NEWSLETTER

Oct 2013
N° 4

Content of Issue 4

Enhanced WISETRIP Project

Enhanced Intermodality of Content, Personalised Information and Functionality of WISETRIP Network of Journey Planning Engines

SEVENTH FRAMEWORK PROGRAMME

GC.SST.2011.7-5.
Integrated intermodal traveller services

International Trip Planning and support based on the needs of travellers

The ENHANCED WISETRIP Approach!

EUROPEAN UNION

www.wisetrip.travel

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Improved UI (1)

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Improved UI

A fundamental concept in application development is that the user interface is the system to the users. The key requirement is that the system must meet the users' needs and be easy to use. The user interface of enhancedWiseTrip has been redesigned (especially the search interface) to be more user-friendly, more intuitive and more flexible. More specifically, the new design was based on the following principles (explained in Software for Use: A Practical Guide to the Models and Methods of Usage-Centered Design, by Larry L. Constantine) which have been proven to create a solid foundation for promoting a quality experience for users:

1. The structure principle. The design organizes the user interface purposefully, in meaningful and useful ways based on clear, consistent models that are apparent and recognizable to users, putting related things together and separating unrelated things. As an example the enhancedWiseTrip interface groups together the various features that comprise trip strategies since they influence in a similar way the trip selection algorithm.

2. The simplicity principle. The design makes simple, common tasks simple to do, communicating clearly and simply in the user's own language, and providing good shortcuts that are meaningfully related to longer procedures. This has been accomplished through a very modular design, providing feature clarity and immediate familiarity with the system's functionality.

3. The visibility principle. The design keeps all needed options and materials for a given task visible without distracting the user with extraneous or redundant information. This is mainly reflected in the interface by not overwhelming users with too many alternatives or by providing a lot of unneeded information.

4. The feedback principle. The design keeps users informed of actions or interpretations, changes of state or condition, and errors or exceptions that are relevant and of interest to the user through clear, concise, and unambiguous language familiar to users. The use of internationalization throughout the system, as well as the attention to detail so that for example messages fully convey what needs to be done or what has gone wrong, provide examples of the implementation of this principle in the interface of the enhancedWiseTrip.

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

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Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Improved UI (2)

5. The reuse principle. The design reuses internal and external components and behaviours, maintaining consistency with purpose rather than merely arbitrary consistency, thus reducing the need for users to rethink and remember. Examples of this principle in the interface can be found in the reuse of dialogs, validation and error messages, css design, wizards, etc.

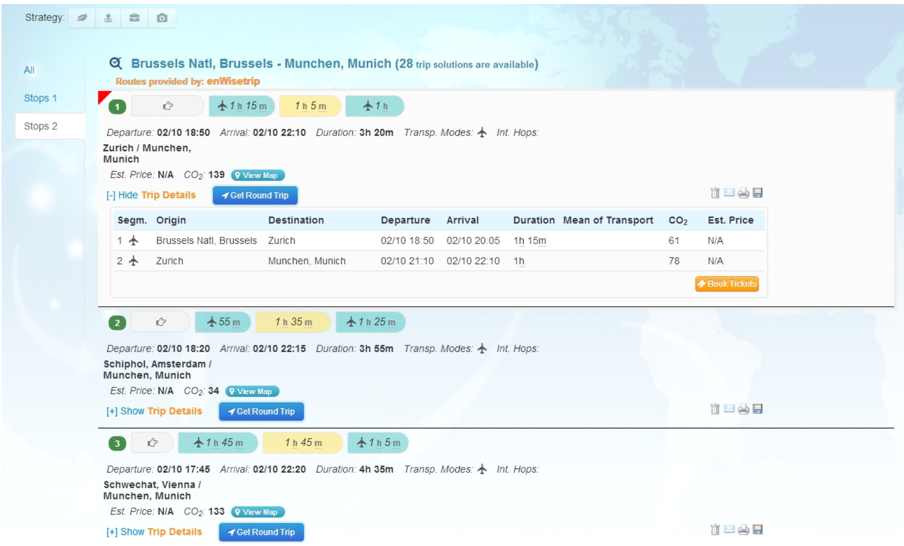

Figure 1: Search results screenshot

The Search interface was completely redesigned to make it easier for the user to better visualize the various trip segments, waiting times and modes of transportation. A horizontal representation of the trip is more natural and also makes better use of the available space. The visual representation of the trip also provides a feeling of how long each segment of the trip will take to complete, as well as what is the length of the waiting time before each trip segment.

