CS 440: Project Report
Natural Disaster Help App

The Document Detailing
The Functions and Design of the Application

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Table of Contents

List of Figures

List of Tables

I Project Description

1 Project Overview

The focus of this project is to create a general purpose application for smartphones, and phones with gps capabilities, that would help reduce the casualties of natural disasters. The application would consist of navigation and tracking subsystems.

Before a disaster, the navigation subsystem will download necessary data from the server. This data should contain possible safe spots, for the supported disasters, near the user's daily route. The user has the ability to turn on tracking subsystem right before a hurricane begins which will ping their location to the server every x minutes.

During a disaster, the server will gather the user's pings and calculate the velocity and acceleration to predict the user's position. The navigation subsystem will make use of the data on the server, offline data that it downloaded previously if no internet access is available, to guide user to the safest location.

After a disaster, the users will be prompted with a wellness check. On a failure or reply of no the server will deploy rescuers to that location for rescue. The server will continue to predict user location in order to provide this data to rescuer.

2 The Purpose of the Project

2a The User Business or Background of the Project Effort

The recent hurricanes have been a devastating experience for those that came in its path. Hurricane Harvey, Hurricane Irma and numerous other catastrophic storms have inflict serious damage to these people. Many have lost their homes, more importantly people have been injured or killed. This product would reduce these casualties.

2b Goals of the Project

We want to provide users with survival guide before, during and after disasters.

2c Measurement

There will be increase in likelihood of rescue and less casualties after a disaster.

3   The Scope of the Work

This product should be working in the everyday lives of its users in order to become as useful as possibly when the need arises. By gathering data about the user's surroundings before catastrophe strikes in order to make use of that data in it's job. While the primary environment for this product is a hazardous catastrophe the preparation work done by the user and the app is done before that occurs.

3a The Current Situation

There are currently a vast selection of hurricane tracking applications several of which are just scams. Those that aren't scams only function as a hurricane tracker which gives no relevant information to the user trying to survive the storm. These applications also often require cell service and or internet service to do their job. This is completely unhelpful as these services are often the first to cease working in the event of a hurricane.

3b The Context of the Work
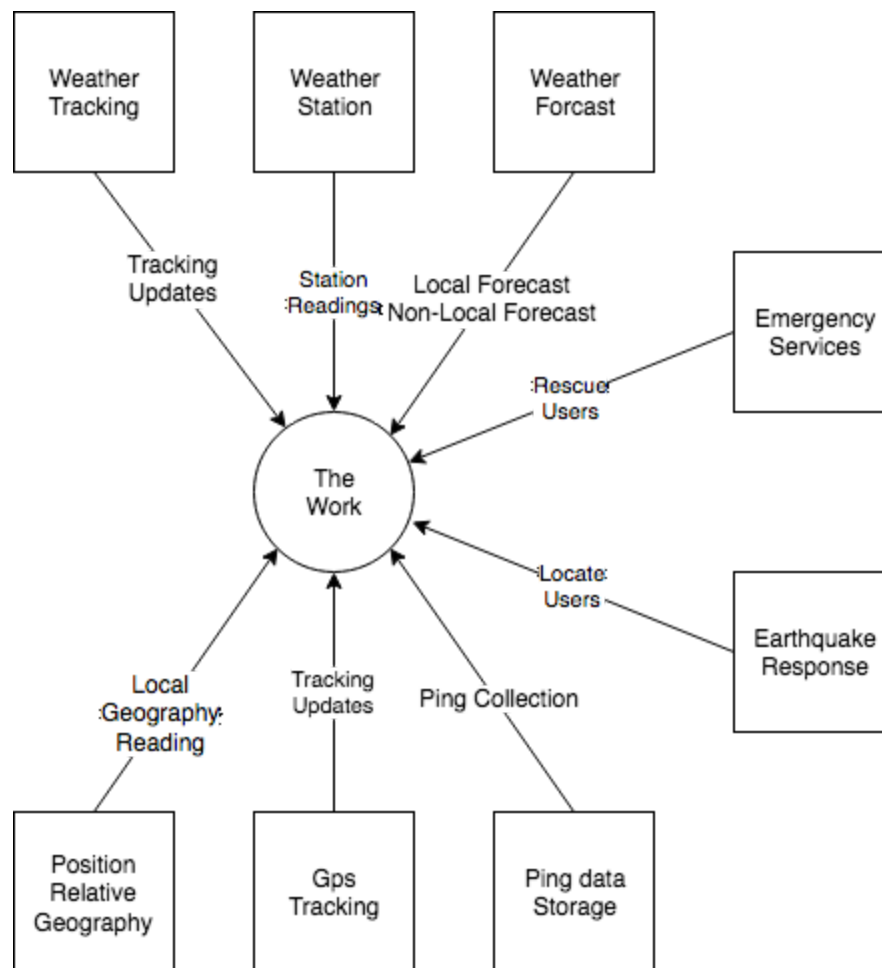
Figure 1 - Context of Work Diagram

8

3c Work Partitioning

Business Event List

Event Name	Input and Output	Summary
1. Weather Tracking transmits location	Weather Tracker Readings (in)	Record the current location of hazardous weather.
2. Weather Station sends a reading	Weather Station Readings (in)	Record the current weather.
3. Weather Station sends local forecast	Weather Station Readings (in)	Record the local weather forecast.
4. Weather Station sends non-local forecast	Weather Station Readings(in)	Record the non local weather.
5. Rescue Users	Location Ping(out)	Emergency services rescue users based on their app response.
6. Locate Users	Location Ping(out)	Emergency services rescue users based on their app response.
7. Ping Collection	Gather successive pings from a user (out/in)	Record the pings a user's app gives out.
8. Tracking updates	Ping location (out)	App Pings server current location if server available else app saves pinged location to be sent once access is available again.
9. Local Geography Reading	Gather info about local shelters (in)	Store Local Geography information on phone for later access.

Table 1 - Business Event List

3d Competing Products

Previously mentioned in The Current Situation there are several competing products currently on the market. However they fall vastly short in a variety of aspects. The most obvious being an number of these apps are just scams to get your money while not giving any product. Those products that aren't scams don't work under the most basic conditions of hazardous weather. This is generally because these apps cannot

work without internet access which is promptly lost in most hazardous weather conditions

4   The Scope of the Product

The app will include GPS functionality that will track the user's location that will provide notifications regarding dangerous natural disasters through the GUI of the app as well as push notifications if the app is not the current open app. The application receives the data regarding dangerous conditions from third-party servers such as Weather.com and Accuweather. The servers of each server is maintained by their respective companies.

4a Scenario Diagram(s)

Natural Disaster Application Scenario Diagram

```
                    ┌──────────────┐        ┌──────────────┐
                    │ Map Updates  │◄──────►│  Weater Api  │
                    │              │        │   updates    │
                    └──────────────┘        └──────────────┘
                          ▲                       ▲
                          │                       │
                          ▼                       ▼
┌──────────────┐    ┌────────────────────────────┐    ┌──────────────┐
│  Storm /     │    │ Application notifies the    │    │ User attempts│
│  Natural     │───►│ user of oncoming danger and │───►│ to protect   │
│  Disaster is │    │ supplies nearby safe havens │    │ themselves   │
│  nearing /   │    │ and instructions to protect │    │ from the     │
│  occuring    │    │ themselves during the event.│    │ storm.       │
└──────────────┘    └────────────────────────────┘    └──────────────┘
```

```
                                          ┌──────────────┐    ┌──────────────┐
                                          │ User answers │    │ application  │
                                          │    "yes"     │───►│ continues    │
                                          │              │    │ normal pre-  │
                                          │              │    │ event        │
                                          │              │    │ functionality│
                                          └──────────────┘    └──────────────┘
┌──────────────┐    ┌──────────────┐         ▲                      ▲
│ Set time     │    │ "wellness    │─────────┘                      │
│ period passes│───►│ check" is    │                                │
│ / event ends │    │ deployed on  │                                │
│              │    │ the device   │─────────┐                      │
└──────────────┘    │ (yes or no   │         ▼                      │
                    │ question)    │    ┌──────────────┐    ┌──────────────┐
                    └──────────────┘    │ User answers │    │ Emergency    │
                                        │ "no" or the  │───►│ response is  │
                                        │ wellness     │    │ dispatched to│
                                        │ check times  │    │ the phones   │
                                        │ out          │    │ location     │
                                        └──────────────┘    └──────────────┘
```
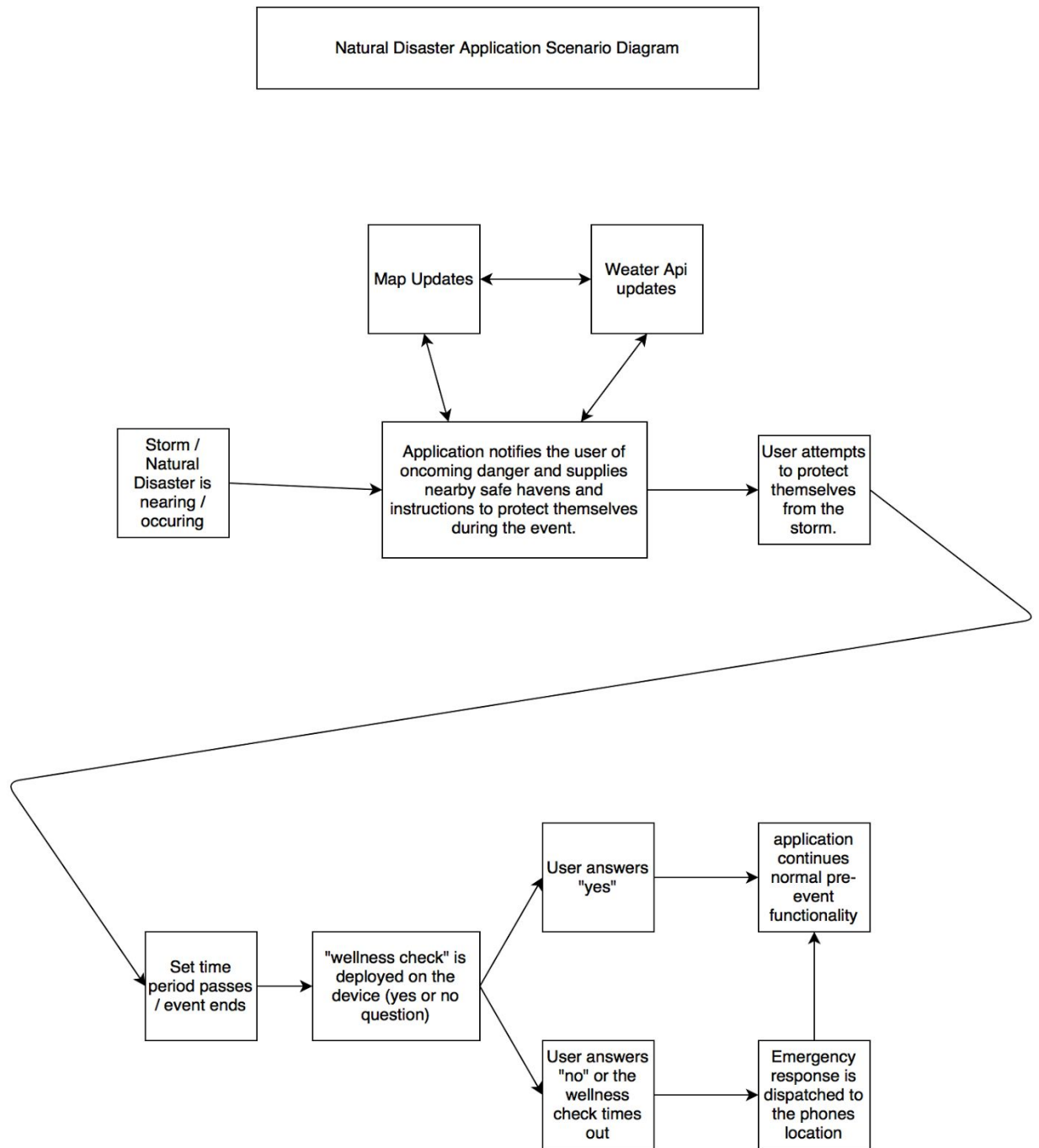
Figure 2 - Scenario Diagram

4b Product Scenario List

1. Hurricane: In the event that the user is in the area of effect of a hurricane, the application will notify the user to take the necessary precautions.
2. Tornado: In the event that the user is in the area of effect of a tornado, the application will notify the user to take the necessary precautions.

