

# UCHELPME

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## Abstract

This application offers an innovative approach to the standard campus safety operations that Universities currently offer their students, faculty, and staff. This new method allows for the utilization of portable technologies which were not yet available when the former model of operation was introduced. This paper covers the process used for the development and implementation of this application. Help On the Go, or UC Help Me, is an emergency application that allows a user to contact emergency services on the UC Campus with ease. The application can be used in conjunction with former protocols to help increase safety for campus living. Through application development, use case data-collection, and test logs, a functional application was created to fulfill this goal. The result of this development, data collection, and testing of an application can be used successfully in a real-world environment. The belief is that with the success of this application, campus security can integrate the application into their operations to increase productivity and create a safer campus environment.

## Introduction

### Project Summary:

The purpose of this project is to enhance campus security, through a mobile help phone application focused for the University of Cincinnati main campus. The Emergency Help Phones stationed around the University of Cincinnati main campus act as a quick and easy access button to initiate contact with University of Cincinnati Police Department, or UCPD, and have an officer sent to the station's location. UCHelpMe - Help on the Go will be developed to be used with any campus or law enforcement jurisdiction that decides to implement this personal safety system.

Currently the Emergency Help Phones have some drawbacks which consist of lacking mobility and limited locations. The University of Cincinnati, according to college factual, reported 660 incidents in 2019 (Stockwell, 1) which are incidents in which UCPD was contacted by cell phone, in person report, or UC Help Phone. The Help Phones are such a critical and urgent service that the service needs to be available as close to 100% of the time as possible. Also, the help phones require the user to be at or near the stations whereas every emergency is different, and this may not always be possible. UCHelpMe - Help on the Go will provide a simple method of offering emergency services and immediate support.

### Problem Statement:

UC Emergency Help Phones are limited in quantity, positioning, and require frequent maintenance to make sure they are functioning properly all while withstanding the elements of their environment. According to the UCPD Public Safety Dashboard, there have been 1255 incidents Year-To-Date (Zidar). In a 2017 Article reviewing the cost-benefit of campus safety collected by Manako Yabe it was stated that: *“Regarding costs, three companies that produce blue light emergency towers provided price estimates. Each of the companies offered different features of blue light emergency towers, such as LED blue light strobe, camera-ready mounting arm, solar powered emergency phone, area lighting platform, and IP or analog call station readiness. Thus, the implementation fees for the blue light emergency towers varied, based on types of features and connection offered. These costs ranged from \$2,000 to \$5,000 per unit, in addition to annual fees for upkeep and upgrade from \$100 to \$300 per unit. For example, if a university purchased 50 units at rates of \$3,000 per unit for installation and \$200 per unit for upkeep, a total of costs would be: \$150,000 for implementation fee and \$10,000 for annual fee”* (Yabe, 208). Based on these quoted costs alone, there is a concern with the current system being the only option. Additionally, the current system would need to be modernized and improved in such a way to cut down on limited availability, lack of mobility, and potential down time.

### Solution:

UCHelpMe/Help on the Go will solve the issues mentioned in the problem statement by developing and implementing perpetrator deterrent technology along with UCPD communication and tracking systems. UCHelpMe/Help on the Go needs to be able to track and provide communication between the person requesting emergency services and the UCPD dispatchers. This allows the police to quickly and accurately find the location of the emergency. The app would also need some level of local client activity to help deter crime. As a result, we decided that a loud alarm like noise would fulfil this purpose as well as potentially making use of some flashlight-based activity. This feature is so that the app can potentially assist in warding off potential assailants. It is important that UCHelpMe/Help on the Go is simple and quick to use due to the nature of the emergency.

### Project Source:

The project was conceptualized after brainstorming for a senior design project and stumbling across several broken help phone stations across UC. Some of the team members work with IT@UC and thus have seen handfuls of tickets regarding broken phones in the previous weeks. This helped to stir up the concept and create a desire for a better alternative that can be more consistently available and easily accessible. The idea was realistically within our scope of ability and close enough to home that there was a desire to work on the project to fruition.

