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# Requirements Presentation

Group 07

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# Content

1. Our interpretation of the brief
2. Approach to the problem
3. Functional Requirements & Acceptance Criteria
4. Non-Functional Requirements
5. Risk Assessment
6. Legal, Ethical, Social & Professional Issues
7. Questions

# **Our interpretation of the brief**

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# The Brief

## PERSONAL SECURITY SYSTEM FOR NIGHT-TIME ECONOMY

It is no secret that in the UK the night life and the night-time economy are heavily fuelled by alcohol. Violent crime that results has been under scrutiny for a number of years, and, in particular, is being studied by Cardiff Crime and Security Research Institute (from the point of view of victims, offenders, the police, city planning and licensing authorities etc.)

With this in mind, a personal security system is proposed to partially alleviate the problem -- by making travel at night safer. (Of course it is easy to see how it will generalise to other scenarios.)

The operation of the proposed system is envisaged as follows. Users install an app, and give permissions to track their GPS coordinates. The app, when the user so wishes, is made to transmit the current coordinates to the central server. In the basic mode, the user sets the "start" and "end" positions of the intended route, and the system monitors their progress. If the user does not arrive at the destination at the expected time, or substantially diverges, the police are alerted. Further, phone's accelerometers can be used to detect anomalies -- e.g. fights, rape etc. Travellers with similar intended routes could be automatically grouped by the system.

There is substantial scope in further improvements to the way the system handles sensitive data, possibly integrates with e.g. payment system to detect anomalous behaviour.

A proof-of-concept implementation may be created on PCs rather than mobile platforms.

