

# Assignment 2: Architecture for Big Brother Driver (BBD)

 [canvas.auckland.ac.nz/courses/23576/pages/assignment-2-architecture-for-big-brother-driver-bbd](https://canvas.auckland.ac.nz/courses/23576/pages/assignment-2-architecture-for-big-brother-driver-bbd)

This assignment is to come up with an architecture that meets specific quality requirements for the [Big Brother Driver \(BBD\)](#) system by using appropriate tactics to develop the architecture that meets the specified Quality Attribute Scenarios below.

<b>Due</b>	Monday 23hr 16 October
<b>Submit</b>	Via <a href="#">ADB</a> (see note)
<b>Worth</b>	7% of final grade for SOFTENG 325

Note: Assignments not submitted through the ADB (in particular those emailed to me) will not be marked. You should get permission from me first before making any assumptions.

## Deliverables

You must hand in a document that describes an architecture that meets the Quality Attribute Concrete Scenarios given below, and also describes how you developed that architecture, that is, what tactics you used in its development and how you used them. In the interests of brevity, you should limit yourself to the following:

- A section that describes your architecture. I am assuming you will use diagrams as the main description aid, plus some explanatory text. I don't expect the text to be more than about 2-3 pages.
- A section that describes what tactics you have used in your architecture, and a brief explanation why you chose the tactics you did. I don't expect much more than a paragraph for each tactic (for example, you don't need to explain what the tactic means). However it must be clear as to how your architecture results from the use of the tactics.
- A section that justifies how your architecture meets the stated quality attributes. If you have done a good job of explaining your use of tactics, this won't need to be much. It may, for example, consist of only one paragraph, but even so should not need to be very long.

You should not provide an introduction or conclusion, or other similar sections that would normally appear in a technical report — think of this as being something that will be combined with work done by other members of the architecture team (such as the people dealing with other quality attribute scenarios), which all together will be the final report.

## Assessment

Your report will be assessed according to the following criteria.

- Is your architecture adequately described, that is, have you provided enough information that it can be evaluated by someone who is technically competent but not knowledgeable about your architecture?
- Is your explanation that your architecture meets the quality requirements consistent with the architecture description, and is it convincing?
- Are the tactics you claim to use actually used in your architecture, and is your explanation of their correct use in the development of your architecture convincing?
- Have you put sufficient effort into the development of the architecture?
- Is your document concise, that is, has no unnecessary repetition or irrelevant detail?

There is no specific presentation criteria. It is expected that your writing and presentation will be to professional engineering standard, however poor presentation will reduce your mark. It is not up to us to try to figure out what

you might be trying to say, you have to explain it clearly. If there is insufficient detail in the system description for you to make the arguments you want, check before making any assumptions.

## Quality Attribute Scenarios

### Scenario 1

*This scenario is intended to capture a performance requirement.*

Part	Concrete
Stimulus	Data is sent or received
Source	... by BBD-V
Artefact	... to BBD-Ops
Environment	... during the course of an average year.
Response	The total data use by the app
Measure	... is not more than <a href="#">5MiB (Links to an external site.)</a> <a href="#">Links to an external site.</a> .

### Scenario 2

*This scenario is intended to capture a performance requirement*

Part	Concrete
Stimulus	A vehicle spends 5 seconds 30kph over the speed limit for the area it is in
Source	... (BBD-V)
Artefact	... (BBD-Ops)
Environment	... with no system problems and no communication failures.
Response	Report vehicle location to Police
Measure	... within 5 seconds of criteria being met by vehicle.

### Scenario 3

*This scenario is intended to capture a performance requirement.*

Part	Concrete
Source	A journey ends
Stimulus	... by a user with BBD-V installed on their mobile device
Artefact	...(BBD-V)
Environment	... with no system problems and no communication failures.

<b>Response</b>	A report describing the journey will be available via BBD-M. The report will contain a map showing the route, annotated with acceleration and decelerations, marking when the speed limit was exceeded and the centre-line crossed, and unnecessary lane-changes. A textual summary of the same information will also be provided. The report will contain the identifier for the BBD-V user.
<b>Measure</b>	... within 10 seconds of journey end.

#### Scenario 4

*This scenario is intended to capture a modifiability requirement.*

<b>Part</b>	<b>Concrete</b>
<b>Source</b>	A mobile device provider
<b>Stimulus</b>	... releases a new device
<b>Artefact</b>	...that must interact with BBD-Ops
<b>Environment</b>	... the functional capabilities of the new device include all of those of previous devices by the same provider, and the provider provides the relevant SDK (including documentation) 1 month before the release of the device to the public.
<b>Response</b>	The BBD-V is able to properly interact with BBD-Ops
<b>Measure</b>	... after not more than 40 hours of development and testing.

#### Scenario 5

*This scenario is intended to capture a security requirement.*

<b>Part</b>	<b>Concrete</b>
<b>Source</b>	A journey report is received
<b>Stimulus</b>	... by an un-authorised person
<b>Artefact</b>	...through BBD-M
<b>Environment</b>	... during a time when there are no system problems and no communication failures.
<b>Response</b>	The report, the time it was requested, the location it was delivered to, and the identifier of device running BBD-M can be provided
<b>Measure</b>	99.9999% of the time.

# Big Brother Driver

 [canvas.auckland.ac.nz/courses/23576/pages/big-brother-driver](https://canvas.auckland.ac.nz/courses/23576/pages/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.](#)), in conjunction with the [New Zealand Police](#) ([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.](#)), flag drivers that drive dangerously in real-time to [Police](#) ([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.)** **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 erratically 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 permanent 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 system, 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 Zealand.
- 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.