D2.1
Analysis and concept development for the pilot operations

<table>
<thead>
<tr>
<th>Project Acronym</th>
<th>HoPE</th>
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<td>Holistic Personal public Eco-mobility</td>
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<td>621133</td>
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Executive summary

The HoPE project will organise and evaluate three pilots, in Coventry, Athens, and the Basque country, with multiple use-cases at each location. Multimodal route planning and tourism information will be introduced at all three pilot sites, while mobile payment and e-ticketing will be piloted in Athens and the Basque country. Athens is also introducing special route planning services for disabled citizens.

In Coventry, Centro, the authority tasked with the service provision and overseeing the performance of the public services, will be the main pilot partner. In Athens it will be OASA the Athens Urban Transport Organisation, and in the Basque country it will be ATTG the Territorial Transport Authority of Gipuzkoa.

Pilots in Athens and the Basque country will target both local public transport users as well as tourists, while in Coventry target passengers will be commuters (primarily university students and employees of the city council). The pilot size in the UK will be about 50 participants, while at the other two locations several hundred potential users are targeted for the route planning function, and a smaller number, depending on the availability of NFC handsets, for ticketing and payment. The multi-modal route planner will be a new service feature for all three sites, while mobile payment and ticketing will need to be deployed under diverse service conditions. In Coventry there is already an existing solution which will be integrated with the HoPE platform, in Athens the service will be completely novel, while in the Basque country the existing e-ticketing infrastructure will be integrated with HoPE’s mobile payment and over-the-air ticket distribution technology.

All three pilots will perform excessive validation and evaluation of the pilot results and user acceptance, employing different techniques including questionnaires and analysis of electronic transaction logs.

Based on the initial assessment of the pilot locations, their technical capabilities, and pilot concept, the implementation of the current technical plans and the work plan is realistic. Based on the feedback received from the operators it can be established that data necessary for the pilot use cases are available at all three sites, and the legacy technical infrastructure should be capable to support
technical integration requirements. Detailed implementation plans will be presented in D2.4, in chapters 5. and 7.

This document does not describe the risk issues related to non-acceptance of the HoPE services by the pilot operators as this subject will be analyzed in D2.4 which describes in details the preparation and operation of the pilot services.

Document History

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☐ PP : Restricted to other programme participants (including the Commission Services)
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HoPE D2.1 Analysis and concept development for the pilot operations
1. Scope of Task 2.1

1.1. Excerpt from the Technical Annex

Operators and technology providers will jointly identify the technical, operating, and service specifics of each pilot location, the individual objectives of each operator, and will define the scope of the pilot activities. The work will focus on the description of the service delivery and operation, as well as on the analysis of the supporting legacy technical environment.

The study will contain details about the available service architecture, software and hardware environment, interfaces and integration opportunities, and will elaborate a plan about the technical introduction of the new modules and functions into to the current environment.

The study will also cover the assessment of the operating details of the service providers to identify how present procedures and activities will need to be modified and extended with new functions to prepare the organisation for the planned technical and operational changes.

The work will elaborate the concept for ensuring the seamless coexistence of the traditional service operation with the new pilot environment.

1.2. Summary of activities performed

1.2.1. Analysis of the supporting legacy technical environment:

Based on a technical questionnaire, the pilot operators described their legacy technical environments, capabilities, practices, and requirements. They provided details about the available service architecture, the software and hardware environment, the interfaces, and integration opportunities and conditions.

1.2.2. Definition of the scope of the pilot activities

Based on the functionality of the HoPE platform and the prerequisites of each feature, the pilot operators selected those services which they wish to enroll in their respective pilot operation.
1.2.3. **Description of the service delivery and operation**

Based on the scope of the pilot operations, each operator has elaborated a plan how the pilot is going to be organised, who will be the participants, how they will be selected, how the new services will be introduced, under which conditions the services will be made available, and what the actual service parameters will be (location, size, …).

1.2.4. **Plan of technical introduction**

The plan is not finalised yet; it will describe how the new modules and functions will be integrated into the current environment, how present procedures and activities will need to be modified and extended with new functions. Furthermore, it will contain details about the broader preparation of the organisation necessary for supporting the planned technical and operational changes. An important part of the document will be to identify those steps which are necessary to ensure the seamless coexistence of the traditional service operation with the new pilot environment.

This part of the deliverable will be integrated into the technical descriptions of the pilots in later forthcoming documents.

1.3. **Audience.**

The intended audiences of this document are all the stakeholders of the HoPE project, but primarily the technology providers, who will need to support the pilot operators based on the conditions described herein.
2. Acronyms used

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>PoS</td>
<td>Point of Sales or Point of Service</td>
</tr>
<tr>
<td>VPN</td>
<td>Virtual Private Network</td>
</tr>
<tr>
<td>UI</td>
<td>User Interface</td>
</tr>
<tr>
<td>AVL</td>
<td>Automatic Vehicle Location</td>
</tr>
<tr>
<td>ToD</td>
<td>Transport on Demand</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed Natural Gas</td>
</tr>
<tr>
<td>NFC</td>
<td>Near Field Communication</td>
</tr>
<tr>
<td>QR</td>
<td>Quick Response (Code)</td>
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<td>GTFS</td>
<td>General Transit Feed Specification</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<tr>
<td>PoI</td>
<td>Point of Interest</td>
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<tr>
<td>ITSO</td>
<td>Integrated Transport Smartcard Organisation</td>
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3. The pilot operation in Coventry

3.1. Introduction of the pilot site

Location:
Country: United Kingdom
City: Coventry
Operator: Centro (coordinates the transport of multiple operators)

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The Coventry and West Midlands pilot will take place in the multimodal public transport environment covering all West Midlands regions, i.e., Coventry, Birmingham, Dudley, Sandwell, Solihull, Walsall and Wolverhampton. According to the 2011 Census, the area had a population of 2,440,986, making it the third most populated in the United Kingdom behind the Greater London and Greater Manchester Built Up Areas. The pilot targets approximately 400 users.

Network West Midlands is the name that connects all public transport in the West Midlands. Its aim is to work towards creating a smoother, safer, more efficient, and user-friendly system. The West Midlands Integrated Transport Authority is responsible for setting public transport policy. Its Executive, Centro, a not-for-profit organisation, puts that policy into action, developing and promoting public transport services for people and encouraging their use. Centro represents the seven metropolitan councils of the West Midlands: Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall and Wolverhampton.

Centro’s vision is to create a world class public transport network delivered by a best in class organisation. They want to ensure everyone benefits from an effective transport system that meets the economic and environmental needs of the area, as well as access to jobs, combat congestion, and offer seamless connectivity for people and goods to UK and overseas markets. Centro works towards an integrated public transport system that’s safe and secure. In partnership with operators in the West Midlands – as Network West Midlands – it develops an integrated
ticketing system that meets customer needs. It also provides information to passengers in electronic, real-time and mobile formats, and traditional paper based at-stop or leaflet versions.

Centro does not operate bus, rail, or Metro services but they do run bus stations, provide bus shelters, and subsidise socially necessary bus services. Bus, rail, and Metro services are operated by private companies in the West Midlands. There are over 30 bus operators in the area, the largest of which is National Express West Midlands. There are five main train companies with London Midland providing the majority of local services. Midland Metro, a light-rail/tram line between Birmingham and Wolverhampton, which is owned by Centro, is run by National Express.

The table below presents fleet size and rolling stock used in West Midlands in 2013 and route network length:

<table>
<thead>
<tr>
<th>Buses</th>
<th>700</th>
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<tr>
<td>Trolleybuses</td>
<td>200</td>
</tr>
<tr>
<td>Light Rail</td>
<td>120</td>
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<tr>
<td>Rail</td>
<td>300</td>
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<table>
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<th>Route network length</th>
<th>3000 (approx.)</th>
</tr>
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<tbody>
<tr>
<td>Number of Stations / Stops</td>
<td>14000</td>
</tr>
<tr>
<td>Number of Routes</td>
<td>150</td>
</tr>
<tr>
<td>Average Journeys/day</td>
<td>30000</td>
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Main transportation hubs are the regional railway stations and Birmingham’s National Exhibition Centre (NEC) which is also close to the Birmingham International Airport.