3. Earthquake: In the event that the user is in the area of effect of an earthquake, the application will notify the user to take the necessary precautions.
4. In each scenario, if the natural disaster event is in the range of life threatening categories, the application will deploy a yes or no wellness check. If the check is answered no or is left idle for a set time, emergency response will be deployed to the location of the phone.

4c Individual Product Scenarios

Hurricane: Molly lives in an area affected by "hurricane season". There has been word on the news that a storm was heading near Molly's area. Molly had taken precautions but had to leave her home and the oncoming hurricane became an afterthought. While out, rain and/or a bit of wind picked up. Molly got a ping on her phone that notified her that the hurricane was about to arrive to her area.

Tornado: Joe lives in a rural area that are prone to tornadoes. Joe is driving along the interstate when he notices some wind picks up. He doesn't pay it much mind as it gets windy frequently in his area. He hears a ping come from his phone. He has received a notification from the application warning him that he is in the area effect of a tornado. Joe is able to look at the map of nearby tornado shelters provided by the application, and proceed to a safe location.

Earthquake: Sarah lives in an earthquake zone in California. When the earthquake hit her area, the application gave her approved earthquake shelters as well as instructions to protect herself in the event she couldn't reach one of the shelters.

Emergency: Jeffery's home was hit by a very destructive storm. His phone was pinged before the storm came and Jeffery did his best to try to find shelter, but he was injured and couldn't reach his phone. The application deployed its wellness check (Yes or No prompt) which if 'No' is selected or if it times out the nearest emergency response team is dispatched to the phone's location. The application tracked the GPS system in his phone after the timeout, and emergency response was able to located the phone, and therefore Jeffery.

5 Stakeholders

5a The Client

The Clients would be any human beings with a smartphone that has the relevant hardware requirements. The clients would be any person with the desire to be prepared in the event of a hurricane with the relevant information to assist them. The acceptance of this product by any particular client is not that detrimental to the profit as the intent is that this product uses hardware already in place to enhance the prospect any person who uses it chance of surviving these catastrophic events.

5b The Customer

This product is intended for use by everyone but specifically for those who live in coastal countries and states. This product is intended for those who live in areas of the world affected by tropical storms and hurricanes as an added measure to affect the chances of the user's survival during and rescue after any natural and unnatural catastrophes.

5c Hands-On Users of the Product

User#1

Name: General Public.

Role: This user must download the info for their relevant common locations

Subject matter experience: The general public probably has fairly little experience with the knowledge behind the technologies in play. Novice

Technological experience: The general public should be fairly well acquainted with smartphones and their relevant features. Journeyman/ Master

Other user characteristics:

User#2

Name: Business Wo(men) or others who travel quite a lot.

Role: This user must download a info for each place they frequent which is likely to be more than the average user.

Subject matter experience: These users have a range of experience with the knowledge behind the technologies in play. Novice/ Journeyman

Technological experience: Business wo(men) should be extremely well acquainted with smartphones and their relevant features. Master

Other user characteristics:

User#3

Name: Emergency Services

Role: These users should be aware of how these systems work so as to be able to use them in the event of a natural disaster.

Subject matter experience: These users most likely have little knowledge behind these technologies. Novice

Technological experience: Emergency Services should be able to operate the location and rescue systems but need not be experienced in the smartphone application. Master

Other user characteristics:

5d Priorities Assigned to Users

The Key Users of this product are the users who live in areas of the world frequently affected by natural disasters and specifically those who own some form of smartphone with which they can use this product.

Secondary Users would be users who either live some place generally unaffected by natural disasters or also those users who do not own a smartphone but still might be targeted to use this product should they have some other device capable of meeting the most basic requirements.

Unimportant users are those users who do not own a device which can meet the most basic requirements and as such do not posses the ability to access much less make use of this software. These users are slowly becoming Secondary users as the most basic requirements are slowly being met by people world wide. Some plan to speed this process up could possibly be included in the product design.

5e User Participation

There are several features that require the users participation at start up time and several other features during the intended use of the product.

When the user originally downloads the app they will need to determine which of the optional functions they would like to use. If they want to send their location to their love ones in addition to the relevant authorities they will need to add these people contact information to a list. They should also give the app their most common locations to be home, work, school, etcetera so that the app can prepare a list of the nearest safe locations to retreat to should they be at one of these places.

In the time leading up to and hopefully during a hurricane the users would be required to turn on the location pinging portion of the product in order to start recording their location. If during this time the user still has access to internet services they would need to use a location function to find the nearest safest location to retreat to. Should the user not have access to the internet they should look at the previously saved position data that will direct them to the nearest shelter/ safest location.

5f Maintenance Users and Service Technicians

Some number of Software technicians will be required to keep the software up to date and fix any bugs or problems that arise. Should any hardware components like weather stations and the like be built as part of this project those will require Hardware technicians to maintain them and software technicians to program and maintain their connection with the user's software. Some technicians with expert knowledge of the systems in place will be require once a catastrophe occurs to help

the emergency services use this software to assist users and to teach these services how to use these systems.

5g Other Stakeholders

Testers

The testers will be the key factor in designing of the user interface. Since the testers may become future customers, it is important to get their opinions on the usability of the software.

Conflicts between testers and developers shall be resolved through voting between the tester, developer and other stakeholders that would be affected by the conflict.

Developers

Programmers need to develop around the testers. They must consult with manager/other developers before adding a new feature that isn't part of the design.

Read Testers for how to resolve conflicts between testers and developers.

Business analysts

These stakeholders will be responsible for identifying and suggesting solutions for business problems that may come up during the development of this software. Business analysts do not get to decide if the solution is taken into affect.

Marketing experts

The marketing experts will be responsible for advertisement related to distributing the application. Since these stakeholders will be the connection between development team and the users of the application, their opinions are also important in the design of the software.

Rescuers

Since the rescuers may also become future customers, they will be another key factor in designing of the user interface.

Conflicts between rescuer and developer shall be resolved through voting between the stakeholders that would be affected by the conflict. If the conflict is related to privacy, then the privacy laws must have priority.

6 Mandated Constraints

6a Solution Constraints

Description: The product shall operate on smartphones or devices with gps navigation system.

Rationale: The product will be used during natural disasters.

Fit criterion: The product must be approved to be on the corresponding application store of the device.

Description: There must be a privacy options.

Rationale: The client's location will not be shared with everyone.

Fit criterion: The product must comply to Privacy Protection Act (PPA).

6b Implementation Environment of the Current System

The product must work when internet access is unavailable and other similar circumstances during natural disasters.

The rescuers must have a different user interface in which they are able to view the locations of the users with privacy disabled.

The product will collaborate with other weather/storm information providing services as described in the Partner or Collaborative Applications section.

6c Partner or Collaborative Applications

This product must collaborate with other weather/storm softwares. These applications will be providing the data related to the natural hazard so that the user gets up to date information about the upcoming storm.

6d Off-the-Shelf Software

The application will use 2 main off-the-shelf software to aid in its functionality. The application will use a map api and a weather api (which exact ones are currently being reviewed). The api's up for review are Google Maps, Mapbox, Weather Channel, and Accuweather.

6e Anticipated Workplace Environment

Some phones may not have GPS services enabled or may not have GPS services at all. The product should be able to at least be able to be given zip codes to store a general region, at most be able to use Wi-Fi IP address to determine a location.

It is possible that cellular data and internet can disconnect during a storm. The product should have a backup system in place to store data such as maps and nearby shelters.

A lot of users of the product will be using their phones away for power outlets, and storms themselves can take down power. The product should be as efficient as possible, terminating and background operations when not in use / needed.

6f Schedule Constraints

The major schedule constraint is the schedule of the developers / testers. Since the is application is not apart of a large company (as of now), most developers / testers would more than likely have primary jobs and would be working on the application as a side project or even possibly as a volunteer.

Another schedule constraint would be testing the application. The testers would have to try to simulate data themselves which would not be time efficient, or the third party company that hosts the weather testing data.

Another scheduling constraint is in regards to updating the application. Other than bug fixes, updates to the map or weather api's are handles by their resective companies. When these companies update their api's and data, then the application can be updated accordingly.

6g Budget Constraints

The main budget constraint is potential costs for access to the third party servers that host the weather / storm tracking data. Depending on the cost of the data and connection to the third party servers (possibly free), the team would have to determine options for funding, such as donations, ads, charge for the app, etc. Ads and making the app premium can turn away prospective users.

Another budget concern is compensating developers for their time creating the product, as well as testers to ensure proper functionality of the application. Also the team to need to figure out legal terms of services with a legal team/professional, to ensure legal safety.

7 Naming Conventions and Definitions

7a Definitions of Key Terms

App: A software product that operates on a mobile smart device such as an phone or tablet.

Wellness check: A yes or no prompt to get wellness of the user after the disaster.

7b UML and Other Notation Used in This Document

No UML or Other Notation used as of yet.

7c Data Dictionary for Any Included Models

No Models used as of yet.

8 Relevant Facts and Assumptions

8a Facts

In the event of an natural disaster the internet is often unavailable.

8b Assumptions

The device that the product will be running on has support for gps navigation.

The device that the product will be running on has support for internet service capabilities.

The device that the product will be running on has support for notifying the user.

II Requirements

1 Product Use Cases

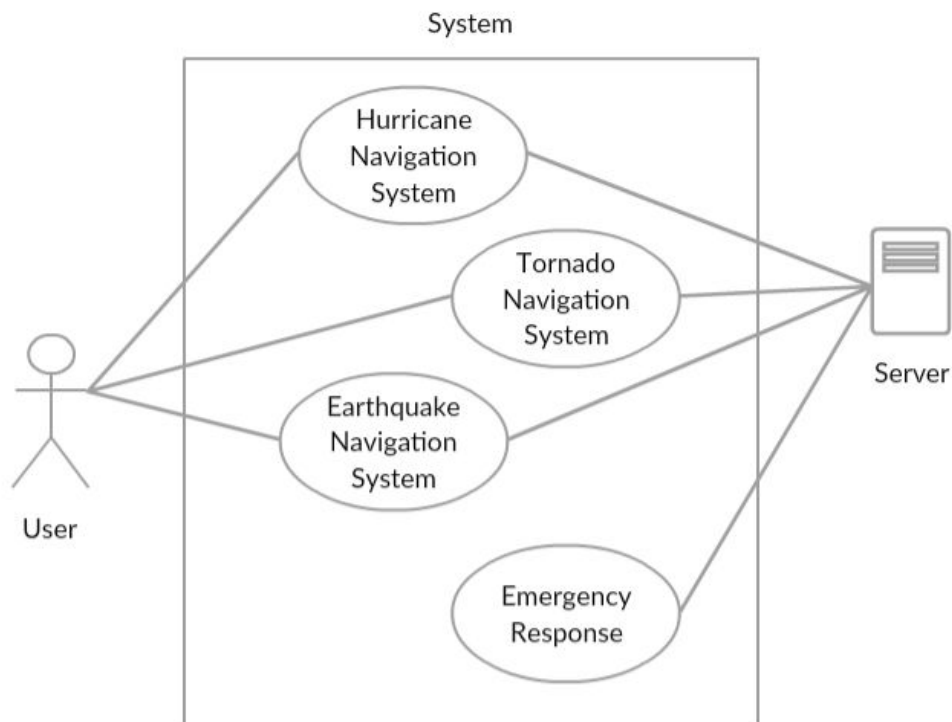### 1a Use Case Diagrams

Figure 3 - Use case diagram

1b Product Use Case List

Not Applicable

1c Individual Product Use Cases

Use case name: Hurricane Navigation System
Participating actors: Initiated by application

Flow of events:
1. Application displays all possible locations on a map.
2. User selects a location.
3. Application displays direction to the selected location.
4. User changes location.
5. Application displays direction to new location.

