Protons – Abstract

STEM represents Science, Technology, Education, and Mathematics. These are the fundamentals of app development. We used scientific inquiry to find a problem that pertained to our community. Technology was the most crucial element of our project. Our application uses the latest technology from MIT, dubbed MIT app inventor. The software allows people to program with ease, eliminating difficulties found within coding.

Mission Folder: View Mission for ' Protons'

State
Texas
Grade
7th
Mission Challenge
Technology
Method
Engineering Design Process
Students

txprotons1
ecyber13
lions17

Team Collaboration

Uploaded Files:

- [**View**] **Team Collaboration document - Team PROTONS** (By: txprotons1, 02/25/2015, .docx)

This document answers all the questions related to Team Collaboration

(1) Describe the plan your team used to complete your Mission Folder. Be sure to explain the role of each team member and how you shared and assigned responsibilities. Describe your team's process to ensure that assignments were completed on time and deadlines were met.

Please see the document attached called "TeamCollab2015ecyber.docx"

Engineering Design

Uploaded Files:

- [**View**] **Engineering Design Process** (By: txprotons1, 02/25/2015, .docx)

This process contains answers to all the questions in this section. We have diagrams and tables that cannot be added to the mission folder.

Problem Statement
(1) What problem in your community did your team try to solve? Why is this problem important to your community?
Please see the attached document

(2) List at least 10 resources you used to complete your research (e.g., websites, professional journals, periodicals, subject matter experts).
Please see the attached document

(3) Describe what you learned in your research.
Please see the attached document

Experimental Design
(4) Develop a design statement. Be sure to describe what exactly your device should be able to do. Do not describe HOW it's going to do what it needs to do.
Please see the attached document

(5) Determine the criteria for a successful solution and identify constraints for your design. Discuss what the device must have in order to accomplish its job and the restrictions of the device (i.e. the size, the cost, the weight, etc.).
Please see the attached document

(6) Identify the relevant variables you will use to test your prototype or model and explain how you will measure your variables.
Please see the attached document

Build Prototype or Model
(7) Develop a design and list the materials you used in your design. Include technologies you used (e.g., scientific equipment, internet resources, computer programs, multimedia, etc.).
Please see the attached document

(8) Explain how you built your prototype(s) or model(s)? Include each of the steps in your process.
Please see the attached document

Test Prototype
(9) Describe the data you collected and observed in your prototype testing (use of data tables, charts, and/or graphs are encouraged).
Please see the attached document

(10) Analyze the data you collected and observed in your prototype testing. Does your data support or refute your design statement? Do not answer with yes or no. Explain your answer using 'Our data supports/refutes the design statement because...'
Please see the attached document

(11) Explain any sources of error and how these could have affected your results
Please see the attached document

Drawing Conclusions
(12) Interpret and evaluate your results and write a conclusion statement that includes the following: Describe what you would do if you wanted to retest or further test your design. Evaluate the usefulness of your prototype or model. What changes would you make to your prototype or model for the future, if any?
Please see the attached document

Community Benefit

Uploaded Files:

- [**View**] **Benefit to the Community eCyber 2015** (By: txprotons1, 02/25/2015, .docx)

  This document contains all the answers to the questions in this section

(1) How could your design help solve your problem and benefit your community? Describe next steps for further research/design and how you have or how you could implement your solution in the future.
See the attached document called Benefit to the Commmunity eCyber 2015.

Mission Verification

Uploaded Files:

- [**View**] **Survey Approval Form** (By: txprotons1, 02/19/2015, .pdf)

  Survey Approval Form

- [**View**] **Summary Presentation** (By: txprotons1, 02/25/2015, .pptx)

  This is a summary presentation of the project.

(1) Does your Mission Folder project involve vertebrate testing, defined as animals with backbones and spinal columns (which includes humans)? If yes, team must complete and attach an IRB.
No

(2) Did your team use a survey for any part of your project? If yes, team must complete and attach a survey approval form.
Yes

(3) You will need to include an abstract of 250 words or less. As part of the abstract you will need to describe your project and explain how you used STEM (Science, Technology, Engineering and Mathematics) to improve your community
STEM represents Science, Technology, Education, and Mathematics. These are the fundamentals of app development. We used scientific inquiry to find a problem that pertained to our community. Technology was the most crucial element of our project. Our application uses the latest technology from MIT, dubbed MIT app inventor. The software allows people to program with ease, eliminating difficulties found within coding.

Team Collaboration

Describe the plan your team used to complete your Mission Folder. Be sure to explain the role of each team member and how you shared and assigned responsibilities. Describe your team's process to ensure that assignments were completed on time and deadlines were met.

Our team consists of three 6th grade students from different schools in the suburbs of Dallas, TX. We all got to know each other through an after school math program.

None of us knew each other before the project, but were all willing to make friends. Once we formed our team, we participated together in another science & technology competition that is similar to eCybermission, called Christopher Columbus Awards. Our team's coach has coached in the eCybermission challenge for three years and this is her fourth year coaching. Once we made the decision to participate in the challenge, we started meeting once to twice a week, brainstorming for project ideas. Our approach was to think about the day-to-day problems we have with First Responders in our community. We chose problems in this field because one of us was participating in the First Lego League and the theme for 2014 was Natures Fury, so we didn't want to solve problems that were far from our comfort zone.

Once we had down selected a few project, we split the responsibility of the team to do further research on the topic. All of the team members had to do research on the likelihood of this project from a technical perspective as well as investigating the need for a First Responder application in the market. For the design, building, and research, the whole team worked together to get one final product.

Task Assigned	Txprotons1	Ecyber13	Lions14	Team Advisor
Brainstorming of ideas	X	X	X	X
Market research of ideas	X	X	X	
Requirement Session with CERT				X
Design Prototype	X	X	X	
Build Prototype	X	X	X	
Review Mission Folder	X	X	X	X
Revise Prototype	X	X	X	
Show CERT Final Design				X
Initial Mission Folder Questions Assignment	X	X	X	
Finish Prototype	X	X	X	
Take Necessary Photographs				X
Submit Mission Folder	X	X	X	

We created a plan in the initial months to complete the work by the deadline, which included regular meetings of twice a week to work on the prototype and research. To keep the work on track we assigned roles:

Gate Keeper:

A gatekeeper who keeps the others on track by e-mailing the tasks that we must complete by the next meeting and sending out the meeting minutes. The gatekeeper is also the main researcher, and is the one in charge of outlining the mission folder and assigning specified questions to the team members. In our team txprotons1 brought a lot of the planning and writing skills to the team and was assigned this role.

Programmer:

The programmer is the person who mainly designed, constructed and worked out the logistics of the actual prototype. He also took charge in programming, and building the prototype. In our team, lions17 the trained individual on MIT App Inventor

Designer:

We all used Fluid UI to design our designated screens and see what they could look like in the final product. On our team, eCyber13 was the one who contributed the most to the designing process.

Documentation Specialist(s):

We decided to split the work on the mission folder and based all worked on the documents together so we could get them done faster and work together as a team.

A true team effort -

As we did more research and started developing a solid design for our prototype, we realized that we needed help from more knowledgeable people who would collaborate with us. Specifically, we needed the approval of First Responder to help finish our product.

Task	Time Spent
Initial Brainstorm	3 months
Feasibility Research	3 weeks
Team Registration	1 day
Market Research	1 wek
Conduct Requirement Survey	1 month
Design on FluidUI	2 months
Create Prototype	2 months
Revise Prototype	2 months
Review Mission Folder	2 weeks
Test Prototype	3 weeks
Review and Submit Mission Folder	1 week

Table of Contents

Engineering Design Process

Problem Statement

What problem in your community did the team try to solve? Why is this problem important to your community?

The problem that we decided to address is the problem of dealing with natural disasters specifically by the CERT group. Natural disasters are unavoidable so effectively managing information and resources can minimize damages and save lives.

The **Community Emergency Response Team (CERT)** program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community. CERT members considered an extension of the first responders

One of the challenges the CERT group in our community faces is the lack of a dedicated tool that helps CERT members to communicate effectively, know each other's location and there is no way to share information such as pictures or map locations to allow for better allocation of resources. This leads to ineffective allocation of the CERT resources. Our team Protons became aware of this issue as we researched communications related issues facing first responders (our topic of choice) and came across CERT concept as part of the research. We reached out to the CERT group in our city and had discussions with them specifically about the challenges they face in terms of communication and how we could help.
We decided to use MT App Inventor to create a mobile app prototype that could help CERT members. MIT App Inventor is a cloud-based tool that helps beginning programmers build an app. We communicated with our local CERT group to find out their requirements and find what ideas they would like to see put in the app.

We decided to address this issue by creating a mobile app called CERTPRO.
CERTPRO is the prototype for an Android based application that allows CERT (Community Emergency Response Team) members in our community to –

- Effectively communicate using SMS, Twitter and phone call. Contact can be made with individual members or a group Tweet or SMS can be sent.
- Know each other's location during deployment and allow for informed allocation of resources to help during emergency deployments.

- Allow Incident Commanders to create a to do list on the spot based on the situation and allocate resources based on location and expertise.
- The application also allows for CERT members to review their training material to allow them to keep the knowledge fresh while in a non-emergency situation.
- Allow members to view each other's profile information such as language skills and certification, which allows for an informed allocation of resources.

Some key features of CERTPRO are that it has low training period and should be easy to learn since CERT members can be from very different training backgrounds. The product should be intuitive to use based on everyday phone use. All these features are in line with what good product design is supposed to be. CERTPRO is based on the above principles.

We hope that by creating a prototype using a open source resources), we can create an affordable product that has all of the above features. The affordability will allow us to provide CERTPRO as part of each CERT community's arsenal of technology.

We hope that by using CERTPRO, a helpful application that can be given to CERT communities across the nation, we can better utilize first responders and keep them safe.

References Used

1. http://www.fema.gov/community-emergency-response-teams
2. htttp://www.redcross.org
3. http://www.usfra.org/
4. http://www.nfro.org/
5. http://www.govtech.com/public-safety/Mobile-App-Tracks-Emergency-Volunteers.html
6. http://www.emergencymgmt.com/disaster/CERT-App-Coordinate-Volunteer-Responders.html
7. http://ai2.appinventor.mit.edu/
8. https://www.fluidui.com/

9. Democratizing Mobile App Development for Disaster Management Applications (http://chato.cl/papers/mobile_app_application_development_disaster_management_2013.pdf)
10. Can mobile apps save lives (http://risktaisaku.com/sys/enarticle/?p=59)

What did you learn in your research –

Our research was divided into 4 categories -

- **Research on ideas from the initial brain storming team sessions**

During this phase we had weekly meetings for project ideas and suggestions. We then picked the top 3 ideas from that week and researched it using Internet based resources or bouncing ideas off of our parents and siblings.