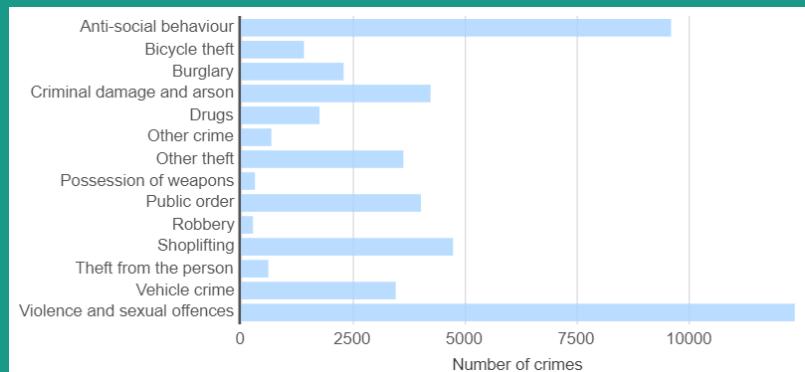
**20% of  
women.**

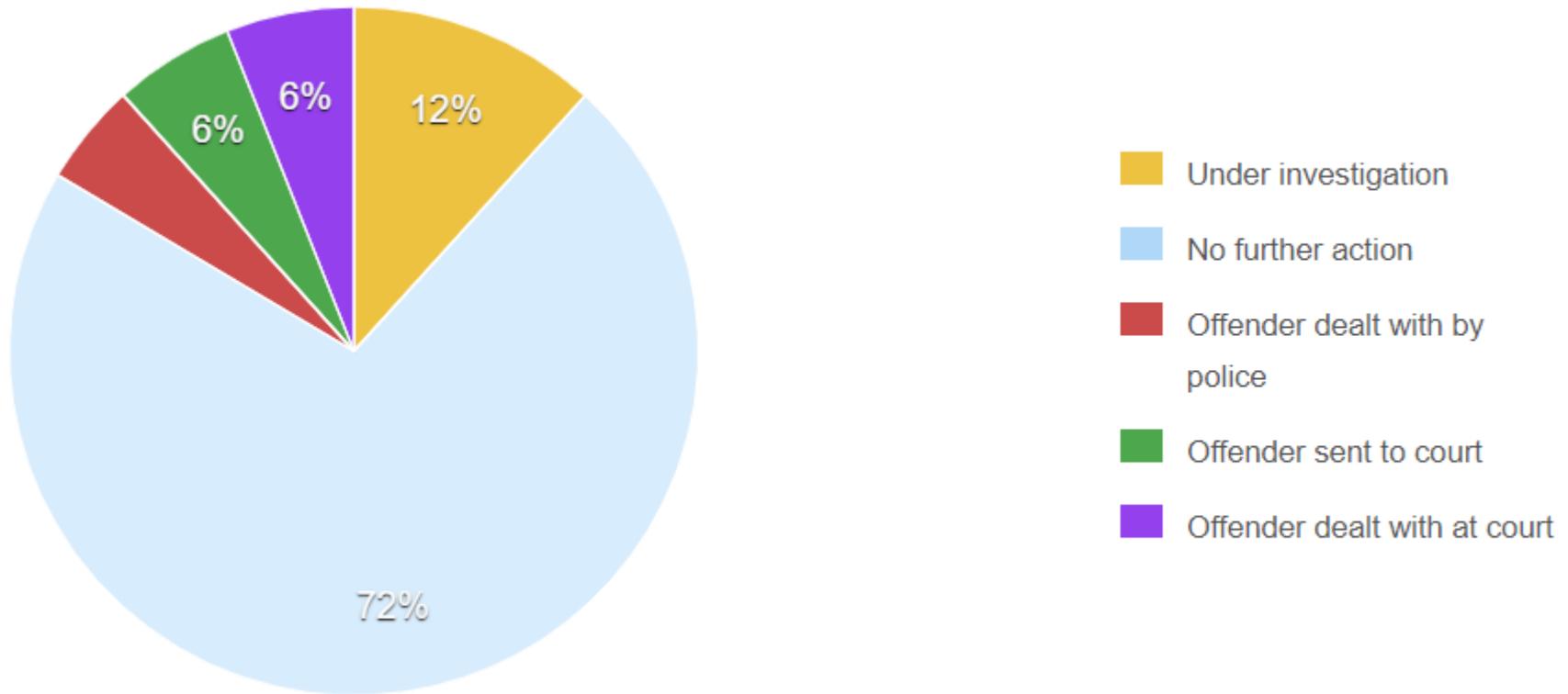
**4% of men.**

have experienced some type of sexual assault since the age of 16, equivalent to 3.4 million female and 631,000 male victims

<https://rapecrisis.org.uk/get-informed/about-sexual-violence/statistics-sexual-violence/>

**25.04% of crimes in  
Cardiff in 2019 are of  
Violence & Sexual  
Offences.**

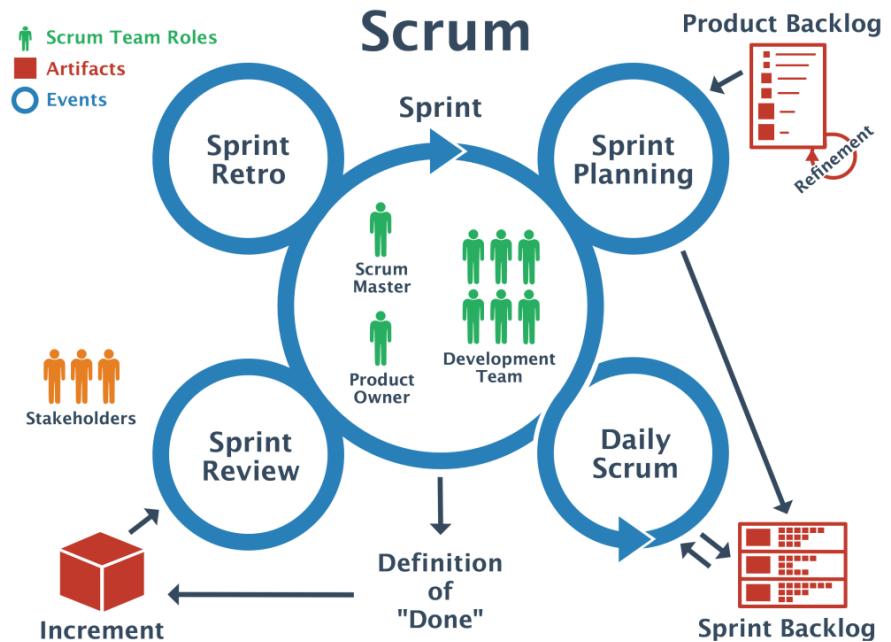




# Planning

Agile / Scrum:

- Prioritises communication
- Improving our productivity through iterations
- Ensures structure within our team, and forced us to define “Done”.



<https://medium.com/@jw207427/how-scrum-help-turn-around-our-development-process-dac6ff7c700>



