Pay As You Drive

Functional Specification

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Abstract

The purpose of the Pay As You Drive project is to develop a mobile application for the Android & iOS platforms that will, first and foremost, track driving habits of a user whilst travelling on a journey. Driving habits are recorded and used for motor insurance purposes, whereby a user pays a monthly insurance price based solely on how much and how well/poorly they drive. The application allows the user to view their past journey, control their profile details and vehicles through the app, and finally create and monitor insurance claims within the application.

Pay As You Drive is designed with a Peer 2 Peer business approach, whereby users are nodes in a network. Each month the nodes are billed for their driving, and this money is gathered into one central money pool. In the event of an accident, fire or theft to their motor vehicle an insurance claim can be made, and if approved, a transfer takes place from the money pool to the users wallet.

Table of Contents

Section 1 - Project Scope

Pay As You Drive is a unique motor insurance experience, combining a modern peer 2 peer insurance design with a personalised motor insurance tracking approach.

This project has a mobile application that allows an insurance provider to record or 'track' the journey a customer takes in their motor vehicle, recording driving habits and events, to generate a monthly billing personalised to each customer. All insurance needs will be available to the user through the mobile app, including making claims and viewing current monthly bill, and editing all information relevant to vehicle insurance coverage.

The customers will be grouped together in a blockchain network using Distributed Ledger Technology (DLT), and all monthly bills will be pooled together into one fund within the system. After a validation process claims will be withdrawn from the fund to cover customers in the event of damage.

The project can be separated into the development of the mobile application and the peer 2 peer motor insurance network:

1.1 - The Mobile App

An insurance customer is considered a standard user. A user can notify the application when they are beginning and ending a journey, view a summary of their journey and a list of their past journeys.

The application will take inspiration from similar applications that use the business idea of 'billing motor insurance by the driving style and mileage of the customer, not by a fixed amount, for a more personalised motor insurance experience'. However, Pay As You Drive is unique in the field as existing insurance providers either offer discounts for safe driving off a fixed amount, or only track the users journeys as 'test

drives' for a short amount of time to generate a personalised, fixed, insurance bill for future billings.

This functional specification document explains the application features and development decisions in-depth.

1.2 - Peer 2 Peer Motor Insurance

The P2P network will be a unique selling point for the project, and will encompass all capabilities of a traditional motor insurance company but with a decentralised approach.

"Motor insurance protects you as a motorist against liability in the event of an accident that you may cause. *Motorists are legally obliged to have motor insurance under the Road Traffic Act, 1961." (Insurance Ireland, 2019)*

Coverage

As the above quotation describes, motor insurance is about protection of motor vehicles belonging to the driver and/or other drivers in the event of an accident. There are three different levels of coverage in the event of an accident:

1. A driver must by minimum requirement have 'Third-Party insurance', this is a protection against liability in the event of the driver injuring a third party, or passengers.
2. 'Third-Party Fire and Theft' provides coverage in the event of damage to a third party or damage by fire or theft to the driver. This is the most commonly chosen form of motor insurance. (Citizen Information, 2019)
3. 'Comprehensive' covers all of the above, plus covers accidental damage to the driver's motor vehicle.

For this project to be a fully functioning motor insurance application the customers must be able to opt in and out of these three coverage options. This must be done

within the mobile application, and the payout from the funds pool in the event of a claim will vary according to the customers coverage.

Risk Profile

Traditional motor insurance will assess the risk to insure a customer before proposing an insurance plan, which is a calculation of the probability of having to settle claims and the frequency for the customer. These calculations take into consideration age, gender and past insurance track records.

This project's insurance scheme will calculate the risk profile of a user solely on their driving habits, with users beginning in a mid-tier rank with a neutral driving score. As time goes on and an accurate driving score can be determined the user will move up or down in insurance tiers. The idea to not build a personal profile based on age, gender and many other factors is to promote anti-discrimination, as discrimintation that can be found in many insurance compaines' policies today.