- **Research on the particular problem we chose to focus on as a team**

Once we had chosen a specific idea - ***communication issues facing the first responders today*** our research concentrated on national groups (FEMA[1], RedCross[2], First Responder Association[3,4]) helping in emergency response and contacting local first responder groups We learnt that the CERT Program concept was developed and implemented by the Los Angeles City Fire Department (LAFD) in 1985[1]. Since then CERT program has been adopted by FEMA with over 2200 registered CERT groups in the US. We met with Region VI FEMA Director in Denton, TX to discuss some of the challenges facing the first responders today. We also met with the CERT Coordinator for the city of Plano to

- Discuss the responsibilities of CERT's,
- Discuss how the group currently operates during an emergency
    - Today the local CERT coordinator does mass email or places robo calls to the members based on contact information that may be out of date. There is no utility to use SMS or Twitter Alert for communication although these are the preferred methods of communication as per FEMA during emergencies. Once there is an emergency all the CERT's meet at a designated area and pick a Incident Commander who assigns work to the assembled CERTS. This is all done manually and arranged verbally leading to inefficient use of resources.
- Discuss the challenge faced by CERT groups in doing their jobs
    - CERT members do not have contact information for other CERT's in the area and hence are not able to collaborate with other CERT members to complete a task. Since CERT members are not aware of the location of the

other team members there is usually an unequal distribution of CERT resources.

- Discuss the challenges of keeping the training and knowledge base current.
    - CERT members get trained in classroom and during exercises and have to keep the knowledge base current to be able to work effectively. Today there is no check on how current the training of the CERT member is.

Once we understood the requirements we wrote down the requirements and prioritized which requirements our team should focus on.

- **Research on existing solutions for the problem –**

CERT Plano team told team PROTONS that they do not use any mobile application for coordinating, executing and communicating work with the CERT members. In their experience none of the registered CERT groups in Texas had such an application.
Our research has led us to only two mobile applications that are in the stage of being released to the market in 2014. The applications are called DeployPro[5] and Certify[6] and both only address a subset of the requirements that CERTPRO addresses.

- **Research for tools that could help us create CERTPRO**

Once we had decided that we wanted to build the prototype of a mobile application to address CERT group issues – our coach introduced us to MIT App Inventor [7]. It is an open-source web application from the Massachusetts Institute of Technology (MIT) that can be used to create mobile apps. We started working through the tutorials, using books such as App Inventor for Android by Jason Tyler and, studying the tutorials by experts on You Tube. Our team attended a course "Creating Android Apps using MIT App Inventor" at UT @Dallas. This class provided us the initial foundation to start creating the prototype. We also researched various tools to mock up the mobile screens and chose Fluid UI[8] as the platform to create the initial mock up of the mobile screens.

Proposed Solution –

We proposed an Android based mobile application called CERTPRO to address the CERT group requirements. We are limited to Android platform for this prototype since we are using MIT App Inventor to program it. Our solution leverages the cutting edge technologies in communication such as Twitter and, SMS to help CERT group communication. In addition by using the advanced features on the mobile phones today – such as camera, videos a lot of information can be instantly shared. By leveraging the cutting edge Geo capabilities on the phone, CERTPRO is able to provide many location-based services such as Geo location and Geo caching. In addition CERTPRO provides the ability for CERT members to take trivia quizzes about the CERT training material to keep up to date on the material. The trivia quiz is timed and the CERTPRO members are granted classification such as Bronze/Silver/Gold based on the accuracy and time. One other important feature is limited to Incident Commander at the time of deployment. This feature allows the

Incident Commander to create a To Do List and assign users based on skills and geo location. In all CERTPRO is an all-comprehensive mobile app that will make the CERT group operate with higher efficiency.

Experimental Design

Develop a design statement. Be sure to describe what exactly your device should be able to do. Do not describe HOW it's going to do what it needs to do.

Our design statement is powerful and simple. We want CERTPRO to be easy to use, simple to navigate and quick study with intuitive user interface.

CERT members can be from very different backgrounds and so the product must cater to a wide range of people with different technical skills. CERTPRO is based on the above principles.

Some of the key features provided by CERTPRO are that it allows CERT members to -

- Effectively communicate using SMS, Twitter and phone call. Contact can be made with individual members or a group Tweet or SMS can be sent.
- Know each other's location during deployment and allow for informed allocation of resources to help during emergency deployments.
- Allow Incident Commanders to create a to do list on the spot based on the situation and allocate resources based on location and expertise.
- Allow for CERT members to review their training material to allow them to keep the knowledge fresh while in a non-emergency situation.
- Allow members to view each other's profile information such as language skills and certification, which allows for an informed allocation of resources.

The following screens in the application meet all of these above design requirements –

Trivia Page
- Lets users improve on their knowledge

Profile Page
- Lets users post their skills and information

To-do list
- Lets users keep track of their tasks

Map

- Lets users locate each other as well show the phone owners current position. In addition, the Map also shows all the contact information of the members.

Login Page

- Lets only CERTS use the app. CERT members can login and make themselves available or unavailable to help.

Contacts page

- Lets the users view other CERT member's profile

Home page

- The home page is the main page to navigate to other pages.
- As an administrator, the user can view the number of CERT members available to help. They can contact everyone via a group SMS or Tweet. In addition they can create a To Do List
- As a general user, the user can view the jobs they are assigned to and can also update the status of the job.

CERTPRO enables CERT group by providing powerful communication tools and map based resources to allow for operational efficiency before and during an emergency deployment.

Determine the criteria for a successful solution and identify constraints for your design. Discuss what the device must have in order to accomplish its job and the restrictions of the device (i.e. the size, the cost, the weight, etc.).

We received the criteria from the CERT group in Plano.
Criteria included functional and non-functional requirements.

Important functional criteria are explained in the above section. While the important non functional criteria included –

- Easy to learn
- Easy to Navigate
- Stable
- Secure application

The biggest constraint the product faces it that it currently only runs on the Android platform. Since MIT App Inventor only supports the creating mobile apps on the Android platform.

Currently CERTPRO prototype has been tested successfully on a variety of Android phones such as HTC, Samsung and LG and different models. In our experience the application works best on the HTC phones.

Identify the relevant variables you will use to test your prototype or model and explain how you will measure your variables.

In case of CERTPRO – since it's a mobile application with certain sets of functional and non-functional requirements we have executed classic software tests such as Unit Test, Integration Test, Systems test and User Testing. All of these tests will allow for testing the functional requirements.

For meeting the non functional requirements – such as security, stability of the prototype when supporting a large number of users, we need to find further resources to set up a formal testing environment

Build Prototype

Explain how you built your prototype(s) or model(s)? Include each of the steps in your process.

We followed the classic software development steps to help us create our app

Each of these steps are outlined below -

Step 1 – Assess Needs - We talked to FEMA and C.E.R.T members in Plano to find out their requirements.

Step 2 – Design Specifications - We created logic trees, flowcharts, and design documents to share within the team and with C.E.R.T group

Step 3- Design/Develop/Test Software - We designed mock up screens on FluidUI . We programmed the app using MIT App Inventor. We tested the software on Android phones using MIT AI Companion

Step 4 – Implement Systems - CERTPRO is a prototype. This is the next step to take the prototype to production to support multiple users.

Step 5 - Support Operations - CERTPRO is a prototype. This is the next step to take the prototype to production to support multiple users.

Step 6 – Evaluate Performance – We are in the process of sharing the prototype with the Plano CERT team to get a sign off on the functional requirements.

Develop a design and list the materials you used in your design. Include technologies you used (e.g., scientific equipment, internet resources, computer programs, multimedia, etc.)

Core Technology Used:

- Mit App Inventor to build the applcation
- Mobile Technology such as Android based OS
- Location Based services such as GeoLocation
- Communication tools such as SMS and Tweet

List of Materials/Skills used in creating this prototype –

- MIT App Inventor
- Fluid UI
- Android Device
- Ability to understand Computer Logic

To design the user interface, logic design and the flow of the application we used several tools such as:

- Flow charts
- Image Design with UI
- Logic Tables

We learnt about some important software development concepts such as:

- Version Control
- Standardization for naming
    - Variables
    - Design Elements
    - Database Tables

- Screen Names
- Images

We created design documents to share our ideas within the team and with the CERT group.

Application Design

The following section outlines the User interface that was designed and the back end programming done to accomplish the prototype.

1. Login Page – Users can login as an administrator or as a general user. When a CERT member is selected as a Incident Commander in case of an emergency they can log in as an administrator and create the to do list. By logging in as available, CERT members are able to keep track of resources available to help. By logging in as unavailable, CERT members can be logged into the app and work on non deployment related activities such as Trivia.

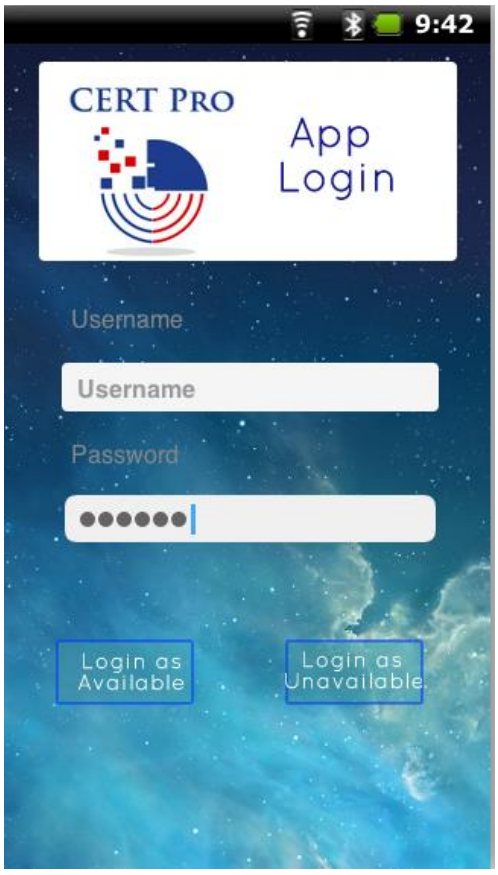


Fig 1 – Login Page

2. ***Finding other cert members location*** – We used Google fusion tables to show the current location of the CERT member, location of other CERT members logged into the system, and contact information of the CERT members. Since use of Maps is very intuitive by nature and mobile phones are very prevalent making use of location based services easy, this function requires little or no training.

Figure 2 – Location Screen.

3. ***Access to a list of people that can be contacted with*** – Figure 3a is the main communication page for the CERT users. This page provides a list of all cert members in that cert community and their contact information. When a certain contact is selected, this page takes the CERT member to Figure 3b, which is the contact page for an individual CERT. Here the CERT member can view that person's profile information and or communicate with via SMS or Twitter.