Beside operators offering their own tickets, Network West Midlands offers value tickets covering the whole network, including trains, buses, and Metro, or a bus ticket for all buses, with the option of adding the Metro, or a Metro card for Metro travel.

Centro introduced its smartcard, SWIFT, in October 2012 for passengers paying for travel on bus in the West Midlands. Initially using the ‘Pay-As-You-Go’ format, passengers top up the card with cash and place it on a reader on the bus, with the fare for the journey then deducted from the credit. All adult season tickets are also available on SWIFT, as well as carnet tickets. It is currently accepted on ten different bus operators covering approximately 100 routes across the area. Most operators offer a discounted fare in comparison to the normal cash fare when using the card. In the years to come it will be rolled out on Midland Metro and the rail network, offering a one card solution to travel.
The project will bring the e-payment developments for Coventry to a new level incorporating in a single process advice on the best route possible (e.g., ‘greenest’, fastest, cheapest), route selection, trip payment, and usage of an electronic card. The service will allow the users to purchase a full journey with payment for multimodal transport, encouraging the modal shift that the authority is trying to achieve. The pilot will be on a route that is heavily congested by commuters who travel to work by car.

Key objectives are:

- Extending the smart card payment method available already in Coventry for public transport only to payments for a multimodal travel
- Enhancing the range of options available for journey planning for the end user from public transport to multimodal
- Providing a feedback from the HoPE project setup to the management of the city for better planning and real-time control
3.2. Technical conditions of the operator

Responses provided to pilot environment questionnaire

3.2.1. Type of IT operation (please select the correct answer)

- In-house personal / outsourced service partner

- Internal access to information / information is under the control of external organisation

- To perform modification and/or integration decision is made
  Internally / external competence - both

- Technical completion is performed by
  Own employees / external subcontractors / exclusively by the vendors / no modifications are possible

3.2.2. Architecture

In this Chapter data about relevant aspects of the technical environment of the pilot operations are collected.

3.2.2.1. HW environment (please specify the various components)

- Servers single server from MODUM, available for use by HoPE
- Storage type Hard disk
- Routers Internet access – through separate ISP (BT)
- HSM

- Is there any known physical capacity constrain that is to be considered when the new system is deployed?
  It is a single server and the MODUM programs are running on it, needs addition of the necessary hardware
3.2.2.2. Software used (please specify the various components)

- Operating system: Intelisense – virtual server spawning virtual machines containing the running algorithms
- Database: none
- Application server: each server runs in its own virtual machine
- Middleware: virtual server
- Firewall: provided by the virtual server
- Is open source allowed? yes

3.2.3. Security policy (please describe the relevant policy)

- Access to test system
  User management - yes
  Authentication + authorisation - yes
  Sign-in policy - yes
  Migration conditions to live system - yes
- Access to live system
  User management - yes
  Authentication + authorisation - yes
  Sign-in policy - yes

- Logging policy: VPN in use
- Archiving rules: none

- Is there a backup site or architecture? – no, every participant in the system looks after its own backup

- Zoning policy: are there any rules in place which specify the separation of certain data and activity type, in respect of where this data may be stored and on which servers they may be run?
  Web
  Secure
  Log
  Application
  Management
  Virtual machines separate all users – each user operates within its own virtual machine
• Are there any constraint in respect of remote access?
  During installation? no
  Operation – support? no
  Monitoring? no

• Antivirus policy? no, every user looks after its own programs within its own virtual machine

• Patch management? does not exist

• Validation of new codes to be used? does not exist

3.2.4. Integration work

• Who may perform the integration task?
  Technology providers / pilot operators

• Are there any specifications for the required set of documentation? – yes for the MODUM operations as part of HoPE

3.2.5. Other policies (please describe the relevant policy)

• Testing? vary from operator to operator

• Training? no training exists

• Documentation? limited

• New release policy? ad hoc

• Operation? 7/24 or other required availability:

• Languages used in UI? English

• Currencies used for payment? UK pound

• Support? 7/24

• What type of support is required?
  Frontline / 1st level technical / 2nd level technical - all
3.3. Capabilities of the pilot sites in respect of the new planned functionalities

3.3.1. Multimodal route planning

- Availability of data:
  - Real-time data from automated traffic control systems (e.g., SCOOT)? yes
  - Real-time data GPS positioning of the public transport? yes (subject to permission)
  - Real-time data from GPS positioning from other sources (e.g. freight operations)? no
  - Real-time data from mobile phones in cars - crowdsourcing (Floating Car Data)? yes
  - Real-time data from mobile phones in public transport - crowdsourcing (Floating Car Data)? yes
  - Real-time data from road side devices (e.g. Bluetooth)? yes

- Public Transit:
  - In which format is timetable data available (e.g., GTFS)? CIF and TransExchange (UK national formats)
  - Is a workflow supported, in which this timetable is updated regularly (e.g., weekly, due to construction work or temporary station closures)? Weekly data build
  - Do you support AVL? yes
  - Do you publish estimated delays from the AVL data? If yes, in what format? Yes, SIRI
  - Is indoor-routing data available for stations? E.g., what level of detail is data available to estimate the walking duration between an underground station entrance and a platform (and between different platforms of a station)? yes
  - Is data available regarding accessibility of platforms (e.g., availability of escalators and elevators, low-floor trams)? no
  - Is data available for each station whether it is roofed/sheltered? yes
  - Can you provide the pricing scheme for the public transit system (including exceptions, special fares, ...)? yes, through MobiWallet API
- Road Data:
  - Is detailed road map data available (road segments and their coordinates for the whole relevant region)? Can it be shared within the project? **yes**
  - Is consistent data available for each road segment, regarding speed limits, direction of traffic, and allowed vehicle type (car, taxi, bicycle, pedestrians)? **yes**
  - Is detailed elevation data available for the project region? **yes**
  - Can you provide data on taxi stations (their position, number of taxis, ...)? **yes, but too cumbersome**
  - Can you explain the pricing scheme for taxis? **no**
  - Are rental bikes available at your pilot sites? If yes, can you provide detailed data regarding rental stations, pricing, ...? **not yet**

- Hardware
  - Powerful machine available for the needs of the project (HoPE)? **no**
  - Internet Access to the HoPE machines setup available? **yes**
  - VPN access to the traffic control servers resolved? **yes**

- Software
  - Journey planning legacy software available? **yes**
  - Interface to legacy journey planning software available? **yes**
  - Legacy mobile phone application available? **yes**
  - Interfaces between the legacy mobile phone application and the legacy journey planner open source? **yes**

3.3.2. *Tour planning for tourists*

The tourist tour planner application uses the multimodal route planning module underneath. In that respect, the data required by the multimodal route planning are also required by the tourist tour planner.

Further issues that need to be clarified:

- Can you support the following fare options?
  - Single fare for a single public transit transfer (A → B, departure time $t_0$)? **yes**
  - Single fare for multiple public transit transfers (A → B, departure time $t_0$; C → D, departure time $t_1$; (E → F, departure time $t_2$, ...)? **yes**
  - One-day pass? **yes**
o Multiple-days pass? yes

- Do you support fares with special discounts (e.g., for elderly or students) for the above fare options? How do they work in detail? Yes

  All fares will be available through MobiWallet API – no need for programming of the fares, need for interrogating MobiWallet

3.3.3. Transport on demand

- Do you provide transport on demand (ToD) services? Yes

- Which are your pricing policies?