## Discussion

### Project Objectives/Goals:

The app is intended to cover a gap that currently exists in the communication between campus-goers and emergency services. The goal is also to help reinforce the current emergency help phone service by improving and strengthening the overall infrastructure. The app in its final form is intended to:

- Create deterrent audio and visual effects
- Communicate location of emergency to UCPD
- Remain a minimalistic app that is also effective

### Project Scope:

The goal of the app is to assist students, faculty, and staff with emergency services from their phones. Due to legal or ethical concerns about the timeline of this project, the app may not reach its final stage in terms of communicating with emergency services. It is currently being scoped to Android applications only at this time for the initial release. This is a decision made to avoid situations and bugs that may arise causing legal/ethical unintentional abuse of emergency services. The project also does not give enough time to communicate and negotiate a contract as well as take care of the legal bureaucracy to implement this app to its full potential.

Deliverables: Listed below are the high-level deliverables for the project.

- Storyboarding – Started with the task of creating a story board in which the process of the application first comes to fruition. By breaking down the application slide by slide the team was able to develop a plan for how to develop the app.
- Wireframing – Next the team took their storyboard and brought it to life through wireframing. By creating a digital footprint of the storyboard, the team started to see a blueprint of how their application could be developed.
- Development – The team moved to development through the android studio development tool. Using JavaScript as the basis of their code, specialized members of the team took to the forefront of this process and created an application that could accomplish the goal of a successful application.
- Prototyping – While the development members continued to work on the fine tuning of the development, additional members began work on prototyping the application through use case scenarios and use case diagrams.
- Testing – The prototyping members continued their work through the prototype into testing by branching out to third party testers. They used their diagrams and wireframes to receive documented results both positive and negative for application usage.

- QA – Once the Development, Prototyping and Testing was completed, the team reassembled to ensure the quality assurance was met and that everything was running at top performance.

Tasks: Listed below are the high-level tasks that will be completed throughout this project.

- Strategy – Throughout the project a development plan to complete tasks and ensure productivity was created.
- Analysis – The team made sure to investigate all capabilities and determine what will be done for the application to be successful.
- Planning – Members of the team broke down the deliverables to ensure that every task could be completed.
- Design – A design was created through storyboarding and wireframes to allow for a digital manifestation of the application.
- Prototype – Through development stages, building from the wireframe a prototype came into play that the team could work off.
- Backend – A backbone of which the code is built on was finalized so that the team could then focus on the functionality of the front end.
- Networking (if necessary) – For concerns with personal safety, the team determined that only the emergency services to which the application connects should store the information collected.
- Testing
  - User – user testing was collected through use cases scenarios and wireframe diagram to collect outside feedback for the design.
  - Functional – In house testing was collected by the team to determine that the application was performing successfully.
- Deployment/Support – A deployment state is not developed yet due to the app being in a beta state.

### Quick Project Timeline:

Listed below are the estimated dates of milestone completion for this project.

1. August 2nd - August 30th: Brainstorming, Product Pitch and Problem Statement – The team was created at this time and began planning and analysis for how the application would be completed.
2. August 30th - September 13th: Market Research and Analysis. – Since the product had been pitched the team began collecting resources and additional information needed to ensure that the application could be successfully implemented.
3. August 30th - September 20th: Team Contract. – A contract was created, stating the terms and conditions in which the team would develop their application.

4. September 13th - September 20th: Solution Idea Brainstorming. – At this time, the team collected their resources and analysis to determine the pathway in which the project would continue.
5. September 27th - October 4th: Project Management, Concepts and Technology Analysis. – The team finalized a file path system to increase productivity, familiarized themselves with a programming platform that is for developing the application and continued work on the wireframes.
6. October 4th - October 18th: Project Design – Wireframes were continued during this time as well as beginning development in Android Studio.
7. October 18th - October 25th: Quality Assurance Methodology, Change Management, and Iterations. – The team used this time to create their TOS and enhance user personas for the application. Additionally, a change management plan was created to ensure productivity would continue.
8. October 25th - November 1st: Budget. – At this time Use cases and app development were still in major development. The TOS was also being updated and discussed by the team. Finally, a budget for the project was finalized.
9. November 1st - November 14th: Technical Documentation. – The team completed initial development of the application. Once this was completed, they generated a collection of information to present to the review committee.
10. November 29th: Presentation. – A presentation of the current model of the application was presented in front of the judging committee.
11. December 5: Peer Review: Technical Review of peers. – Once the presentation was completed the team configured a review to assist in analysis of work that has been done for each member.
12. December 6<sup>th</sup> - March 2022: Fine tune Presentation, Polish app. – The team continued to improve on the application from the comments and reviews they obtained during their presentation as well as their peer review. Create a backlog of features. Create stories to be completed. Potential GPS implementation. Potential Call-To-Text option. Finalize front end design.
13. April 2022: IT Expo – A final presentation was concluded for the project in which a finalized application was shown on display.