It thus provides a nice way of comparing the various alternative trip options which is further augmented by sorting and filtering options. It is, for example, possible to filter the trip results by the number of hops that comprise the trip, or the number of transportation modes, while it is also possible to sort by the trip's duration, the departure or arrival date, etc.

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Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
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University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
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Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Improved UI (3)

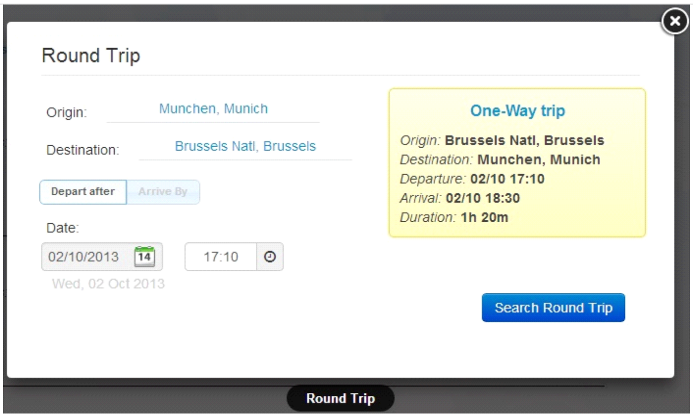

Figure 2: Round trip screenshot

A new functionality of the system is the Round trip service. This has been considered very important to the end users since most people when travelling depart and return to the same origin. Thus, when planning their trip they would like to have full information for the round trip.

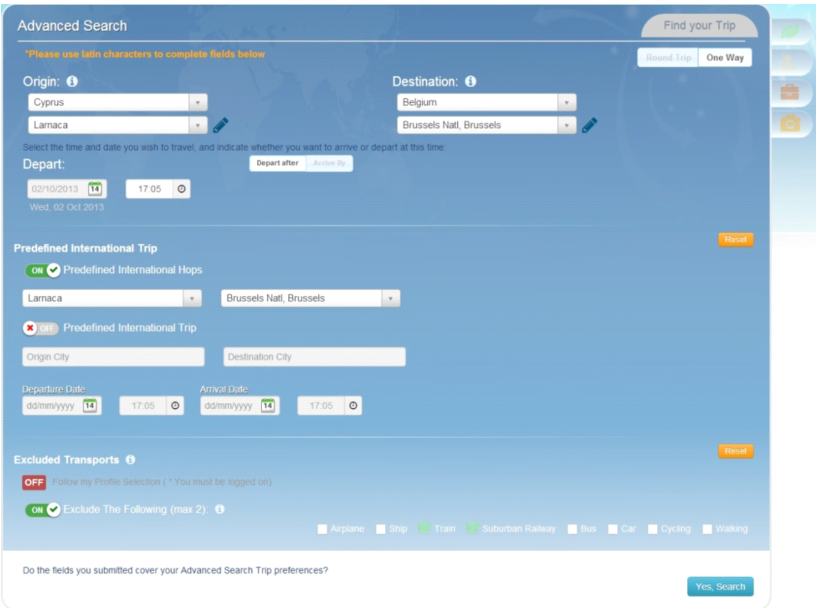

Figure 3: Advanced search screenshot

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Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

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Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Improved UI (4)

The system now includes targeted ways to accommodate the needs and requirements of different user groups, which can be expressed through:

- Personal preferences which formulate the profile of a specific set of requirements that correspond to a user group.
- The inclusion of well-defined trip strategies that have been designed to fit to the needs of specific user groups. When such a strategy is selected the needs of this group will be in top priority.

