PEACOX – Persuasive Advisor for CO2-reducing cross-modal trip planning

Project Reference: 288466

FP7-ICT 2011: 6.6 Low carbon multi-modal mobility and freight transport

Project Duration: 1 Oct 2011 – 30 Sept 2014

D6.3.1 System Design and Interface Definition

[FLU]

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Date: 20/04/2013

Dissemination level: (PU, PP, RE, CO): PU

Project Co-Funded by the European Commission within the 7th Framework Program

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1. Introduction

1.1 Background

The objective of this work package is to define, design and implement the PEACOX applications (journey planning application and navigation client). In the first step, the use cases for the PEACOX applications will be defined, representing the basis for the development phase of the PEACOX applications.

Furthermore, the overall system architecture will be finalised, as well as the definition of all system components.

Another important aspect of this WP is the interface design of the PEACOX applications. Within this WP the interaction design as well as the visual design of the PEACOX applications will be finalised.

The last step deals with the development of the PEACOX applications for the planned trials (Vienna, Dublin).

1.1.1 Scope of this Deliverable

In the first chapter, the system architecture of the overall system will be presented and explained in detail. Additionally, the database concept of the PEACOX system will be discussed.

The next two chapters deal with the interaction concept as well as the interface design of the two PEACOX clients (journey planner application and navigation client).

The last chapter deals with the summary and the outlook.

2. System architecture

2.1 Overview

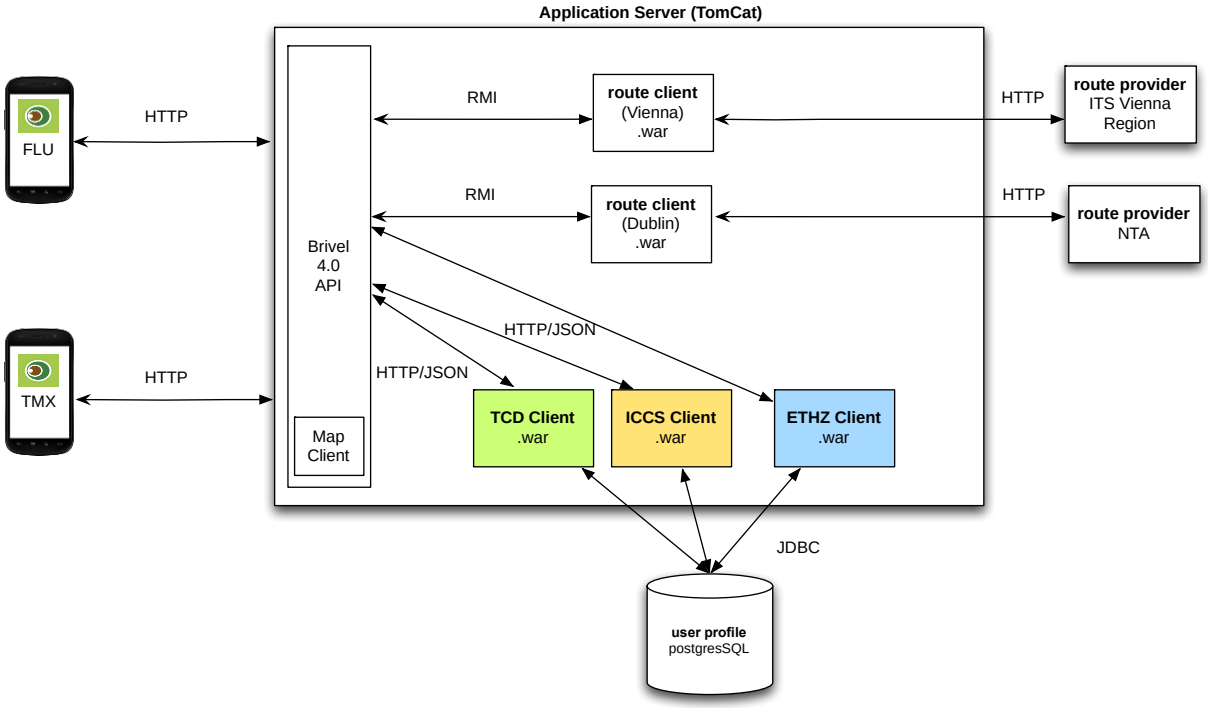

Figure 1: Overall system architecture

Figure 1 represents the overall system architecture of PEACOX. There exist two client components, journey planner application and the navigation client. The journey planner application, provided by FLU, is connected to the ITS Vienna Region / NTA routing engine in order to receive routing results. The navigation client, provided by TMX, uses also the ITS Vienna Region / NTA routing engine in order to receive multimodal routing results. Therefore, FLU will provide TMX a route API (part of the brivel 4.0 API).

The application server represents a central component within the architecture, covering the main business logic that is necessary within the PEACOX system. Additionally, all other components will be integrated: ICCS Client (recommendation component), ETHZ client (travel mode detection and trip mode detection) and TCD client (emission model and exposure model) will be integrated within the application server.

In case of the TCD client and the ICCS client JSON (Java Script Object Nation) will be used as data-interchange format. The benefits of this format are: is easy to read for humans and it is easy for machines to pare and generate. Furthermore, JSON enables simple data structures because of the used lightweight text data interchange format.

All partner components will be provided as .war files and will be deployed within the application server. The deployment process will be defined together with all partners, depending on the development process of the individual partners.