  All fares will be available through MobiWallet API – no need for programming of the fares, need for interrogating MobiWallet

- Who does the service address? (i.e., disabled, school, groups, …) only disabled

- How many vehicles are involved? 40

- How many passengers per day does your ToD have at the average? 400

- How the ToD service is planned? Is it planned offline (i.e., up to one day before supplying the service) or online (i.e., while vehicles are running)? Offline – pre-planned usually on a weekly basis
3.4. The pilot concept

The Coventry pilot case for the HoPE project will be staged in a complex and very advanced environment in Coventry. The current technical developments in Coventry have seen moves towards e-payment and mobile phone application, which are both well advanced and already used in the city. The overall technical environment is described in the following Figure. The technical architecture consists of four separate modules (tiers):

- Mobile Application – HoPE Front End: a prototype already in existence in Coventry – some modifications are required to enhance the functionality of the application to allow changing starting points and destinations for each journey, and for the application to be able to talk to the journey planning facility provided by HoPE (API development)
- HoPE Server - HoPE Back End: this tier is looking after the journey planning facility and provides multimodal planning options to the front end mobile application – needs API to the mobile application and to the MobiWallet pricing framework, needs to be recalibrated for use in Coventry and enhanced with more efficient dynamic routing and traffic prediction algorithms
- MobiWallet Pricing Framework and Fare Calculation: will be in place in Coventry for the trials – will provide API for fare calculations
- SWIFT smart card: already in place in Coventry

The pilots testing environment will be following the following technical pattern:

a) Step 1

- The user will start the mobile application and select a journey
- The request for journey planning will be sent to the HoPE back end server
- The HoPE server will connect to the MobiWallet Fare Calculation Framework and will produce a set of journeys related to different criteria, e.g., ‘greenest’ cheapest, fastest journey et cetera
- The server will enquire again about the prices for the selected set of journeys and will add the pricing information to the HoPE output
- The server will add additional information if required, e.g., price for taxi
- The journeys will be sent to the mobile application for the user to choose its preferred option
b) Step 2
   - The user will select a journey and buy the ticket electronically directly from the MobiWallet Framework. The ticket will be delivered to the mobile phone application.

c) Step 3
   - Using NFC DESFire the user will transfer the ticket to the SWIFT smart card which is accepted for use in Coventry.

d) Step 4
   - The application will inform HoPE back end about the journey automatically.
### 3.4.1. Integrated route planning

The participants in the pilot will be the public transport operators in Coventry under the guidance of Centro. Centro is the authority tasked with the service provision and overseeing the performance of the public services.

- Local authority – Coventry Traffic Control Centre and Coventry City Council
- Technology providers

Centro will participate by ensuring seamless integration between the smart card in-house developments and the HoPE multimodal journey planning facility, in order to deliver route choice options according to the HoPE journey selection criteria.

Infohub Ltd. will be the main technology provider and integrator for the HoPE trials. The company will ensure that all technology deployed is working properly, and will look after the technical aspects of integration and interfacing.

End users of the pilot will be all public transport users who will be given an option of using various different transport options. Using the MODUM EU FP7 project application once the route has been chosen and the various modes have been given, it will give an option to the participant to pay for the full journey on all transport modes suggested. Volunteers will be chosen amongst the commuters along the route chosen. Participants will be targeted through brochures, leaflets, and adverts on the Coventry City Council website. There may be an option of selecting people who are employed by the council who could take part in the trials as testers and subsequently as users. The aim is to provide up to fifty people to take part in the trials, this would give good data for evaluation.

The pilot will be set up in Coventry, on a selected route and all means of transport were possible will be used. The proposed route would take the commuters between Warwick University and Coventry City into account. This route has several benefits:

1. It is a key corridor within the City of Coventry City
2. It has a lot of Students who commute along this route
3. It has a Park and Ride half way along the route
4. The users have multiple public transport options
5. The main railway station is along this Route
6. Along the A429 Kenilworth Road
7. It links two other towns (Warwick and Birmingham) along the A45
The pilot setup will be completed by M24. The pilot will start with limited number of testers to test the technology and the whole path for service delivery. Once we have a stable, robust, and reliable operating system, it will be extended to more commercial-like operation and the pilot will run for a period of about three months from implementation. The collected data will be considered of archival quality. Expected finishing date is M33. The Pilot will be started in a controlled environment to satisfy our requirements. Once satisfied with the performance, the system will be introduced in a real live environment on the selected route.

Once the trial is completed, the Coventry Traffic Control Centre will carry out a customer satisfaction survey. The results obtained will be a gauge of the uptake of the product.

Each one of the main objectives will be measured through:

- The shift in numbers from not using smart card travellers to the number of using smart card travellers – we are aiming at 30% increase as a result of using the HoPE project facility
- Evaluation of the importance of multimodality in the options for route selection through survey – currently only public transport option available – we are aiming at high user satisfaction from the availability of more journey travel options in the survey
- Evaluation of the importance of real-time feedback in the traffic control centre through survey - we are aiming at high user satisfaction from the availability of more journey travel options in the survey
4. The pilot operation in Athens

4.1. Introduction of the pilot site

Location:
Country: Greece
City: Athens
Operator: Public Transport Authority: Athens Urban Transport Organisation (OASA)

Contact Information
Name: Garyfallia Pantelopoulou
Position: IT Director
Phone: +302108200010
Email: fpantel@oasa.gr

OASA – Athens Public Transport Organisation – serves the Athens greater area with a network of diesel, CNG, electric buses, light rail, and metro through its two subsidiary companies. Additionally, the Athens area is served by a suburban rail network and the suburban bus network operated by Proastiakos SA (subsidiary of Hellenic Railways) and a consortium of private operators, respectively. The table below presents the current situation of the fleet size and rolling stock used.

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel / CNG Buses (12m. or less)</td>
<td>1,717</td>
<td>2,868</td>
</tr>
<tr>
<td>Diesel Articulated Buses (18m.)</td>
<td>279</td>
<td>467</td>
</tr>
<tr>
<td>Trolleybuses (12m.)</td>
<td>315</td>
<td>373</td>
</tr>
<tr>
<td>Articulated Trolleybuses (18m.)</td>
<td>51</td>
<td>77</td>
</tr>
<tr>
<td>Light Rail vehicles (3 vehicles per train)</td>
<td>57</td>
<td>88</td>
</tr>
<tr>
<td>Metro vehicles (6 vehicles per train)</td>
<td>926</td>
<td>1,152</td>
</tr>
</tbody>
</table>

(∗) source: General Transport Plan of Athens

Athens has a traffic and signalling control centre operated by the Traffic Police. Traffic data are acquired by 130 traffic sensors. Currently, 190 trolley buses, accounting for 50% of the respective trolley bus fleet, can be monitored from a control centre in real-time with an analogue spatial information system with a basic AVL and fleet management functionality. This telematics system, installed in 1997, also includes voice (driver communication) and limited data capabilities (e.g., PA information). A pilot fleet management system with enhanced functionality was installed in the
CNG bus fleet system in 2002. Both systems will be replaced with the Passenger Information and Fleet Management System, which is in the final stage of the procurement process.

OASA, through its subsidiary operators, offers adequate connectivity between urban and suburban modes in several stations.

OASA is responsible for developing both timetables and schedules for buses and trolleybuses, using specialised software (HASTUS) while its subsidiary company ‘STASY S.A’ is responsible for the same, for the Metro and Light rail networks using the ‘Microbus’ software.

Major indicators of the Athenian public transport network are presented in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Diesel CNG Buses</th>
<th>Electric Buses</th>
<th>Light Rail</th>
<th>Metro*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route network length (both directions)</td>
<td>6,199</td>
<td>388</td>
<td>24</td>
<td>148</td>
</tr>
<tr>
<td>Number of Stations / Stops</td>
<td>7,520</td>
<td>738</td>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>Number of Routes</td>
<td>266</td>
<td>22</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

(*) Includes network and stations common with suburban rail (extension of Line 3 to Airport)

As a rule of thumb, the Athenian public transport system reduces the usage of private cars by 20%.

The available characteristics of the public transport users are presented in the following tables.

<table>
<thead>
<tr>
<th></th>
<th>Diesel CNG Buses</th>
<th>Electric Buses</th>
<th>Light Rail</th>
<th>Metro*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Boardings (2012)</td>
<td>322.1</td>
<td>64.2</td>
<td>15.0</td>
<td>251.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Diesel CNG Buses</th>
<th>Electric Buses</th>
<th>Light Rail</th>
<th>Metro*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak trips</td>
<td>50.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Passenger-km.</td>
<td>40.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trips (typical day)</td>
<td>34.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger-km (typical day)</td>
<td>13.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No detailed information or surveys exist regarding the usage of public transport by tourists. In general, tourists use mainly the metro network from/to the port of Piraeus and the Athens International Airport and major tourist attractions in the city centre (Archeological Museum, Thission, and Acropolis).