Trip strategies for the following user groups have been implemented:

- Cost sensitive users: an estimated price per trip segment is provided by the user interface where available and the journey planning algorithm gives preference to cheaper routes.
- Business travelers: the fastest routes the ones preferred, giving priority to the length of the trip and the departure and arrival times.
- Eco-Sensitive: the CO2 footprint criterion serves the need of the traveller who wants to find the most eco-friendly way of transport.
- Elderly and/or disabled: the journey planning algorithm gives higher ranking to routes involving short waiting times as well as routes consisting of stations with appropriate facilities available such as trolleys for luggage, electric stairs, availability of lifts, WC facilities, etc.

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
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Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Integrated Ticket (1)

Integrated Ticket

Unified ticketing mechanisms are of great importance in the context of implementing a user friendly inter-modal transport system. Fully supporting integrated ticketing in the context of enhancedWiseTrip is not a realistic objective due to the fact that providing single ticket for the whole journey necessarily involves different transport policy issues and the integration of different pricing, regulatory and distribution systems.

The aforementioned aspects make it clear that the integrated ticketing mechanism that has been implemented in the project operates as a high level assisting mechanism and merits passengers with the benefits of a seamless experience throughout the booking process. The implementation facilitates passengers by abstracting the vast diversification of the (multiple) existing external ticketing/booking systems and allowing each passenger to book his/her trip and organising accordingly his/her ticketing plans in a master itinerary that's easy to access.

The implemented system provides a structured process for booking either parts of a trip or the whole itinerary through a wizard interface. The main steps of this process are depicted in the following screenshots.

Initially the passenger is informed about the available tickets for the selected trip and is asked to choose the ones of interest. (Figure 4).

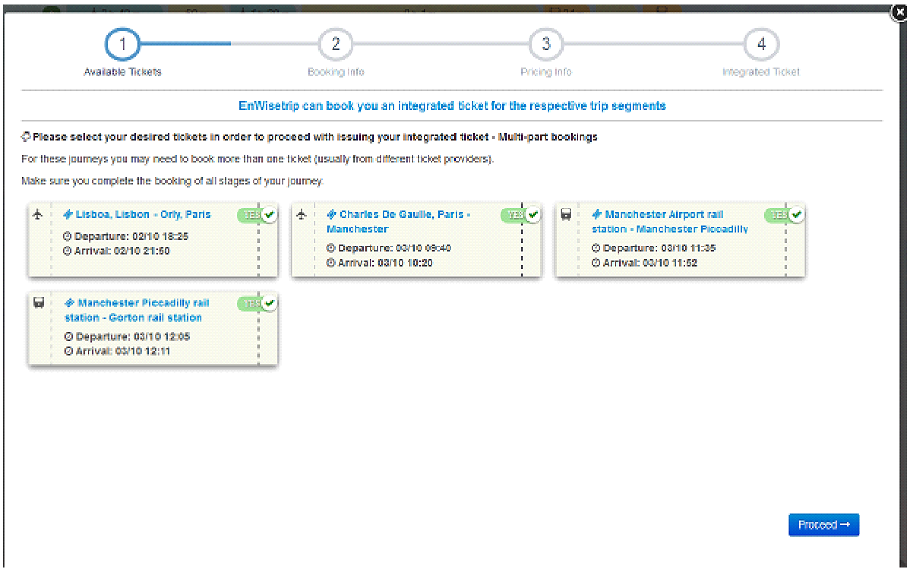

Figure 4

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Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

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School of Geosciences,
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Elphinstone Road,
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Integrated Ticket (2)

In the next step the passenger is presented with a four-step wizard interface which provides guidance for completing the booking process. For each individual booking mechanism (or ticket if needed) the passenger is asked to fill the appropriate information to proceed with the booking process (Figure 5).