Peer 2 Peer Network

Hyperledger Fabric is an open-source Distributed Ledger Technology (DLT), this project will use Fabric to develop a decentralised network of customer nodes that interact without the need for a 'overseeing' party like that of the traditional motor insurance approach.

Section 2 - Precedents

2.1 - Guevara

The idea of Peer 2 Peer motor insurance has been tried before by a UK based startup called **Guevara**, a startup that closed in September 2017.

Guevara aimed to revolutionise the new UK insurtech industry, named after Che Guevara from the Cuban Revolution.

"Guevara takes a fresh approach to car insurance by allowing customers to pool their prem*iums in order to lower the collective premium and then refund unclaimed capital to the group." (Hugh, 2019)*

Guevara used a P2P network that pooled customer by two ways; A customer could get invited by friends and family, or Guevara would make a risk profile of the customer and recommend a suitable pool. The idea to have customers invited to pools already containing friends and family was a clever way to reduce the amount of claims a customer makes because of the loyalty a customer has to others in the pool.

This project will take inspiration from Guevara, although they did not have a motor insurance application that this project will contain, it will be useful for the design of the P2P network in Fabric.

2.2 - BoxyMo

BoxyMo is a very popular feature in many Irish motorists cars, it is a small hardware system that monitors how the motorist drives to calculate a 'driving score'.

BoxyMo collects the following information (BoxyMo, 2019):

- **Speed**
- **Driving Smoothness** - Cornering, braking and acceleration
- **Where and When** - eg. dangerous roads or at night
- **Distance**

Motor insurers with a BoxyMo in their car pay less premiums and receive mileage discounts, as long as they adhere to strict rules that are monitored by BoxyMo.

The way insurance companies use BoxyMo is to enforce safe driving onto the customer, which has proven to be very successful. This project's mobile app will build on this idea and also encourage and incentify safe driving with the customers in full control.