Entry conditions: User is in hurricane warning zone and application is opened with locations pre installed from the server.
Exit conditions: User is on the way to safe location or is at the safe location.

Use case name: Tornado Navigation System
Participating actors: Initiated by application

Flow of events:
1. Application displays all possible locations on a map.
2. User selects a location.
3. Application displays direction to the selected location.
4. User changes location.
5. Application displays direction to new location.

Entry conditions: User is in tornado warning zone and application is opened with locations pre-installed from the server.
Exit conditions: User is on the way to safe location or is at the safe location.

Use case name: Earthquake Navigation System
Participating actors: Initiated by application

Flow of events:
1. Application displays all possible locations on a map.
2. User selects a location.
3. Application displays direction to the selected location.
4. User changes location.
5. Application displays direction to new location.

Entry conditions: User is in earthquake warning zone and application is opened with locations pre-installed from the server.

Exit conditions: User is on the way to safe location or is at the safe location.

Use case name: Flood Navigation System
Participating actors: Initiated by application

Flow of events:

6. Application displays all possible locations on a map.
   7. User selects a location.
8. Application displays direction to the selected location.
   9. User changes location.
10. Application displays direction to new location.

Entry conditions: User is in flood warning zone and application is opened with locations pre-installed from the server.
Exit conditions: User is on the way to safe location or is at the safe location.

Use case name: Emergency Response System
Participating actors: Initiated by server

Flow of events:

1. Application displays a wellness check alert.
   2. User's response to the wellness check
      a. User selects "No" or fails to respond to the alert displayed on device.
      b. User selects "Yes" in which case the application state resets to before the natural disaster.
3. If event (a) occurs then application tells server to send emergency response to the device location in order to rescue the user..

Entry conditions: Server detects natural disaster has ended.
Exit conditions: User either responds a "Yes" to the wellness check or emergency response is sent to the user's location.

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2 Functional Requirements

Requirement: Tracking_1

Description: The server should track the user's location when tracking is enabled.

Rational: The user wants their location tracked so they can be rescued after the natural disaster has passed.

Originator: Deep Patel

Fit Criterion: The application consistently pings the user's location every x minutes to the server so that the server can store the data.

Customer Satisfaction: 85%

Customer Dissatisfaction: 15%

Priority: High

Conflicts: Users might not like being tracked.

Requirement: Offline_Navigation_1

Description: The application should display navigation even if internet access is not available during the natural disaster.

Rational: This product will mainly be used during natural disasters when internet access is mostly unavailable.

Originator: Deep Patel

Fit Criterion: The user can navigate to a safe location while wifi is turned off for device after data has been downloaded to their device.

Customer Satisfaction: 90%

Customer Dissatisfaction: 10%

Priority: High

Conflicts: Not enough space on device to download navigation data or user doesn't want to use up storage space on their device.

Requirement: User_Data_1

Description: The system shall not store the tracking data of a user when there is no need to.

Rational: By destroying this data after a natural disaster is over is a great way to maintain security.

Originator: David Kay

Fit Criterion: Two months after the event of a disaster has occurred the tracking data acquired during that event shall be deleted.

Customer Satisfaction: 30%

Customer Dissatisfaction: 10%

Priority: High

Requirement: Offline_Data

Description: The application must display data in the event of cellular disconnection.

Rational: If the user gets disconnected from cellular service and a natural disaster occurs, a lister of shelters will still be available.

Originator: Briana Crockett

Fit Criterion: The data will be updated frequently, the user has the option to accept downloads.

Customer Satisfaction: 90%

Customer Dissatisfaction: 70%

Priority: High
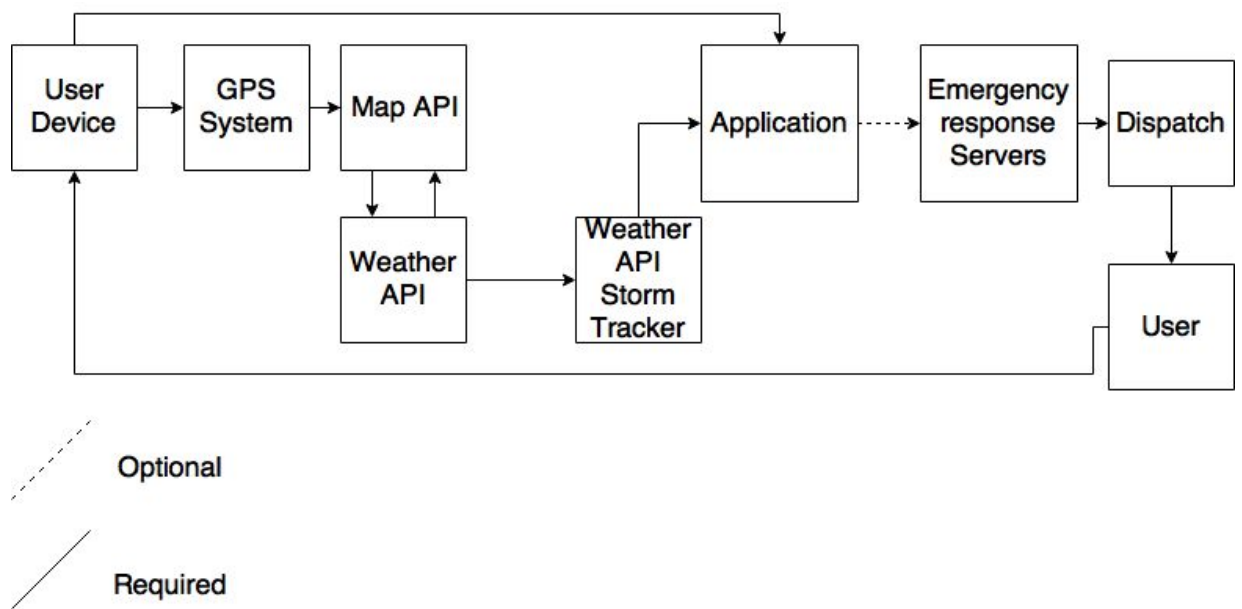

3 Data Requirements

Figure 4 - Data Requirements Diagram

4 Performance Requirements

4a Speed and Latency Requirements

Identification: P_SaL_1_Weather_Interuption

Description: Given that this product is intended to be used during natural catastrophes we need to be flexible when it comes to internet connection. Given that, the speed of those components that we do have control over need to be optimized

Fit Criterion: The components we choose must fall within 10% of the theoretical speed at available at the time of implementation.

Identification: P_SaL_2_Alert_Speed

Description: The time between the sending out of an alert from the system to the users and the users getting a notification on their phone need to be as fast a possible.

Fit Criterion: The recorded time must fall within 10% of the theoretical speed.

Identification: P_SaL_3_Activating

Description: The time between the user activating the product and it collecting the data it needs from the server needs to be as fast a possible.

Fit Criterion: The recorded time must fall within 10% of the theoretical speed.

4b Precision or Accuracy Requirements

Identification: P_PoA_1_WPosition

Description: All weather positioning data needs to be accurate to at least 10 miles.

Identification: P_PoA_2_UPosition

Description:All user positioning data needs to be accurate to at least 100 ft.

Identification: P_PoA_3_Directions

Description:All user direction data needs to be accurate to at least reasonable vision limit.

4c Capacity Requirements

Identification: P_C_1_Phone_Capacity

Description: The app must be able to vary its amount of data stored on the phone depending on how much the user wants to download prior to natural disaster.

Fit Criterion: There must be at least three different sizes of download.

Identification: P_C_2_Server_Need

Description: There must be enough local servers to enable everyone directed to them to have access to the data needed.

Fit Criterion: There must always be 25% more room on the local servers than users in the area.

Identification: P_C_3_Sever_Capacity

Description: The server load capacity must be continually increased as the number of registered users in that area increases.

Fit Criterion: There must always be 25% more room on the local servers than users in the area.

5 Dependability Requirements

5a Reliability Requirements

Identification: Dep_R_1_Stored

Description: No data stored on a user's phone shall be made inaccessible for any reason.

Fit Criterion: There shall be no systems set in place that prevents the user from accessing their data.

Identification: Dep_R_2_Internet_Loss

Description: The system must continue to work despite loss of internet.

Fit Criterion: The system shall switch to offline mode when no internet connection is available.

Identification: Dep_R_3_Partial_Failure

Description: The system shall be designed to fail independently. If one part fails it takes as few systems down as possible.

Fit Criterion: Any subsystem shall not bring down more than 15% of the whole system.

5b Availability Requirements

Identification: Dep_A_1_Time

Description: The product shall be available for use 24 hours per day, 365 days per year.

Identification: Dep_A_2_Work

Description: Should the product need to be down for repair or maintenance this shall occur when the reported weather is clear for at least the next 24 hrs.

5c Robustness or Fault-Tolerance Requirements

Identification: Dep_RoF_1_Internet_Loss

Description: The product shall revert to the local info when internet becomes unavailable.

Identification: Dep_RoF_2_Energy

Description: The product shall continue to ping its location until energy is lost or the user disables it.

5d Safety-Critical Requirements

Identification: Dep_Sc_1_Direction

Description: The product shall not direct the user to go to an unsafe location.

6 Maintainability and Supportability Requirements

6a Maintenance Requirements

The product shall be able to be maintained by developers who are not the original developers of the application. Any changes to the server must not require an update to the application unless the update is required to fix privacy issues. Any changes to the server take no more than a week to deploy.

6b Supportability Requirements

There should be email support and twenty four hour phone support during a natural disaster. This service must provide information for the product and navigation information to help people escape disasters.

6c Adaptability Requirements

The product must be ported to iOS and android platforms.

The product might eventually be ported to portable platforms.

6d Scalability or Extensibility Requirements

The product shall be capable of processing the existing customers which is expected to grow exponentially during a natural disaster.

We expect the user base to be ~1,000 when there are no natural disasters, and to grow to over ~20,000 during and right before natural disasters.

The product shall be able to process 500,000 transactions per hour during the natural disaster.

6e Longevity Requirements

The product shall be expected to operate within the maintenance budget until a better replacement is released by our company or another company. We expect this product to last for at least 5 years.

7 Security Requirements

7a Access Requirements

Identification: SR_AcR_1_GPS

Description: The product must be allowed access to the users GPS hardware and location tracker.