Figure 3a– All Contacts page

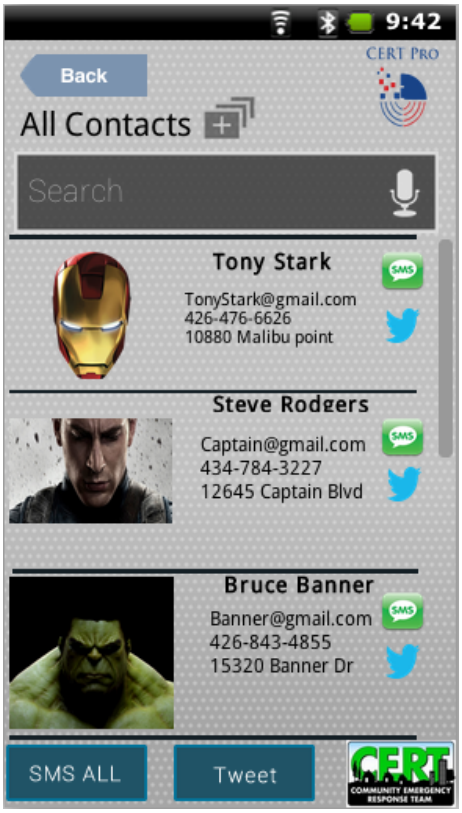
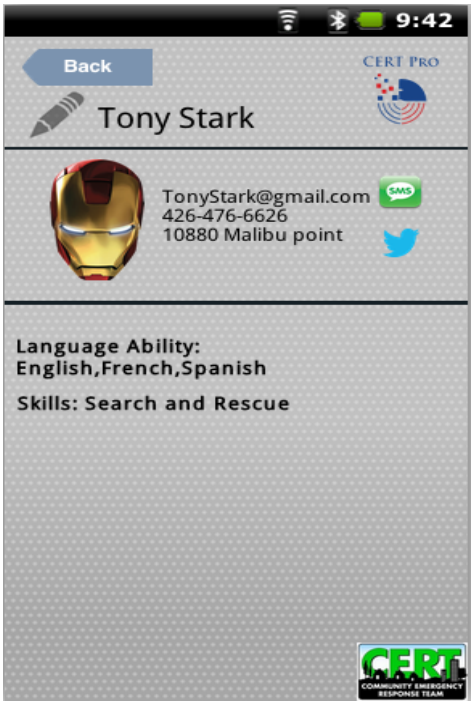


Figure 3b– One Contact page



4. ***Home page to view the general outline of the app*** – The profile of a CERT member consists of contact information, language ability and additional skills.The Home page also shows emergency alert message issued by the central office such as FEMA Twitter Alerts or Information from National Weather Service. Tasks that have been assigned to the CERT member are at the bottom of the page. The page serves as a gateway to the other pages. From here you can navigate to the four other parts of the app. The difference between the Admin home page and normal home page is that the Admin home page contains a create TO-DO button. It also lists CERT's available for assigned tasks.

Figure 4a– Admin Home Page

Figure 4b– Home Page

5. ***List to view tasks*** – This page provides a list of activities created by the Incident Commander (Using Figure 5a). An activity consists of; the name of the task, the names of the people assigned to it, the estimate on how long the job will take, and the criticality of the job. A Status is provided next to the activity. This page is only available to the user with the administrator privileges. It allows the individual assigned as the Incident Commander to create a To-Do list.

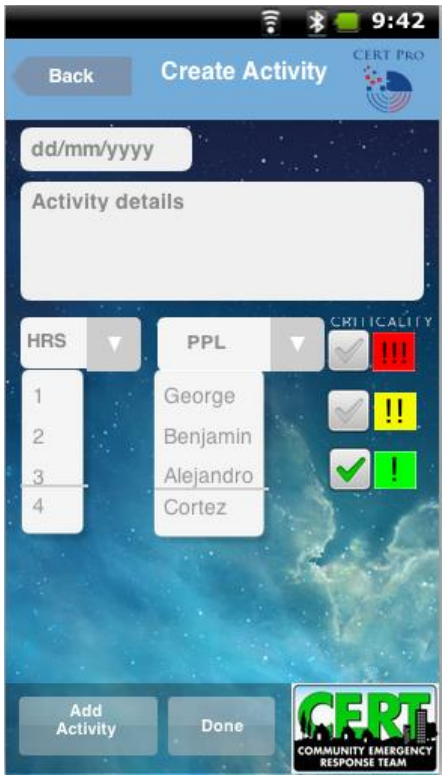


Figure 5a– To-Do list creator

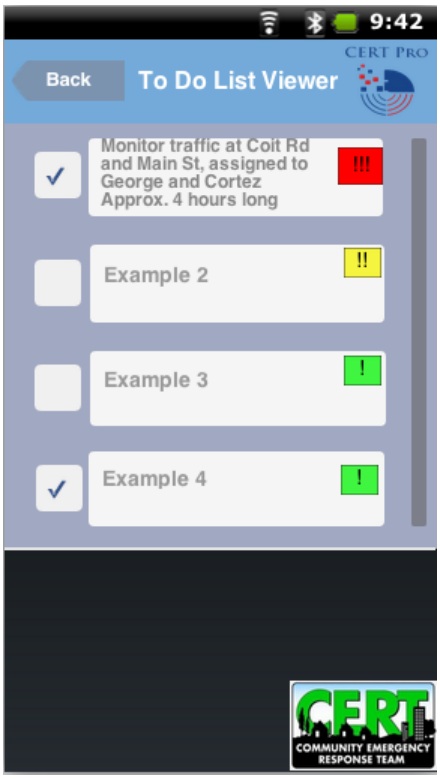


Figure 5a– To-Do list viewer

6. Training to keep in touch with skills – CERT members can play trivia games to keep in touch with their skills. Figure 6a allows a CERT Member to pick the topic they want to review. Figure 6b shows a sample of the type of questions. The page indicates the level reached by the individual member.

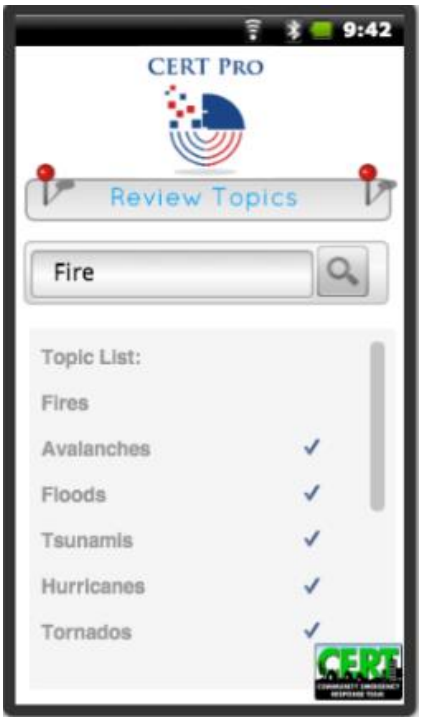


Figure 6a– Topic picker

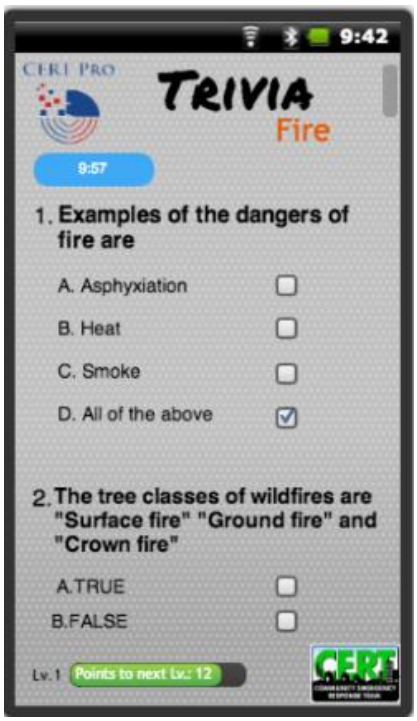
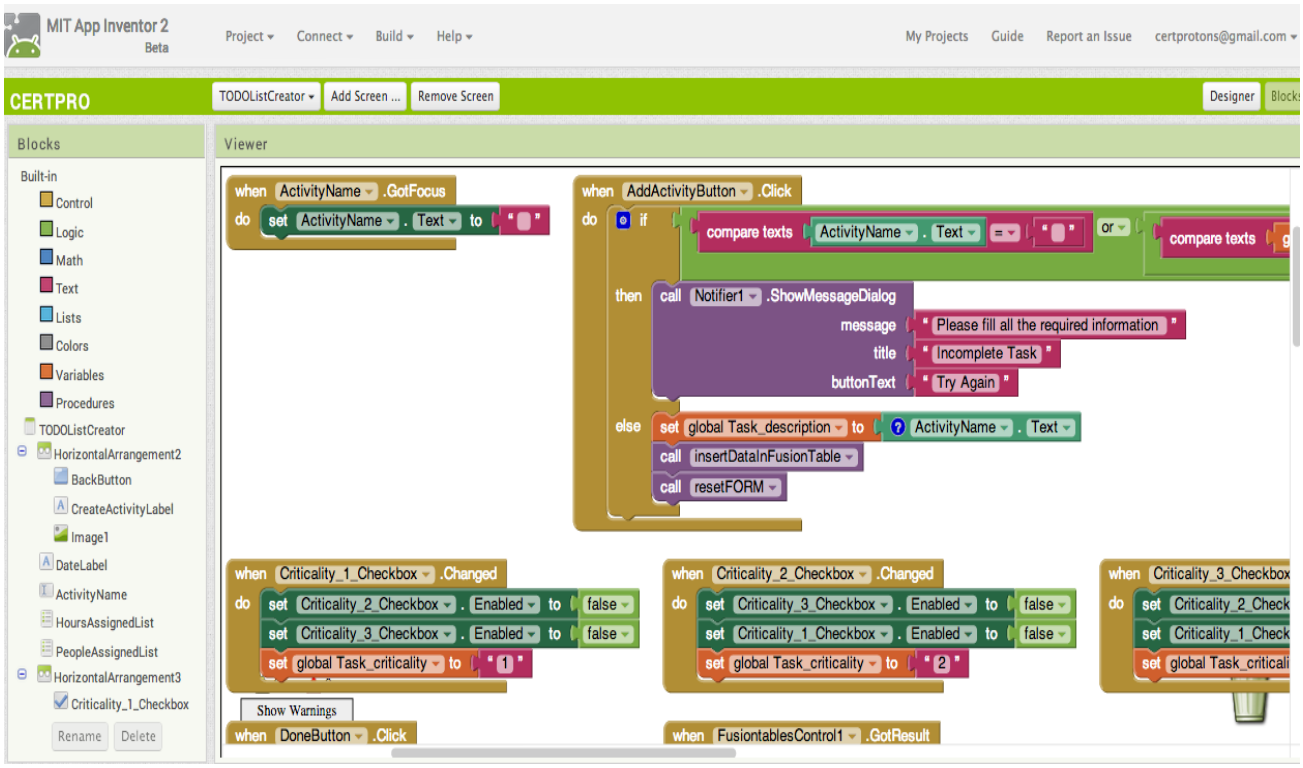