Open Street Map (OSM) will be used within the PEACOX journey planner application, whereas the navigation client will use the TomTom maps. The map data will be used in both trial cities, Vienna and Dublin.

2.2 Database concept

Each partner will be connected to the central database, the user profile database. During the development phase the database will be hosted by ICCS. Afterwards, the dump of the final version will be also hosted on the application server.

Server components are free to JDBC to connect to the database and manage the database entities manually, or to use Hibernate framework to take the advantages provided by Hibernate framework. Figure 2 shows the current status of the central database, which was defined together with other project partners.

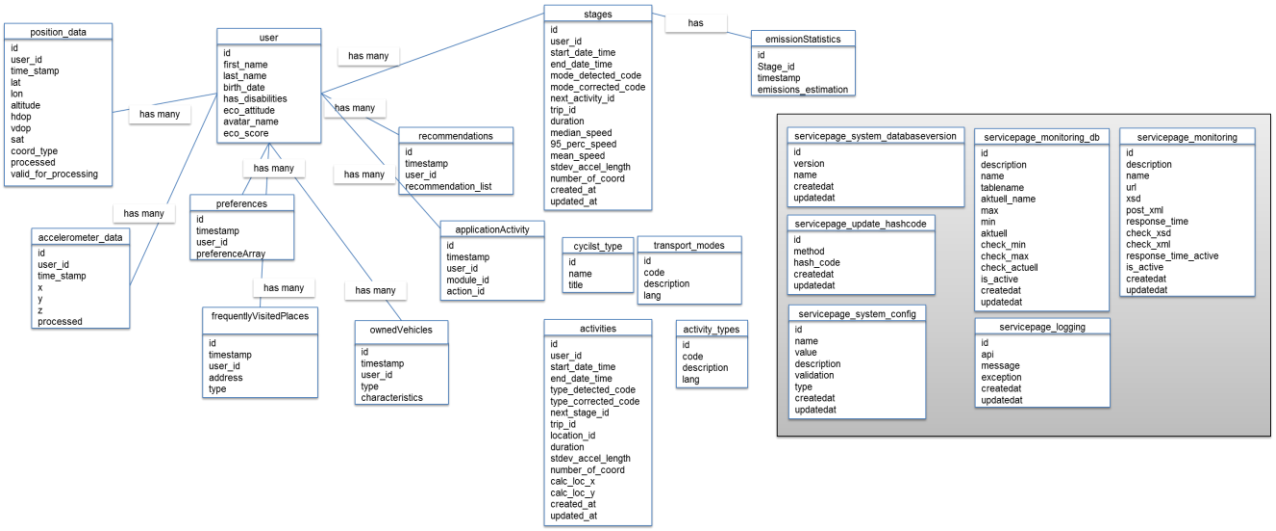

Figure 2: Central PEACOX database

3. User Interface Design - Journey Planner Application

3.1 Overview

One main goal of the PEACOX project is to use persuasive methods to nudge the user towards eco-friendlier travel behaviour. When designing a product, or an interface, the decision made during the design process always influence the users in some way. By being aware of this effect a field of possible solutions opens up beyond those that designers typically consider[1]. By choosing different kinds of visualization, or by showing information at certain times it is possible to influence the users' decision-making in an unobtrusive way.

The technologies as well as the information developed by different project partners in the PEACOX project are integrated into one application and the functionalities as well as the user interface of the PEACOX journey planner client aims to support users on their journeys by presenting the right information, in the right way on the right time. Additionally the presentation of the information uses persuasive strategies to nudge the user to choose an eco-friendlier option over others.

The persuasive strategies that were implemented in the User Interface were researched in WP5 (more details available in D5.1 Persuasive Strategies Report and D5.4.1 Detailed Design persuasive eco-feedback strategies - Version 1).

Some of the researched strategies were integrated in the final design, while others were considered during the design process and helped to make informed design decisions. The next figure shows an overview over the persuasive strategies that are considered within the UI of the journey planner application.

[1] Fabricant R. (2009), "Design With Intent", designmind.frogdesign.com, 27 May [Online]. Available at *(http://designmind.frogdesign.com/articles/power/design-with-intent.html)* (Accessed 26 March 2013).