### Technologies Used:

The technologies have been chosen due to the cost and use cases of each technology. Java can be used to create dynamic mobile apps and web applications which are integral to UCHelpMe/Help on the Go. Android Studio is an android-based application testing/developing platform that can be used in conjunction with Java. Phone Gap is an open-source mobile app development framework that works in conjunction with HTML5 to create native applications for android, which is important due to the app being developed specifically

for android. Widget pad will also be used due to being a mobile application develop framework that again utilizes HTML5 to edit source code, versioning, and distribution.

Technical Architecture Diagram:

This Sequence Diagram presents the usage scenarios of the application. It demonstrates the process of actions that occur from the user to the application, and from the application to the user. From left to right the diagram shows the user options available in the application. From there the diagram displays what the application will produce based on the user’s choices. Additionally, the diagram states the backend information that is collected by emergency and non-emergency services, while also still responding back to the end user.

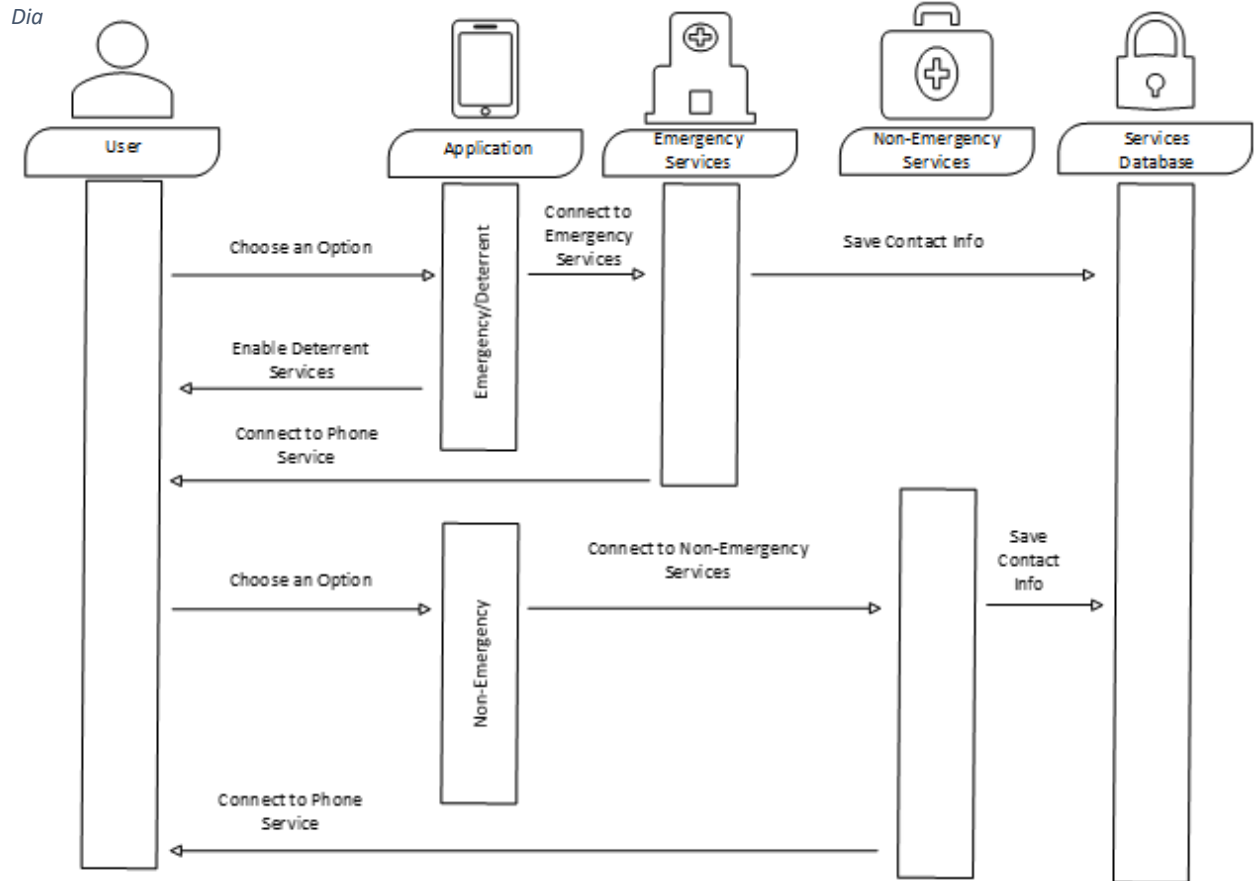


Diagram 1: Technical Architecture Diagram

User Personas:

The user personas that have been developed encompass a scenario fit for the typical situation that can be found in a campus environment. The first user personas follow that of a potential late-night student who would need the application due to the timing and location of their persona. The second user persona involves a faculty/staff member of the university

environment in which they also fall into a scenario where the application can be a sense of security within their situation.


User Persona: 1	
	Title Late Night Student
	Name Adam Smith
	Age 22
	Gender Male
Behavior	Student Attends evening class in hope of being able to go to and from work and school without any concern for safety.
Pain	Safety concerns regarding nighttime on campus when travelling to and from class.
Needs & Goals	Feel safe around campus. Reliable form of communication.

Figure 2 User Persona Table 1


User Persona: 1	
	Title Dr. Teacher
	Name Lindsey Thompson
	Age 41
	Gender Female