# Timeline

**Sprint 1:** Research & Planning

**Sprint 2:** Defining Requirements

**Sprint 3:** Planning for presentation

**Sprint 4:** Beginning of Development

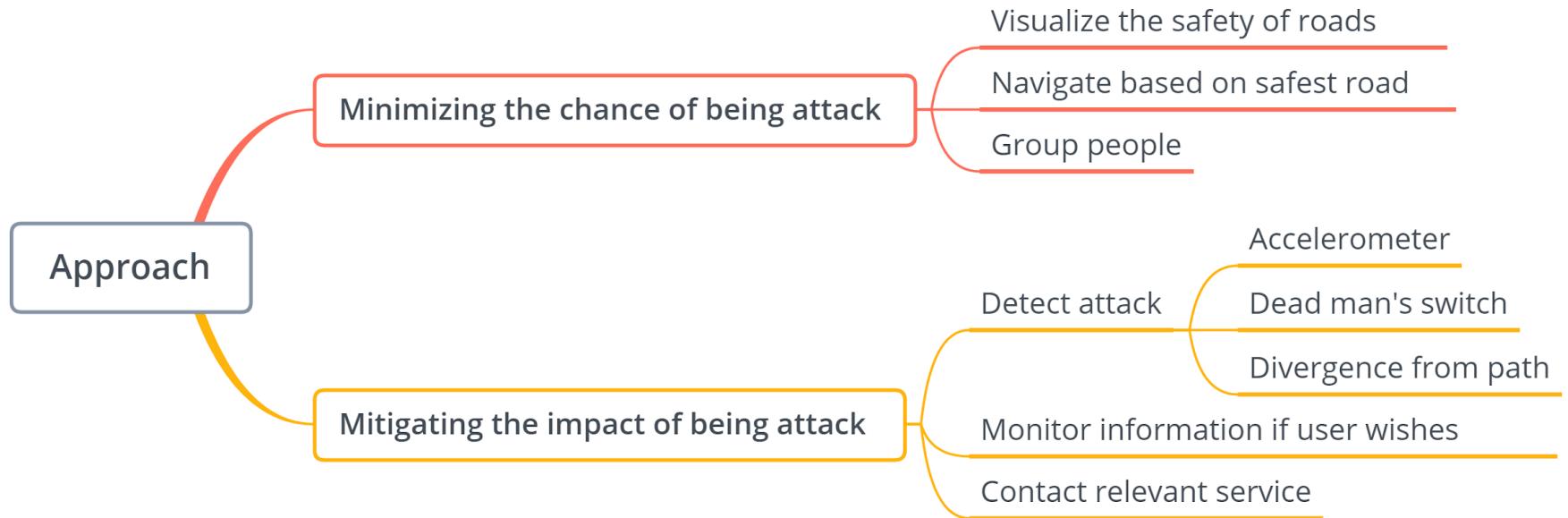
**Sprint 5:** Basic navigation features

**Sprint 6:** Crime Data Overlay

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# Approach

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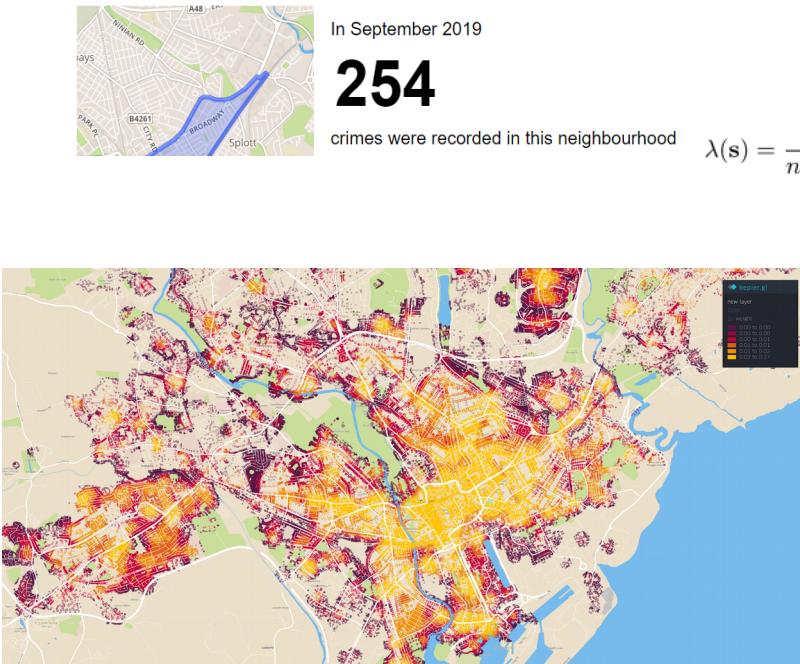


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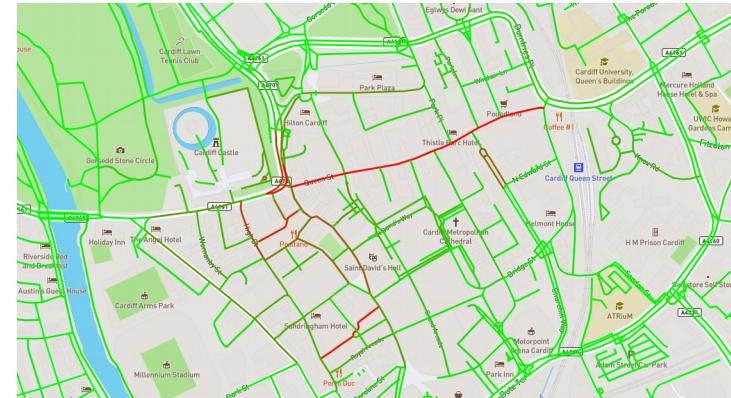
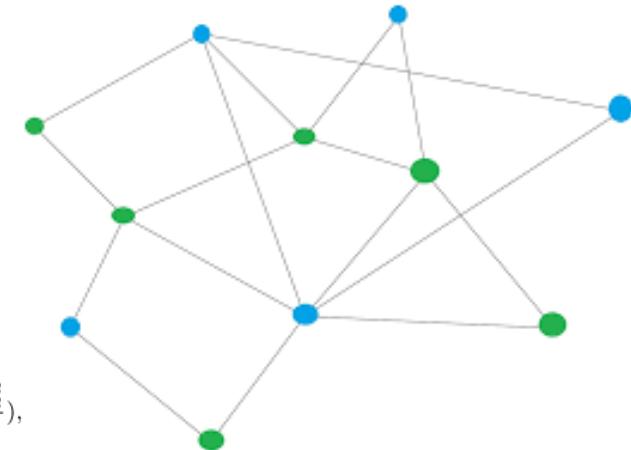
## **Visualise and suggest safer routes**