Identification: SR_AcR_2_ER

Description: Only verified emergency response personnel will have access to direct user locations and information such as names, ages, etc.

7b Integrity Requirements

Identification: SR_InR_1_AccessD

Description: The product must prevent unauthorized access to application data.

Identification: SR_InR_2_Encrypt

Description: The product must encrypt user data in the case of unauthorized access into the application.

Identification: SR_InR_2_AccessP

Description: The product must prevent unauthorized access to the users phone and phone services (GPS, microphone, etc.)

7c Privacy Requirements

Identification: SR_PR_1_Collection

Description: The product shall make its users aware of its information practices before collecting data from them.

Identification: SR_PR_2_Policy

Description: The product shall notify customers of changes to its Privacy Policy and Terms of Service.

Identification: SR_PR_3_OrgRevealPolicy

Description: The product shall reveal private information only in compliance with the organization's information policy.

Identification: SR_PR_4_OrgProtectPolicy

The product shall protect private information in accordance with the relevant privacy laws and the organization's information policy.

Identification: SR_PR_5_ProductStruc

The product will be internally structured in a way to try to prevent access to the users private information.

7d Audit Requirements

Identification: SR_AdR_Regulations

Description: The product must comply with industry standards, specifications, contractual agreements and any other regulations set up by the IEEE Standard for Software Reviews.

7e Immunity Requirements

Identification: SR_ImR_1_Block

Description: The product must be built in a way that does not that does not allow unauthorised entry into the product, nor unauthorised data retrieval.

Identification: SR_ImR_2_Protect

The product must encrypt user data to protect user information in the case of unauthorized retrieval.

8 Usability and Humanity Requirements

8a Ease of Use Requirements

Identification: UaH_EoU_1_Age

Description: The major functions of the product shall be able to be used by people older than 5.

Identification: UaH_EoU_2_Qualifications

Description: The product shall be able to be used by any person with the ability to read and operate a smart device.

Identification: UaH_EoU_3_Language

Description: The product shall be readable in all currently spoken languages.

8b Personalization and Internationalization Requirements

Identification: U_P_1_Language

Description: The product shall use the device's default language that is selected by the user.

Identification: U_P_2_Configuration

Description: The product shall have some basic configuration for appearance of the application such as dark mode and layout so that users can personalize it.

8c Learning Requirements

Identification: U_L_1_Users

Description: The product shall be easy for a child, teenager and adult to learn after going through the introductory tutorial in the application.

Fit criterion: 75 percent of a test panel shall successfully navigate within three minutes.

Identification: U_L_2_Rescuers

Description: Emergency response members shall be able to be figure out the rescue locations within a short time after going through the training.

Fit criterion: 75 percent of emergency response members in a test panel shall successfully find locations of rescue within two minutes.

8d Understandability and Politeness Requirements

Identification: UaH_UaP_1_Tutorial

Description: The product shall include a tutorial that 90% of users can follow without external assistance that shall describe all the functions of the product.

Identification: UaH_UaP_2_Insult

Description: The product and the tutorial shall seek to not insult the user.

8e Accessibility Requirements

Identification: UH_AR_Vision

The product shall be usable by users with vision impairment by providing a way for the user to listen to the content within the product.

8f User Documentation Requirements

Identification: UH_UDR_InApp

Help menu will be accessible in the application. The Help menu will provide moderate information regarding the application.

Identification: UH_UDR_Wiki

Wiki Documentation will be available outside of the application. The wiki will provide in depth information regarding the application.

8g Training Requirements

Identification: UH_TR_Intro

A introductory tutorial will start when the app is first loaded up (with the option to skip if the user as used the app before and had to do a new install).

Identification: UH_TR_ER

Emergency response centers will need training with their equipment that shows the user's location (whether will be on a screen at the center, on a HUD on an emergency response person, etc), as well as how to read and understand any data sent from or servers that they have access to.

9 Look and Feel Requirements

9a Appearance Requirements

Identification: LO_A_1_Branding

Description: The product shall comply with corporate branding standards.

Fit criterion: The office of branding shall certify the product complies with the current standards.

Identification: LO_A_2_Attractive

Description: The product shall not alienate a child, teenager and/or adult.

Fit criterion: A sampling of representative children, teenagers and adults shall, without prompting or enticement, start using the product within five minutes of their first encounter with it.

Identification: LO_A_3_Stand_Out

Description: The product's design shall not stand out from other navigation applications on that device.

Fit criterion: The user should not have to learn a new method to navigate to safest location.

9b Style Requirements

Identification: LO_S_1_Authoritative

Description: The product shall appear authoritative.

Fit criterion: After their first encounter with the product, 75 percent of representative potential customers shall agree that they can trust the product.

Identification: LO_S_2_Appropriate

Description: The product shall feel appropriate for natural disasters.

Fit criterion: The application must not be offensive and should be easy to use when in middle of a natural disaster.

Identification: LO_S_3_Alert

Description: Wellness check prompt should be an alert to identify them as important and mandatory.

Fit criterion: The alert takes up whole screen, no other user action allowed until wellness check is completed.

10 Operational and Environmental Requirements

10a   Expected Physical Environment

Identification: O_E_1_Nature

Description: The product shall be used by a children, teenager or adult outside in middle of a natural disaster.

Identification: O_E_2_Sound

Description: The product must be louder than environment so that the user can hear the navigation instructions.

10b   Requirements for Interfacing with Adjacent Systems

Identification: O_REQ_1_Interface

Description: The product must interface with applications that provide weather and storm information.

Fit criterion: The weather data must include live information of the current weather near the user. The information about the upcoming storm and current level of danger zone near user must be included. This information should consistently be kept up to date for the user.

10c   Productization Requirements

Identification: O_P_1_Distribution

Description: The product shall be distributed on the Apple Store for iOS and Google Play Store for android.

Identification: O_P_2_Installation

Description: The product shall be able to be installed by an untrained user without recourse to separately printed instructions.

10d   Release Requirements

Identification: O_REL_1_Maintenance

Description: The maintenance releases will be offered to end users once every three months.

Identification: O_REL_2_Installation_Requirement

Description: Each release shall not cause previous features to fail and shall not be required for proper functionality.

11 Cultural and Political Requirements

11a   Cultural Requirements

Identification: CaP_C_1_Discrimination

Description: The product shall not discriminate against any person following the anti-discrimination laws.

Identification: CaP_C_2_Offense

Description: The product shall strive to not be offensive based on the country it is being used in.

11b   Political Requirements

Not Applicable

12 Legal Requirements

12a   Compliance Requirements

Identification: LR_CR_1_DPA

Description: Personal information shall be implemented so as to comply with the Data Protection Act.

Identification: LR_CR_2_RDPL

Description: Personal information must be handled in accordance with data protection laws in each user's respective country.

Identification: LR_CR_3_RTL

Description: The production must be in compliance with all (if any) GPS tracking laws in each user's respective country.

Identification: LR_CR_4_TSaPS

Description: The product must include a Terms of Service and Privacy Statement in all languages of the countries the product is available in, detailing all activity the product has on the users device.

12b Standards Requirements

Identification: LR_SR

Description: The product must meet the requirements set up by the IEEE Standards of Software Review.

III Design

1 System Design

1a Design goals

The application should provide accurate weather information about the natural disasters, while also prioritizing speedy navigation data.

The navigation should be displayed when user tries to configure the tracking system.

It should be easy for users to select/change destination for navigation and configure the tracking system.

2 Current Software Architecture

The current software available that is comparable to this project has a wide variety of software architectures depending on the project. Some have multiple platforms while others are restricted to one. Some use certain subsystems and others use something different. The choices relating to software architecture all depend on the major focus of the particular product. The majority of the current products however focus on the tracking of the disasters rather than the personal help of the products users which sets these products in a different frame from the goals of our product.

3 Proposed Software Architecture

3a Overview

The goal of this product is to assist its users in surviving the natural disasters which are relevant to them. As such architectural decisions will be heavily influenced by

this. While different software architectural models will most likely be used in different subsystems of the product especially those portions of the product which are built and maintained by different companies the overarching software architectural model that will be followed by this product is the Client-Server model. It will also implement some form of the Repository model as Client-Server models often do.

3b Class Diagrams
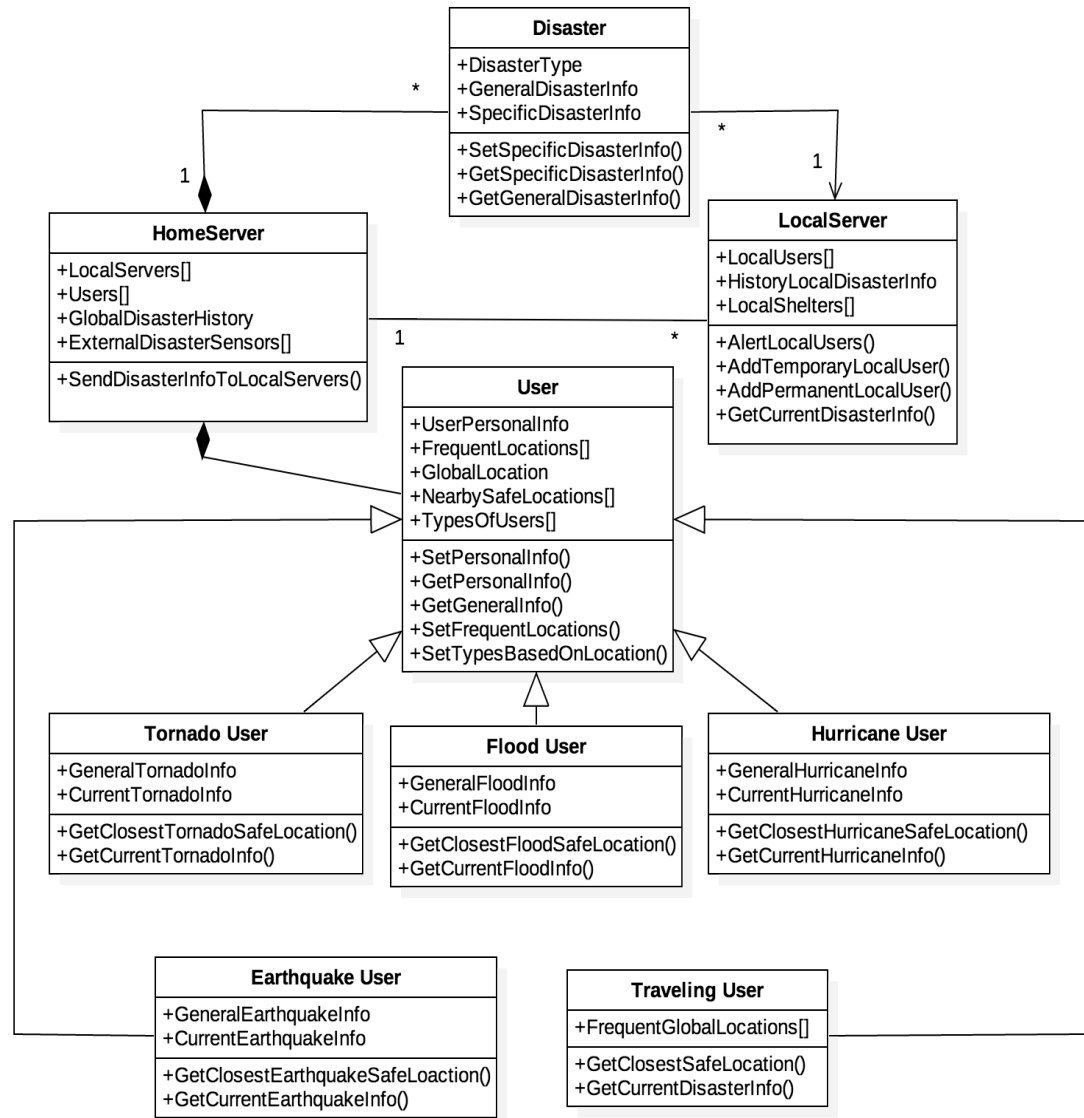
Figure 5 - Class Diagram