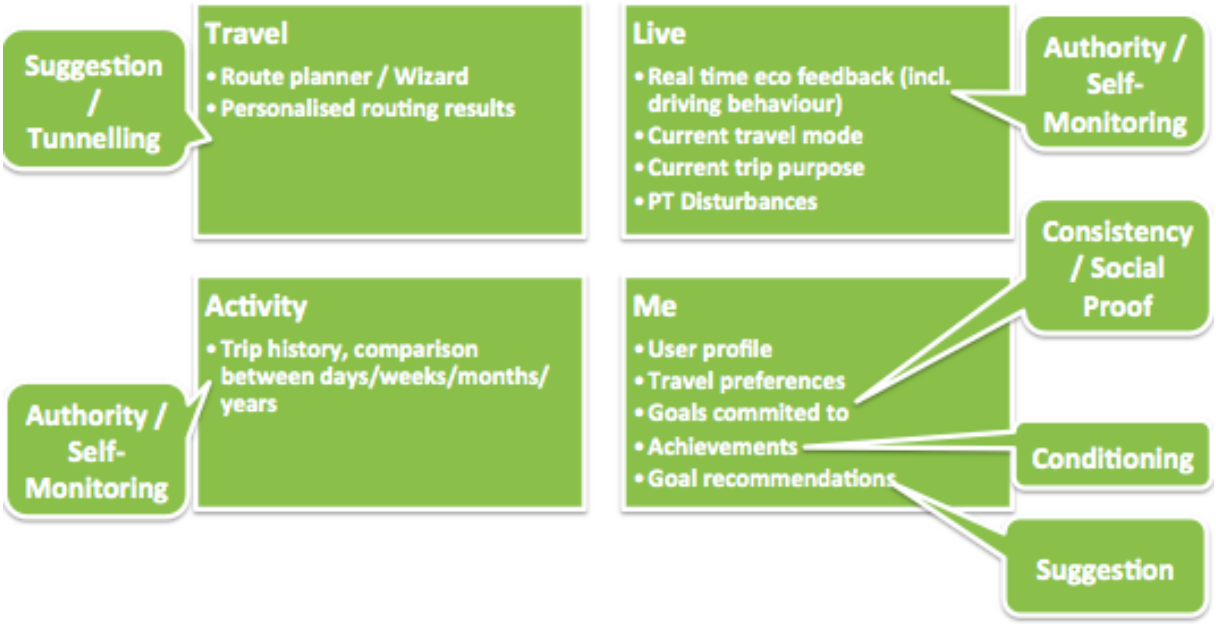

Figure 3: Persuasive strategies within the UI of the journey planner application

3.2 Concept of the Journey Planner Application

The UI of the PEACOX journey planner application aims to support its users on their daily trips, providing personalized and ecological information before, during and after the trip.

3.2.1 Pre-trip functionalities and design

Route personalization through route wizard

Each person chooses one available travel-route over another by considering different criteria. The interface of a journey planner faces the challenge of offering the right depth of choices to each user. To support the user in this personalization process the PEACOX journey planner application offers two levels of information input.

One is identified as the “global travel preferences” which define the users travel preferences and possibilities in general. Because these criteria seldom change and are valid over a long period of time they are available in the user profile of the PEACOX journey planner application.

The second one are those preferences which change from day to day or even could change for each route (e.g. Does the user prefer to take the more comfortable route, even if it takes a little longer?). These options are considered less permanent and are therefore presented to the user in the route wizard. The wizard allows the user to personalize his route in an easy

and straightforward way. In the first screen the users sees an overview of the currently set route options. The user can click on any of those options to enter the route wizard. Each screen of the route wizard offers the user the possibility to swipe back and forth to other route options or to finish the input and send the route query to the routing system.