- Obtain crime data
- Turn map into graph with OpenstreetMap
- Calculate risk
- Visualise risk

# Visualise and suggest safer routes



$$\lambda(\mathbf{s}) = \frac{1}{nh^2} \sum_{i=1}^n \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{\|\mathbf{c}_i - \mathbf{p}\|_2^2}{2h^2}\right),$$



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# Safe navigation

- A length-risk bi-objective shortest path problem
- Apply A\* or other path search algorithm to it
- Provide user with choices to minimise risk
- Deploy on online server



	Path 1	Path 2	Path 3	Path 4	Path 5
Length $\ell$ (m)	3955	4027	4060	4922	5988
Risk $r (\times 10^{-3})$	2.32	2.02	2.01	1.71	1.70

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# Feasibility

- Crime data cannot perfectly reflect safety
  - -Inside building & irrelevant to the road
  - -Crime probability per capita decrease in hot crime area
  - -No accurate temporal data
- Lack of evaluation method of math model
- Performance of routing algorithm

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# Grouping

- Group people if they share same path
- Only group user in a trustable situation to prevent criminal to find target:
  - When a certain number of person is started for a certain number of different location
  - All user have passed some kind of ID verification
  - We should take into account users' history before allowing them to pair

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# Mitigation of attack

Detecting an attack

Collection of useful information

Contact the relevant service

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# Detecting an attack

Combination of:

Reliable detection

Minimizing user input

Quick response time



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# Accelerometer

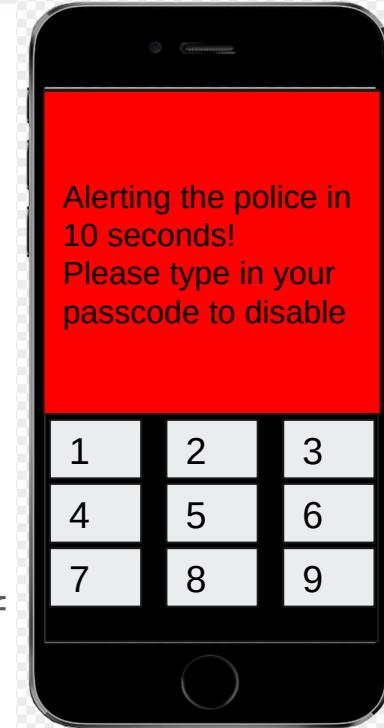
How would it work

Constantly monitor the phone's accelerometer

When it detects an abnormality (extreme shaking) it goes off

Phone start vibrating

Can be disabled within a X second window





# Accelerometer

## Good

Detects an attack without user's input

Quick response time

Convenient to use

## Bad

Unreliable - many false negatives

Not all phones support it

Unknown feasibility

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# Dead man's switch

## How would it work

User activates it by clicking a button

User holds finger on their phone when in a dangerous area

When the user lets go, the police is alerted, unless they enter their password.



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## **Dead man's switch**

### **Good**

Very reliable

Easy to implement

Easy to understand

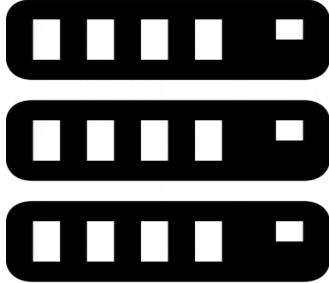
Works on all phones

### **Bad**

Not convenient to use

Battery drain because the screen is kept on

You are walking with your phone out which makes you an easy target



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## Divergence from path and stopping

How would it work

Tracking

Continuously check if the user is on the right path

If not, alert the police



## Divergence from path

Good

Requires no user input

Easy to use

Easy to understand

Bad

People might forget it is on

Unreliable data from GPS

SLOW!

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# **Audio detection**

**How would it work**

Continuously check for loud noises and screams



# Audio detection

## Good

Requires no user input

Easy to use for the user

Pretty quick

## Bad

People might forget it is on

Movies/Loud noises

Hard to implement well

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## **Collection of relevant information**

Once an attack is detected our app would send:

The user's current location

The journey they are on

Clip of audio and video (maybe)

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## Trusted contact

The user will have the option of adding in trusted contacts.

These people will be contacted in case something goes wrong.