Figure 6b– Trivia quiz

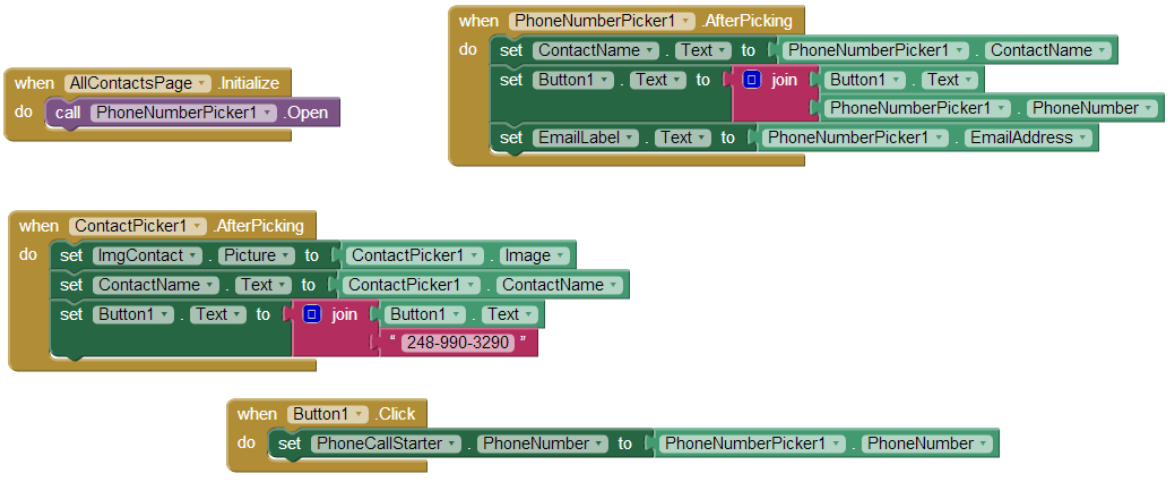
Back end Programing:

The back end programming for the MIT App Inventor is done using pre programmed blocks that are provided out of the box. The following figure is a snap shot of the Back End programming component.

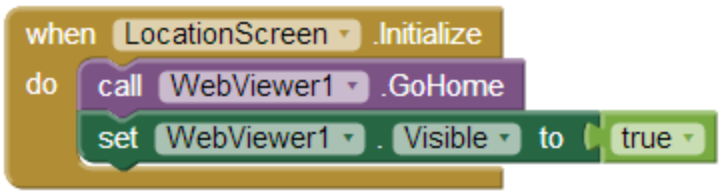


The following snapshots show the blocks of back end programming including conditional loops, use of databases, lists and other event driven programming for each of the pages-

AllContactsPage

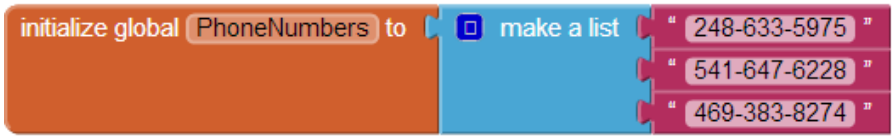


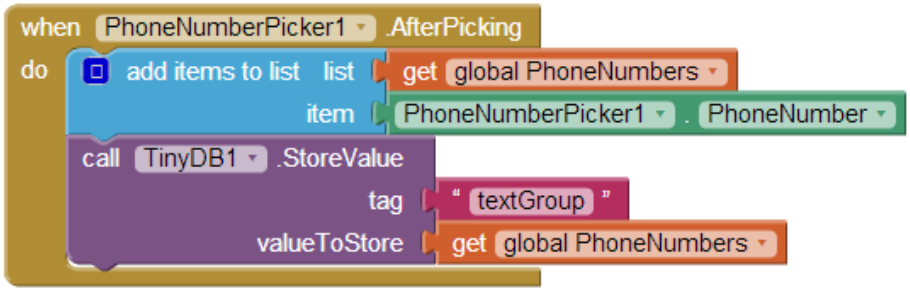
LocationScreen

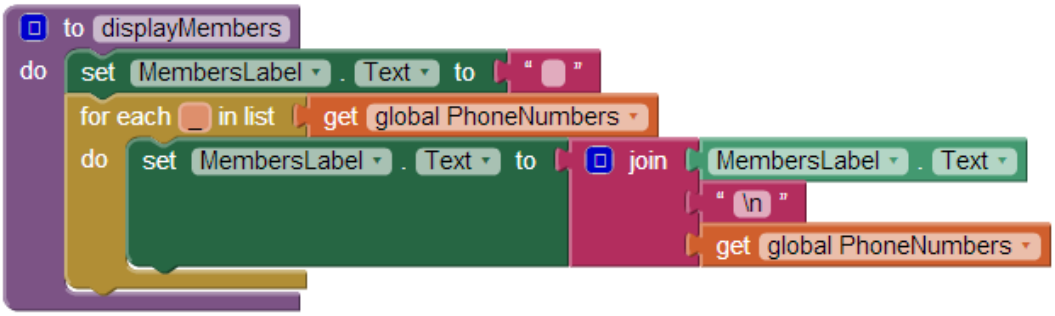

when LocationScreen .Initialize
do call WebViewer1 .GoHome
set WebViewer1 . Visible to true


when BackButton .Click
do open another screen screenName " Screen2 "

TextScreen

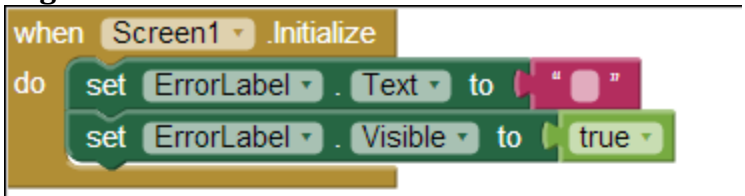

initialize global PhoneNumbers to make a list " 248-633-5975 " " 541-647-6228 " " 469-383-8274 "

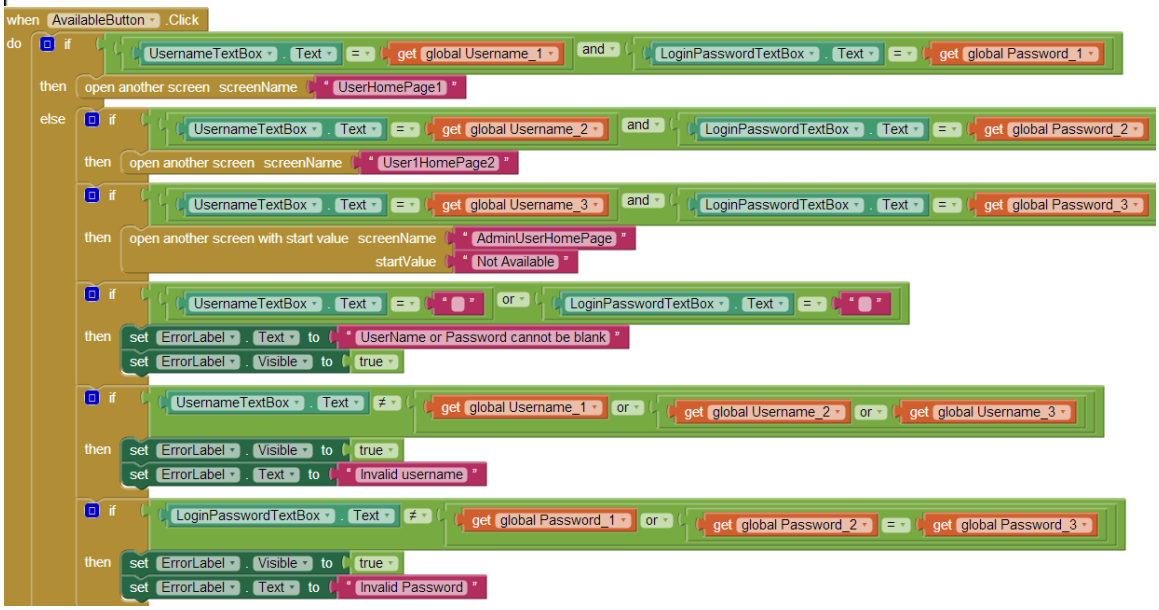

when PhoneNumberPicker1 .AfterPicking
do add items to list list get global PhoneNumbers
item PhoneNumberPicker1 . PhoneNumber
call TinyDB1 .StoreValue
tag " textGroup "
valueToStore get global PhoneNumbers


to displayMembers
do set MembersLabel . Text to " "
for each _ in list get global PhoneNumbers
do set MembersLabel . Text to join MembersLabel . Text
" \n "
get global PhoneNumbers

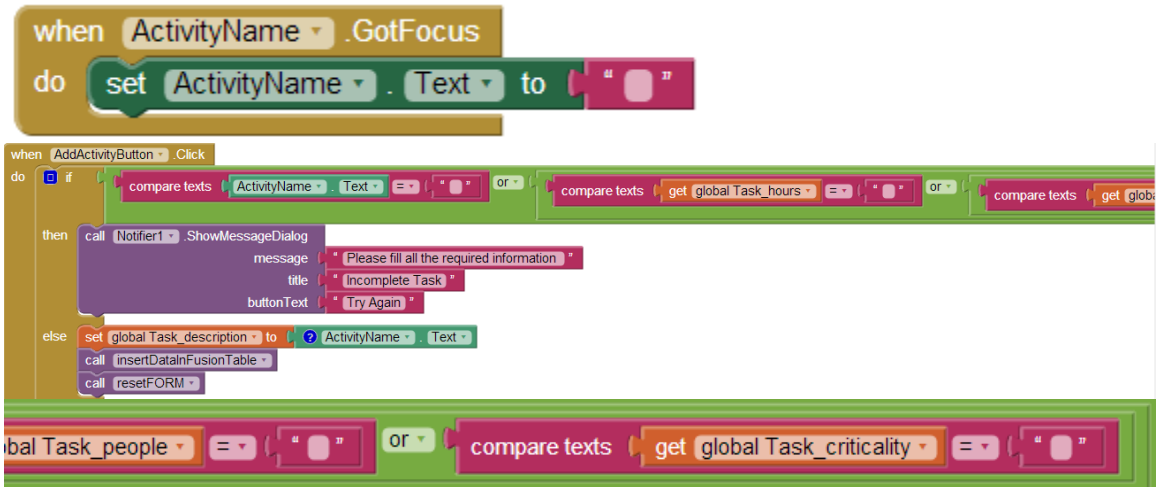

when ListPicker1 .BeforePicking
do set ListPicker1 . Elements to get global PhoneNumbers

LoginScreen

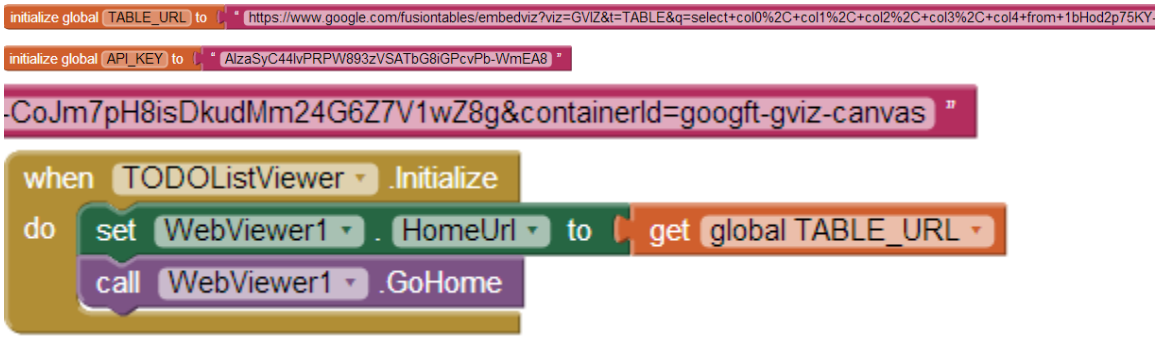




TODOListCreator



TODOListViewer



Some of the major Components used in the back end programming were –

WebViewer :
This component can be used to load a webpage/website into an app using *WebViewer* component. To do that, drag the *WebViewer*component to *a* window and set the *HomeUrl* property of the *WebViewer* to the webpage we want to view when the app boots up. This component was used extensively in the Location based pages as well as the pages where persisted information for the database needs to be viewed.