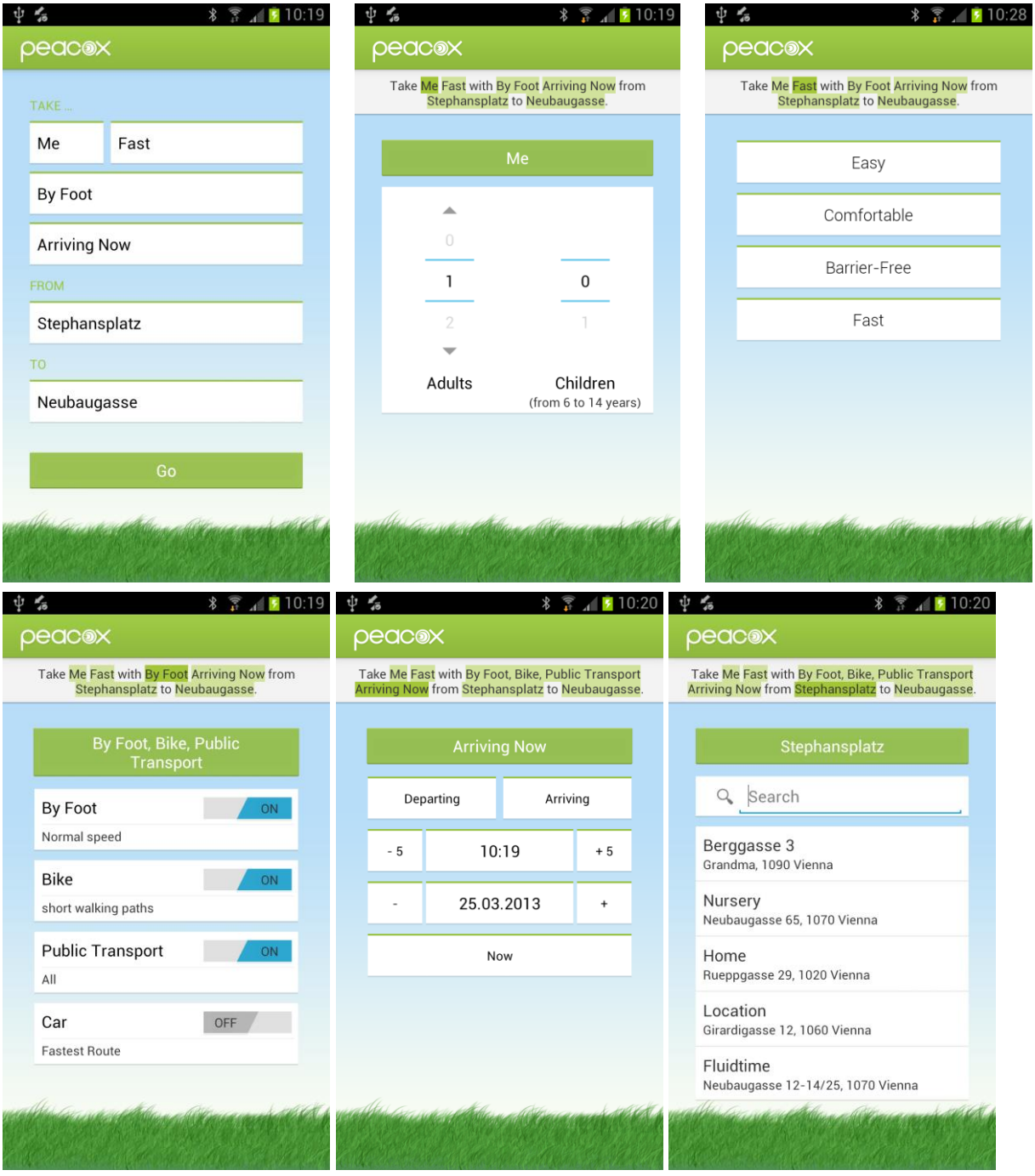

Figure 4: Screenshots 1st release, route wizard

Route overview with focus on eco-friendly route

The route overview informs the user of available routes for the chosen criteria. It allows the user to compare all available routes on some basic information that is given for each route like travel time and duration, number of changes and transport modalities involved. To nudge the user to an ecological decision the PEACOX journey planner application will additionally highlight one route that fits best all user preferences and would be the most ecological choice.

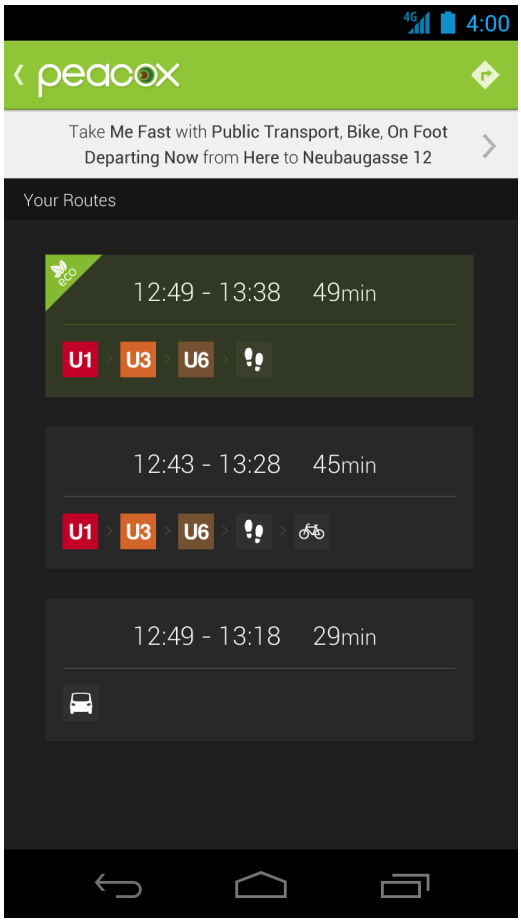

Figure 5: Screenshots 1st release, route overview

Route Detail with ecological information

The Route Detail screen displays all available information on one specific route. The PEACOX Application emphasizes the ecological information in this screen. Also the user can decide to take this route. The Application then displays the available information for the route in the On-trip-mode. If the route is a single-modality car route or a multi-modal route with a car trip-segment the user can start the PEACOX navigation client.

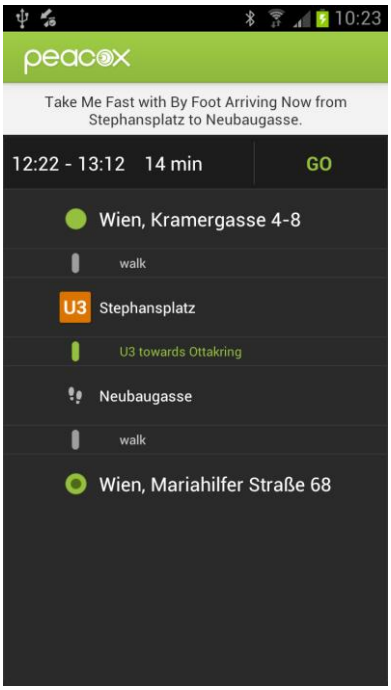

Figure 6: Screenshots 1st release, route detail

3.2.2 On-trip functionalities and design

Personalized mobility information

The on-trip mode of the PEACOX journey planner application supports the user while travelling. Sometimes the system won't know the users route because for routine routes the entering of the route key data could be too much effort. In such cases the system considers the users known context (e.g. the current time and place of the user, the user's preferences, and the user's history) to present useful information.

It is possible to offer more relevant information if the route is known by the PEACOX journey planner application because the routes' modalities and direction function as another filter on all available mobility information.