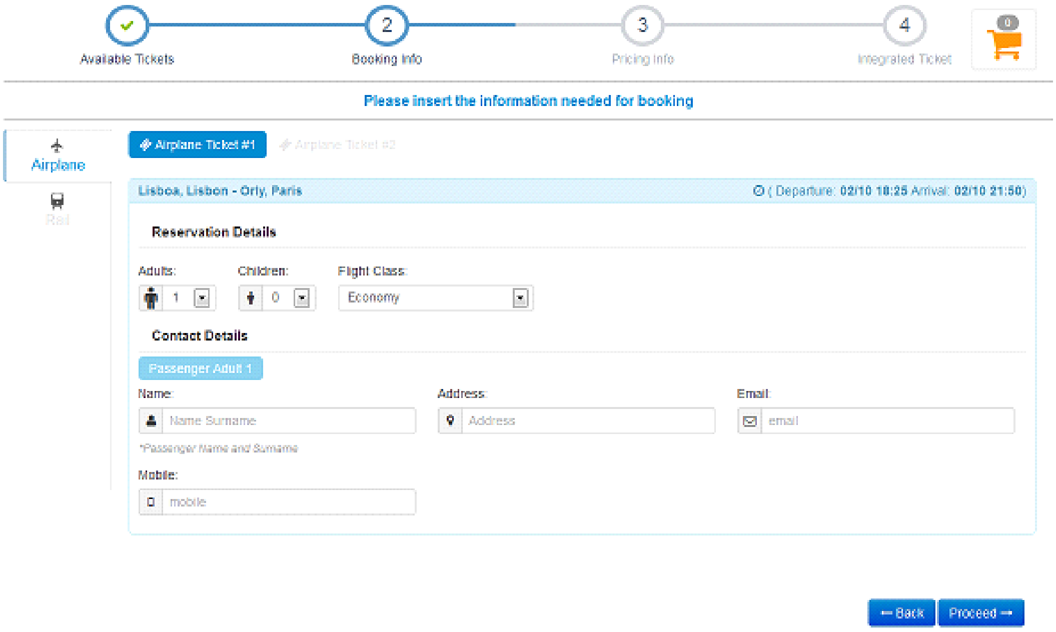

Figure 5

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Integrated Ticket (3)

After completing this process the passenger is asked to enter the payment information that is required to complete the process. The information then is forwarded to the respective external booking systems in a transparent way.

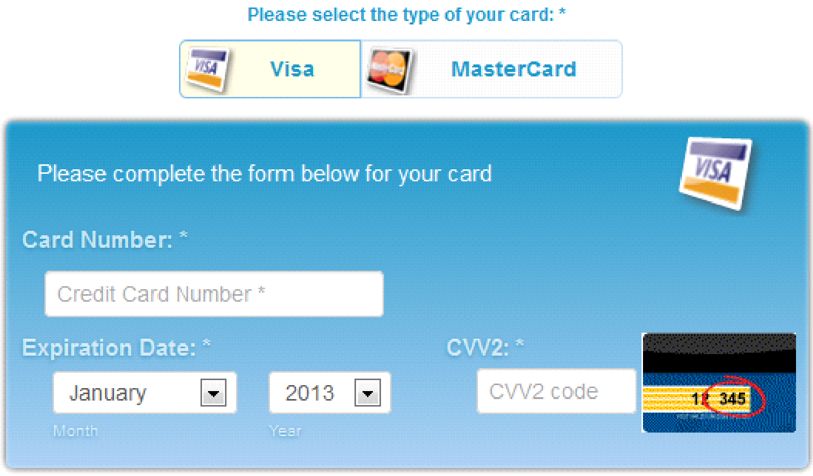

Figure 6

The last step of the process informs the passenger about the outcome of the ticketing process. The passenger is presented with the booked tickets and relevant information associated with the booking and is given the option to save this information to his/her profile.

Deploying a unified ticket mechanism is an essential condition for a user-friendly multi-modal journey planner, and the current implementation focuses on achieving the right balance between a complicated and fragmented booking ecosystem and the use of a passenger oriented interface that promotes a holistic approach on ticketing services.