Behavior	Works at campus full time. Comes in and out of the office at sporadic times that are uncommon from the standard.
Pain	Safety concerns coming and going at odd times. Insecurity with the environment while traveling alone.
Needs & Goals	Sense of security in the workplace as well as arrival to and from the office.

Figure 3 User Persona Table 2

## Use Cases:

The tables below are example cases in which a user would fall into a scenario in which the application in question could be used to resolve the issue. In the first use case the application can be used for a sense of security to help in the scenario of a late-night campus attack. In the second case the application can be used to help get a user out of a “stuck” scenario.

Use Case ID	UC001
Use Case Name	Late Night Campus Attack
End Objective	Provide criminal deterrent or police emergency services
User/Actor	Late Night Student or Dr. Teacher
Trigger	A user is approached late at night while on/near campus with perceived hostile intent from the perpetrator
Frequency of Use	
Preconditions	User is on/near campus and needs criminal deterrent or police assistance
Basic Flow	User is approached, user accesses app, user presses the deterrent button and attempts to dissuade assailant continuing
Alternate Flow	User is approached, user access app, user presses the police button and attempts to get police to the location to de-escalate the problem.
Postconditions	

Figure 4 Use Case Table 1

Use Case ID	UC002
Use Case Name	Stuck in an Elevator
End Objective	Assist in getting users in contact with the police so they can get out of the elevator.
User/Actor	Late Night Student and Dr. Teacher
Trigger	Users are stuck in an elevator, and something prevents the elevator phone from being effective.
Frequency of Use	
Preconditions	User is stuck in an elevator. User is unable to contact police through the elevator phone.
Basic Flow	User gets stuck in an elevator. The user attempts to use elevator phone but is unable to

	make contact or be assisted. User uses app and presses the non-emergency help button.
Alternate Flow	
Postconditions	User is put in contact with the authorities.

Figure 5 Use Case Table 2

### Use Case Diagram:

Below is the use case diagram for this application. This diagram describes the process in which a user would be able to use the diagram and the process in which their usage would create potential outcomes.