Athens utilises a paper ticket system, over a variety of fare products. The tickets are validated by validating machines either in the vehicles (for buses, trolleybuses, and light rail) or stations (metro,
The procurement of a new integrated fare management system has been completed and implementation is planned to be completed in 2016. In the meantime, a one year long mobile ticketing pilot will be launched in 2015.

The key target of the Athens pilot is to attract passengers from private modes to public transport by increasing the quality of the service provided while reducing the costs.

- Attracting people to public transport requires a more personalised approach to their needs. Therefore, the Athens pilot will introduce a more personalised, multicriteria, multimodal route planner for different groups of users (elderly, tourists, …), through the eCOMPASS functionalities, that will be incorporated to the HOPE platform. The ‘tour planning for tourists’ will be a very important functionality for the Athens pilot.

- In order to meet the special needs of specific groups (e.g., tourists, disabled, …) in efficient ways, the already existing demand responsive transport (3 buses used for people with special skills) may be combined with the Ride2GO! chosen functionality: ‘transport on demand for disabled people’ that will incorporate optimisation services (cost optimisation at maximum service levels).

- Finally, the Athens pilot will introduce the iCheque-DIAD functionalities, regarding electronic payment and ticket delivery, respectively. NFC technologies will be used, as opposed to the current e-ticket pilot which is based on QR technologies.

The previous functionalities were chosen because:

- It is very important – especially today – for the user of a public transport route planner to be able to plan the trip, taking into account both the time and the cost (public transport tickets) of the selected route.

- The number of tourists visiting Athens every year (“It is estimated that throughout 2013 Greece welcomed over 17.8 million tourists” source: Wikipedia\(^1\)) shows that a tour planner would attract a significant amount of passengers to the public transport system.

- The existing service of demand responsive transport for people with special needs may be optimised with the ‘transport on demand for disabled people’ of the HoPE platform.

- The e-ticketing system (e-payment and ticket delivery) will be incorporated in the Athens pilot, giving OASA the chance to test a quite new technology (NFC) and its potential, regarding

security aspects, as opposed to the currently tested technology (1 year pilot project of e-tickets and thermal tickets) of QR.

The actors involved in the pilot are OASA and OSY (and maybe some of OASA’s tech developers).

Since, all the information will be disseminated through the internet (a site or a mobile app), there will not be a specific device (e.g., touchscreen module) implemented at specific gates of the city (e.g., Athens International Airport) for the tourists. However, a method to attract the visitors to use the tour planner should be foreseen.

The Athens pilot will take place in the Greater Urban Area of Athens. Different locations will be chosen, depending on the detailed design of the applications to be tested. For example, applications addressed at visitors will be tested at Athens’ main entry points such as the airport and the railway station. Other applications combining route planning with environmental criteria and integrated fare management will be tested at main transfer stations and/or along the public transport routes. There will be approximately 500 to 1000 targeted users.
4.2. Technical conditions of the operator

Responses provided to pilot environment questionnaire

4.2.1. Type of IT operation (please select the correct answer)

- **In-house personal** / outsourced service partner

- **Internal access to information** / information is under the control of external organisation

- To perform modification and/or integration decision is made
  - **Internally** / external competence

- Technical completion is performed by
  - **Own employees** / external subcontractors / exclusively by the vendors / no modifications are possible

4.2.2. Architecture

In this Chapter data about relevant aspects of the technical environment of the pilot operations are collected.

4.2.2.1. HW environment (please specify the various components)

- Servers: HP & Dell
- Storage type: EMC SAN
- Routers: Cisco
- HSM
- Is there any known physical capacity constrain that is to be considered when the new system is deployed?
  - No known constraints were identified

4.2.2.2. Software used (please specify the various components)

- Operating system: Windows, Linux
- Data base: Oracle
- Application server: Oracle
- Middleware
4.2.3. Security policy (please describe the relevant policy)

- Access to test system
  - User management
  - Authentication + authorisation
  - Sign-in policy
  - Migration conditions to live system

No policies were identified

- Access to live system
  - User management
  - Authentication + authorisation
  - Sign-in policy

- Logging policy

- Archiving rules

- Is there a backup site or architecture? yes
  - Is it hot backup? yes
  - Does it need to be considered for the new services to be deployed? yes

- Zoning policy: are there any rules in place which specify the separation of certain data and activity type, in respect of where this data may be stored and on which servers they may be run?
  - no
    - Web
    - Secure
    - Log
    - Application
    - Management

- Are there any constraint in respect of remote access? no
  - During installation?
  - Operation – support?
  - Monitoring?

- Antivirus policy? yes
- Patch management? yes

- Validation of new codes to be used?

4.2.4. Integration work

- Who may perform the integration task? Technology providers / pilot operators

- Are there any specifications for the required set of documentation?

4.2.5. Other policies (please describe the relevant policy)

- Testing? yes

- Training? no

- Documentation? yes

- New release policy? Periodic / ad hoc

- Operation? 7/24 or other required availability:

- Languages used in UI? Greek / English

- Currencies used for payment? Euro

- Support? 7/24 or 8/5
  What type of support is required
  Frontline / 1st level technical / 2nd level technical
4.3. Capabilities of the pilot sites in respect of the new planned functionalities

4.3.1. Multimodal route planning

- Availability of data:
  - Real-time data from automated traffic control systems (e.g., SCOOT)? **not available to OASA**
  - Real-time data GPS positioning of the public transport? **no**

  Data will be available early 2016. *(Q1-Q2)*

  We have one bus line in a pilot phase. The real-time data are updated every ~20 to 30 seconds. This info may be used in the project, depending on the time plan of the OASA Passenger Information and Fleet Management Project, which is in progress.

  The positions of the metro vehicles are also known to the metro control centres and relevant passenger info is displayed in every station (i.e., arrival time for the next 2 trains). This data could also be used.

  - Real-time data from GPS positioning from other sources (e.g., freight operations)? **no**
  - Real-time data from mobile phones in cars - crowdsourcing (Floating Car Data)? **no**

    Moovit has started providing services in Athens. This is a 3rd party app, out of our control for OASA.

  - Real-time data from mobile phones in public transport - crowdsourcing (Floating Car Data)? **no**
  - Real-time data from road side devices (e.g., Bluetooth)? **no**

- Public Transit:
  - In which format is timetable data available (e.g., GTFS)? **GTFS**
  - Is a workflow supported, in which this timetable is updated regularly (e.g., weekly, due to construction work or temporary station closures)?

    **The bus timetables are updated twice per year**

  - Do you support AVL?
    To be answered
  - Do you publish estimated delays from the AVL data? If yes, in what format?
    To be answered
Is indoor-routing data available for stations? E.g., what level of detail is data available to estimate the walking duration between an underground station entrance and a platform (and between different platforms of a station)?

**No indoor routing data**

Is data available regarding accessibility of platforms (e.g., availability of escalators and elevators, low-floor trams)? **No**

**This information is provided by an operator through the PA system**

Is data available for each station whether it is roofed/sheltered? **Yes**

**Information for all 7,500 bus stops are available**

Can you provide the pricing scheme for the public transit system (including exceptions, special fares, ...)? **Yes**

- **Road Data:**
  
  Is detailed road map data available (road segments and their coordinates for the whole relevant region)? Can it be shared within the project? **Yes**

  **The data is from 2004 (without direction, speed limits etc)**

  Is consistent data available for each road segment, regarding speed limits, direction of traffic, and allowed vehicle type (car, taxi, bicycle, pedestrians)?

  Fully updated data will be available by mid-December 2014. However, depending on the range and the detail of the data required for the pilot, a confidentiality agreement with OASA may be required.

  Is detailed elevation data available for the project region? **No**

  Can you provide data on taxi stations (their position, number of taxis, ...)? **No**

  this is actually dynamic data, since some of the official taxi stations are not in use and some ‘unofficial’ are in use.