3c Dynamic Model

38
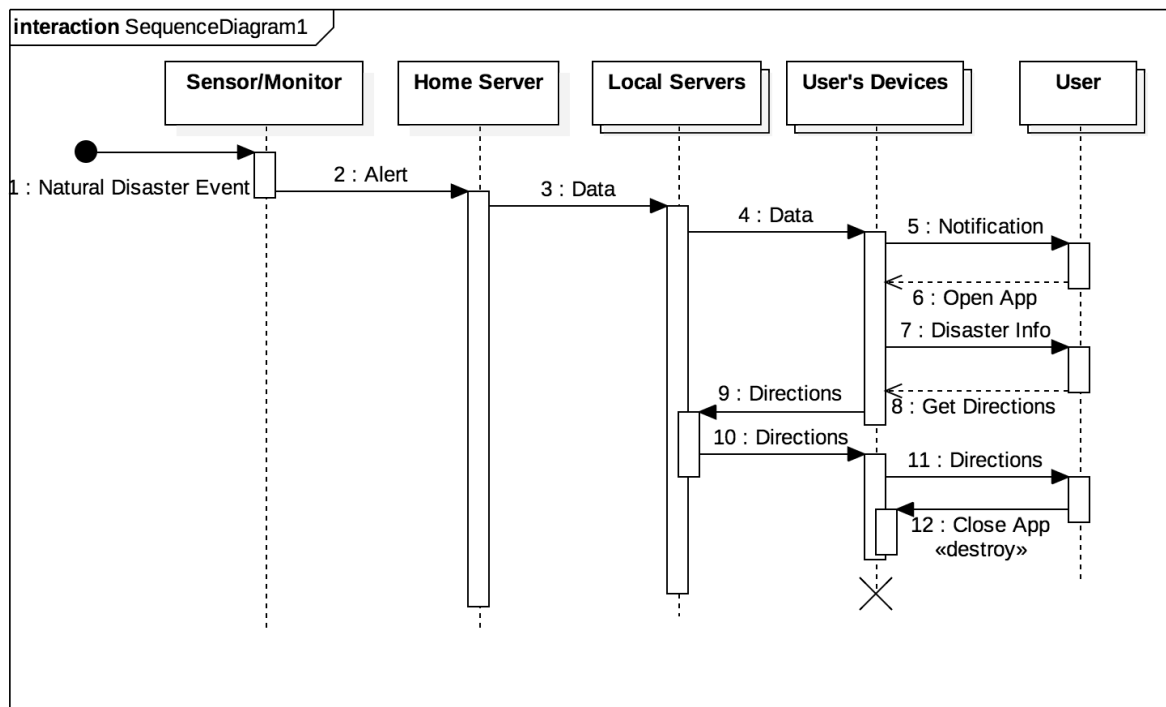
Figure 6 - Dynamic Model

3d Subsystem Decomposition
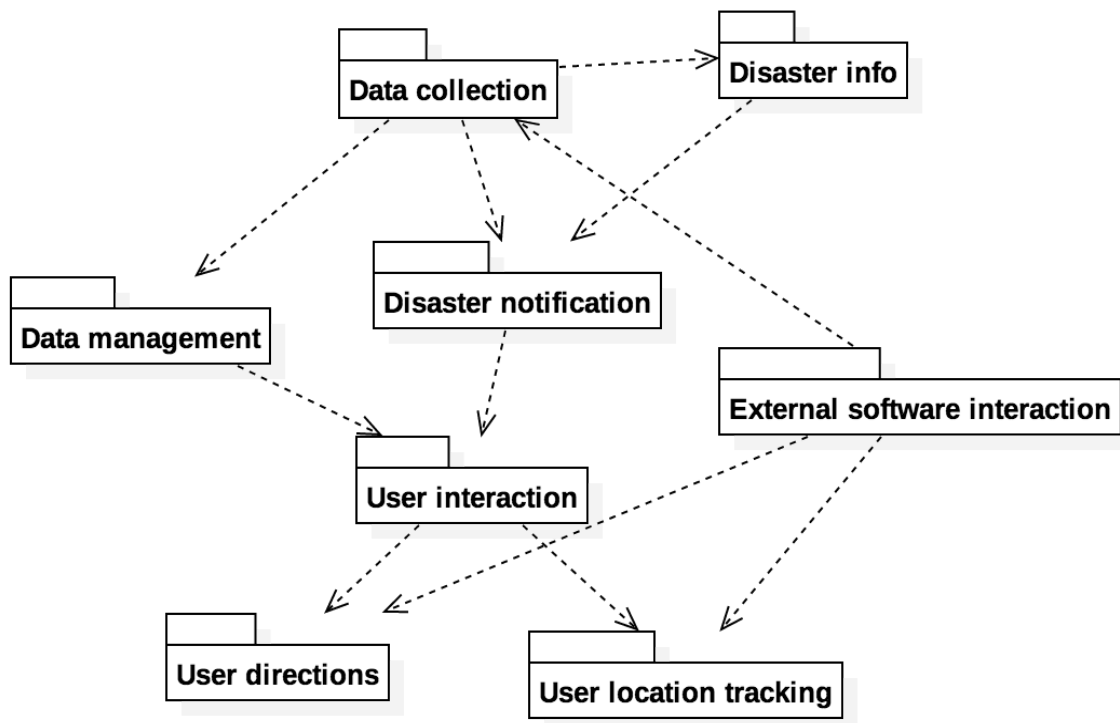
Figure 7 - Model Decomposition

3e Hardware / software mapping

The hardware and software mapping shall be taken care of by the various systems on which we run our system.

3f Data Dictionary

The design of the data dictionary shall be created by those who implement this project in a manner that fits the best with the design of the rest of the system.

3g Persistent Data management

There are many different types of persistent data in our system. There is the History of natural disasters used to determine how useful of product is by how many fewer people died. Minimal user information such as their name, phone number, home location. During a disaster their tracked location and their state of life. These each need to be managed in a different way the historical data can be kept in a storage only to be accessed in house. The User information should be accessible to the user at all time so there needs to be some kind of login to a server to get that info.

3h Access control and security

As the only thing our system stores of value would be the tracking locations of users during the occurrence of a natural disaster. The system would need to be secure during these times. Although we have their general area of residence we are not tracking their location during normal running and we aren't storing any health data, financial data or any other valuable vital data as such the security of our system would have to be good but not in the excess.

3i Global software control

This is not applicable to our project as all our software will be controlled by the organization and the external services we use will be in control of their side of the software.

3j Boundary conditions

While there may be many boundary conditions we want to focus on those that would jeopardize any life whether user or emergency personnel. The most prominent of these is the case when the nearest safe zone is on the opposite side of the disaster from the user. To handle this as we have detailed above the navigation API need to specify not the nearest safe zone but instead the nearest safe zone which does not cause the user to head into peril. This applies to emergency personnel as well we want to give them the fastest route to a user that does not take them thru life threatening peril. The measurement of peril for these two instances is different as the emergency personnel are equipped to handle more perilous situations.

4 Subsystem services

There are couple main subsystems services that are part of this product. These subsystems are navigation, tracking and server.

Navigation subsystem will be responsible for providing destinations and paths to safe locations. Before a natural disaster, the user should be able to download all navigation data through this subsystem for offline usage. During a disaster, this system should try to get more updated data from the server as long as internet access is available.

Tracking subsystem will be responsible for saving user's location every x minutes during a natural disaster.

Server subsystem which is where both these subsystems will communicate through. The server will save the data related to tracking and gather information about natural disaster from other weather servers.

5 User Interface

This is a crucial part of system in terms of user wants and needs. The Graphical User Interface (GUI) will be made up of multiple different displays. The first display will be

for navigation and the second will be for personalization. The application will start with the navigation display.

The navigation display should display the map, search bar with button to go to personalization display, and a non-intrusive tracking button to enable/disable tracking.
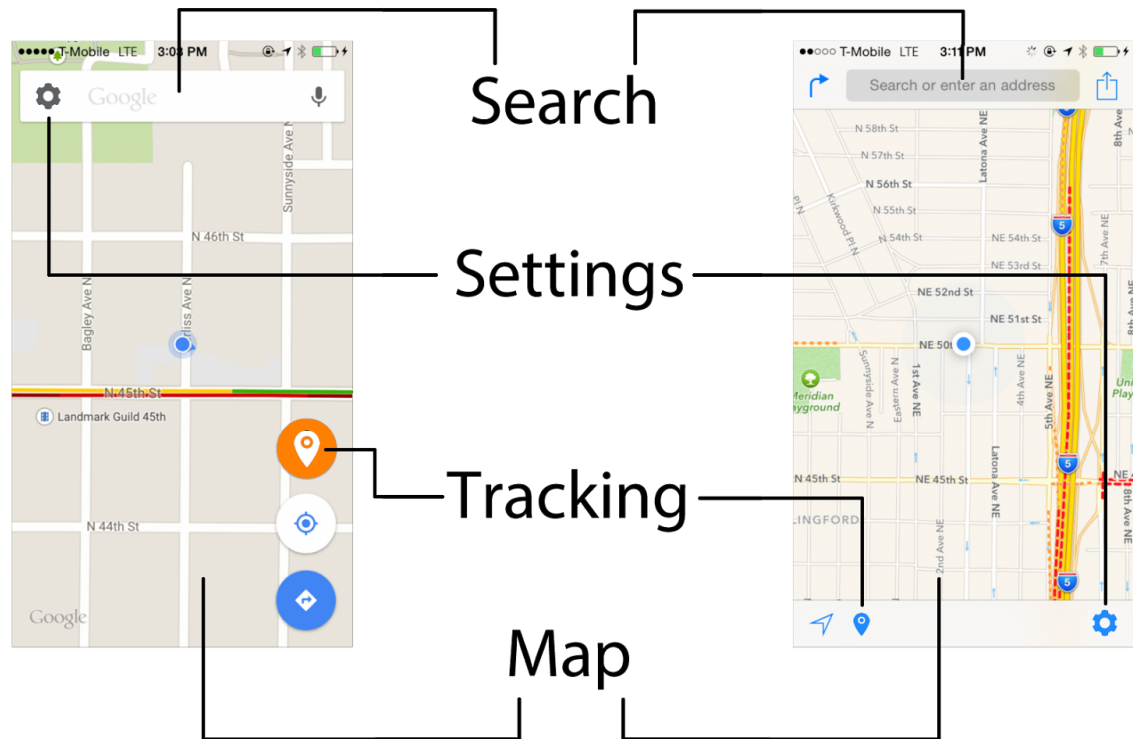
Figure 8 - Basic user interface for the navigation display.

The personalization display should have a way to go back to navigation display and a list of configurations for the user to personalize the application.

6 Object Design

6a Object Design trade-offs

Topic: Memory space vs Response time

Decision: Since our system focuses on providing emergency services to natural disaster victims, response time is more important factor.

Topic: Throughput vs Latency

Decision: Our system uses event based control flow. For instance, our web server will create multiple threads for multiple users which will increase throughput but reduce latency due to overhead.