# Summary

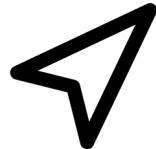
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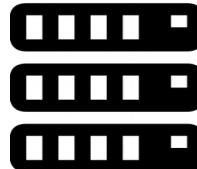
Safety visualisation



Attack detection



Navigation



Tracking



Grouping



Emergency contact

# Functional Requirements

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**MUST**

## MUST

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# 1. The user is able to create an account

### ACCEPTANCE CRITERIA:

- Upon opening the app, the user is presented with the login page within 5 seconds.
- On this page is a 'Create Account' button.
- After pressing this button, the user is prompted for their name, phone number, age and password.
  - The password field will appear as dots for security.
  - The user will have to enter their password twice for verification.
- The user must be 18 to make an account because of grouping.
- The user will receive a verification number via text that they have to enter to gain access.
- Their account details will then be stored 99.9% of the time.

MUST

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## 2. The user is able to log in to the app

### ACCEPTANCE CRITERIA:

- Upon launching the application, the user will be presented with the login page within 5 seconds.
- If the user is not logged in already, they will be prompted for their phone number and password in the provided input fields.
- If they enter correct information, they are granted access to the app's functionality.
- If they enter incorrect information, the user will be presented with a message informing them 'Your phone number or password is incorrect.'
  - The user will then be asked to try again.

## MUST

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### **3. The user must add at least two trusted contacts before using the app**

#### ACCEPTANCE CRITERIA:

- A section to add trusted contacts is presented to the user once they sign in to the app for the first time.
- The user is required to add between 2 and 5 trusted contacts (name and phone number) in the provided input fields before being able to access the app's functionalities.
- When these contacts are saved, they are sent a text within 20 seconds informing them that they have been chosen.
  - The text sent to the trusted contacts will provide an email address for any complaints / queries.
  - The trusted contacts information is stored reliably 99.9% of the time.

MUST

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## 4. The user must be able to edit their account information

### ACCEPTANCE CRITERIA:

- While logged in and on the home page, the user will be able to click on the 'My Account' tab
- Upon clicking the tab, the user will be presented with their information within 3 seconds.
- From here they can change their name, password or phone number by clicking the 'edit' button to the right of the current field they wish to change
  - Password requiring re-verification.
- Within 1 second of clicking the 'edit' button an empty text box will be presented to the user
- The user can enter their new information and select 'Save'. Upon clicking save, the system will store their new details accurately 99% of the time.

## MUST

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# 5. The user can input a destination and receive an appropriate selection of routes

- The user's current location will be used as the starting location
- Standard addressing or post codes can be used (E.G "21 Left Street" or "CF5 2QE")

### ACCEPTANCE CRITERIA:

- Provided the user is logged in, they are able to input a destination in the relevant tab on the navigation page.
- If the user enters a valid destination they are shown a set of routes to choose from.
- If the user enters an invalid destination they receive an error and be prompted for an address again.

MUST

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## 6. The user can select the route they would prefer to travel, based on time vs. safety

ACCEPTANCE CRITERIA:

- The user is presented with one or more safe routes within 10 seconds of entering the destination.
  - The device must be compatible by containing GPS.
- The user can choose their preferred route by clicking on one of the options presented.
- Once selected, the user should get a message notifying them that their journey has begun, and the system should start tracking the user's progress on the aforementioned route.
  - The system should start tracking the user within 5 seconds of starting the journey, allowing the user to see their progress.
  - The tracking of the user should be accurate to a 0.1 mile radius.

MUST

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## **7. The user is able to pause the journey if they need to stop**

ACCEPTANCE CRITERIA:

- While on a route and the user is logged in, a pause button will be displayed in the apps navigation page.
- When the user selects to pause the journey, they must verify it is them performing the action by entering their passcode or using biometric data, if supported.
- If they successfully verify, the user will be notified that the journey has been paused and the route will be paused until the resume button is pressed.

MUST

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## 8. The user is able to cancel the journey

ACCEPTANCE CRITERIA:

- While on a route and the user is logged in, a cancel button will be displayed in the apps navigation page.
- When the user selects to cancel the journey, they must verify it is them performing the action by entering their passcode or using biometric data if supported.
- If they successfully verify, the route is cancelled.

MUST

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## **9. The police are alerted if the user substantially diverges from previously chosen route**

ACCEPTANCE CRITERIA:

- The user's progress along the chosen route is tracked by the system.
- The user is able to view their progress along the route and any divergence from it on the navigation page.
- The police are alerted if the divergence from the user's chosen route exceeds a maximum distance of 25 metres and they fail to cancel within the time limit.

MUST

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## **10. The user is able to intercept the ‘contact police’ functionality**

ACCEPTANCE CRITERIA:

- Upon detecting a diversion of over 25 metres, the app must notify the user.
- After this notification, a timer will appear on the app based on the users settings.
- If the user does not enter their passcode within this time, the police will be informed.