  Can you explain the pricing scheme for taxis? **Yes**

  Are rental bikes available at your pilot sites? If yes, can you provide detailed data regarding rental stations, pricing, ...? **No**

- **Hardware**

  Powerful machine available for the needs of the project (HoPE)? **Yes**

  We have several computers, and we can purchase a couple for the project, if it is required
o Internet Access to the HoPE machines setup available? **yes**

o VPN access to the traffic control servers resolved? **yes**
4.3.2.  Tour planning for tourists

The tourist tour planner application uses the multimodal route planning module underneath. In that respect, the data required by the multimodal route planning are also required by the tourist tour planner.

Further issues that need to be clarified:

- Can you support the following fare options?
  - Single fare for a single public transit transfer (A → B, departure time t₀)? yes
  - up to 70 mins (single integrated ticket, or daily ticket)
  - Single fare for multiple public transit transfers (A → B, departure time t₀; C → D, departure time t₁; (E → F, departure time t₂, ...)? yes
  - up to 70 mins (single integrated ticket, or daily ticket)
  - One-day pass? yes
  - Multiple-days pass? yes (5-day pass)

- Do you support fares with special discounts (e.g. for elderly or students) for the above fare options? How do they work in detail? yes (check previous table)

4.3.3.  Transport on demand

- Do you provide transport on demand (ToD) services? Yes, there are 3 vehicles available but actually only 2 are used

Please respond to the following questions only if you answered “yes” to the previous question.

- Which are your pricing policies? Free service
- Who does the service address? (i.e., disabled, school, groups, …) disabled people, on a ‘fair use’ scheme: The service is not provided for disabled commuters (repeating the same trips every day)
• How many vehicles are involved? **3 mini-vans**

• How many passengers per day does your ToD have at the average? **During the 1st semester of 2014, 220 passengers used the service, carrying out 877 trips, covering 16,902 vkms**

• How the ToD service is planned? Is it planned offline (i.e., up to one day before providing the service) or online (i.e., while vehicles are running)? **The service is available between 8:00 and 22:00 hours and a phone call reservation is required, at least a day before the trip**

4.3.4. **e-payment**

• Do you have a website to sell tickets? **no**

  Not yet; there will be a dedicated site for this purpose

• Do you have a mobile application in which tickets can be paid for? **no**

  Not yet; there will be mobile ticketing in the near future.

• Which type of electronic payment do you accept?

  **Bank card**

  on bus PoS, in some metro stations (soon to be installed in all metro stations)

• Can you generate an e-transaction record for the transactions? **Not yet**

• Is your e-payment system connected to the ticket issuance system? **Not yet**

• Do you use any type of mobile payment solution? **Not yet**

• Do you have a dedicated bank for e-payments? **Not yet**

• Would you be able to use any other bank for the pilot, just to simplify implementation? **No**

4.3.5. **Ticket delivery**

• Do you have any type of mobile ticketing solution? **no**

  Not yet, **but in the near future**

• If you have a mobile ticketing solution do you have a dedicated app for the purpose or another technology is used?
Yes (under development)

- How do you represent the ticket on the mobile: **QR**

- Do you have a contactless ticketing solution deployed?
  Not yet; a PPP project is under development, including metro gating. This will be implemented in 2 years

- What types of validators are used: No validation planned for mobile ticketing.
  The user will validate its own ticket
4.4. The pilot concept

4.4.1. **Route planning for public transport & tour planning for tourists**

Multimodal route planning is selected as one of the pilot functions because travel costs become high priority for public transport users especially during this period of economic crisis.

The introduction of new information services, like the ‘tour planning for tourists’ will facilitate a specific group of users to plan their trip(s) with public transport to PoI’s around Athens, providing them the specific information they need.

The service of the multimodal public transport route planner (which already exists: Google Transit), incorporating the fare system (within the HoPE platform), may be introduced for the whole Athens public transport, taking into account the current fare system. However, if such a generalisation is impossible due to economic or other constraints, a metro line could be selected (e.g., the blue line) and combined with specific bus feeder lines that have high passenger volumes.

The service of the tour planning for tourists could be implemented for specific PoIs with large numbers of visitors (e.g., the Acropolis Museum, the National Archaeological Museum, the Greek Parliament Square, and the Central Shopping Area), combined with specific accommodation locations (e.g., the Hilton Hotel, the Great Britain Hotel, the Saint George Lycabettus Hotel) and main gates of the city (e.g., the Athens International Airport, the Piraeus Port).

The tourist tour planner could be tested within a six-month period, from May to October, when the highest volumes of visitors are in the city. During the same period, the multimodal, multicriteria public transport route planner could also be tested, covering on-peak and off-peak periods for the Athenian PT system.

The peak period occurs during May, June and September, when both residents and tourists use the public transport system for many different trip purposes (commuting, leisure, urban trip as part of vacation trip to the islands, …).

The off-peak period covers June, August and October, when many residents leave the city for half or one-month vacations or the number of visitors decreases (during October).

It is expected that 2.5 months of preparation would be sufficient to decide and pre-design both the data set (of the specific routes and fares) that will be incorporated to the HoPE public transport route planner, as well as the data set (transport modes and fares, PoIs, gates and accommodation areas) that will be incorporated to the HoPE tourist tour-planner.
The pilot will be open for everyone and no special devices will be used, as all information should be available in the HoPE smart application. We expect that the smart route planning function will attract new passengers to Athens public transport and public transport share may increase in transport.

Information about the pilot will be provided to the people by advertisements on the OASA website or brochures, that will be handed out to the people at special pre-chosen areas like PoIs, the Athens International Airport, and at the starting points of pre-chosen bus feeder lines, ... There could also be posters advertising the new services at special points of the city.

The success of the pilot will be measured by the increase in the number of passengers compared to the same period of the previous year. A 3% increase in revenues will be considered a success.

Passenger feedback will also be measured by a questionnaire asking their opinion about the new function and further recommendations. Data collected in the HoPE platform will also be analysed to draw further conclusion about usage patterns.

4.4.2. Service facilitation for disabled people.

The pilot will introduce an efficient and easy-to-use system for booking paratransit services in Athens. It will be used in the greater Athens Area, i.e., the area in which OASA is responsible for providing public transport services. The pilot will run for six months, and the whole operation will be organised from OASA’s own resources.

Target users of the pilot will be disabled passengers who already use paratransit facilities and for whom the quality of the services will be enhanced by the pilot. Every one presently using the service will be enrolled into the pilot, which will emulate 100% the commercial conditions. However the pilot will need to consider such issues as:

- The limited number of available resources (vehicles and drivers)
- The limited scope of the current service modus operandi. I.e., the service cannot be used by the same person on a periodic basis (e.g. for commuting)
- The eligible origins and destinations of the paratransit service which should not include locations which are already in proximity with metro stations, or served with public transport vehicles that can accommodate disabled persons

Besides improving the service level another key target of the pilot is to reduce administrative burden of the operation and increase its efficiency.
The success of the pilot will be measured by the ratio of disabled users utilising the HoPE application for this purpose. A 10% share will already be a good result.

4.4.3. Athens mobile tickets and payments Pilot

Athens is planning to introduce an electronic ticketing system in 2016. The pilot should provide important information and real life expertise about the new service, to allow OASA to better prepare for the new challenges.

In the pilot mobile ticketing will be tested on a special monthly pass, which can be used for / to the Athens International Airport. This personalised pass is used by approximately 6,000 people every month and costs €45 (reduced - €23). If a personalised fare is not technically possible, then another fare type will be selected, or a new one will be created for the purpose of the pilot.

The pilot is expected to run for six months by OASA but the involvement of external parties may be necessary such as the Athens Suburban Rail, depending on the scope of the operation.

The Athens mobile pilot will emulate a real commercial service with a limited number of users, on a specific fare type.