6b Interface Documentation guidelines

This section will provide guidelines on naming conventions to make our system more understandable.

Identifier: Package

Naming convention: The names for packages should be short and simple. The prefix of the package should consist of lowercase word, except for abbreviations such as UI for User Interface.

Identifier: Class

Naming convention: Class names should be nouns and should have first letter of each noun capitalized.

Identifier: Interface

Naming convention: Interface names should be capitalized just like class names.

Identifier: Methods

Naming convention: Method names should consist of verbs with camelcase (first verb lower cased and every subsequent verb capitalized).

Identifier: Variables

Naming convention: All variable names should be short yet meaning and will be camel cased just like method names.

6c Packages
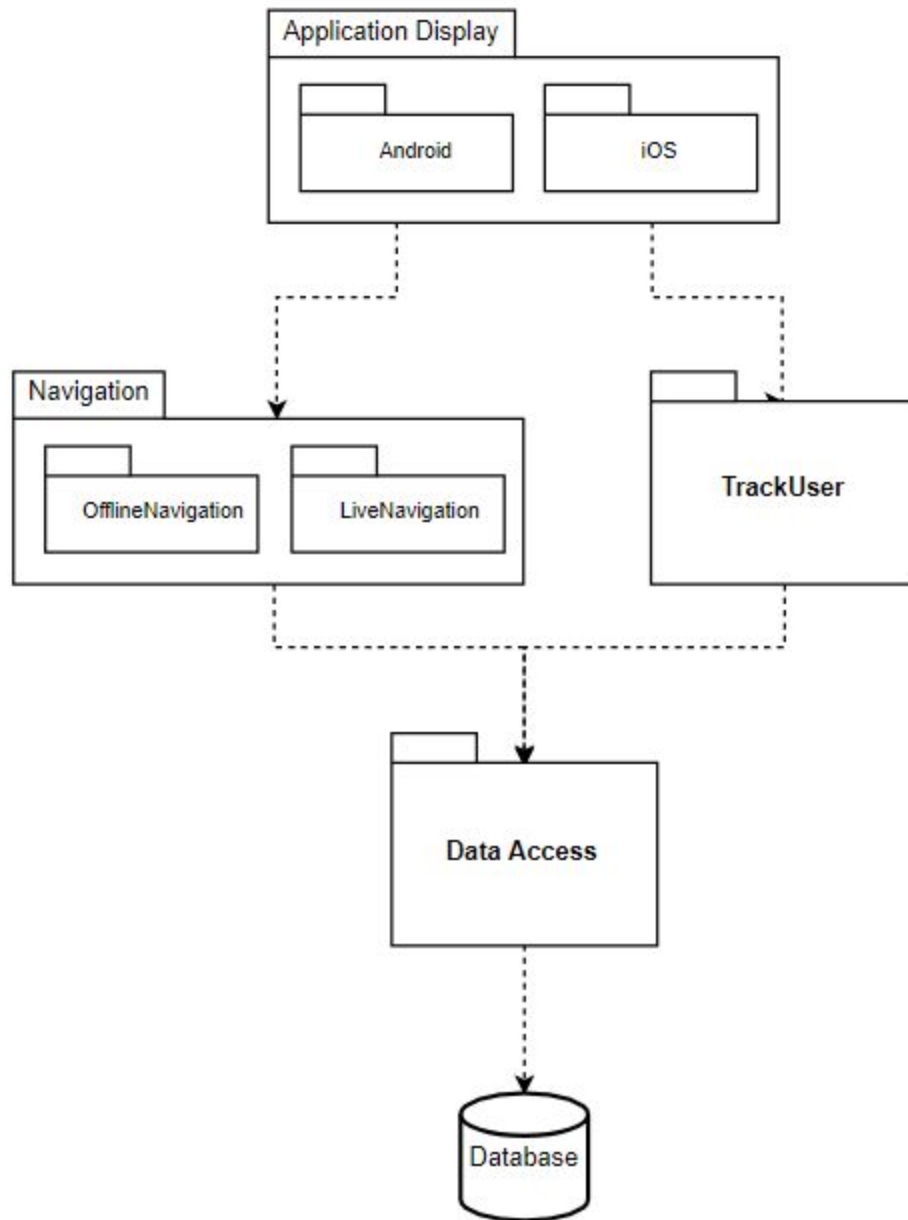
Figure 9 - Packages Diagram

6d Class Interfaces

Information methods and fields of classes can be viewed in Class Diagrams section of Proposed Software Architecture.

IV Test Plans

1 Features to be tested / not to be tested

All features developed specifically for this project will be tested unless otherwise noted later in this section.

It is assumed that external products were evaluated properly before choosing that product with our software. The interface to these products will be tested but the functionality or performance will not be tested.

2 Test cases

Each test case corresponds to a requirement, more information about the requirement can be found using the identification.

Identification: U_P_1_Language

Test criteria: All the text in the application should be displayed in the default language set on the device.

Approach: A testing script shall be written to compare the selected language and the displayed language.

Testing materials: N/A

Pass/Fail: The test shall pass if the two compared values are equivalent.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during production of the software.

Identification: U_P_2_Configuration

Test criteria: 75 percent of users in the test panel agree that the application is personalizable.

Approach: A testing script shall be written to check the different options available.

Testing materials: N/A

Pass/Fail: The test shall pass if there are available options and different options have different effects.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during production of the product.

Identification: U_L_1_Users

Test criteria: More details described as fit criterion in the learning requirements section.

Approach: Introduce testers to the application and track the amount of time it takes the testers to start navigation to nearest safest location.

Testing materials: Device with our application already installed with gps and internet capability.

Pass/Fail: The test shall pass if 75 percent of the testers shall start navigation within three minutes.

Suspension and Resumption: If this test is failed, further production/testing must be stopped until the user interface is implemented to meet these requirements.

Testing schedule: This test shall be run during testing of the product.

Identification: U_L_2_Rescuers

Test criteria: More details described as fit criterion in the learning requirements section.

Approach: Introduce rescuers to the application and track the amount of time it takes them to find rescue location.

Testing materials: Device with our application already installed and a server setup with data related to rescue locations. The device must have internet capabilities.

Pass/Fail The test shall pass if 75 percent of the testers shall find the rescue location within two minutes.

Suspension and Resumption: If this test is failed, further testing must be stopped until the user interface for rescuers is designed and implemented to meet these requirements.

Testing schedule: This test shall be run during testing of the product.

Identification: LO_A_1_Branding

Test criteria: More details described as fit criterion in the appearance requirements section.

Approach: Ask the office of branding if the product has the branding requirements.

Testing materials: The design of the application.

Pass/Fail: The test passes if design/branding of the application complies with requirements specified by the office of branding.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during the design stage.

Identification: LO_A_1_Attractive

Test criteria: More details described as fit criterion in the appearance requirements section.

Approach: Introduce users to the application.

Testing materials: Device with our application installed.

Pass/Fail: A sampling of representative children, teenagers and adults shall, without prompting or enticement, start using the product within five minutes.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during the testing stage.

Identification: LO_A_1_Stand_Out

Test criteria: More details described as fit criterion in the appearance requirements section.

Approach: Introduce users to the application.

Testing materials: Device with our application installed.

Pass/Fail: This test fails if the testers need to ask how to use the navigation.

Suspension and Resumption: If this test fails, further testing/production needs to be stopped until the user interface is designed to have a simple navigation system.

Testing schedule: This test shall be run during the testing and production stage.

Identification: LO_S_1_Authoritative and LO_S_2_Appropriate

Test criteria: More details described as fit criterion in the style requirements section.

Approach: Ask testers if the application feels authoritative and/or appropriate for natural disaster help application.

Testing materials: Device with our application installed.

Pass/Fail: The test fails if the testers deny the application's authority and appropriateness.

Suspension and Resumption: If this test fails, further testing needs to be stopped until the application's look and feel requirements are met.

Testing schedule: This test shall be run during the design and testing stages.

Identification: LO_S_1_Alert

Test criteria: More details described as fit criterion in the style requirements section.

Approach: A testing script will be written to check if the alert takes up full screen.

Testing materials: N/A

Pass/Fail: The test fails if the alert does not cover the whole screen.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during the production.

Identification: O_E_1_Nature

Test criteria: The application should be visible when device is under a bright light (bright sun light).

Approach: Test application usability under a bright light.

Testing materials: N/A

Pass/Fail: The test fails if the application is not usable under a bright light.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during testing.

Identification: O_E_1_Sound

Test criteria: The sound of the navigation system should be capable of being heard in middle of factory.

Approach: Test application navigation when in middle of a simulated factory setting.

Testing materials: Device with our application installed.

Pass/Fail: The test fails if the navigation is not loud enough to be heard.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during testing.

Identification: O_REQ_1_Interface

Test criteria: More details described as fit criterion in the requirements for interfacing with adjacent systems section.

Approach: Test scripts will be written to check if the the external software's interface complies with the requirements.

Testing materials: N/A

Pass/Fail: The test fails if interface does not meet the requirements for our that external product.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during production.

Identification: O_P_1_Distribution

Test criteria: The application complies to the rules and regulations for iOS and android.

Approach: Submit application to appropriate distributer.

Testing materials: Complete application.

Pass/Fail: The test fails if the application is rejected for distribution.

Suspension and Resumption: Application must be re-implemented to comply with requirements for distribution.

Testing schedule: This test shall be run during post-production/distribution.

Identification: O_P_2_Installation

Test criteria: 90 percent of users in the test panel shall be able to start download/install of application within 2 minutes.

Approach: Introduce testers to our application's name and ask them to download it.

Testing materials: Devices with capability to install our application.

Pass/Fail: The test fails if the tester is unable to download the application without specific instructions.

Suspension and Resumption: Distribution for the application needs to be reconsider.

Testing schedule: This test shall be run during testing.

Identification: O_REL_1_Maintenance

Test criteria: This will not be tested.

Testing materials: N/A

Approach: N/A

Pass/Fail: N/A

Suspension and Resumption: N/A

Testing schedule: N/A

Identification: O_REL_1_Installation_Requirement

Test criteria: New updates do not break older versions of the applications.

Approach: Test if application with older version works alongside another device with that new version.

Pass/Fail: Test passes if the applications can work alongside.

Suspension and Resumption: N/A

Testing schedule: This test shall be run during maintenance.

Identification: SR_AcR_1_GPS

Test Criteria: The must not be a way for unauthorized access to device GPS through the product.

Approach: Use a phone with mock data and use a mock server

Testing Materials: Phone, Server

Pass/Fail: If the test fails the structure of the product must we reexamined.

Suspension and Resumption: n/a

Testing Schedule: Tested throughout the project

Identification: SR_AcR_2_ER

Test Criteria: Only emergency response personnel has access to direct data.

Approach: Use a phone with mock data and use a mock server

Testing Materials: Phone, Server

Pass/Fail: If outside sources can access personal data, the test fails.

Suspension and Resumption: n/a

Testing Schedule: Tested throughout the project

Identification: SR_InR_1_AccessD

Test Criteria: The product must prevent unauthorized access to user data.

Approach: Test known mobile application exploits.

Testing Materials: Phone(s), Computer, Mock Data

Pass/Fail: If personal data is accessible, the test fails.

Suspension and Resumption: n/a

Testing Schedule: Tested throughout development.

Identification: SR_InR_2_Encrypt

Test Criteria: User data must be successfully encrypted.

Approach: Use a secure method of data encryption to test user data.

Testing Materials: Phone(s), Computer, Mock Data

Pass/Fail: If data is still accessible, the test fails.