TinyDB: Used to store information on the phone for temporary use. We used this feature in the pages that used SMS and texting.

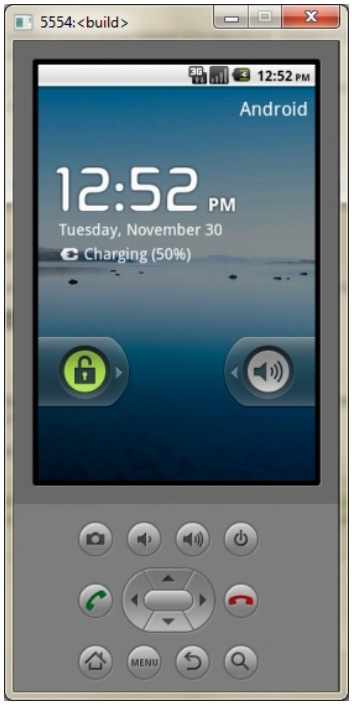
Google Fusion Tables –
Fusion Tables is an experimental data visualization web application to gather, visualize, and share larger data tables. We used these tables extensively in the Location based pages.

Test Prototype

Describe the data you collected and observed in your prototype testing.

We followed the usual software testing paradigm to test the prototype. The basic tests performed were –

1. **Unit Testing using the MIT Emulator -** The Emulator allows for testing of the individual screens on the Android phones. Performed by individual programmers.



Integration Testing using the AI2 Companion –
This tool allows for quick testing of the individual UI or backend components. Individual programs do this testing. To do the live testing, programmers need to install MIT App Inventor Companion app on an Android phone or tablet.

The process is as follows –

- Go to App Inventor and open a project (or create a new one).
- Then Choose "Connect" and "AI Companion" from the top menu.
- A dialog with a QR code will appear.
- On your device, launch the MIT App Companion app just as you would do any app. Then click the “Scan QR code” button and scan the code in the App Inventor window. Within a few seconds, you should see the app you are building on your device. It will update as you make changes to your design and blocks, a feature called “live testing”.

2. Functional Testing – This is the test when a group of screens are tested together as an application. Friends and family completed this test.
   We have created a simple user manual for the application to be used by the users to complete this testing.

3. Non-Functional Testing – This test has not been completed since we are still in the prototype stage.

4. User Acceptance Testing – The first of these has been completed as we shared CERTPRO prototype with the Plano CERT group. More of these needs to be completed once the final product is created.

5.

Analyze the data you collected and observed in your prototype testing. Does your data support or refute your design statement? Do not answer with yes or no. Explain your answer using 'Our data supports/refutes the design statement because...'

Our data supports the design statement because simply put the prototype works.

The unit testing and integration testing have indicated that the core functionality of the prototype is working well. The application supports our design principle of being easy to use, easy to navigate and intuitive user interface. Our successful

functional testing with non-experienced users shows that we have met the requirements in the design statement.

We are in the process of doing more elaborate User Acceptance testing. The first round of UAT has been completed with the prototype to give the users a sense of how the app will look and feel.

The non-functional testing and the final user acceptance testing will only be completed once we are in the production stage. CERTPRO is still a prototype that can be further improved.. This is a starting prototype that must pass through iterations of design before it is completed.

Explain any sources of error and how these could have affected your results (use of data tables, charts and/or graphs are encouraged)

There are many potential sources of error –

We have only tested the current application with 3 users. Once the application is scaled, we may find that the reources are contstrained.

We are leveraging Google Fusion Tables for the database persistance. This feature from Google is still in its infancy and there are some performance issues, which we hope will get resolved in time.

There are still some non functional screens that have static information to complete the prototype. These may potentially lead to some redesign when the information is displayed dynamically.

Drawing Conclusions

Interpret and evaluate your results and write a conclusion statement that includes the following: Describe what you would do if you wanted to retest or further test your design. Evaluate the usefulness of your prototype or model. What changes would you make to your prototype or model for the future, if any?

In conclusion, the prototype of a mobile application that will help CERT community – a.k.a CERTPRO works. All the functional criteria given to us by the client have been met. There is a smooth transition between the pages in the app. The app is easy to use.
We think this prototype can be further developed into a robust application that can be implemented across various CERT groups in the country.

In direct input from the customers for this prototype we have received very encouraging feedback. The customers acknowledge the need for such an application to increase the speed and efficiency of the process of disaster management.

If we were to redesign the application and retest it again, we would probably tackle the non-functional requirements also – specifically of security and stability of the application.

But all in all, we are very happy with the way the prototype turned out and so are the clients. Please read the following article in the local news paper for some of the comments from our clients –

http://starlocalmedia.com/planocourier/news/sixth-graders-develop-app-to-help-plano-first-responders/article_1f2c9192-903e-11e3-bcb2-0019bb2963f4.html

Benefit to the Community

How could your design help solve your problem and benefit your community?

Describe next steps for further research/design and how you have or how you could implement your solution in the future.

The **Community Emergency Response Team (CERT)** program educates citizens about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. Once the training is complete the CERT members can assist others in their neighborhood or workplace in case of a natural disaster. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community.

See the image below for the representation for the CERT groups across the country-

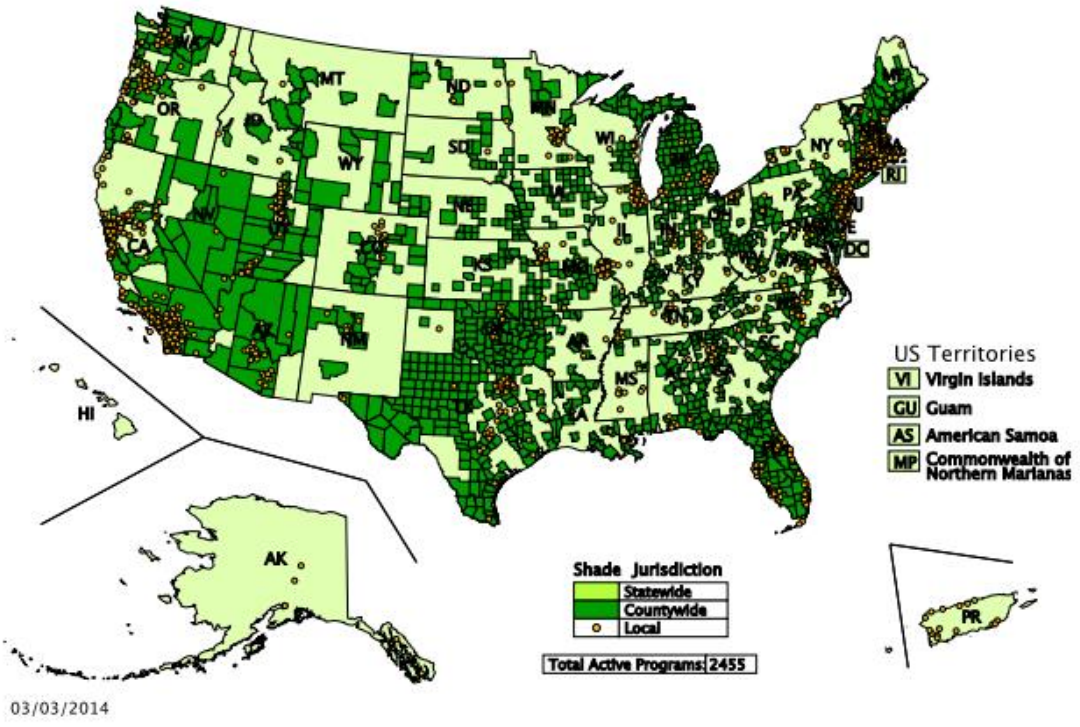


Image is a courtesy of http://www.vashonbeprepared.org/

What is the problem?

Today, there are over 2000 CERT groups in the country and there are over 130 of them in Texas alone. Today, are there are no mobile applications in the market to aid CERT groups to work in emergency and non-emergency situations.
One of the challenges the CERT group in our community faces is the lack of a dedicated tool that helps CERT members to communicate effectively, know each other's location and there is no way to share information such as pictures or map locations to allow for better allocation of resources. This leads to an ineffective allocation of CERT resources. Our team Protons became aware of this issue as we researched communications related issues facing first responders (our topic of choice) and came across CERT concept as part of our research. We reached out to the CERT group in our city and had discussions with them specifically about the challenges they face in terms of communication and how we could help.

What is our solution?

CERTPRO is the prototype for an Android based application that allows CERT (Community Emergency Response Team) members in our community to –

- Effectively communicate using SMS, Twitter and phone call. Contact can be made with individual members or a group Tweet or SMS can be sent.
- Know each other's location during deployment and allow for informed allocation of resources to help during emergency deployments.
- Allow Incident Commanders to create a to do list on the spot based on the situation and allocate resources based on location and expertise.

- The application also allows for CERT members to review their training material to allow them to keep the knowledge fresh while in a non-emergency situation.
- Allow members to view profile information of other CERT members such as language skills and certification which allows for an informed allocation of resources.

Some key features of CERTPRO are that it has low training period and should be easy to learn since CERT members can be from very different training backgrounds. The product should be intuitive to use based on everyday phone use. All these features are in line with what good product design is supposed to be. CERTPRO is based on the above principles.

Trivia Page
- Lets users improve on their knowledge

Profile Page
- Lets users post their skills and information

To-do list
- Lets users keep track of their tasks

Map
- Lets users locate each other

Login Page
- Lets only CERTS use the app

Contacts page
- Lets the users view profile of other CERT members

Future Enhancement

We have some great ideas on how we can further enhance the product further. We plan to

- Make CERTPRO available on all different types of mobile OS such as iOS, Android and Windows.
- Additional Functionality -
    - Provide detailed training material to C.E.R.T members at disaster sites.
    - Send images of disaster sites to first responders so that they know what to expect upon arriving at the site.
    - Keep track of each member's training and provide information on available and updated training.
    - The app would have to be secure so that any misuse can be prevented.