MUST

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## **11. The user is able to modify the timer for contacting the police**

ACCEPTANCE CRITERIA:

- In the settings page of the app, the user will see a 'Contact Police' section.
- In that section, the user will be able to set the time limit on contacting the police to any value between 10 seconds and 5 minutes.

MUST

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## **12. The user can send GPS coordinates to the central server**

ACCEPTANCE CRITERIA:

- When the user presses the panic button, their current coordinates are sent to, and stored by, the server.

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# SHOULD

SHOULD

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## 13. The user can use a dead-man's switch when they're worried for their safety

ACCEPTANCE CRITERIA:

- On the main menu there is a button that says 'Dead-man's switch'.
- When the user presses the button, they are shown information about how the function works.
- The user can choose who to contact (police or trusted contact).
- When they begin holding down on the screen, the switch is primed.
- Once they remove their finger, a countdown begins based on the user's settings. If they do not enter their account password before the countdown reaches zero, the users choice of contact will be notified.

SHOULD

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## 14. The user can change the colour scheme

ACCEPTANCE CRITERIA:

- In the settings page of the app, there is an option for changing the colour scheme.
- The user is able to select one of the colour schemes depending on which form of colour-blindness they have.
- All the colours in the app change to reflect this selection.

SHOULD

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## **15. The user can access a ‘help’ page within the app**

ACCEPTANCE CRITERIA:

- A help option can be selected from the main menu of the app.
- When the user selects this option, they are directed to a page which describes the app’s functionalities.

SHOULD

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## 16. The user can access a ‘contact us’ page

ACCEPTANCE CRITERIA:

- A contact us option can be selected from the main menu of the app.
- When the user selects this option, they are directed to a page which gives them a contact number and email for the developers, to be used for reporting bugs, grievances, etc.

SHOULD

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## **17. The user can see a colour-coded heat map of crime data along a route**

ACCEPTANCE CRITERIA:

- A colour-coded heat map of crime data for a route should be overlayed.
- This data for this is based on crimes within the last 3 months, and automatically updated.

SHOULD

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## **18. If the user does not arrive at the destination in the estimated time, the police are informed**

- If the user has not reached the destination within twenty minutes of the expected time, and they have not paused or cancelled the journey, a countdown will begin based on their settings.
- If they do not enter their password before the end of the countdown, their location will be sent to the police.

SHOULD

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## 19. The user can change the destination of their journey after starting

ACCEPTANCE CRITERIA:

- An option to change destination is shown while the user is on a route.
- When the user chooses to change destination, they are required to verify with password or biometric security.
- If they successfully verify, the user can input the new destination and select the preferred route.

SHOULD

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## 20. The user can be put into a group of people taking a similar route

ACCEPTANCE CRITERIA:

- If the system detects 3 or more users travelling across largely similar roads (70% the same), those users receive a notification that they can join a group.
- If the user accepts, the app will suggest a meetup point.
- If they decline, they will be expected to continue following the route individually.

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COULD

COULD

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## 21. The user can allow the app to capture and store video and audio footage when a threat is perceived

ACCEPTANCE CRITERIA:

- The user can enable/disable this function in the settings page of the app.
- When it is enabled, and the app detects a threat (via gyroscope or dead man's switch), video and audio from the camera and microphone are recorded until the user puts in their password.

COULD



## 22. The user is warned about low battery

ACCEPTANCE CRITERIA:

- While the user is logged in and the app is in use, if their phone battery reaches 20% or less they receive a notification telling them.

COULD

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## **23. If the user is on a route and their phone detects atypical movement the police alerted**

- If the user is on a route and the gyroscope detects shaking or spinning in a way that is irregular a countdown will start based on their settings.
- If the user doesn't enter their password in time, the police are alerted.

COULD



## **24. The user gets a notification when a dangerous road is in close proximity**

ACCEPTANCE CRITERIA:

- When the user is within a 0.1 mile radius of an area with crime reports on more than 60% of the days in the last three months, they will receive a notification warning them of this.

COULD

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## **25. The user can see roads with popular nightclubs/bars where the crime data may be inflated due to anti-social behaviour within the bar**

ACCEPTANCE CRITERIA:

- When viewing a map of their route, while logged in and having chosen a preferred route, the user is shown locations of popular nightclubs/bars along their route.
- The user is then able to determine if there is a correlation between the locations and crime hotspots.

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**WON'T**

WON'T



## **26. Users have a rating which determines how trustworthy they are**

ACCEPTANCE CRITERIA:

- The app's external database will load the user's current rating and the number of ratings they have received to the user's profile.
- The rating will be from 1 to 5, 1 meaning avoid grouping with this person and 5 meaning extremely trustworthy.