The pilot would be considered successful if between 5-10% of the travelers would be using the mobile ticketing feature. Users will be motivated to use the mobile fare, instead of the existing paper coupon by appropriate means. The number of users will be balanced between the actual number of people willing to utilise this technology and the final budgeted cost. Further benefits expected are the availability of transport information, and the testing of new multimodal fare types.
5. The pilot operation in Basque Country

5.1. Introduction of the pilot site

Location:
Country: Spain
City: Gipuzkoa County (San Sebastián)
Operator: Autoridad Territorial del Transporte de Gipuzkoa – ATTG (Territorial Transport Authority of Gipuzkoa)

Gipuzkoa is a province of the autonomous community of the Basque Country, its capital city is Donostia-San Sebastián. The province has a population of 709,607 inhabitants (2011), of which more than half live in the Donostia-San Sebastián metropolitan area.

The Territorial Transport Authority of Gipuzkoa (ATTG) is an instrument developed by public institutions to improve passenger services by coordinating the numerous operators and resources. It aims to integrate the entire territory of Gipuzkoa in a sustainable transport system, providing its citizens with quality mobility and information, according to current and future demands, accomplishing fair integration by promoting the use of a single smartcard in all public transportation modes and implementing a single fare structure. The members of ATTG are the Regional Government of Gipuzkoa (45%), the Basque Government (45%), the Town Hall of Donostia – San Sebastián (7%), the Town Hall of Irún (2%) and the Town Hall of Errentería (1%).

Each Gipuzkoan carries out an average of three daily displacements. In 2008 over 64,000,000 trips were carried out in public transport within Gipuzkoa, of which 18 million were by train, over 17 in interurban buses and 28 in urban buses. Most passenger movements are generated in the city of Donostia-San Sebastian.

2.6% of Gipuzkoan territory is occupied by transport infrastructures whereas the EU average is 1.2%.
In Gipuzkoa, interurban train service is offered by RENFE (80 km with 29 stations) and EUSKOTREN (2 passenger service lines), interurban bus service by Lurraldebus with over 100 bus routes, and 8 municipalities provide urban bus service. Most of these systems have just a few routes, except for Donostia-San Sebastián, which has 28 bus routes – dBus.

On an average weekday in 2009, the ridership of Lurraldebus was 60,000 passenger trips, that of dBus was 90,000.

The contactless integrated MUGI card can be used on Lurraldebus, on dBus, on Euskotren, on Irunbus, and the urban bus services in Errenteria, Arrasate and Hernani.

The Basque Government plans to realise the integration in one unique ticket of the entire transportation network of the Basque Country, including RENFE railway network services, by 2015. As the Basque Government is committed to boast public transport, it started a portal called Moveuskadi, with information on the whole public transport network in Basque Country, with route-planning information, for all systems. The mobile application is available for Android, iOS, and Windows phones.
5.2. State of art of Basque pilot transport system

This Chapter aims to present an overview of the transport network system in Gipuzkoa County to provide a better knowledge of the current situation of all those aspects concerning HoPE project.

5.2.1. Ticketing system in Gipuzkoa: MUGI

MUGI is a unified tariff system started up by the Territorial Transport Authority of Gipuzkoa (ATTG). Under this system, traveller can use all transport modes in the whole territory with a unique smart contactless card. Mugi system offers important benefits for those people who regularly use the public transport in Gipuzkoa.

5.2.1.1. Integration of transport modes

MUGI card can be used in the following transport modes operating in the territory of Gipuzkoa:

- Urban buses in the following cities: Hernani, Irun, Donostia, Arrasate, Errenteria, Eibar, Zarautz
- Interurban bus service operated by Lurraldebus
- Train: Routes from Hendia (France) to Ermua (Gipuzkoa)

5.2.1.2. Transport card types

Mugi system holds three types of contactless cards:

- Customary – Customised and non-transferrable card. Only the owner can use it and benefits from all “Mugi” advantages
- Collectives – Customised and non-transferrable card. Only the owner can use it and benefits also from discounts for special groups
- Anonymous – Multi-personnel card. This type of card allows trip cancellation for more than one user at the same time. Users can only benefit from 1st rank of discounts
- Occasional users can buy one-trip ticket (paper ticket). This paper ticket is directly sold by the bus driver.
5.2.1.3. **Tariff policy**

Tariff system is based on zones and number of trips.

The territory is divided into 15 integrated zones and fare calculation is based on the trip origin and destination. Transfers with the same transport operator are free of charge and discounts are applied between different transport operators.

Special discounts are applied for different collectives:

- **Large Family:**
  - General → discount of 20% over the general tariff
  - Special → discount of 50% over the general tariff
- **Young people (< 25):** Discount of 12% over the general tariff
- **Elderly, disable and social:** Discount of 52% over the general tariff

Children under age of 5 are free of charge.

Discounts are not applied for night tariffs.

On the condition that transport transfer is not performed, for a trip a maximum of 6 areas change are allowed. The trip fare increases as more jumps between zones are performed.

1. Bidasoa Beheia
2. Donostialdea
3. Urola Costa
4. Debabarrena
5. Durangaldea
6. Arratia-Amorebieta
7. Bilbao
8. Busturialdea
9. Tolosaldea
10. Goierri
11. Debagoiiena
12. Urola Erdia
13. Lekeitio
14. Araba
15. Vitoria-Gasteiz
5.2.1.4. **Operational schema**

Transport cards are rechargeable (e-purse). A card can be re-charged at:

- Kiosks
- Some public administration locations
- Post offices
- Transport operators terminals
- Automatic recharge machines
- Specific automatic teller machine (Kutxabank) adapted for this purpose
- Private area at the ATTG website. In this case, recharge should be validated when the passenger gets on the bus. It means that this type of recharge is stored in the server and one needs to download this recharge to the transport card before use. This operation is performed by the bus driver.

Credit is stored on the contactless card (pay-as-you-go style). Contactless card should be validated on the gates or stationary readers for each trip and price is deducted from the credit amount on the tariff policy basis.

Application of discounts is performed within each calendar month. This means that the counter starts from 0 the 1st day of each month.

Transport contactless cards should be validated:

- For interurban buses. As the pricing schema depends on the number of jumped areas between the origin and the destination, the passenger needs to validate the contactless card when ‘getting on’ and ‘getting off’ to get the applied tariff.
- For urban buses. Public transport within the same city has a flat tariff independent of the starting and end point. The contactless card needs only to be validated when boarding the bus: ‘getting on’.
- For train trips operated by Euskotren. Tariff also depends on origin and destination, a check-in, check-out system is used. The contactless card needs to be validated at the train platform.
5.2.1.5. **Technology**

Mugi plastic contactless card uses MIFARE classic technology fulfilling ISO 14443 requirements.

Mugi card should be validated on gates or stationary readers. Card readers accept the following technologies:

- MIFARE
- 14443 A
- 14443 B
- Also some readers are able to accept DESFire

5.2.2. **Route planning in Gipuzkoa**

In the last years, cities and regional areas have been systematically collecting and integrating traffic information. Today, the most advanced cities have a real-time traffic image of the main traffic flows in their traffic management centres, and a detailed monitoring for detection of incidents and disruptions.

Dynamic information input for traffic information service providers is needed for dynamic navigation and rerouting in navigation devices and for dynamic multimodal navigation on smart phones for travellers. Most transport operators have management systems that allow real-time monitoring of the location of their fleets. This real-time information is offered by transport operators to travellers on the website, bus shelters, tram stops, and metro stations by e-panels or other innovative ways such as SMS and Bluetooth.

Nevertheless, this real-time information for all transport modes is fragmented (from different sources) and in different formats.

Mugipuzkoa is a web platform that offers:

- Multimodal trip planner based on Google Transit
- A public transport GPS navigator. Based on GPSTransit technology, this app available for Android and iOS allow citizens to plan their journey in public transport depending on the user location in each moment.
At regional level, Moveuskadi is a platform that aims to integrate all information (static and dynamic) related to the public transport network operating in the whole territory.
Within the HoPE project, the Basque pilot intends to go further in their ticketing and route planning services, in order to explore all the possibilities that the NFC technology can provide for the mobile payment and trip validation, as well as including real-time information in mobility services for travellers.