CERT PRO

TEAM PROTONS PRESENT CERTPRO

ECYBERMISSION 2015

TEAM COLLABORATION

HOW DID WE COME UP WITH THE IDEA?

Research Ideas

Team Work

Brain Storming Sessions

Our IDEA

Share with experts

We worked together as a team, listened to each others ideas and stayed focused.

PROBLEM STATEMENT

Natural disasters are unavoidable

Effectively managing information and resources can minimize damages and save lives

C.E.R.T members in our community lacks a dedicated tool to effectively communicate, know each other's location during deployment and allow for informed allocation of resources

What is (Community Emergency Response Team) C.E.R.T?

- C.E.R.T's are citizens who have been trained by the local police, fire and EMT and can assist others in their neighborhood following an event when professional responders are not immediately available to help
- There are over 2200 registered C.E.R.T groups in the US

SOLUTION PROPOSED – ANDROID BASED MOBILE APPLICATION

Allows members to
- Login and mark their availability
- Geo locate other C.E.R.T members

- View member contact, skills and language capabilities
- Contact other members individually or as a group via SMS & Twitter

- Review Training material
- Play trivia games on the training material
- Earn points based on time and accuracy

- Incident commanders can assign work to resources based on location and expertise
- C.E.R.T members can view work assigned
- Update status upon task completion

CERTPRO enables C.E.R.T group by providing powerful communication tools and map based resources to allow for operational efficiency before and during an emergency deployment.

CORE TECHNOLOGY USED

MIT App Inventor TEACH

MIT App Inventor

CERT PRO

Mobile Technology

Location Based Services

SMS

Communication Tools

MARKET RESEARCH

- **Commercial Apps** such as Foursquare, Facebook Places for check-in functionality.
- **Federal Apps** such as FEMA, American Red Cross, NIMS ICS, NFPA 2010.[1]
- Open Source Apps such as Google Crisis Maps, SAHANA Foss
- **C.E.R.T focused Apps** – none on the market today. DeployPRO[2] has launch dates in 2014.

1. http://blog.missionmode.com/blog/15-disaster-and-crisis-apps-for-iphone-and-ipad.htm
2. http://deploypro.net/

SOFWARE DEVELOPMENT PROCESS

We talked to FEMA and C.E.R.T members in Plano to find out their requirements.

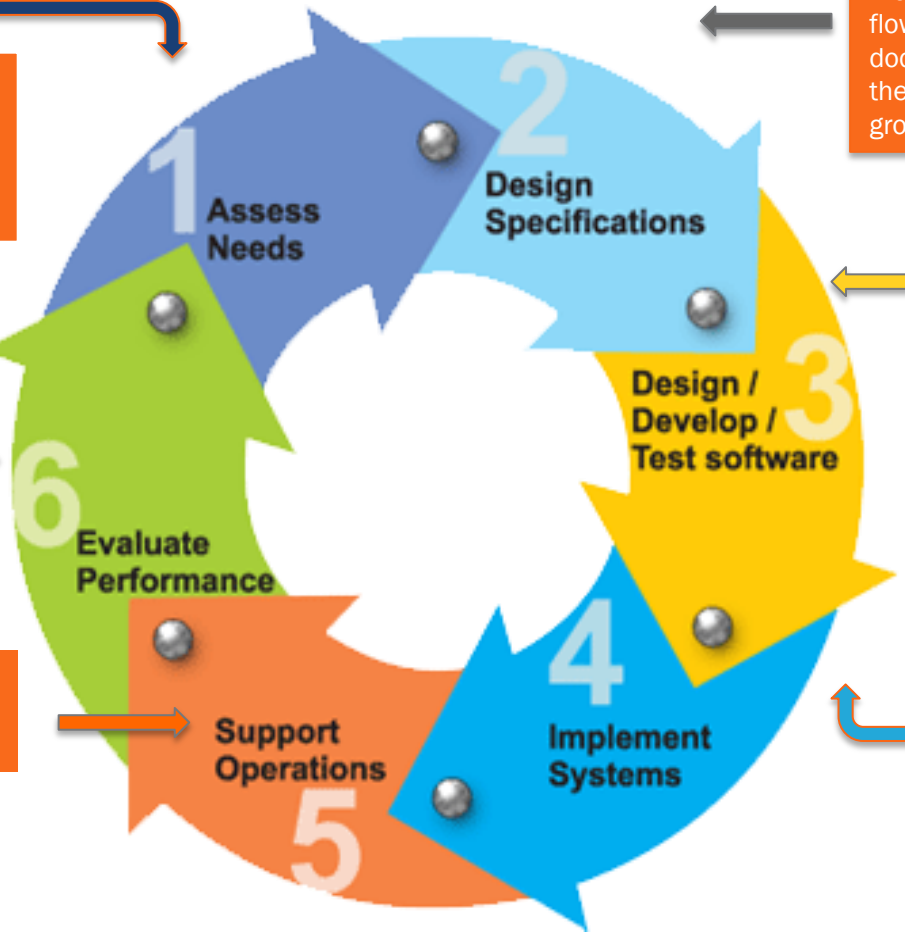
We created logic trees, flowcharts, and design documents to share within the team and with C.E.R.T group

We designed mock up screens on FluidUI . We programmed the the app using MIT App Inventor. We tested the software on Android phones using MIT AI Companion

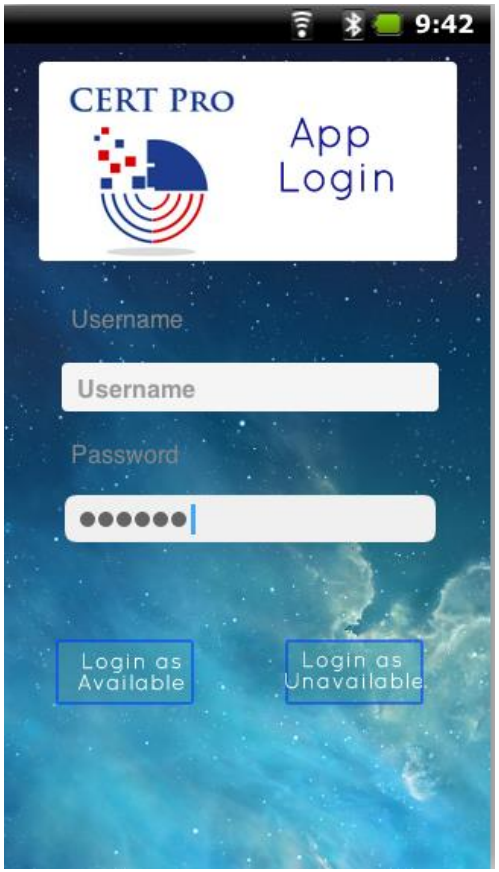
CERTPRO is a prototype. This is the next step

We will reach out to the C.E.R.T members to get their

CERTPRO is a prototype. This is the next step



SOLUTION DESIGN – LOGIN SCREEN



- Users can login as an administrator or as a general user
- When a C.E.R.T member is selected as a Incident Commander in case of an emergency – they can log in as an administrator and create the to do list
- By logging in as available, C.E.R.T groups are able to keep track of resources available to help
- By logging in as unavailable, C.E.R.T members can be logged into the app and work on non deployment related activities such as Trivia
- The UI is well defined and easy to use

SOLUTION DESIGN – HOME SCREENS

The profile of a C.E.R.T member consists of

- contact information,
- language ability and
- additional skills.

The Home page also shows

- emergency alert message issued by the central office.
- FEMA Twitter Alerts
- Information from National Weather Service
- tasks that have been assigned to you at the bottom of the page.

The page serves as a gateway to the other pages.

The Admin home page –

- contains a create TO-DO button
- lists C.E.R.T's available for assigned tasks.

SOLUTION DESIGN – LOCATION SCREENS

This page uses Google fusion tables to show

- the current location of the CERT member
- location of other CERT members logged into the system.
- contact information of the CERT members.

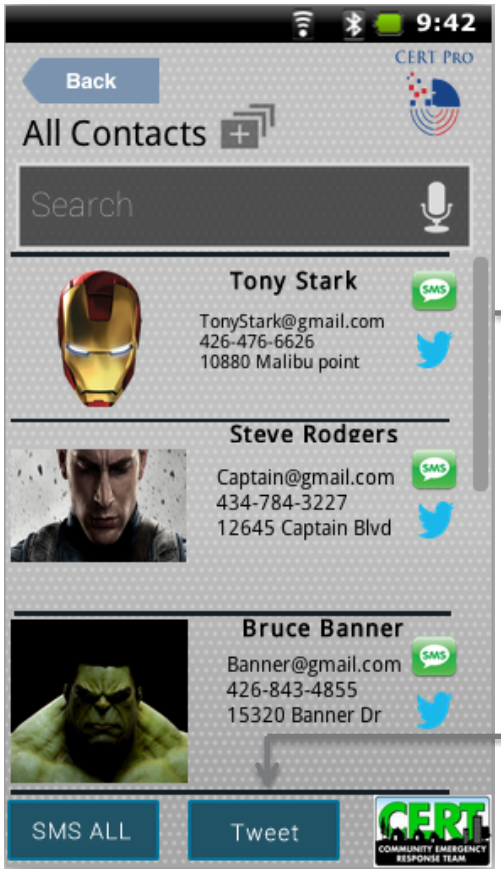
Use of Maps is very intuitive by nature.

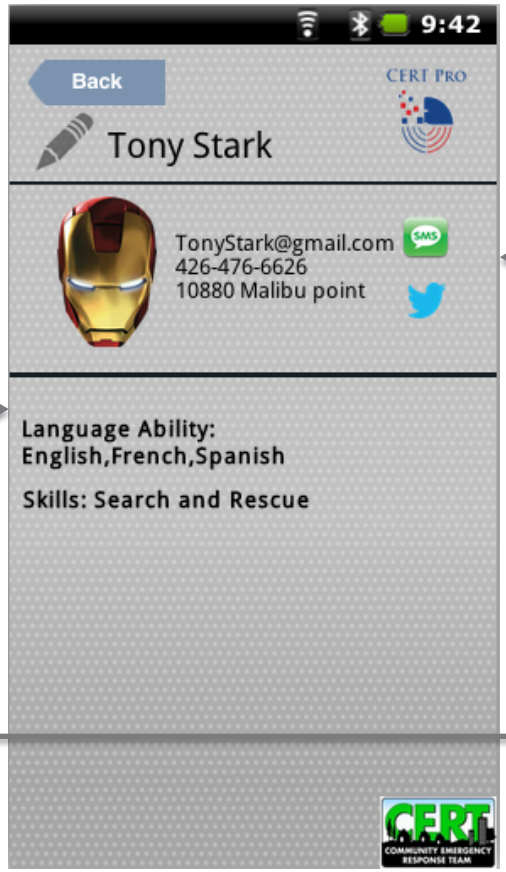
Mobile Phones are very prevalent making use of location based services easy

Little or no training required.

C.E.R.T members with wide range of technical skills can use the application.

