Big Brother Driver

This provides some details of the requirements for a system. The real requirements for this kind of system would fill a very large book, so what is here is necessarily incomplete. There is enough detail to provide a realistic situation for the assignment, but in the case where you need more details, feel free to make some up. If you do, *state them clearly* so that the markers know what assumptions you are making. Do not make up details that mean a solution becomes trivial. It would be wise to confirm with me any assumptions you make.

It is quite likely that clarification will be needed as questions come up that I haven't thought of. Feel free to ask.

Overview

Following the stunning success of BackPocketDriver the New Zealand Transport Agency (NZTA) (Links to an external site.)Links to an external site. , in conjunction with the New Zealand Police (Links to an external site.)Links to an external site. , have decided to require that all vehicles on New Zealand public roads must have an occupant with a mobile device with a similar system installed. This system will track each vehicle, provide a report of the driver's behaviour at the end of each journey to the NZTA (Links to an external site.)Links to an external site., flag drivers that drive dangerously in real-time to Police (Links to an external site.)Links to an external site., and other such functionality (more details below). Your organisation, **Oceania Central Design** (OCD), has been contracted to create the system, which is to be called **Big Brother (Links to an external site.)Links to an external site. Driver (BBD)**.

You are to develop an architecture for BBD. The system consists of the app that is installed on the mobile devices (BBD-V) for use recording the journeys of vehicles, an app for use by relevant users for accessing the journey information (BBD-M), and a central service for managing and distributing the information gathered by the apps (BBD-Ops).

The functionality BBD has to support includes:

- At the end of each journey a report has to be able to be provided by BDD-Ops containing such information as: the length of the journey, the time taken, the maximum acceleration, the number of unnecessary lane changes, the amount of time spent over the speed limit, and the number of times the centre-line is crossed when not at an intersection.
- Some drivers (e.g. those required ordered by the Court and those on a Learner or Restricted license) are required to register the beginning of each journey via BBD-V. These drivers can be tracked in real-time by the police and by parents of drivers on a Learner or Restricted License under the age of 17.
- If a vehicle is driven erractically or with excessive speed, its details are to be immediately reported to the Police.
- Provision has to be made to allow changes to the speed limit and road layout (what lanes there are and where intersections are) both for temporary road-works and permenant changes.

BBD has to support other functionality necessary for operation, such as supporting the on-line registration of the vehicles (or their occupants at least)

OCD is responsible for the software that runs on the mobile devices, the part of the system responsible for registrations, creating and providing access to trip reports, and other kinds of reporting (e.g. number of trips a day per region).

System Architecture

There are various aspects of the system architecture that can be assumed.

- This is all going to be paid by the tax-payer, so while a reasonable amount of money is available, you cannot assume unlimited, or even a huge amount, of resources (e.g. a million dollar server farm).
- Location is a fairly important part of this sytem, but determining location accurately is quite difficult. We will assume that location of a vehicle can be determined within 1 metre some sufficiently advanced GPS technology (Links to an external site.)Links to an external site. .
- NZTA has done a deal with an unnamed "tracking solutions" company **WKWYL** that provides an API that will provide real-time details about the speed limit and road-layout for the a specified GPS location. These details are delivered formatted in JSON, taking not more than 512 bytes.

Notes

- A journey begins when the vehicle starts moving on a public road and ends when it is no longer on a public road, or is stationary on the side of a public road (i.e. parked).
- You should consider how much data needs to be sent around the system. Is it uniformly spread over all areas or will there be bursts of activity?
- The mobile devices are expected to communicate using the owner's data plans.
- It is not a requirement that the driver having the mobile device with the App installed, just that someone in the vehicle does.
- According to the Ministry of Transport (Links to an external site.)Links to an external site. there are about 4 millions road vehicles in New Zeland.
- A vehicle travelling at 100kph travels about 27.7 metres in 1 second.
- Assume that the average journey time is 20 minutes and that each vehicle makes on average 1 journey per day.
- Reporting to the Police is done via a RESTful API that the Police IT system provides for such things.