Looking at HoPE functionalities defined in Task 2.3, the Basque pilot is exploring to implement different scopes for:

- Multimodal route planning for public transport including real time information
- Multimodal tour planning for tourists (data availability needs to be solved to introduce this function; at this point it is still questionable)
- E-payment and ticketing validation on mobile phones using NFC technology
5.3. Technical conditions of the operator

Responses provided to pilot environment questionnaire

5.3.1. Type of IT operation (please select the correct answer)

- In-house personal / **outsourced service partner**

- **Internal access to information** / information is under the control of external organisation

- To perform modification and/or integration decision is made
  - **Internally** / external competence

- Technical completion is performed by
  - Own employees / **external subcontractors** / exclusively by the vendors / no modifications are possible

5.3.2. Architecture

In this Chapter data about relevant aspects of the technical environment of the pilot operations are collected.

5.3.2.1. HW environment (please specify the various components)

- Servers: Cisco model 7200
- Storage type: HP Storage Works 1/8 Autoloader 960 LT0 (7x800GB)
- Routers: 2 switches – model Procurve 1800/24 (Hewlett-Packard)
- HSM: Netlan connectivity for the secure transmission of data

- Is there any known physical capacity constrain that is to be considered when the new system is deployed? **No there isn’t (in principle)**

5.3.2.2. Software used (please specify the various components)

- Data base: Data storage - Microsoft SQL Server 2005/2012
- Application server: RedHat Linux v.4 and Oracle version 10g
- Middleware: Oracle
• Firewall Cisco, Fortigate

• Is open source allowed? Not directly; we can get data in GTFS format about timetables, lines, frequency, stops, …

5.3.3. Security policy (please describe the relevant policy)

• Access to test system
  User management Dissociated backup of the DDBB (although there is not a real testing environment)
  Authentication + authorisation Yes
  Sign-in policy There is no need for a username or password
  Migration conditions to live system In principle, there are no special conditions for migration

• Access to live system
  User management Yes
  Authentication + authorisation Yes
  Sign-in policy Yes

• Logging policy Yes

• Archiving rules

• Is there a backup site or architecture? Backup system is composed by internal streamer HP Storage Works DAT 72GB hot pluggable

Is it hot backup?
Does it need to be considered for the new services to be deployed?

• Zoning policy: are there any rules in place which specify the separation of certain data and activity type, in respect of where this data may be stored and on which servers they may be run?
  Web
  Secure
  Log
  Application
  Management

• Are there any constraint in respect of remote access?
  During installation? yes
  Operation – support? yes
Monitoring? yes

- Antivirus policy? yes

- Patch management? no

- Validation of new codes to be used? yes

5.3.4. **Integration work**

- Who may perform the integration task? **Technology providers** / pilot operators

- Are there any specifications for the required set of documentation?

5.3.5. **Other policies (please describe the relevant policy)**

- Testing? no

- Training? no

- Documentation? no

- New release policy? Periodic / ad hoc

- Operation? 7/24 or other required availability: **8/5**

- Languages used in UI?

- Currencies used for payment? **Euro**

- Support? **7/24** or **8/5**
  
  What type of support is required
  
  **Frontline** / 1st level technical / 2nd level technical
5.4. Capabilities of the pilot sites in respect of the new planned functionalities

5.4.1. **Multimodal route planning**

- Availability of data:
  - Real-time data from automated traffic control systems (e.g., SCOOT)? **no**
  - Real-time data GPS positioning of the public transport? **yes**
  - Real-time data from GPS positioning from other sources (e.g., freight operations)? **no**
  - Real-time data from mobile phones in cars - crowdsourcing (Floating Car Data)? **no**
  - Real-time data from mobile phones in public transport - crowdsourcing (Floating Car Data)? **no**
  - Real-time data from road side devices (e.g., Bluetooth)? **no**

- Public Transit:
  - In which format is timetable data available (e.g., GTFS)? **GTFS**
  - Is a workflow supported, in which this timetable is updated regularly (e.g., weekly, due to construction work or temporary station closures)?
  - Do you publish estimated delays from the AVL data? If yes, in what format? **no**
  - Is indoor-routing data available for stations? E.g., what level of detail is data available to estimate the walking duration between an underground station entrance and a platform (and between different platforms of a station)? **no**
  - Is data available regarding accessibility of platforms (e.g., availability of escalators and elevators, low-floor trams)? **no**
  - Is data available for each station whether it is roofed/sheltered?
  - Can you provide the pricing scheme for the public transit system (including exceptions, special fares, ...)?

- Road Data:
  - Is detailed road map data available (road segments and their coordinates for the whole relevant region)? **yes**
  - Is consistent data available for each road segment, regarding speed limits, direction of traffic, and allowed vehicle type (car, taxi, bicycle, pedestrians)? **no**
  - Is detailed elevation data available for the project region? **yes**
  - Can you provide data on taxi stations (their position, number of taxis, ...)?
  - Can you explain the pricing scheme for taxis? **nes**
o Are rental bikes available at your pilot sites? If yes, can you provide detailed data regarding rental stations, pricing, ...? yes

- Hardware
  o Powerful machine available for the needs of the project (HoPE)?
  o Internet Access to the HoPE machines setup available? yes
  o VPN access to the traffic control servers resolved? no

5.4.2. Tour planning for tourists

The tourist tour planner application uses the multimodal route planning module underneath. In that respect, the data required by the multimodal route planning are also required by the tourist tour planner.

Further issues that need to be clarified:
- Can you support the following fare options?
  o Single fare for a single public transit transfer (A → B, departure time t₀)? yes
  o Single fare for multiple public transit transfers (A → B, departure time t₀; C → D, departure time t₁; (E → F, departure time t₂, ...)? no
  o One-day pass? no
  o Multiple-days pass? no
- Do you support fares with special discounts (e.g., for elderly or students) for the above fare options? How do they work in detail? Yes

  Being resident in Gipuzkoa is a must for all of them, so it does not look viable

5.4.3. Transport on demand

- Do you provide transport on demand (ToD) services? no

5.4.4. e-payment

- Do you have a website to sell tickets? no

  But you can recharge your transport card on the web
  
  if yes: can one buy on this site any type of tickets or just selected types

  Any type; the website is for recharging credit, you can travel more depending on the type of card or the profile (elderly, young, ...)

  Can you manage fares with special discounts on this site – like student discount? yes
• Do you have a mobile application in which tickets can be paid for? **no**

• Which type of electronic payment do you accept?
  
  **Bank card**

• Can you generate an e-transaction record for the transactions? **yes**

• Is your e-payment system connected to the ticket issuance system? **yes**

• Do you use any type of mobile payment solution? **no**

• Do you have a dedicated bank for e-payments? **no**

• Would you be able to use any other bank for the pilot, just to simplify implementation? 
  
  **Probably yes**

5.4.5. **Ticket delivery**

• Do you have any type of mobile ticketing solution? **no**

• Do you have a contactless ticketing solution deployed? **yes**
  
  if yes which technology do you use: **MIFARE**, MIFARE Plus, DESFire, Calypso, other

• What type of tickets are included in the e-ticketing program?
  
  **Single trip,**
  **Multiple trip,**
  Periodic passes,
  **Tickets with special discounts**
  **Check-in , check-out**
  **Pay as you go**
  server wallet
  e-purse

• How and where do you sell the e-tickets?
  
  **Kiosk**
  **Terminal**
  **Web**
  Other channel – **Kutxabank**

• How are the tickets sold?
On-line – recharge of contactless transport card
Off-line – single tickets

- What types of validators are used:
  
  Gates
  Stationary readers
  Mobile terminals
  Mobile handsets

- How are the tickets validated?
  
  On-line
  Off-line

- Are there any ticketing standards your solution is based on?
  
  ITSO
  Calypso
  Other (please specify): ISO 14443

- What are the contactless tickets made of?
  
  Paper
  Plastic
  Other (please specify):

- Do you have any experience with an NFC ticketing solution?
  
  if yes please specify:

- What type of readers are used?
  
  Maexbic, Telvent

- What type of cards can the reader accept?
  
