bus dynamic info (position)		X	X								
	Set Traffic dynamic info			X		X						
	Set car service availability			X								
	User detection info				X							
	Set delayed bus info		X									
	Get Parking Occupance											X
	Get EV Parking Occupance											X
CTR	Traffic Control		X		X			X				
	Information Notification		X					X				
	Priority Assignation / Rearming		X									
	Priority request		X									
	Activate Demand				X							
	Activate/Confirm Smart Crossing				X							
	Traffic Light Management (Phase on/off)				X							
TOP	Device/Topology Configuration		X		X	X						
	Set Crossing static info				X							
	Set Bus static info		X	X								
	Set Traffic Static info		X	X		X						
	Set Bike static info (location)			X								
	Set Car service static info (location)			X								
	Set influence zones		X									

	Get Parking Places											X
	Get EV Parking Places											X
ECC	CF/EC Calculation			X	X		X			X	X	

Table 76 Preliminar mapping of the use cases from the three pilot cities

4 Conclusions

The job performed in Task 2.4 and described in chapter 2 has demonstrated that the role of incentives as a tool to change the mobility behaviour is still to be discovered and studied in depth.

Monetary incentives are inexistent except some forms of commuter cash out and the very new initiative of the City of Paris, just at the beginning; third parties incentives are totally unknown.

This represents a challenge for MoveUs, where incentives play an important role; the project has the opportunity to use the Living Labs as an instrument to gather ideas and proposals from experts and stakeholders; then in the pilot phase it will be possible to test them in real cases.

The job performed in Task 2.5 and described in chapter 3 is exhaustive and allows the Consortium to smoothly proceed in the performance of the subsequent Work Package 3.

In particular the results from task 2.5 will be the base upon which the following tasks will develop: Task 3.2 "specification and architecture design of the MoveUs cloud-based platform", where the MoveUs platform will be specified, the Task 3.3" Specification and design of the MoveUs city services" where the specification of the services to be piloted in the cities will be carried out, and the Task 3.4 "Data Security and Privacy" where the security and privacy specifications will be identified so as to be taken into account in the platform and services implementation and development in subsequent phases.

5 References

[7] TNO 2006, ECOdriven 2008

[8] University of the West England, Bristol, Centre for Transport & Society, *"Individual Behaviour Change. Evidence in transport and public health"*, Department for Transport Contract PPRO 04/06/33; Editors: Erel Avineri and Phil Goodwin.

[9] Most definitions are taken from TDM Encyclopedia, Victoria Transport Policy Institute, www.vtpi.org

[10] http://en.wikipedia.org/wiki/Use_case last modified on 6 May 2014 at 00:50.

[11] http://www.uml.org/ last updated on 05/05/2014.

[12] http://www.uml-diagrams.org/sequence-diagrams.html based on OMG™ Unified Modeling Language™ (OMG UML®) 2.5 specification.

[13] http://www.uml-diagrams.org/use-case-diagrams.html