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Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

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University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
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Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
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Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

International Journey Planner Defining the network (1)

International Journey Planner Defining the network

It is evident that using the entire international transportation network to identify alternative itineraries leads to a computationally burdensome task. Moreover, the entire international transportation network may include transport links that would never be included in a feasible itinerary due to time constraints. For instance, if the trip request is from Athens to London, then considering an itinerary that includes Moscow airport is not viable due to the extended time duration of the trip. A way of decreasing the computational effort required to determine alternative itineraries and avoiding non-viable itineraries from consideration, is to pre-process the underlying international transportation network by identifying (off-line) for every possible pair of origin and destination countries a sub-network that would include transportation links that could be possibly included in a viable itinerary. The pre-processing phase should be applied to any pair of countries covered by the system. The expected outcome for each pair of origin and destination countries is a network connecting the international gateways of the origin-country to the international gateways of destination-country, so that any path does not exceed an estimated maximum travel time of L hours (e.g., 12 h). Note that the threshold value (L) may be different for different pairs of countries. The threshold value (L) applicable for a given origin and destination may be specified by the following steps: i) determine their direct distance (D) (from the longitude-latitude coordinates of the corresponding locations), ii) provide an estimate of the travel time (T) if this distance was covered by a direct flight (the use of an ad-hoc travel speed is needed), and iii) multiply the emerging time (L) with multiplier (λ), $\lambda > 1$, e.g. 1.5. Thus $L = \lambda T$, allowing for a flexibility in the size of the customized network. In particular, for larger values of λ the larger the emerging customized network. The emerging customized network is static in the sense that its links correspond to transport connections with no timetable information.

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

International Journey Planner Defining the network (2)

A major prerequisite for applying the pre-processing steps relates to the availability of a static version of the international transportation network with the following features:

- The static network involves a list of international gateways and a list of static links representing transport connections between the international gateways. The list of transfers (if any) between two gateways is also assumed available.
- Each node (gateway) is identified by its unique ID, while it is also associated to the following type of information: i) country, ii) longitude-latitude coordinates, iii) transport mode.
- Each link of the static network is identified by its two end-nodes (gateways) and a transport mode.

The following approach is proposed in order to determine the static network associated to a given pair of countries:

1. Specify all international gateways of both origin and destination countries
2. Apply a forward shortest path label setting algorithm from the origin-country gateways and a shortest path backward label setting algorithm from the destination-country gateways on the static international transportation network.
3. Each time a (forward or backward) label is fixed for a gateway two issues are checked: i) if the gateway is already (backward or forward) labelled (so a path from an origin-gateway to a destination-gateway has been found) and ii) if the labelled gateway is connected (via transfer) to another gateway which is already (backward of forward) labelled. In both cases the travel time of the path is calculated (by adding the corresponding travel times of the constituent sub-paths). If the path travel time exceeds L then the process is terminated and the links already associated to at least one identified path constitute the customized network for any trip request associated to the specific pair of countries. In practice the above process excludes any path of the static network for which a lower bound on its travel time exceeds the ad-hoc threshold value (L).

The travel time on any static link is calculated by the ratio of the distance (calculated from the gateways' coordinates) with the ad-hoc set travel speed. This pre-processing phase is applied before solving any of the international itinerary planning problems.

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Smart Algorithms (1)

Smart Algorithms

enhancedWiseTrip deals with two major categories of trip planning problems: static and dynamic. The static refers to journey planning decisions at the pre-trip phase and includes: i) the elementary itinerary planning problem defined within a given pair of origin/destination points within a given earliest departure and a latest arrival time at destination, ii) the return trip itinerary planning problem, iii) the itinerary planning problem with multiple intermediate stops, and iv) the trip itinerary contingency planning problem, i.e., planning in advance alternative back-up itineraries that may resolve several anticipated trip disruptions. The dynamic refers to the journey on-trip re-planning problem. The emerging itinerary planning problems are defined on the hierarchically interconnected international, interurban and urban transportation networks modelled as a multimodal time-dependent network.