Suspension and Resumption: n/a

Testing Schedule: Tested throughout development.

Identification: SR_InR_3_AccessP

Test Criteria: The product must prevent unauthorized access to device services.

Approach: Test known mobile application exploits.

Testing Materials: Phone(s), Computer, Mock Data

Pass/Fail: If phone services are accessible, the test fails.

Suspension and Resumption: n/a

Testing Schedule: Tested throughout development.

Identification: SR_PR_1_Collection

Test Criteria: Data is collected only if allowed by the user.

Approach: Setting variables, if allowed, collect.

Testing Materials: Phone, Mock data

Pass/Fail: if data is collected regardless, this test fails.

Suspension and Resumption: N/a

Testing Schedule: tested throughout development.

Identification: SR_PR_2_Policy

Test Criteria: Users must be notified with any changes in policy.

Approach: Variable setting accept to true after policy changes.

Testing Materials: Phone

Pass/Fail: If the application opens to full functionality without accepting changed policy, this test fails.

Suspension and Resumption: N/A

Testing Schedule: Throughout development.

Identification: SR_PR_3_OrgRevealPolicy

Test Criteria: Company / overseers of the application only reveals user information in accordance to its policy

 Approach: N/A

Testing Materials: N/a

Pass/Fail: N/A

Suspension and Resumption: N/A

Testing Schedule: N/A

Identification: SR_PR_4_OrgProtectPolicy

Test Criteria: Company / overseers of the application protects user information in accordance to its policy

 Approach: N/A

Testing Materials: N/A

Pass/Fail: N/A

Suspension and Resumption: N/A

Testing Schedule: N/A

Identification: SR_PR_5_ProductStruc

Test Criteria: The product must protect data in the case of unauthorized retrieval.

Approach: see SR_InR_2_Encrypt

Testing Materials: see SR_InR_2_Encrypt

Pass/Fail: see SR_InR_2_Encrypt

Suspension and Resumption: see SR_InR_2_Encrypt

Testing Schedule: see SR_InR_2_Encrypt

Identification: SR_AdR_Regulations

Test Criteria: Product must meet IEEE standards.

Approach: test the app against the standards.

Testing Materials: Phone, application

Pass/Fail: If a standard is broken/ applicable standard not met, this test fails.

Suspension and Resumption: N/a

Testing Schedule: throughout development

Identification: SR_Amr_1_Block

Test Criteria: The application must prevent allow unauthorized access.

Approach: see SR_InR_3_AccessP

Testing Materials: see SR_InR_3_AccessP

Pass/Fail: see SR_InR_3_AccessP

Suspension and Resumption: see SR_InR_3_AccessP

Testing Schedule: see SR_InR_3_AccessP

Identification: SR_Amr_1_Block

Test Criteria: The application must prevent allow unauthorized access.

Approach: see SR_InR_2_Encrypt

Testing Materials: see SR_InR_2_Encrypt

Pass/Fail: see SR_InR_2_Encrypt

Suspension and Resumption: see SR_InR_2_Encrypt

Testing Schedule: see SR_InR_2_Encrypt

Identification: UH_AR_Vision

Test Criteria: The application must be usable by visually impaired users.

Approach: add text-to-speech and voice navigation.

Testing Materials: Phone, Application

Pass/Fail: If some part of the application is not voiced, voice accessible, this test failed.

Suspension and Resumption: N/A

Testing Schedule: after development of features.

Identification: UH_UDR_InApp

Test Criteria: The application must contain in app user documentation.

Approach: add a menu option in the application to bring up documentation.

Testing Materials: Phone, Application

Pass/Fail: if the documentation is not displayed successfully, this test fails

Suspension and Resumption: N/A

Testing Schedule: after development of features.

Identification: UH_UDR_Wiki

Test Criteria: The application must have in-depth wiki documentation.

Approach: add in depth explanation of application and features .

Testing Materials: Application, Computer, Browser

Pass/Fail: if the documentation is not displayed successfully, this test fails

Suspension and Resumption: N/A

Testing Schedule: after development of features.

Identification: UH_TR_Intro

Test Criteria: The application must contain an introduction on how to use its features.

Approach: When the application is first opened, instructions on how to use the application is displayed.

Testing Materials: Phone, Application

Pass/Fail: if the introduction is not displayed successfully, this test fails

Suspension and Resumption: N/A

Testing Schedule: after development of features.

Identification: UH_TR_ER

Test Criteria: Emergency response must be trained on how to respond to emergency pings sent from the application.

Approach: When the emergency ping is dispatched from the application, emergency response successfully responds.

Testing Materials: Phone, Application, Server, ER

Pass/Fail: if the emergency ping is not successfully sent to emergency response, or if the information in the ping sent is incorrect, or if this test fails

Suspension and Resumption: N/A

Testing Schedule: after development of features.

Identification: LR_CR_1_DPA

Test Criteria: The application must handle personal information in accordance with the Data Protection Act.

Approach: Handle data in accordance to the DPA.

Testing Materials: Phone, Application, Servers

Pass/Fail: if personal information is not protected, this test fails

Suspension and Resumption: N/A

Testing Schedule: throughout development.

Identification: LR_CR_2_RDPL

Test Criteria: The application must handle personal information in accordance with the privacy laws of the user's respective country.

Approach: Handle data in accordance to the privacy laws in the user's respective country.

Testing Materials: Phone, Application, Servers

Pass/Fail: if personal information is not protected, this test fails

Suspension and Resumption: N/A

Testing Schedule: throughout development.

Identification: LR_CR_3_RTL

Test Criteria: The application must handle personal information in accordance with the tracking laws of the user's respective country.

Approach: Handle data in accordance to the tracking laws in the user's respective country.

Testing Materials: Phone, Application, Servers

Pass/Fail: if personal tracking information is not protected, this test fails

Suspension and Resumption: N/A

Testing Schedule: throughout development.

Identification: LR_CR_4_TSaPS

Test Criteria: The application must have Terms of Service and Privacy Statement in accordance and in the language of the user's respective language.

Approach: Have Terms of Service and Privacy Statement in accordance and in the language of the user's respective language.

Testing Materials: Phone, Application, Servers

Pass/Fail: if Terms of Service and Privacy Statement is not reachable or not readable or not in accordance with respective country laws, this test fails

Suspension and Resumption: N/A

Testing Schedule: throughout development.

Identification: LR_SR

Test Criteria: The application must meet the requirements set up by the IEEE Standards of Software Review.

Approach: Meet the requirements set up by the IEEE Standards of Software Review.

Testing Materials: Phone, Application, Servers

Pass/Fail: if the requirements set up by the IEEE Standards of Software Review are not met, this test fails

Suspension and Resumption: N/A

Testing Schedule: throughout development.

Identification: P_SaL_1_Weather_Interuption

Test Criteria: The speed of components that are not affected by weather must be optimized

Approach: Each component not affected by weather is selected from the fastest possible from a list of possible versions of said component. These are run thru a simulation to determine in the presence of difficult natural conditions does this component hold up.

Testing Materials: The computer needed to run the simulation on software components and the hardware needed to run the simulation on the hardware components.

Pass/Fail: The component passes if it is at least 95% as fast as the fastest estimates of all similar components.

Suspension and Resumption: N/A

Testing Schedule: These tests should be run on components when they are being selected during the first physical prototype.

Identification: P_SaL_2_Alert_Speed

Test Criteria: The time between the system sending an alert and the user getting that alert needs to be optimized for speed.

Approach: The system shall be put in a simulated state of alert and shall send out alerts to 1000 some testers in different locations the time between the send and receive shall be recorded and analysed to find any way to reduce that time.

Testing Materials: The 1000 phones to receive and the alert sending hardware/software.

Pass/Fail: The test passes if some reasonable majority of the testers can receive their alerts within 5 seconds of the system sending them.

Suspension and Resumption: N/A

Testing Schedule: This shall be done during the creation of the alert software.

Identification: P_SaL_3_Activating

Test Criteria: The user needs to collect the relevant data from the system after receiving an alert fast before the likely event of loss of internet.

Approach: The system shall be put in a simulated state of alert and shall send out alerts to 1000 some testers in different locations the testers shall try to gather the relevant data about the disaster. The time between receiving the alert and collecting the data shall be recorded and analysed to find any way to reduce that time.

Testing Materials: The 1000 phones to receive and the alert sending hardware/software.

Pass/Fail: The test passes if some reasonable majority of the testers can receive the data within 3 minutes of the system sending them an alert.

Suspension and Resumption: N/A

Testing Schedule: This shall be done during the creation of the disaster tracking software.

Identification: P_PoA_1_WPosition

Test Criteria: The weather positioning software needs to be accurate to at least 10 miles

Approach: When selecting a weather tracking software the tracked position and the real position of 100 occurring storms shall be compared and analyzed.

Testing Materials: 100 storms. Various weather tracking software.

Pass/Fail: The software shall pass if at least 80% of the storms are track accurately to at least 10 miles.

Suspension and Resumption: N/A

Testing Schedule: The software shall be tested during the prototype building phase.

Identification: P_PoA_2_UPosition

Test Criteria: All user positioning data needs to be accurate to at least 100 ft.

Approach: When selecting a global position tracking software the tracked position and the real position of 100 people shall be compared and analyzed.

Testing Materials: 100 people. Various position tracking software.

Pass/Fail: The software shall pass if at least 80% of the people are track accurately to at least 100 feet.

Suspension and Resumption: N/A

Testing Schedule: The software shall be tested during the prototype building phase.

Identification: P_PoA_3_Directions

Test Criteria: User directions need to be accurate to at least reasonable vision limit of the average person.

Approach: 100 testers of various degrees of visual ability must follow the directions of the various software their success is recorded and analysed.

Testing Materials: 100 testers. various directional software.

Pass/Fail: The software passes if at least 90% of the testers are successful.

Suspension and Resumption: N/A

Testing Schedule: The software shall be tested during the prototype building phase.

Identification: P_C_1_Phone_Capacity

Test Criteria: The app must be able to vary its amount of data stored on the phone depending on how much the user wants to download prior to natural disaster.

Approach: There must be different packages of the app that are of different size.

Testing Materials: The app software.

Pass/Fail: The product passes if it has a variable download amount.

Suspension and Resumption: N/A

Testing Schedule: The software shall be tested during the prototype building phase.

Identification: P_C_2_Server_Need

Test Criteria: There must be enough local servers to enable everyone directed to them to have access to the data needed.

Approach: The number of local servers are increased as users in that area sign up if the number of users ever exceeds the recommended number of users on that server add another server.

Testing Materials: Servers. number of users in that area data.

Pass/Fail: This passes if the number of users in all areas is less than the number of server load in that area.

Suspension and Resumption: N/A

Testing Schedule: This should constantly be tested.

Identification: Dep_R_1_Stored

Test Criteria: No data stored on a user's phone shall be made inaccessible for any reason.

Approach: The software is designed not to prevent the user from accessing downloaded information.

Testing Materials: The software.

Pass/Fail: The test passes if the software never restricts the user from the downloaded data.

Suspension and Resumption: N/A

Testing Schedule: This should be tested in the production of the software.

Identification: Dep_R_2_Internet_Loss

Test Criteria: The system must continue to work despite loss of internet.

Approach: The software shall be run 50 times during the absence of internet.

Testing Materials: The software.

Pass/Fail: The software passes if it continues running in the absence of internet 100% of the time.

Suspension and Resumption: N/A

Testing Schedule: This should be tested in the production of the software.

Identification: Dep_R_3_Partial_Failure

Test Criteria: The system shall be designed to fail independently. If one part fails it takes as few systems down as possible.