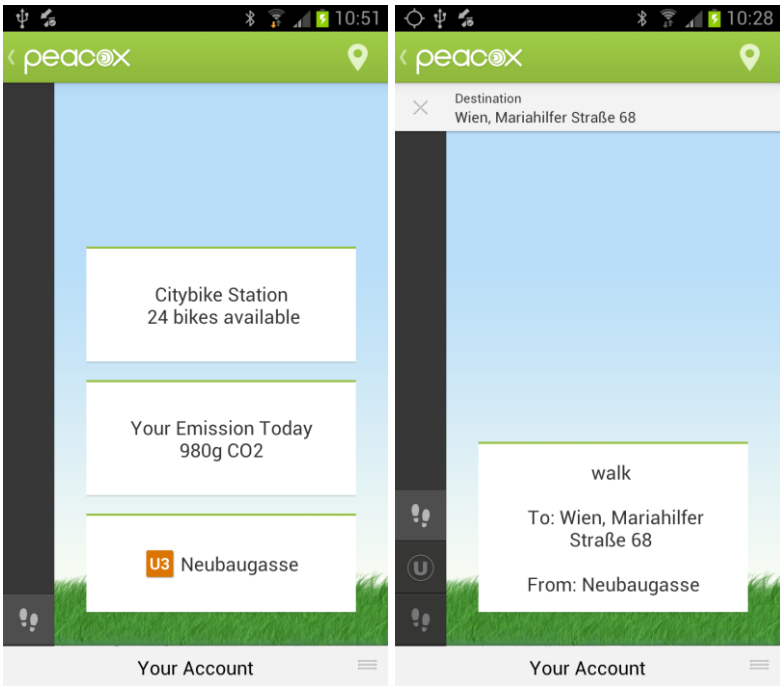

Figure 7: Screenshots 1st release, on-trip information, with and without route

Eco information

The PEACOX journey planner application also includes on-trip eco-information. The visual design a well as the presented data of this component helps the user to monitor his/her travel behaviour and represents the persuasive strategy of self-monitoring.

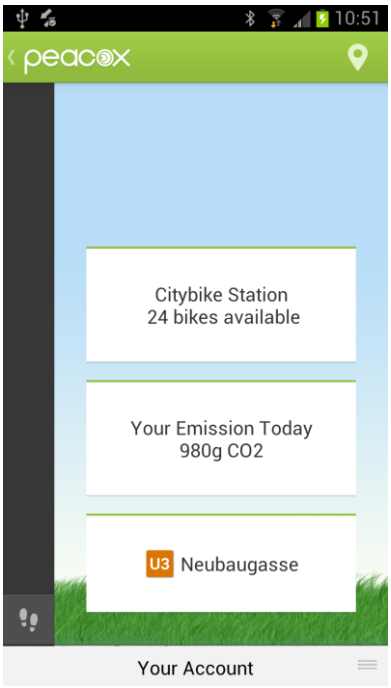

Figure 8: Screenshots 1st release, on-trip eco information

3.2.3 Post trip functionalities and design

Personal travel statistic

The user can review his/her travel behaviour through the travel-statistics provided by the PEACOX journey planner application. This statistics focus on the ecological aspects of the users' routes (e.g. CO_2 emissions) and support the persuasive strategy of self-monitoring.

Depending on the integration process of the Emission model, a statistic will be shown to the user.

The Navigation Concept

For the navigation concept an innovative approach was chosen, the so-called "integrated mobility client" which integrates all available functionalities in an intuitive interface. The design forgoes a traditional menu, but offers all functionalities through the main screen. Hereby, the client integrates the pre-, on- and post-trip functionalities and information in a seamless way, supporting the user on his/her trips by offering the right information at the right time. The concept is shown in Figure 9.

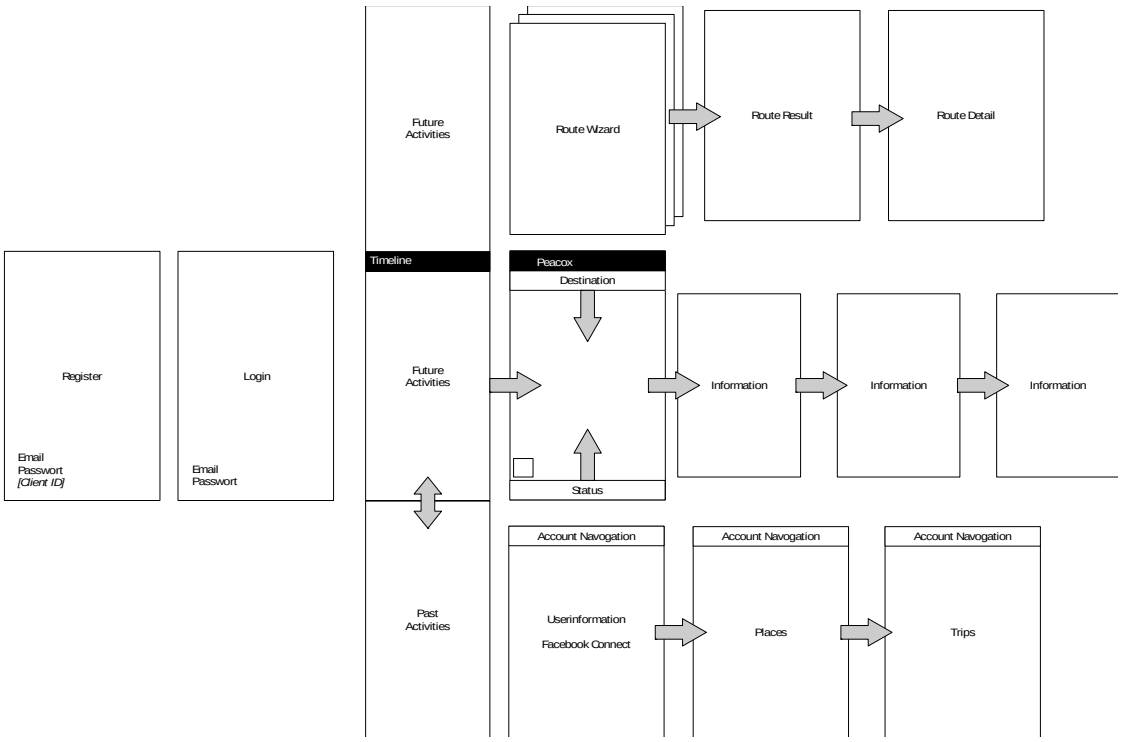

Figure 9: Concept of the integrated mobility client

The central and most important screen is the status screen, which is displayed on app start-up and immediately presents mobility information available around the current location of the user.