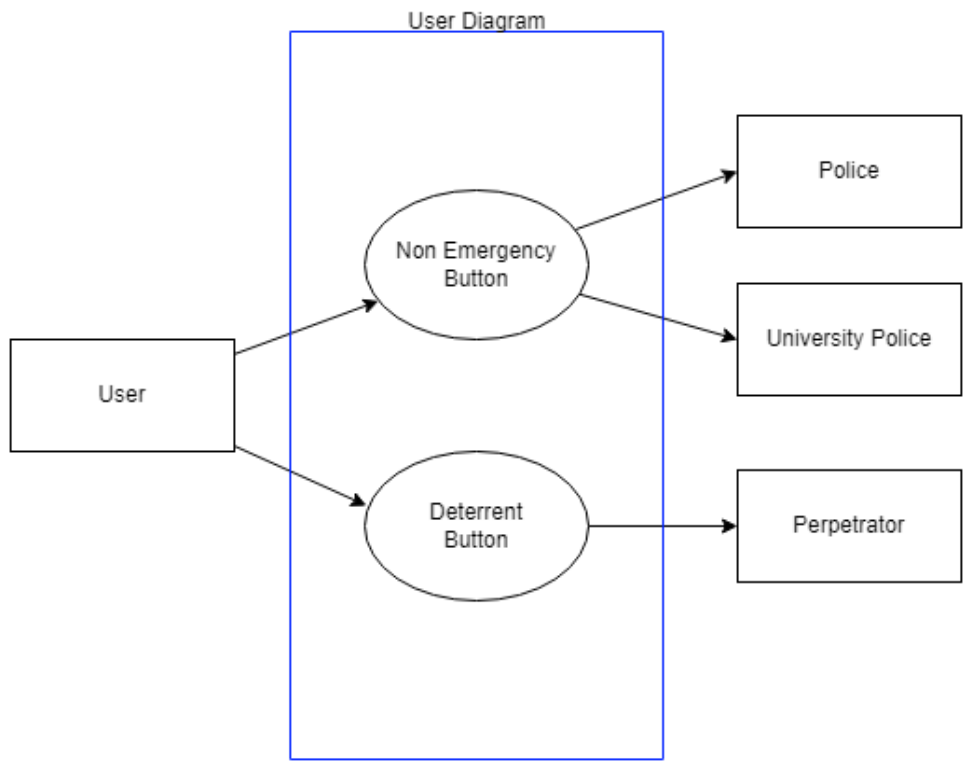


Figure 6 Use Case Diagram

### Testing Plan:

#### Overview

The testing Methodology, Scope, Objectives, Logs and Procedures, and Testing Review were outlined. The purpose of the proposed testing plan is to highlight the various processes performed to test iterations of the application. Additionally, the plan helps define the scope of testing, while also including the logs and analysis of the results obtained.

## Methodology

To test the progress made with UCHelpMe - Help on the Go, at least one technician and one third party tester would run through the application. The testers are to go through each button and check for functionality. The testers are also to stress test the application by pressing buttons as much as possible, testing multiple different buttons at once, or any other ideas they can think of to try and break the application. This allows for some open-endedness in stress testing as users often have the best ideas and should not be constrained only to specific testing instructions. The thought process of this methodology is to find ways in which the application can be broken/used incorrectly so that these options can be reconciled and no longer cause issues. Any issues that arise should be immediately documented including what version was tested, what was done to produce the result, was it able to be replicated, and who produced it originally.

## Scope

Listed below is the scope of testing:

- Users can log in to the app quickly: We want to make sure that we have basic information about the user in case of emergency. It is imperative that the login process is quick and simple.
- Accuracy of the geolocation: Make sure the app can get the location of the user, so the correct authorities can be contacted.
- Emergency button: It is important that in a moment of distress the emergency button works and sends notifications to the correct authorities for immediate help.
- Deterrent switch: When the deterrent switch is turned, it needs to turn the phone into a deterrent mechanism.

## Objectives

At this time, a test schedule is needed where one technician and one third-party tester, one at a time, go through the design and wireframe of our application. The end goal is to have an application that runs bug free through both technician and third-party testing in time for the IT Expo.