  MIFARE
  MIFARE Plus
  DESFire: some readers also accept DESFire
  14443 A
  14443 B
  Other
5.5. The pilot concept

5.5.1. Multimodal route/tour planning for public transport and tourists
Travellers in urban and interurban areas have available pre-trip online information on destinations and route but are not dynamically informed about changes when on the move.

The objective would be to gather static and dynamic data for public transport in the territory, and to provide a route planner service with real-time information for travellers.

Tourists are becoming a target group as tourism in the Basque Country is considerably increasing. A tour planning application containing information not only about public transport but also PoIs, in which visitors can calculate their daily routes according to their preferences, is an interesting service to offer with the aim of facilitating their mobility across the city and optimising their time.

For these two services, collaboration from third parties is required to gather information about static and dynamic information of the different transport modes operating in the territory and PoIs.
5.5.2. **Pilot Test Scope**

Multimodal route planning for public transport and tour planning for tourists’ mobile apps will allow locals and tourists to get the best routes to destinations according to their preferences and fare calculation for each route.

Both services will have the possibility of integration with the mobile payment and e-ticketing modules so that users can pay for their selected routes.

For these two services, collaboration from third parties is required to gather information about static and dynamic information of the different transport modes operating in the territory and PoIs.

The route planner would be used at a regional level to allow any citizen with a smartphone to use the service, as there should be no specific device requirements. For the tour planner, the target audience are tourists visiting the region.

A communication campaign to encourage users will be carried out in advance of the piloting phase. A pilot strategy will be defining the selection concept of target users and actions to be performed. MLC dissemination tools and other media channels will be used to inform every potential user about the services and the possibility to participate in the pilot and information will be distributed at specific points such as tourism offices, bus/tram stop shelters, metro platforms, …

At this moment NFC technology is not widespread in the market and still has limitations. This fact is also going to limit the scope of the testing phase in terms of number of users.

The first step is to identify requirements for smartphones with the adequate NFC technology to interact properly with the ticketing transport system. The pilot site leader (MLC) will provide the required devices to confident users that will be selected in cooperation with the transport authority.

In order to increase the sample size as much as possible and improve the results, the pilot partners will try to find other people having mobile devices with appropriate NFC technology and encourage them to use the solution implemented.

5.5.3. **Mobile payment and e-ticketing**

One of the pilot objectives is to introduce NFC technology in its ticketing system. Under this concept, the Basque pilot aims to test different use cases addressed to different target users.
5.5.4. **Pilot Test Scenarios**

- **MUGI transport card users**

  **Goal:** Recharge transport contactless card anywhere at any time. Under this approach, e.g., parents will be able to recharge their children’s transport card without going to any specific recharging point.

  **Operational approach:**

  1. A transport card user request to recharge action with a fixed amount (e.g., € 10)
  2. He performs the payment on the mobile app solution, inputting and storing the card details
  3. iCheque performs the payment transaction to the transport operator bank account provided by the HoPE project
  4. The transport operator receives the payment confirmation
  5. The transport operator sends the recharge details to the HoPE platform, or directly to the ticketing module
  6. Credit is sent to the user’s mobile app
  7. Using NFC MIFARE, the user will transfer the credit to the smart card which is accepted for use in Gipuzkoa
Occasional users and tourists

Goals: User does not need to have a physical transport card.
User can use the system for multi-personal-use (e.g., a tourist can use the system for the entire family, as a ‘bonus’ without the need for buying paper tickets for each person for each trip).
Drivers do not need to sell occasional paper tickets, reducing delays on the route, improve driver safety – driver interaction is not required and there is no cash in the bus (preventing thieves and vandalism)

Operational approach:
A foreign family arrives in San Sebastian to spend their holidays. They are informed that there is a tour planner mobile app to organise their daily routes according to their preferences and including public transport information to move across the city. The mother has also a smartphone with NFC technology compatible with the ticketing system used in Gipuzkoa. They are explained that tickets for the selected route can be acquired from the app and even recharging the credits on the phone during their stay is possible.

Pre-condition
As pre-requirement transport card system accepted in Gipuzkoa is emulated on the NFC mobile phone

Case 1

1. She requests a credit recharge on the mobile to be used by the whole family during their stay
2. She performs the payment on the mobile app solution providing the card details
3. iCheque performs the payment transaction to the transport operator bank account provided by the HoPE project
4. The transport operator receives the payment confirmation
5. The transport operator sends the re-charge details to the HoPE platform, or directly to the ticketing module
6. Credit is sent to the user’s mobile app
7. Each time they use the public transport, multiple validation (for all family members) is performed using the mother’s mobile
8. Trip fares are deducted from the credit
Case 2: Services Combination

1. A tourist (or an occasional user) requests the daily route using tour planner app (or route planner)
2. The user gets different routes and tariff calculation for each route
3. The user selects a route and requests payment (single or multiple tickets) providing credit card details
4. iCheque performs the payment transaction to the transport operator bank account provided by the HoPE project
5. The transport operator receives the payment confirmation
6. The transport operator sends the ticket details to the HoPE platform, or directly to the ticketing module
7. NFC ticket(s) are received on the mobile’s app
8. NFC ticket(s) are validated in gates or stationary readers
Interoperable framework in the Region

Goals: Test how the system works on other environments. In that way, tourists visiting the Basque Country or occasional users only need to emulate one system in their mobile to be used in the whole territory.

Operational approach:
Different pilots are planned in the Basque Country to implement stationary readers able to accept all smart contactless transport cards operating in the region.

This use case is based on the occasional user approach in which transport card technology accepted in Gipuzkoa (MIFARE) is emulated on the mobile phone.

Once a user has got the credit on the mobile phone, he moves to another city in the Basque Country, e.g., Bilbao, and use his mobile wallet (NFC) in another transport mode (with readers compatible with MIFARE technology), operated by different administration.
The objective for the long term would be that citizens (especially local occasional users, tourists, …) do not need to have plastic cards neither buy single paper tickets. Only their mobile device would be needed to move across the whole territory on public transport in a transparent way and they could acquire their transport pass/ticket at any time and place.
6. **Assessment of technical conditions of the pilot operators**

Based on the assessment of the identified technical conditions, as described in the pilot questionnaires by the pilot operators, it can be established that the available technical environments meet the requirements of the HopE pilots.

Going into more details it is obvious that the acquisition of some new hardware and software components may be necessary, however none of the operators have any restrictions in this regards. The only worrying point is that in the Basque Country the use of open source software may be restricted; this limitation needs to be better understood.

It is a benefit for the project that the necessary information is possessed at all three sites by the pilot operators, members of the project, and no external parties need to be contacted for this purpose. This situation may accelerate the communication and progress of the work. The same conclusion stands for the internal decision making in respect of the integration requirements.

The scenario for the technical completion of the work is different at each site. It seems that most challenging environment will be in Coventry where the work will need to be performed by external subcontractors.

The strictness of the security policy seems to be the highest in Coventry where they require the same level of control in their test architecture what is used in the live environment. In respect of the operation itself a comprehensive policy needs to be followed at all three sites, including authentication, authorisation, user management and sign-in features.

Installation, testing, and support is made simpler by the fact that both Coventry and Athens allow remote access to the systems and only the Basque Country has limitations in this respect. Similarly, it is favourable for the project that none of the operators have formal code verification procedures and patching may also be performed on an ad hoc basis.

It is also a great simplification for the pilot operations that there are no formal training requirements, and there are also no guidelines present for the documentation which allows us to use more or less the same documents at all three sites.
The greatest challenges are posed by the operational and support requirements. While the Basque country is satisfied with an 8/5 operation model (8 hours on 5 weekdays), it nevertheless requires a 24 hours support service.

In contrast to this scenario, OASA needs a round the clock, 24 hour service, but support is necessary only during working hours.

Coventry establishes the strictest requirements with 7/24 service level in both respect.

The type and level of support is also widely diverse at the three sites, with Coventry and Athens requiring all types and level of support, whereas the Basque country only needs the availability of a frontline help desk.

The insensitivity and extent of the operation and related support services will need to be harmonised on project level. Although these aspects do not establish additional technical challenges, but the modes of service provisioning may substantially increase the cost of the pilots.