The user can access the route wizard through an icon in the action bar. Once the user has chosen his/her route, the route segments (walk, bike, go by public transport, …) with their respective information is displayed in the status screen. The user can remove the route information from the status screen by deleting the destination on the top of the screen. After the user has travelled a route the information is available in the travel history, which is located in the timeline and in the user account section.

Account information as well as the application settings, travel history and travel preferences are available to the user by pulling up the bottom bar in the status screen.

3.3 Visual Design

The basis for the visual design of the PEACOX journey planner application was the PEACOX logo and the defined colours within the logo. Furthermore, the visual design was created in order to achieve a “natural” and “sustainable” look&feel of the application. Next figures show the visual design of the PEACOX journey planner application.

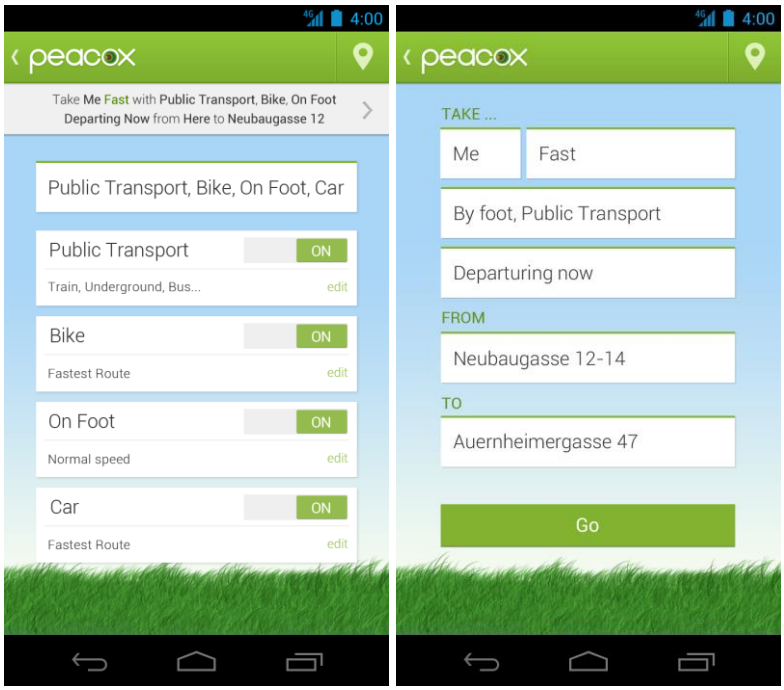

Figure 10: Visual design – journey planner application

3.3.1 Font

- Roboto Light (Standard Text)
- Roboto Regular (Special Text, Links, Button Text,...) 20pt – 36pt

3.3.2 Colours

#96c141	#474747	#1c1c1c	#343434	#cecece	#ffffff

- **#96c141** - is used for the action bar, clickable text links („Start Navigation") and other interactive parts like dropdown elements (Screenshot 1) and highlighted buttons (Screenshot 2).
- **#474747** - is used for standard android interface elements such as buttons or on/off switches (Screenshot 2).

- **#1c1c1c, #343434** - background colours. While #343434 is the main colour for backgrounds, #1c1c1c is used when the background needs to be separated into two parts (Screenshot 1).
- **#cecece** - additional interface colour
- **#ffffff** -standard text colour.

4. User Interface Design – Navigation Client

4.1 Overview

Dynavix PEACOX is multimodal navigation application for Android. It allows users to search for routes to their desired destination and select their transportation mode (walk, public transport, car). TMX plans to develop this application in two steps, where in first will be integrated functionality of turn-by-turn navigation with multimodal routing and in second step will be ad persuasive strategy and other section to this client.

Current client version covers these use cases:

- Navigation
- Route calculation
- Route recalculation
- Route simulation

4.2 Concept of the Navigation Client

Dynavix PEACOX is based on Dynavix navigation application. The user has several options to choose destination. Searching by address allows user to choose city, street or intersection of two streets and exact address. Favourite option allows the user to select destination which was marked as favourite by user. Recent contains all destination selected earlier by the user. Another way is searching destination by Google. Also searching POI and precise coordinates options are available.

