Assignment Software Architecting

Part 1

Leiden University, Software Engineering 2007-2008

Car Navigation System

Context

Several companies are offering in-car navigation systems (CNS). It is a pocket-sized device that has a graphical display. A driver can enter a destination and the CNS will guide the driver to the location by providing instructions on which streets to drive and where to turn. These instructions are shown graphically on the display, and may be supported by text or voice. A CNS knows the current location of the car via GPS (Global Positioning System). Also, a CNS has access to a collection of maps such that it can relate a pair of GPS-coordinates to a position on the map. CNS devices can receive information about traffic conditions (esp. traffic jams) via the Radio Data System (RDS). The CNS can adapt its suggested route based on the current traffic situation.

Assignment

Engineer an architecture for the Car Navigation System.

As part of the engineering you will go through the following steps that you will document in a report that you hand in at the deadline.

1. Define the requirements in a SMART manner
    - Which will at least include the extra-functional properties: usability, performance, especially accuracy.
2. Define the use cases (at least 7)
3. Your architecture should be layered. Describe the layers of your architecture.
4. Define the structural view by means of a component diagram and/or class diagram.
   Describe the responsibility of each of the components in your architecture.
5. For each of the use case of question 2, provide a sequence diagram for the regular execution. Add sequence diagrams that illustrate the handling of erroneous input or irregular behaviour.
6. Design a deployment diagram.
7. Identify the top 5 technical risk to the successful realization of your architecture
8. Assess the economic feasibility of your design

In this assignment you can use methods and techniques that you have learnt in earlier courses.

You will hand in:
- a UML model of the system – with explanatory notes, and
- a document that describes the architecture.

Requirement for the Car Navigation System

You have been commissioned to design an in-car navigation system. The device will contain an lcd-screen for displaying maps. The maps will be updated according to the

current position and speed of the car. The position of the car is provided by a GPS system. Maps to the system are provided by a memory-card. Input can be entered via a touch-screen. Traffic information can be received via the RDS-TMC standard via the radio.

Your system should be able to:

1. Switch the system on and off
2. Enter a destination
3. Calculate and display the route to a given destination from the current position of the car
4. The calculation of the route to follow can take into account current traffic information
5. The system will provide instructions on where to go both by displaying arrows on the map as well as by spoken instructions.
6. Zoom in and zoom out on the map that displays the route
7. Select and display point-of-interests on the map that displays the route
8. Display traffic problems
9. The system provides a function for logging trips. A log will contain whether the trip was business or private and statistics concerning the distance.
10. Display the current time
11. Display the driving speed of the car

Further Reading

- GPS – global positioning system
  - http://en.wikipedia.org/wiki/Global_Positioning_System
- Radio Data System
  - http://en.wikipedia.org/wiki/Radio_Data_System
  - http://home.wxs.nl/~kreul1/verslagen/rds/rds.html (Dutch)
  - RDS-TMC: ftp://ftp.rds.org.uk/pub/acrobat/tti_article_spring99_e-2.pdf
- Find examples of products at:
  - www.tomtom.com
    www.garmin.com
    http://www.mio-tech.be/en/index.htm

Deadlines

- Draft of the architecture design: Wednesday 27 February, 12:00, 2008
- Final submission (all documents): Wednesday 19 March, 12:00, 2008
- Hand in paper version in my postbox (floor 1 of Snellius)