WON'T



## 27. The user can rate users they are grouped with anonymously

ACCEPTANCE CRITERIA:

- An option to rate others while the user is logged in and a shared journey is currently underway, is present in the 'peers' section of the navigation page.
- The user is prompted by the app to rate the users on the shared journey on a scale of 1 (lowest) to 5 (highest), after they reach their destination.
- This score is stored in a database to represent how 'trustworthy' a particular user is in future shared journeys.
- A user can only submit one review per each person to prevent spamming which would falsely inflate review scores.

WON'T



## **28. The user can see the ratings of users they're about to share a route with**

ACCEPTANCE CRITERIA:

- An option to view the ratings of other users is available in the app's 'peer' section on the navigation page.
- When the user is asked to share a route, they are able to view the ratings of the other users they're about to share the route with.
- The review data should be refreshed every 30 minutes to inform users of the most recent activity from users they're about to share the route with

WON'T



## **29. The user will be banned from the app if they have a low rating**

ACCEPTANCE CRITERIA:

- An option for the user to view their own rating will be present in the app's main menu while the user is logged in.
- If a user's average rating after 10 reviews is lower than three, they will receive a message saying "You have been banned from the app due to low rating."
- They will then be unable to use the app's functionality.
- The app should ban the user within 10 minutes of their rating dropping below the threshold.

# **Non-Functional Requirements**

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**1. The system's database must be secure from people outside of the development team as sensitive GPS data and personal data is being stored**

**The system should load the location route within 10 seconds of the user's request on a compatible device with GPS**

**The app should be maintainable:**

**Ability to change code to meet the client's requests**

**The source code should be backed up on one physical device and a cloud service/version control system.**

**The system should update its crime data on the first day of every month to ensure relevance.**

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## **5. The interface should be simple and easy to navigate:**

**Easy to read font**

**Clearly labelled buttons**

**All menus must have a consistent layout**

**Most users should be able to understand how to use the app within 5 minutes of their first use.**

**The app should contain help sections to provide the user with detailed usage information**

## **6. All accounts must have strong passwords to be accepted.**

**8 or more characters**

**Mixture of upper/lower case letters, numbers and symbols**

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**7. Should run smoothly on all mobile devices (For prototype: MacOS, Linux and Windows)**

**The app start up cycle should last no more than 5 seconds on a compatible device with GPS. (MacOS, Linux and Windows for prototype)**

**8. User data must be stored securely**

**Passwords must be encrypted**

**All user data must be backed up weekly**

**9. All user input must be parsed correctly to ensure there are no unhandled exceptions for incorrect input**

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## **10. Accessibility**

**The app should accommodate for people with specific vision disabilities**

**Different colour schemes for colour-blind people**

**Option to display the UI in a larger font**

**Text-to-speech to read aloud any text displayed**

**11. The app should have 99.9% uptime, excluding cases where the map API we use is down**

**12. The app should detect potential users to group with 90% accuracy and efficiency**

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**13. The app should not use more than 10% of battery every 30 mins**

**The app could have a battery saver mode to minimise the battery consumption**

**The app could warn the user to turn off their WiFi and Bluetooth to preserve as much battery as possible**

**14. Low storage**

**The app should take less than 200mb of storage space**

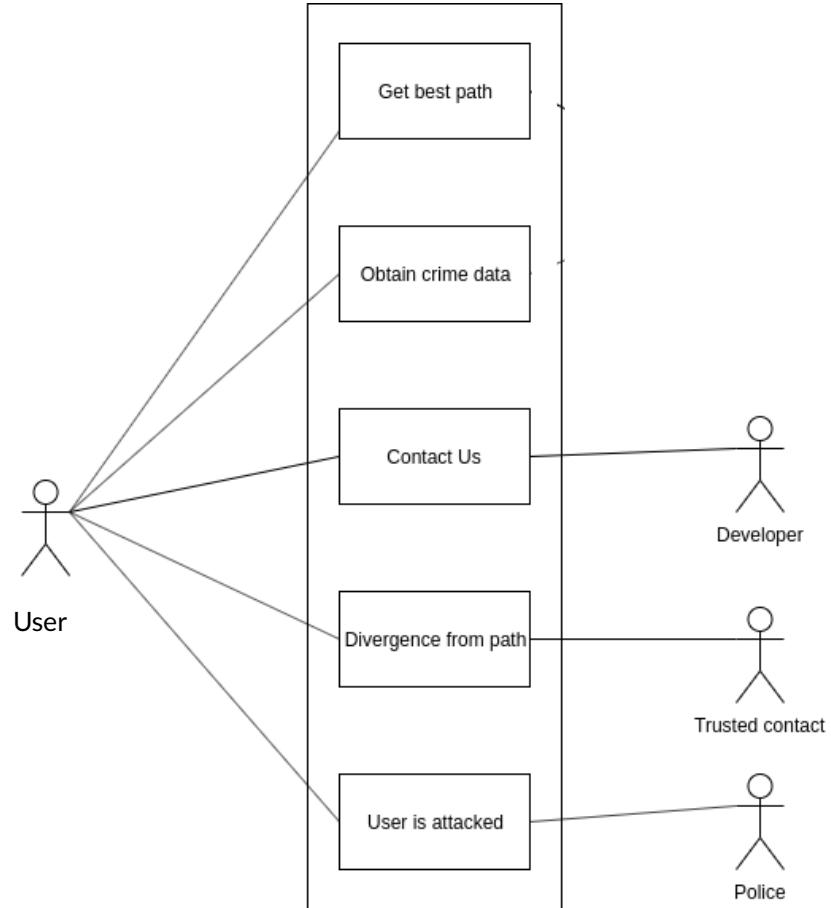
**15. The app should not crash on more than 2% of actions within a one hour time limit.**