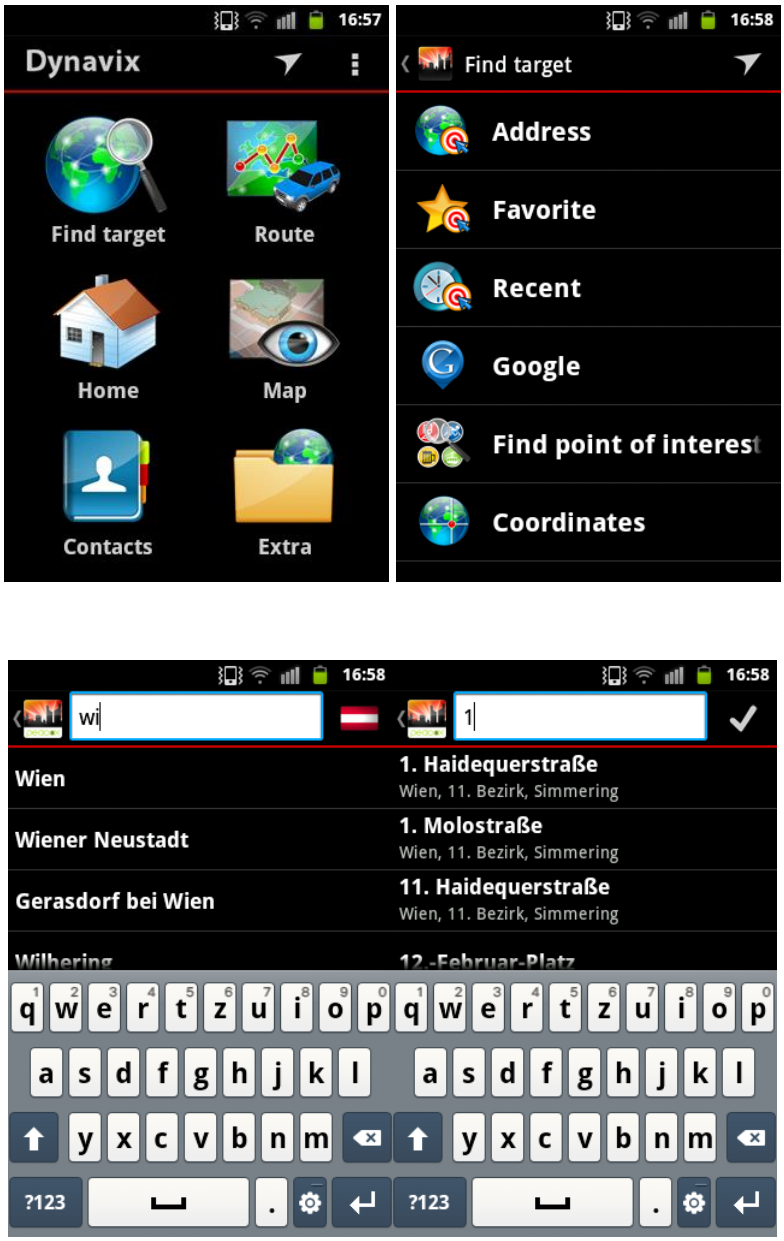

Figure 10: Screenshots of the route calculation wizard

After selecting destination the user can specify mode of transport. There are three modes of transportation - on foot, by public transport, by car). For each route user can choose single mode navigation (only one option highlighted) or multimodal navigation (multiple option highlighted). Only if the selected option will be public transport alone, on foot option will be added automatically. After choosing modes of transport, date and time of departure can be set. According to user-specified parameters application starts search for possible routes.

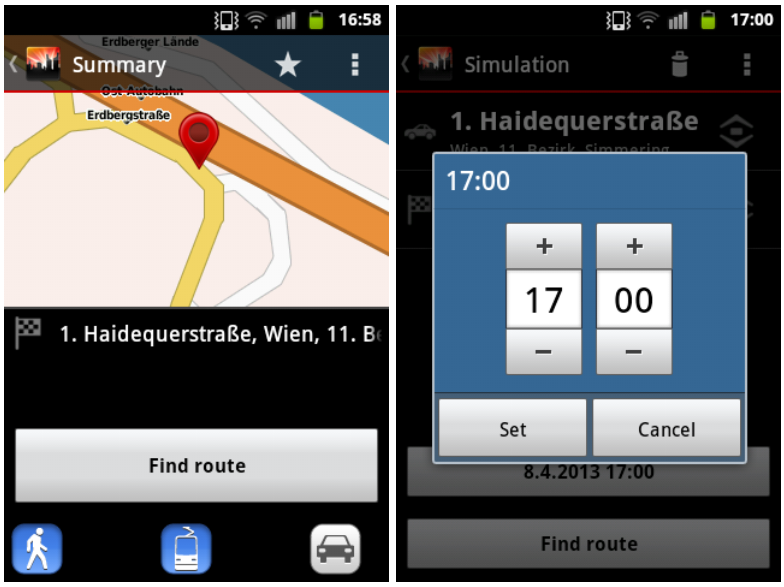

Figure 11: Screenshots of the route wizard

The route overview informs the user of available routes and displays information given for each route (departure time, arrival time, number of changes and transport modalities involved). After choosing one of the routes navigation screen appears with essential information for user (highlighted route, distance to next change of direction, distance to destination, time to destination, name or number of the street).