SOLUTION DESIGN – CONTACTS SCREEN





This page is the main communication page for the C.E.R.T users.

From this page an individual member or the entire group can be contacted via SMS or Tweet.

SOLUTION DESIGN – ACTIVITY PAGES

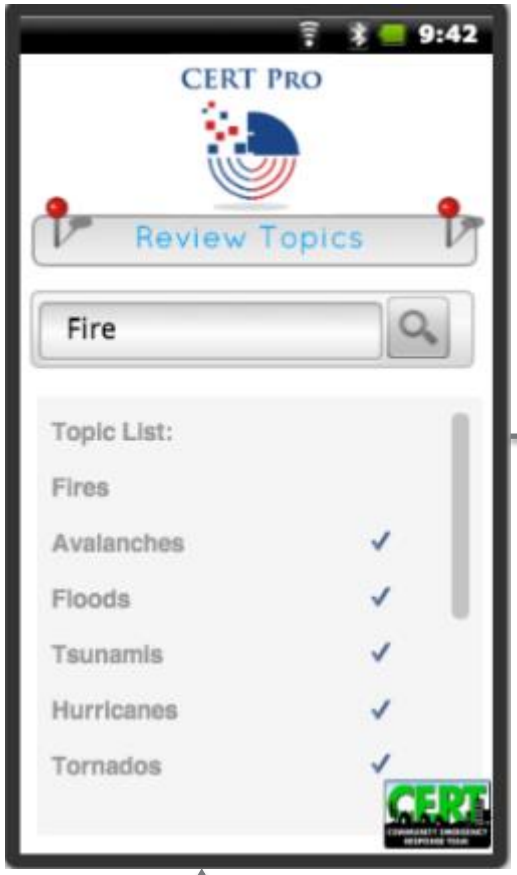
This page provides a list of activities created by the Incident Commander.
An activity consists of

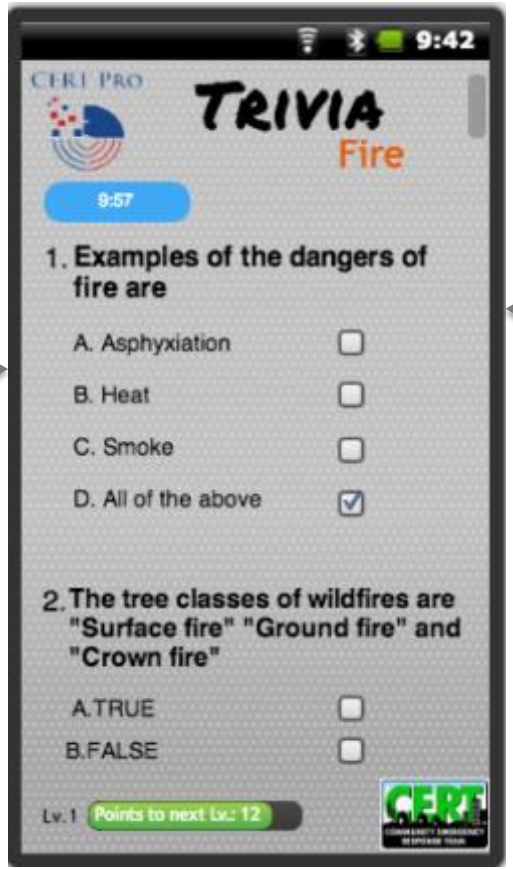
- name of the task,
- the names of the people assigned to it
- the estimate on how long the job will take and the
- criticality of the job.

A Status is provided next the activity

This page is only available to the user with the administrator privileges. It allows the individual assigned as the Incident Commander to create a to do list.

SOLUTION DESIGN – TRIVIA SCREENS





- This page shows a sample of the type of questions. The page indicates the level reached by the individual member.
- This page allows a CERT Member to pick the topic they want to review.

SOLUTION DESIGN

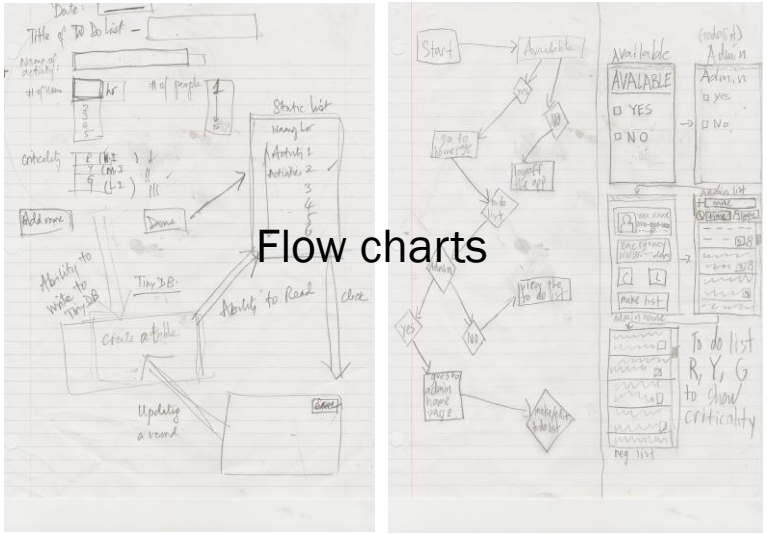
To design the user interface, logic design And the flow of the application we used several tools such as

- Flow charts
- Image Design with UI
- Logic Tables

We learnt about some important software development concepts such as

- Version Control
- Standardization for naming
  - Variables
  - Design Elements
  - Database Tables
  - Screen Names
  - Images

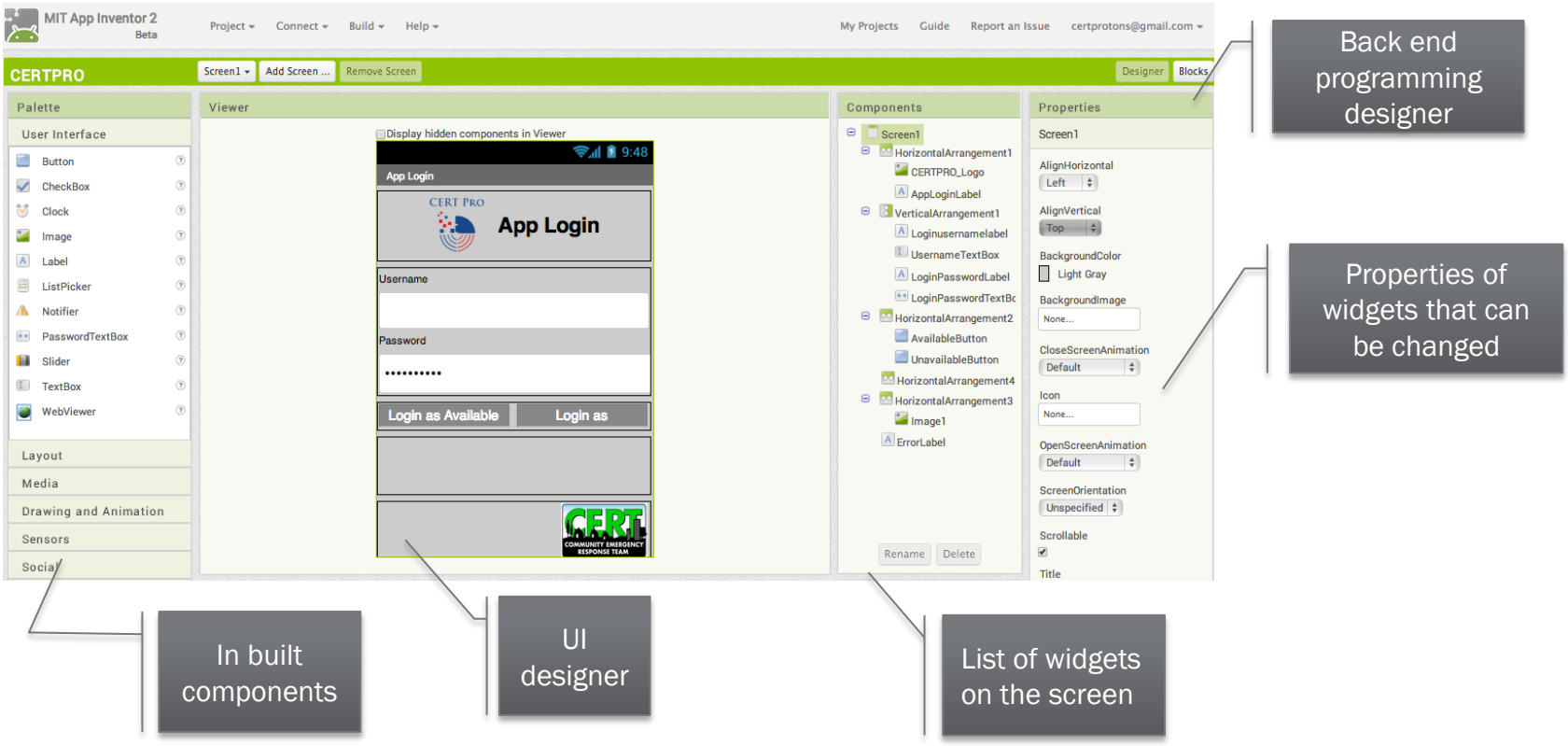
We created design documents to share our ideas within the team and with the C.E.R.T group.



Username	Password	Output
correct	correct	Homepage reached
correct	incorrect	error
correct	blank	error
incorrect	correct	error
incorrect	incorrect	error
incorrect	blank	error
blank	correct	error
blank	incorrect	error
blank	blank	error

