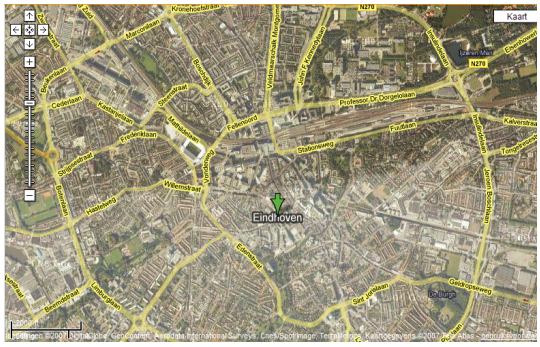
Assignment Software Architecting

TU Eindhoven 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. This instructions are shows 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 related 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 is 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 (at most 2 pages)
    - 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.
   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 extra sequence diagrams for
6. Design a deployment diagram.
7. Perform a performance analysis:
   - Find out about the performance and accuracy of GPS
   - Estimate the frequency of events that happen in/to the system
   - Estimate the load of each event to the system
   - For the 3 most critical performance scenario's, show that your architecture handles these within their limits
8. Identify the top 5 technical risk to the successful realization of your architecture
9. Assess the business value, criticality and effort of the 7 use cases by means of provided excel sheet.
10. Assess the business value, critically and effort of the 7 most important components of the architecture by means of provided excel sheet.

You will hand in:
- a UML model of the system,
- a document that describes the architecture, and
- the excel sheets for ranking use cases and components.

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 on 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: Monday 19 november, 12:00, 2007
- Final submission (all documents): Monday 10 december, 12:00, 2007