2.3 - By Miles

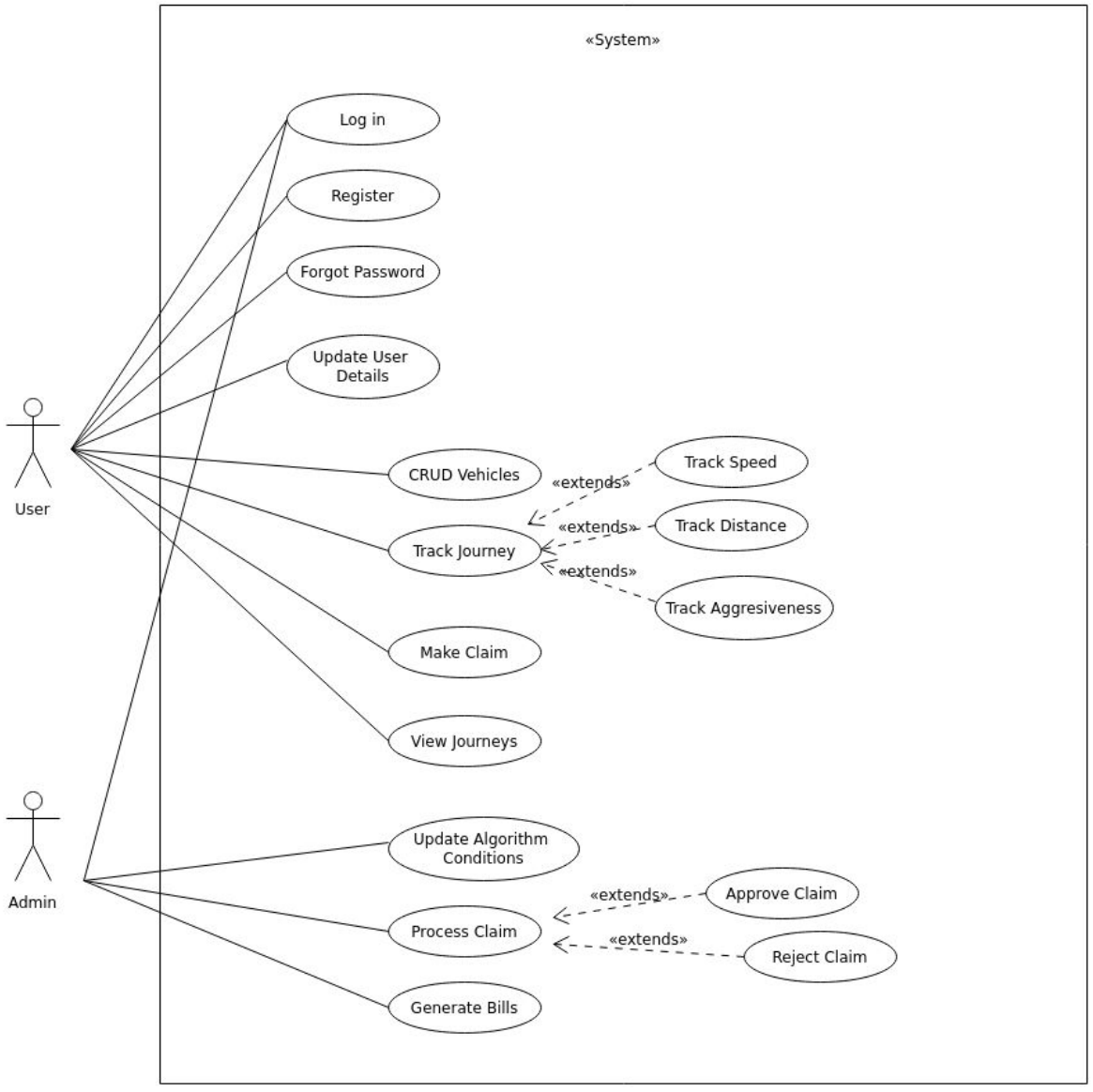
By Miles is UK based motor insurance company with the idea of *"By Miles offers a form of pay-as-you-go car insurance, where you pay per mile you drive. The less you drive, the less you pay." (Wheal, 2019).*

The idea is to charge customers monthly by the amount of kilometers they drive within that month. By Miles collects this information by installing a 'Miles Tracker' device in the car that sends data back to their system.

By Miles has a very similar concept to this project, where customers pay a monthly bill of their mileage. However, By Miles only tracks distance travelled, and uses a peripheral within the vehicle for tracking, similar to BoxyMo.

This project will take inspiration from all three of these existing ideas to create a unique motor insurance idea.

Section 3 - Use Cases



3.1 - Login

Title: Log in

Actors: User, Admin

Preconditions: User is logged in

User is on the Welcome screen

Primary Path:

1. User is clicks ‘Login’ button and directed to login page
2. User enters email and password
3. If user authorisation is successful the login the user
4. User is directed to the Homescreen

Alternative Path:

3a. Email is identified as Admin email and checks password

4a. If admin email then user directed to Admin screen

3.2 - Register

Title: Register

Actors: User

Preconditions: User is on the Welcome screen

Primary Path:

1. User is clicks Sign Up’ button and directed to ‘createuser’ page
2. User enters details and clicks next
3. User is directed to ‘Add vehicle screen’
4. User enters vehicle details and clicks next
5. System validates fields and creates new user
6. User directed to Home screen

Alternative Path:

5a. There are invalid fields and alerts user

3.3 - Update User Details

Title: Update User Details

Actors: User

Preconditions: User is logged in

User is on the More tab

Primary Path:

1. User clicks on ‘Profile’ button and directed to Profile screen
2. User edits Profile fields
3. User submits changes
4. User is alerted if the changes were successful or not

3.4 - CRUD Vehicles

Title: Log in

Actors: User

Preconditions: User is logged in

User is on the More tab

Primary Path:

1. User clicks on Vehicles button and directed to Vehicles screen
2. User selects vehicle from dropdown menu
3. User edits vehicle details in form
4. User submits changes and is alerted if it is successful or not