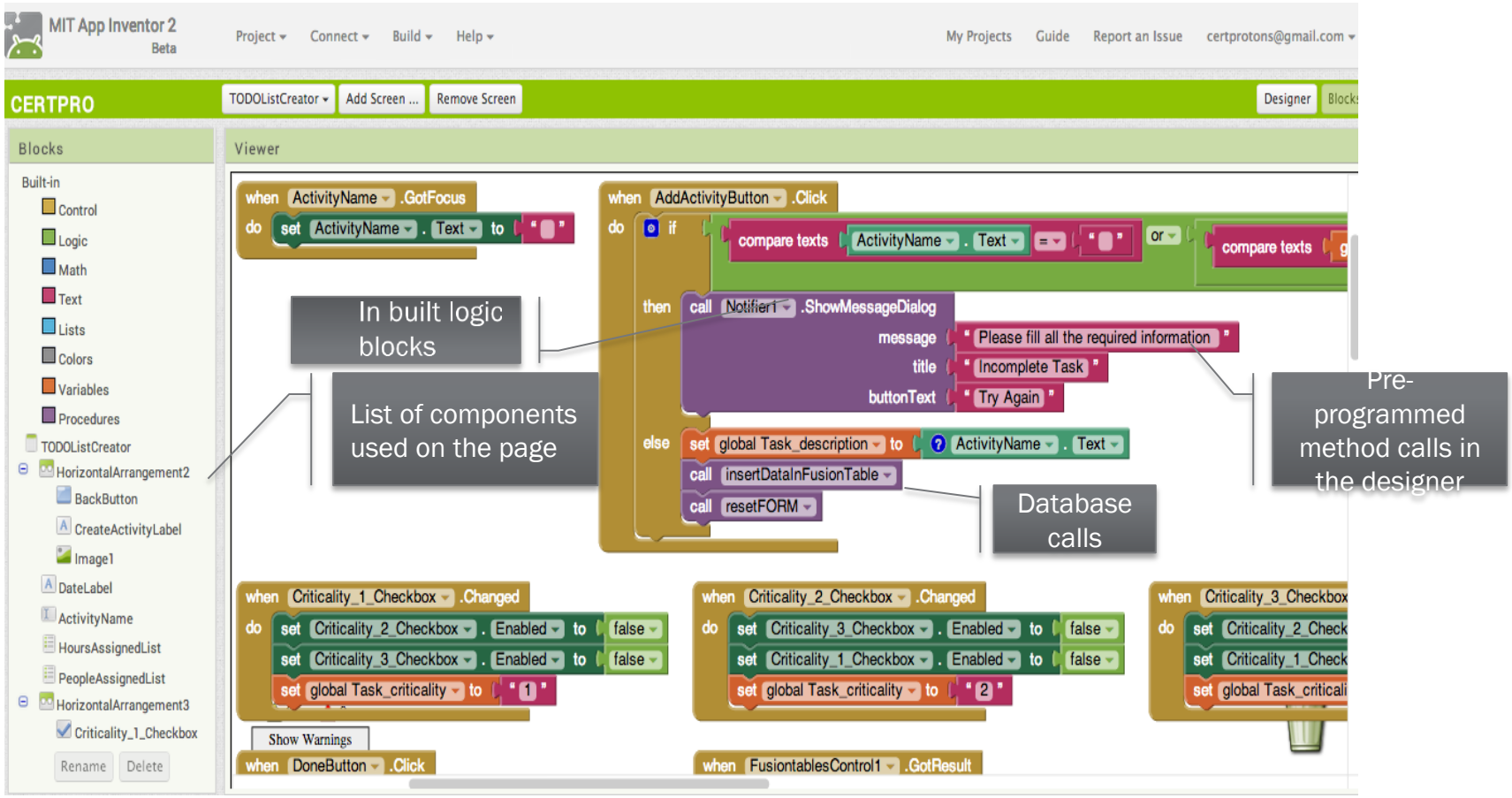
Logic Table to enable user testing

IMPLEMENTATION USING MIT APP INVENTOR



App Inventor is an open-source web application maintained by MIT that allows non-experienced programmers to create mobile applications

BACK END PROGRAMMING USING MIT APP INVENTOR



TESTING PROCESS

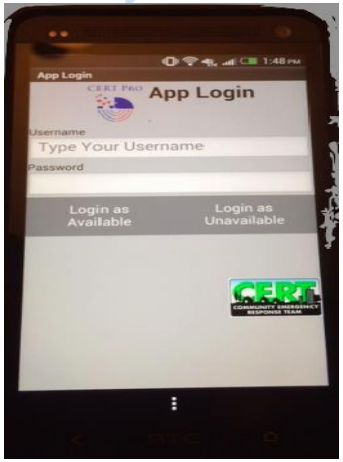
Unit MIT Emulator

Allows for quick testing of the individual UI or backend components. Performed by individual programmers

Integration AI Companion

Allows for testing of the individual screens on the Android phones. Performed by individual programmers

Functional Download on the Android Phone



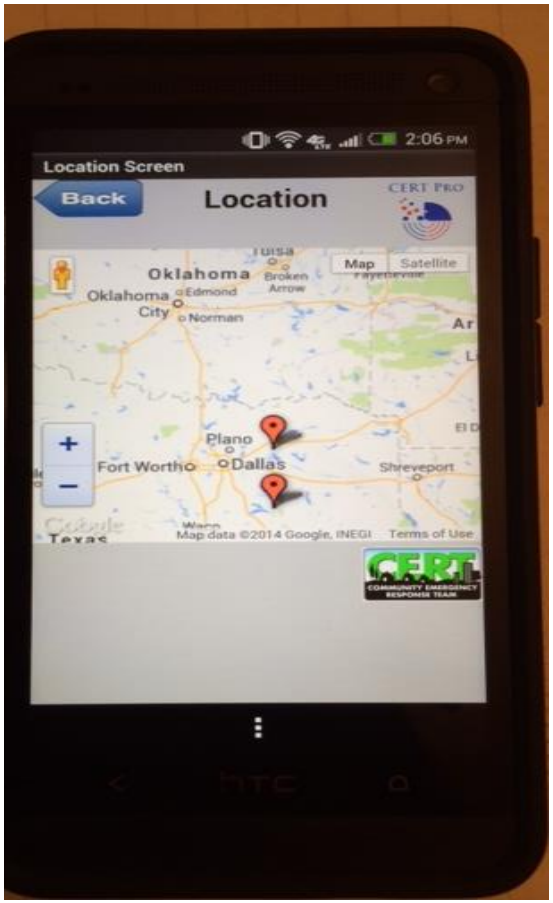
Test a group of screens together as an application. This was completed by friends and family

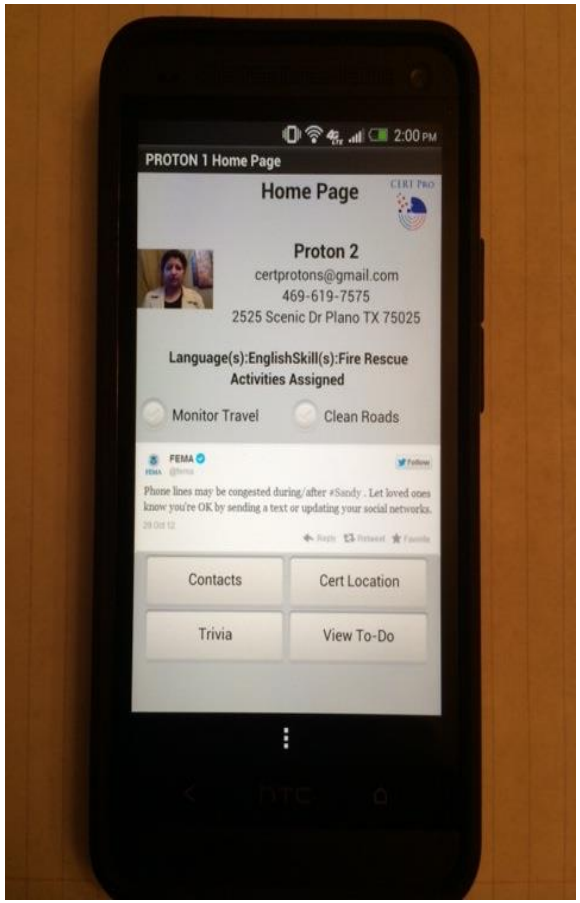
Non Functional Not Yet Completed

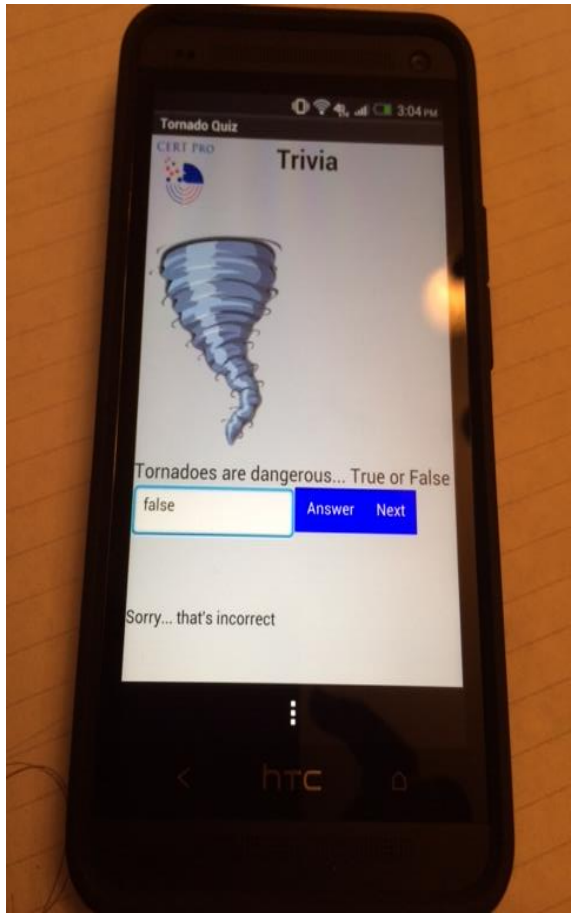
User Acceptance Not Yet Completed

To be Completed

PROTOTYPE







These are snapshots of the working prototype of CERTPRO on an HTC Android Phone

FUTURE WORK

- Make CERTPRO available on all different types of mobile OS such as iOS, Android and Windows.
- Additional Functionality -
  - Provide detailed training material to C.E.R.T members at disaster sites.
  - Send images of disaster sites to first responders so that they know what to expect upon arriving at the site.
  - Keep track of each member's training and provide information on available and updated training.
  - The app would have to be secure so that any misuse can be prevented.
- CERTPRO is a prototype of the application. We need professional help to make this product available in the market

SUMMARY

- CERTPRO is the prototype for an Android based application that allows C.E.R.T members in our community to effectively communicate, know each other's location during deployment and allow for informed allocation of resources
- CERTPRO prototype was created using MIT App Inventor a cloud based open source framework that helps non programmers learn to create mobile app
- There are currently no mobile applications in the market that assist the C.E.R.T members
- We believe that there is a market for this product. There are over 2290 C.E.R.T groups in the US
- CERTPRO is our team's vision to contribute to our community. Grant money will help us realize the vision

eCYBERMISSION Survey Approval Form

eCYBERMISSION team name: Team Protons

Team Advisor name: Shri Chander

Team Advisor email: shri.chander@gmail.com

Team Advisor phone: 248-990-3290

Student usernames: txprotons1, ecyber13, lions17

School name: Academic Center of Science

School address: 13435 Clifton Drive, Frisco, TX - 75035

Describe the survey your team will conduct:

Present the product to the CERT (Community Emergency Response Team) at the City of Plano. The survery will ask the users to rate the features of the product and the useability of the product.

Describe the participants you plan to distribute your survey to:

CERT (Community Emergency Response Team) members at the City of Plano

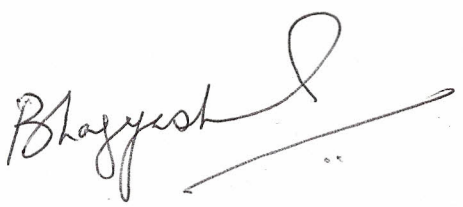
Project approved by school administration?

☑ Yes ☐ No

Approved by: Bhagyashri Chander

Title: Founder - Academic Center

Date approved: 09/15/14

Signature, School Administrator: 

*Please save form and upload to your team's Mission Folder.