The proposed solution approach for the international itinerary planning problems (i)-(iii) includes two major stages. In stage I, the international part of the trip is identified, (i.e., sequence of international segments from the origin to the destination), including the walking/urban/interurban transfers where necessary (i.e., transfer from the origin to the first international gateway, the transfer from the last international gateway to the destination, and the transfers between international gateways. In this stage of planning the emerging paths are not fully defined in the sense that the transfer links are not fully specified (an indicative estimate for travel time is only used in this stage). As a consequence there are two issues pending to be specified in the second stage of the solution approach for each of the generic itineraries identified: i) determine the optimal (possibly multimodal) local/interurban itinerary for performing each transfer while retaining the overall feasibility of the entire itinerary, and ii) validate that the complete itinerary (enhanced with the detailed transfer itineraries) remains optimal/non-dominated. Thus, is stage II each of the identified generic itineraries is further refined by identifying alternative transfer itineraries for performing the corresponding urban/interurban transfers. In general, more than one alternative international gateways may be used in order to start or finish a journey. Thus, the elementary itinerary planning problem is treated as a multi-criteria time-dependent shortest path problems with multiple origins and multiple destinations. Considering each destination separately, the emerging problem is decomposed to a series of multi-criteria time-dependent shortest path problems with multiple origins and single destination. A backward label setting algorithm is proposed for solving the arising multi-criteria path finding problem.

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

Smart Algorithms (2)

The round trip consists of two separate elementary problems. The questions that arises is whether one should address this trip planning problem as a single two stage problem or as two separate problems. Considering the total travel time of both trip phases, may be misleading in assessing two alternative solutions. For instance, say that there are two solutions S1 and S2 with total travel time 14h and 12 h respectively. The second solution clearly dominates the first in terms of travel time. However it could be the case where the two phases of S1 have 7h duration while S2 involves phase 1 with 9h and phase 2 with 3h (e.g., due to schedule issues). In such a case the traveller may have favoured solution S1. Similar cases may exist for transfer time or the number of transfers. This observation implies that the two problems should be addressed as two separate problems. Similar approach is suggested for the multiple trip planning problem.

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: stratakis@forthnetgroup.gr

Dissemination Manager
University of Aberdeen
School of Geosciences,
St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

Newsletter Editor
Forthnet S.A.
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr

www.wisetrip.travel

We Need Your Support

enhancedWISETRIP partners would like to thank the User Group members that took part in the WISETRIP project. We have recognised your comments in the design of enhancedWISETRIP and hope you will continue to support the development and evaluation of the system. If you have any comments regarding any aspect of our work or content of this newsletter, please contact Prof. J.D. Nelson at University of Aberdeen (j.d.nelson@abdn.ac.uk).

enhancedWISETRIP in operation

The focus of the project in the past months has been on refining, and implementing the first functional interface, incorporating new enhanced features. Project has also concentrated on integrating new co-operating journey planning systems that extent the European coverage of the network.

enhancedWISETRIP news & events

1. Presentation of the itinerary planning models and algorithms in the 1st European Symposium on Quantitative Methods in Transportation Systems (September 4-7 2012, Lausanne, Switzerland)
2. Interferry Conference 2012, Venue & Date: Dubai, 21-24 October 2012
3. 19th ITS World Congress, Venue & Date: Vienna, 22-26 October 2012
4. National Verkeerskundecongres 2012, Venue & Date: Netherlands, 31 October 2012
5. Annual Meeting of the Transportation Research Board, Washington D.C., USA, January 13-17, 2013
6. Holyrood Conference on Smart Sustainable Transport, Edinburgh, Scotland 28th May 2013.

the consortium

Forthnet S.A., GR (Co-ordinator)
Hellenic Telecommunications & Telematics Applications company
www.forthnet.gr

AUEB-RC / TRANSLOG, GR
Athens University of Economics and Business
www.translog.aueb.gr

ETRA SA, Spain
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University of Aberdeen, UK
School of Geosciences, Centre for Transport Research
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Softeco Sismat Srl
www.softeco.it

Project Coordinator
Forthnet S.A., Manolis Stratakis
Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
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St Mary's Building,
Elphinstone Road,
Aberdeen AB24 3UF
Tel: +44 1224 272354
Email: j.d.nelson@abdn.ac.uk

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Science & Technology Park of Crete,
Vassilika Vouton, GR71500
Tel.: +30 2811 391200
Fax: +30 2811 391207
e-mail: contact-innov@forthnetgroup.gr