- All major features of the application are accounted for
- All use cases are accounted for
- All use cases account for all user roles
- All bugs need to be resolved before the IT Expo

## Test Logs and Procedures

Table 1 Test Logs

Item	Test Case	User	Role	Expected Output	Actual Output	Pass/Fail	Reason for Pass/Fail
App	1	Internal	Open Application	App runs	App ran	Pass	Achieved Expected Output
App	2	Internal	Emergency Button	Button completes task	Button completed task	Pass	Achieved Expected Output
App	3	Internal	Detterent Button	Button completes task	Button completed task	Pass	Achieved Expected Output

The team has only conducted internal testing of the current version of the application. Team review has determined that additional features need to be designed and implemented before outbound testing for the application is implemented. With that said, regarding the internal testing, the application at this time is running efficiently and effectively. The procedures that have followed cover the testing of the core roles of the current application with the intent of delivering actual outputs that match the intended expected outputs as seen in the graph above.

### Testing Review

Throughout the testing phase, the application performed its main function with little to no issues. Bugs covered, were corrected in a timely manner. The method of using one technician and one third party tester to run through the application proved to be quite successful, because it generated feedback from the consumer side as well as the technical side. After completing the testing phase, one potential change could be to have more people running through the application to check for potential bugs. Having a larger group of testers would provide a better chance of catching problems in the application that could be overlooked.

### Change Management Plan:

During the process of this project, the team was able to determine that changes will need to be made during the development of this application. To ensure no drop in productivity and deadlines are met, a change management plan was created and implemented to make sure everything was completed, and adjustments could be made without loss of time or structure to the project. Below are the steps in which that management plan was calculated and executed.

- Who can request a change and in what circumstances?
  - Any team member can request a change
    - Must be addressed in team meeting with all members present.
  - Any advisor can request a change
    - Must be addressed in advisor meeting with all members present.
- How will we triage a change?
  - Member/Advisor will identify pros/cons during proposal.
  - Team will decide on approval/denial with a majority vote on the spot.
  - The team will then determine priority/task responsibility and delegate accordingly.

- All communication of change management when completed will be documented within our SharePoint documentation so that Advisor has additional notice if the change is recorded outside of an advisor meeting.
  - If change occurs in this scenario, advisor will also be notified via Teams as well as reminded in the following advisor meeting.

**Budget:**

The following section lists the budget to develop the application. The Software and Hardware section includes a breakdown of the budgeting for those specific line items in the spreadsheet.

Software: Microsoft Office Family (6 Devices)- \$100  
 Android Studio - \$0  
 Hardware: Laptops (5) - \$10,000 (\$2,000 each)

Table 2 Project Budget

Estimated Rough Cost					
		Rate Per/HR	Work Effort	Employees	Total
Labor		\$20	80 Hours	5	\$8,000
Software		\$100			\$100
	Android Studio	\$0	60 Hours		
	Microsoft Office	\$100	20 Hours		
Hardware		\$10,000			\$10,000
	Laptops	\$2,000 Each	80 Hours		
<b>Total</b>					<b>\$18,100</b>

**Problems Encountered and Analysis of Problems Solved:**

Difficulties that the team encountered during the development of this application were primarily the focus within software development. Listed below are some examples of difficulties that occurred.

- Learning software: What the team did to resolve this issue was a steady repetition of practice within the Android studio software to familiarize the team with the process. Additionally, the team looked towards external sources as a resource for resolutions.
- Bugs in the software: To resolve the bugs in question, the team worked with one another to work out the bugs that we were able to find. Additionally, like the process of learning the software, the team reached out to external sources for knowledge on similar bugs that others have encountered to find a resolution to the problems encountered.

## Conclusion

In conclusion, the application has made great strides towards the end goal of developing an application that could function in correlation with current safety protocols. From the original proposal for the design, to creating a storyboard specific for functionality within the application, finalizing on wireframes for the application, creating a working application from the concept within Android Studio, developing use cases and collecting third party information. There were difficulties during the development and data collection due to the initial lack of knowledge in the material, but with gained experience and use of external resources, the goal was able to be achieved. The goal all along was to create an application that could work in conjunction with campus security protocols and increase the standard in which campus safety is maintained. The current model of the project provides an application which can function on its own but can also be implemented into the current campus security system. While there is currently still room for the application to continue to grow, this project was able to successfully create a functioning program that can assist with the originally planned goal. The application will continue to be developed further along the spring timeline to hopefully achieve the full breadth of the initial end timeline. With improvements in functionality, added implementations towards the pre-built application, and an upgrade on the graphical end, the hope is for a sharpened application by the original end timeline.

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