Approach: The system shall be designed modularly so as to fail in parts.

Testing Materials: The software.

Pass/Fail: The systems passes if all simulated failures fail to bring down the whole system.

Suspension and Resumption: N/A

Testing Schedule: This should be tested in the production of the software.

Identification: Dep_A_1_Time

Test Criteria: The product shall be available for use 24 hours per day, 365 days per year.

Approach: The product shall be designed to run round the clock.

Testing Materials: The system.

Pass/Fail: The system passes if the system is up for all time except repair, maintenance and failure.

Suspension and Resumption: N/A

Testing Schedule: This should constantly be tested.

Identification: Dep_A_2_Work

Test Criteria: Should the product need to be down for repair or maintenance this shall occur when the reported weather is clear for at least the next 24 hrs.

Approach: This can't really be tested it is a procedure requirement.

Testing Materials: N/A

Pass/Fail: N/A

Suspension and Resumption: N/A

Testing Schedule: N/A

Identification: Dep_RoF_2_Energy

Test Criteria: The product shall continue to ping its location until energy is lost or the user disables it.

Approach: The software shall be run until loss of power on 100 different smart devices.

Testing Materials: 100 smart devices. The software. The ping storage.

Pass/Fail: The software passes if 90% of the phones continue to ping until power loss.

Suspension and Resumption: N/A

Testing Schedule: This should be tested in the production of the software.

Identification: Dep_Sc_1_Direction

Test Criteria: The product shall not direct the user to go to an unsafe location.

Approach: The directional software shall be run in a simulation with various dangers separating the simulated user from the safe location that it is trying to direct it to.

Testing Materials: The directional software.

Pass/Fail: The software shall pass if it does not direct the user thru any of the various dangers.

Suspension and Resumption: N/A

Testing Schedule: The software shall be tested during the prototype building phase.

Identification: CaP_C_1_Discrimination

Test Criteria: The product shall not discriminate against any person following the anti-discrimination laws.

Approach: The program shall be compared to the anti-discrimination laws by a lawyer.

Testing Materials: The contents of the program.

Pass/Fail: The program shall pass if the lawyer says it follows the law 100%.

Suspension and Resumption: This test shall be run again should the laws change.

Testing Schedule: This shall be tested during the production of the software

Identification: CaP_C_2_Offense

Test Criteria: The product shall strive to not be offensive based on the country it is being used in.

Approach: The product shall be altered within decent humane reason at the complaint of its users.

Testing Materials: The user feedback.

Pass/Fail: The product passes if at least 15% of feedback is used.

Suspension and Resumption: This shall be suspended and resumed for each piece of feedback.

Testing Schedule: This shall be done continuously.

Identification: UaH_EoU_1_Age

Test Criteria: The major functions of the product shall be able to be used by people older than 5.

Approach: The product shall be given to 100 5 year old testers with directions to complete each of the major functions.

Testing Materials: 100 5 year olds. The product.

Pass/Fail: The product shall pass if 90% of the testers can complete at least all but one of the major functions.

Suspension and Resumption: N/A

Testing Schedule: This shall be run once the first fully functional prototype is created.

Identification: UaH_EoU_2_Qualifications

Test Criteria: The product shall be able to be used by any person with the ability to read and operate a smart device.

Approach: The product shall be given to 100 testers who can read and operate a smart device. Then they shall be given a survey to judge their reactions to the product.

Testing Materials: 100 testers. The product. A survey.

Pass/Fail: The product shall pass if 85% of the users give the product at least a 50% review.

Suspension and Resumption: N/A

Testing Schedule: This shall be run once the first fully functional prototype is created.

Identification: UaH_EoU_3_Language

Test Criteria: The product shall be readable in all currently spoken languages.

Approach: The product language selection list shall be compared to the list of known languages in the world.

Testing Materials: The product's available languages list. The list of known languages.

Pass/Fail: The product shall pass if the lists match 100%.

Suspension and Resumption: This test shall be resumed each time a new language is added.

Testing Schedule: This shall be run once the first fully functional prototype is created.

Identification: UaH_UaP_1_Tutorial

Test Criteria: The product shall include a tutorial that 90% of users can follow without external assistance that shall describe all the functions of the product.

Approach: 100 testers shall be given the tutorial.

Testing Materials: 100 testers. The tutorial.

Pass/Fail: The product shall pass if after following the tutorial the testers can complete 90% of the functions on the product.

Suspension and Resumption: N/A

Testing Schedule: This shall be run once the first fully functional prototype is created.

Identification: UaH_UaP_2_Insult

Test Criteria: The product and the tutorial shall seek to not insult the user.

Approach: The product shall be altered within decent humane reason at the complaint of its users.

Testing Materials: The user feedback.

Pass/Fail: The product shall pass if 10% of the users feedback is used.

Suspension and Resumption: This test shall be resumed for each piece of feedback.

Testing Schedule: This shall be done continuously.

V Project Issues

1 Open Issues

How to handle user disconnect from cellular service.

How to handle user device shutting down abruptly.

2 Off-the-Shelf Solutions

2a Ready-Made Products
1. Google Maps API
2. OpenWeatherMap API
3. Google Weather API

2b Reusable Components

N/A

2c Products That Can Be Copied

N/A

3 New Problems

3a Effects on the Current Environment

Any glitches in the API systems could cause false alarms or not show the correct data resulting in the user not being warned.

3b Effects on the Installed Systems

The application will be installed on Android and iOS and must be compatible with current versions as well as Android 4.1 and above.

Server applications must be compatible on the system they are installed on.

Any compatibilities can cause crashing and lack of proper application and system functionality.

3c Potential User Problems
1. Disconnection from servers due to loss of internet signal.
2. Phone powering down due issues not related to the application.

3d Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

Storms may cause telecommunications to fail, resulting in the app not being able to connect to the internet and in turn unable to connect to the API's.

The power capabilities of the user's device may not satisfy the applications projected consumption.

3e Follow-Up Problems

Loss of internet signals during a natural disaster, inhibiting connection to servers.

Loss of system power on the user's device.
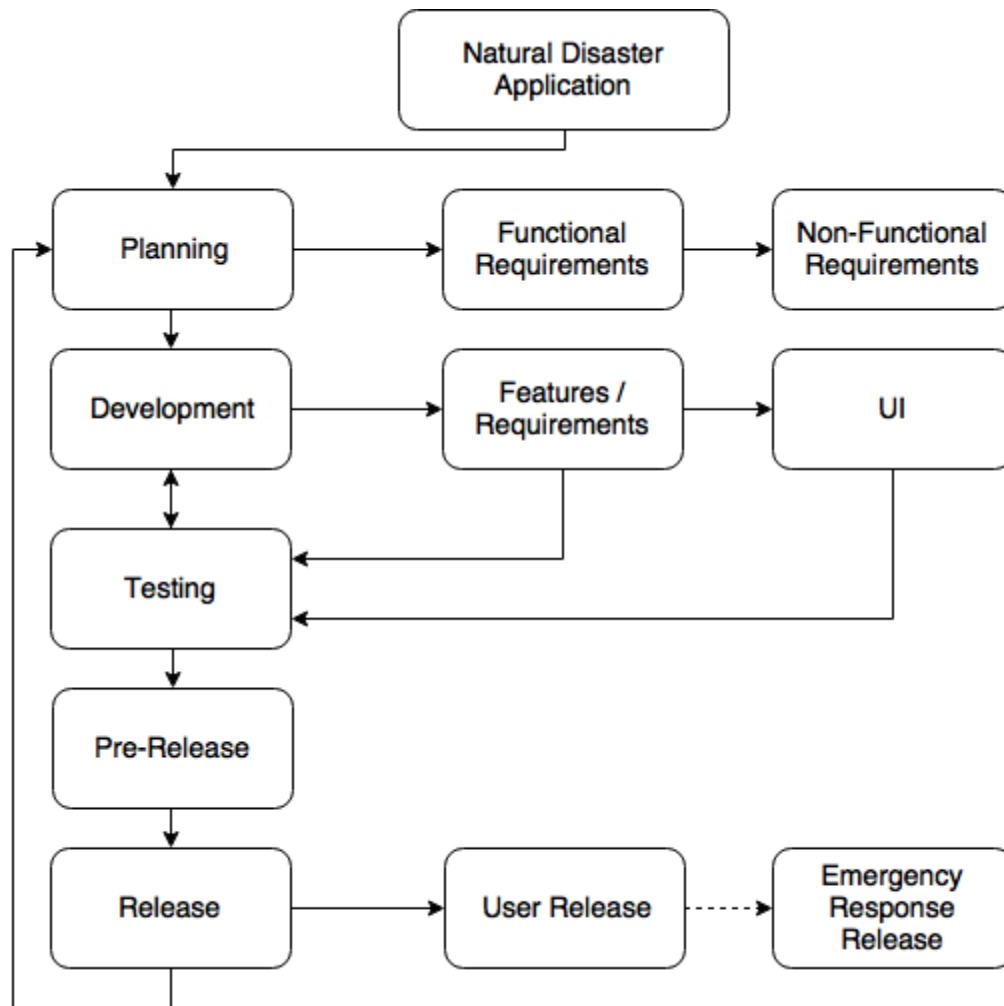
3f Project Planning

Figure 10 - Project Planning

3g Planning of the Development Phases

Name of the phase. : Planning

Required operational date.: Before development

Operating environment components included.: Cellular device, Servers, ER, Computers.

Functional requirements included. : All

Nonfunctional requirements included. : All

Name of the phase: Development (cyclic with testing)

Required operational date: After planning, before testing

Operating environment components included: Cellular device, Servers, ER, Computers

Functional requirements included: All

Nonfunctional requirements included: All

Name of the phase: Testing (cyclic with development)

Required operational date: After development, before Pre-release

Operating environment components included: Cellular device, Servers, ER, Computers

Functional requirements included: All

Nonfunctional requirements included: All

Name of the phase: Pre-release

Required operational date: After testing

Operating environment components included: Servers, ER, Computers

Functional requirements included: All

Nonfunctional requirements included: All

Name of the phase: Release

Required operational date: After Pre-release

Operating environment components included: Servers, ER, Computers

Functional requirements included: All

Nonfunctional requirements included: All

4 Migration to the New Product

4a Requirements for Migration to the New Product

Emergency response must be trained in using the product.

Servers must be large enough for user data.

Product must be compatible on specified systems.

4b Data That Has to Be Modified or Translated for the New System

User data on device must be translated into computer readable data to be stored in a database on the server.

5 Risks

Any errors with the integrated API's could cause a halt to productivity until a patch is applied.

Need a backup service in place in the case of server outages as well as user device outages to protect the integrity of data.

6 Costs

500,000 - Initial

Used to pay developers, buy servers, and set-up development.

500,000 to 1,000,000 - Yearly

Used to maintain the application, implement new features, maintain the servers, pay developers / other employees acquired during growth.

Development of the requirements of the application do not have a cost. API's to be implemented are available freely.

7 Waiting Room

App customization

8 Ideas for Solutions

Backup issue: Set up a system to periodically back up servers and user data on user device.

9 Project Retrospective

Went Well:

In cases of not being able to meet, the group came up with alternatives (voice calls, chats, etc).

Assignments to sections were always fair, if a member needed help another stepped up.

Didn't Go Well:

N/A

VI Glossary

ER - Emergency response (police, fire department, etc)

Application - the product.

API - application programming interface - an application that handles a task that can be added to another application.

VII   References / Bibliography

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VIII   Index