# Use Case Diagram & Descriptions

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# Use case diagram



# Risk Assessment

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<b>Risk</b>	<b>Likelihood</b>	<b>Impact</b>	<b>Strategy to minimize disruption</b>
1) The user has disabilities	Medium	Large	The system will have a 'colour-blind' scheme in which popular colour contrasts that can cause an issue. The text on the application will be as minimal as possible, as a result, as developers we can ensure that the text is at least font size 12 to minimize the possibility of users with eye defects experiencing problems when using our application.
2) Team members communicating inefficiently.	Medium	Large	Team members must update the rest of the group with the task they plan to work on during the SCRUM meetings. If the team member changes the task they are doing, they must inform the team via the Facebook group messaging chat.
3) Team members missing meetings.	Medium	Moderate	All team members are aware that Monday's meeting at 12:10pm is compulsory. This meeting must always be attended by all members, Tuesdays 1pm meeting and Thursdays 10am meetings attendance is also monitored by the rest of the team. However, in certain circumstances, if the team member cannot make Tuesdays or Thursdays meeting, they can Facebook call or Skype one of the team members to have an active contribution to the meeting.
4) The app doesn't accurately locate the user's location.	Low	Large	The OpenStreetMap's API will be rigorously tested by all 8 members of the development team on separate devices to develop an efficiency percentage. This efficiency stat will be provided to the user upon delivery of the system, so they are aware of the efficiency we have found the tracking to have.
5) The app fails to alert the police when an attack / diversion takes place.	Low	Large	The application that is developed will also be repeatably tested by all 8 members of the development team on separate devices and an efficiency percentage will also be acquired from these results. This efficiency stat will also be provided to the user of the app, so they are aware of the likelihood of a failure to contact the police.
6) The app doesn't run on a variety of devices.	Medium	Medium	The application will be rigorously tested by all team members on all major operating systems such as IOS and Android (Windows, Mac and Linux for prototype).
7) The development team loses the code when developing the application	Low	Large	1 team member will be responsible for a physical back-up storage of the developing code on devices such as a laptop or an external hard drive which they will have to update every team meeting. All updated code will also be uploaded to a private GitHub repository.

# **Legal, Ethical, Social & Professional Issues**

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# Legal - GDPR & DPA

## GDPR

### Art. 17: "Right to be Forgotten"

once it is confirmed that a user's journey has been completed safely his/her GPS data from that journey will automatically be deleted. If a users data isn't needed it'll have to be removed

### Art. 13: "Right to be Informed"

We must update users when there has been an update on our privacy policy and the data that we will be gathering. This is to be kept in mind for future updates.

## DPA

Although the Data Protection Act of 1998 isn't entirely redundant, GDPR tends to encapsulate the principles that have been outlined in DPA.

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# **Legal - Distribution Platform Requirements**

The requirement to inform the user of which data we need separate to the terms of service.

We are not unauthorized to publish or disclose peoples non public contact e.g. mobile numbers

We need to have confirmation separately to the T&C about the data we will need

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# Ethical

- Our responsibilities over the users and their safety, make them aware of the safety of the road
- The app will only track the phone during active routes or when the app is open.
- What's the probability of us being able to recommend a safe route?
- Make them aware of possible inaccuracies (GPS tracking, unreported crime etc)
- Accommodate disabilities such as colour blindness with different heat maps etc

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# Social

**How do we ensure people with malicious intent do not use our app?**

- a. **Users must be CRB checked to use the application**

The registration process would be much more rigorous and time consuming, thus reduce the scope of the users but it would be more secure.

- b. **Users must enter their phone number when signing up.**

This allows us to know most of the users details, but it doesn't provide any solution for the safety issues. Once again, it's a case of mitigation rather than prevention.

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# Professional

*“Computer-based technologies underpin almost everything we do; they directly affect us all. It is therefore vital that those working within the computing industry are aware of their professional responsibilities in guiding the development”*- (P. Duquenoy et al., 2008)

Ethical, Legal and Professional Issues in Computing

- Only deploying features that will increase the safety of our users, rather than making them more vulnerable. We need research or reasoning behind features
- Clarification of the data that will be distributed while using the app within the terms & conditions
- Create a bug report feature & act fast on repairing bugs

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# Questions