Alternative Path:

2a. User clicks ‘Add vehicle’ and it directed to ‘Add vehicle’ screen

3a. User clicks ’delete vehicle’ and prompted to confirm

3b. User confirms and vehicle is removed

3.5 - Track Journey

Title: Track Journey

Actors: User

Preconditions: User is logged in

User is on the Homescreen

Primary Path:

1. User navigates to ‘Journey’ Tab
2. User Selects vehicle from dropdown
3. User clicks ‘Start Journey’
4. Start ‘Track Speed’, ‘Track Distance’ and ‘Track Aggressiveness’ Use Case.
5. User clicks ‘End Journey’ button once journey has come to an end
6. Database is updated with new journey
7. User is returned to ‘Journey’ tab

3.5.1 - Track Distance

Title: Track Distance

Actors: User

Preconditions: User is logged in

User has started journey

Primary Path:

1. Location updates listener begins
2. Distance calculation is made using haversine algorithm

3.5.2 - Track Speed

Title: Track Speed

Actors: User

Preconditions: User is logged in

User has started journey

Primary Path:

1. Location updates listener begins
2. Speed calculation is made using distance and time measurement

3.5.3 - Track Aggressiveness

Title: Track Speed

Actors: User

Preconditions: User is logged in

User has started journey

Primary Path:

1. Accelerometer listener begins
2. Aggressiveness calculations are made using acceleration reading

3.6 - Make Claim

Title: Make Claim

Actors: User

Preconditions: User is logged in

User is on the ‘More’ Tab

Primary Path:

1. User clicks ‘Make claim’ and directed to ‘New Claim’ screen
2. User fills in all fields and uploads image requirements
3. User submits claim and is redirected to ‘More’ Tab

3.7 - View Claims

Title: Make Claim

Actors: User

Preconditions: User is logged in

User is on the ‘More’ Tab

Primary Path:

1. User clicks ‘My Claims’
2. User is directed to Claims screen
3. User is shown a list of past claims filed

3.8 - View Journeys

Title: View Journeys

Actors: User

Preconditions: User is logged in

User is on the Homescreen

Primary Path:

1. User clicks the 'View Journeys’ button and is taken to View Journeys Screen.
2. User is displayed a list of all journeys made

Alternative Path:

2a. User pulls down and Journeys list is refreshed

3.9 - Update Algorithm Conditions

Title: Update Algorithm Conditions

Actors: Admin

Preconditions:

Admin is logged in

Admin is on Admin Screen

Primary Path:

1. Admin clicks ‘Update Algorithm’ and is redirected to Algorithm Conditions Screen
2. Admin edits conditional variables in the form
3. Admin submits changes and is alerted to success or failure

3.10 - Process Claim

Title: Process Claim

Actors: Admin

Preconditions:

Admin is logged in

Admin is on Admin Screen

Primary Path:

1. Admin clicks ‘Process Claims’ and directed to claims screen
2. Admin selects pending claim and directed to Claim detail screen
3. Admin Selects approve or reject claim

3.11 - Generate Bills

Title: Process Claim

Actors: Admin

Preconditions:

Admin is logged in

Admin is on Admin Screen

Primary Path:

1. Admin clicks Generate Bills

Section 4 - Mobile Application (FURPS+)

4.1 - Functionality

Front-end

From opening of the mobile application the user will be required to authenticate by use of a **login/sign up screen**.. After authentication the user can **create a new journey** where the user's driving habits are recorded for the duration of the trip. Once the user ends the journey he/she will then be able to **view a summary of the journey**, where all calculations (made by the application in the background) will be displayed. After authentication the user should also be able to **view previous journeys.**

Back-end

The application should be able to **read in the users driving habits** for the duration of a journey, by tracking geolocation and gyroscopic outputs within the mobile phone's sensors. The application needs to **store incoming user data** on the mobile phone's internal storage in a readable database format. At the end of a user's journey the received data should be **uploaded to a realtime database**. The application should **calculate the insurance premiums** by algorithms, taking into consideration the configuration of the insurance policy of the pool the customer is in.