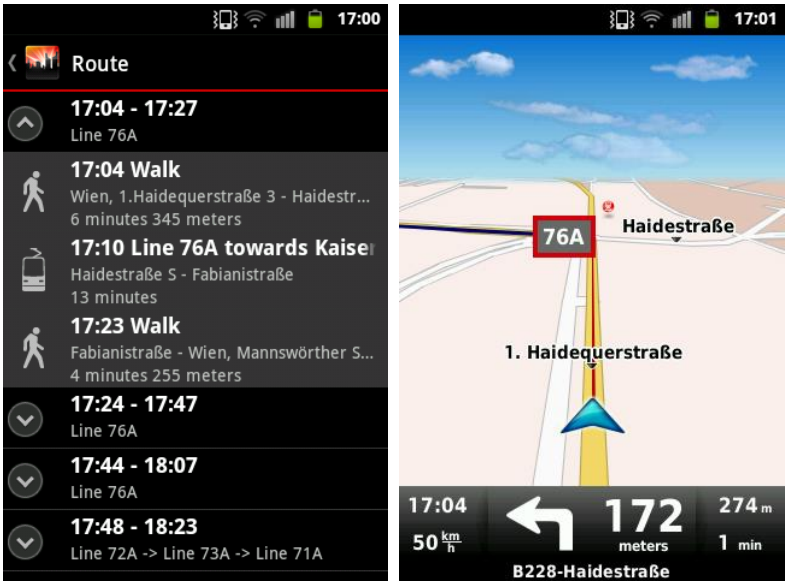

Figure 12: Route overview and navigation screen

The typical use of navigation client can be described as:

1. User find required destination as an address, POI or target from map.
2. Then it can be chosen which modes will be used for route calculation.
3. The whole multimodal route is calculated at server side, when using public transport modes is required.
4. Server sends description of calculated route to client using CAI and server defines points for changing mode of transport.
5. Client software calculates car and on foot navigation using off-line maps stored in flash memory of mobile phones. These parts are merged with description of calculated public transport route and whole result is displayed.
6. User is navigated turn by turn during car and on foot navigation. Only route without any voice command is displayed in case, that public transport vehicle is just used.

4.3 Visual Design

Next figures show the visual design of the application.

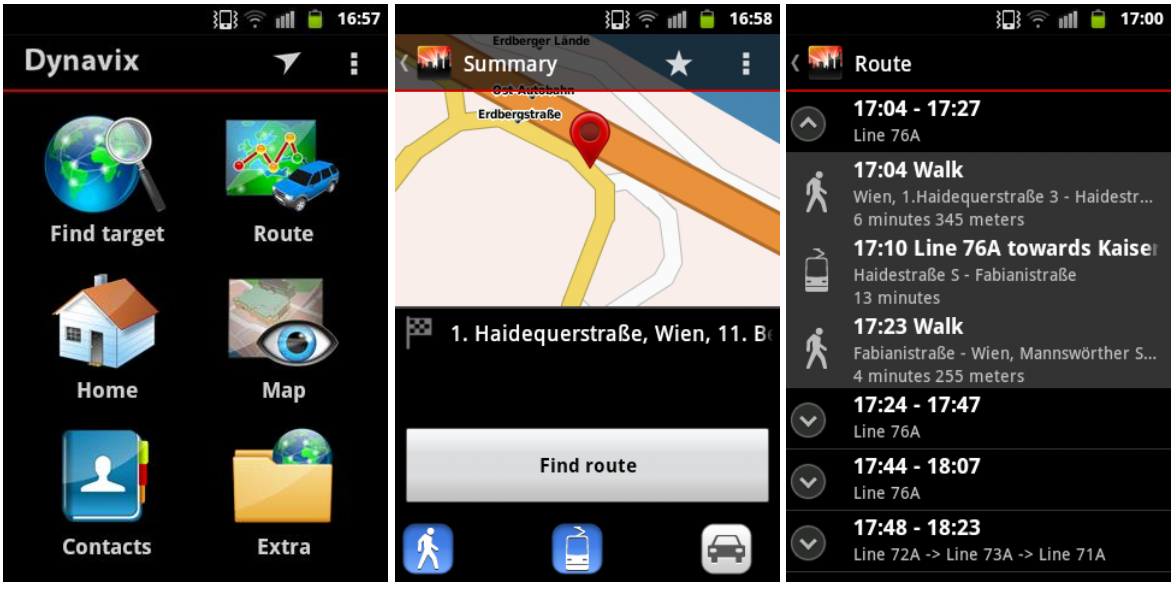

Figure 13: Visual design – navigation application

5. Summary and Outlook

The deliverable documents the work performed in Task 6.3 “System Design” representing a part of the PEACOX WP6 “System Design and Implementation”.

The main objective of this deliverable was to describe the overall system design. Additionally, the interaction concept as well as the interface design of the two PEACOX clients (journey planner application and navigation client for the 1st trial) will be explained in detail.

The overall system architecture is based on a central component, the application server, covering the main business logic that is necessary within the PEACOX system. Additionally, all developed components will be integrated within the application server: ICCS Client (recommendation component), ETHZ client (travel mode detection and trip mode detection) and TCD client (emission model and exposure model). The partner components will be provided as .war files and will be deployed within the application server after the development process is finished for the first trial. Furthermore, a central user profile was defined together with the project partner containing all fields necessary for the development progress of the individual components. This database will be hosted by ICCS during the development phase. Afterwards, the dump of the final version will be also hosted on the application server.

For the first field trial both applications: journey planner application and navigation client will be developed.

The journey planner application will focus on the pre and on trip functionalities. The pre-trip functionalities cover the innovative solution for the route wizard and getting route results. The on trip functionalities include the eco information and personal mobility information. In case of the mentioned functionalities a special attention was given to the persuasive strategies and the way they will be included within the user interface design. In case of the visual design, the application was designed in order to achieve a “natural” and “sustainable” look&feel. The focus for the second trial will be on post trip functionalities (statistic) as well as the connection to the navigation client.

The navigation client will first will focus on turn-by-turn navigation with multimodal routing. For the second trial the persuasive elements will be integrated as well as the connection with the journey planner application.