4.2 - Usability

The application should have a simple 'user flow' to be easily navigatiable and understandable. Clear navigation throughout the app is one of the most important UX features, so this app needs a simple navigation bar, accurately labeled buttons and informative screen information.

The application must exist on both platforms to offer functionality for both groups of users.

The application needs to minimize the amount of steps the user needs to take to use features of the application. For example, the user must be able to start a journey in 3 clicks from logging in “Journey Tab > Select Vehicle > Start Journey”.

The user should not have to log in every time the app is opened if they so choose, so the app should have a remember me function to boost UX.

4.3 - Reliability

The application deals with user finance, so accuracy of data and calculations must be very high.

Location data collection must be reliable and consistent across all users. Both react-native-geolocation and Google Directions API return an object with an `accuracy` field, which describes how accurate the API has returned the users location. For the `longitude` and `latitude` to be considered accurate the value of accuracy should be less that < 60.

The application uses Firebase as its Backend-as-a-Service software to store the data in a realtime database. This software is considered a very reliable option with an accurate and ‘Zero downtime’ API, as of late 2018 the service was used to deploy and maintain 1.5 million apps and 1625 corporate companies such as Twitch and Square (StackShare, 2019).

Using a cloud based database option increases recoverability in the case of system failure at a mobile application level.

4.4 - Performance

During the tracking of the user's journey the application must consistently and continuously receive data from tracking API’s in use, downtime during this time results in missing and tainted data.

Data response time both to and from the cloud based server must be quick and consistent. Performance testing code should validate response time at peak response time and average response time.

0.1 seconds is considered the most preferred time, where users feel the system is responding instantly and do not feel interruption. The app must have response times of less than a second, as this is considered the maximum time before the user starts to feel interruptions and begin to negatively affect user experience (Guru99, 2019).

4.5 - Supportability

The mobile app is to be supported on Android and iOS on initial release, both having full functionality and no platform differences.

The application should be modifiable, with customizable features, by the admin to support more use cases.

Section 5 - Issues and Risks

Does React Native have all the capabilities required for this project?
Although React Native is developed and maintained by Facebook, it's capabilities aren't equal to fully native development. For example, development in Android Studio is specific to Android, and so everything an Android phone can do both in software and hardware can be written in Java based Android Studio. As a developer there is a reliance on React Native and it's libraries to have not overlooked a capability that this project may require.

Research into how well React Native can work with iOS' and Android's hardware sensors has shown that React Native works very well with hardware sensors and there is yet to be a case where the language can not work. However, with in-depth development this may not be true.

Is Peer 2 Peer Insurance the correct approach?
Peer 2 Peer Insurance is a very new and seldom attempted insurance approach, and of those that have tried there are some that fail. Guevara motor insurance for example targeted the UK motor insurance, but found that people would rather not take a risk with a new idea and instead choose the traditional, tried and tested, insurance company.

People also like accountability in the case of out of their control problems, and a decentralised system is designed so there is no singular party with all the control and no accountability.

However, the word 'blockchain' and 'bitcoin' are hype words that a lot of people feel are the systems of the future, and the number of startups that use blockchain networks are growing more and more. Ethereum and Bitcoin have shown that decentralised systems with no accountability work, and although a decentralised

P2P network in the insurance industry is uncommon, it does not mean it can't be a new success.

Will there be time to implement Peer 2 Peer insurance approach?
Choosing to implement a P2P insurance approach expands the project scope, with more work demand, more time and a steep learning curve.

The initial focus of the development stage of this project will be on developing all features of the mobile application and its backend setup. Development of the P2P network will come after this, with a back up plan of implementing the traditional motor insurance approach as a fall back.

Although development of the mobile app and the P2P network within the short amount of time given for this project will be challenging, as developer I am confident the time demand can be met.

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