

# Cal Poly WOW: Week of Welcome's Leader Android Application

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# I. ABSTRACT

The Week of Welcome Android application aims to improve the efficiency and ease at which Orientation Leaders function during the week long program designed to aid in new student assimilation to the San Luis Obispo campus and community. It focuses on four utilities combined in one easy location that Leaders use on a regular basis. They are maps, the online guidebook, budget keeper, and contact list. These four utilities are commonly used by Leaders in their day to day guidance of new students, making one single application with each tool very desirable to the WOW Program.

Currently there are no alternatives for Orientation Leaders at Cal Poly to use, except the possibility of utilizing four individual applications available either through the Android market or the internet. The origin of this project comes from many years of personal involvement in almost every aspect of the Program, from new student to Executive Board as well as the input from many current participants.

The initial functionality of the WOW Application comes from four of the top needed utilities asked for by Orientation Leaders throughout the years. Because of time constraints, not every need can be serviced through this application. Instead, the goal was to get a start on a continuously growing WOW application that would keep improving the functionality of Leaders as they guide incoming freshman. After selecting the functions this project will aim to complete, the next step involves the implementation of the code required to accomplish these four tasks. This code will be broken up into four smaller programs that the main program will call when each is selected.

Lastly, testing becomes a major factor in judging the success rate of the application. The tests will be administered to a select group of individuals that will directly relate to the needs serviced with this utility. Getting feedback from these users generates the next steps to producing the “perfect” WOW utility app.

## II. INTRODUCTION

This report covers every aspect of creating the Week of Welcome Android Application for Cal Poly's Computer Engineering Senior Project, created by Eric Cerney. The overseeing advisor for this project was Dr. Hugh Smith, Computer Engineering Director during both Winter and Spring Quarter, 2011. The report follows the general flow of events that occurred from start to finish in completing the described Android Application. This includes research, design process, implementation, testing, pitfalls, future designs, etc.

### INTRODUCTION TO WOW

California Polytechnic State University's Week of Welcome Program is well known throughout one of the nation's largest Orientation Programs. The program consists of many tiers of volunteer workers with the one goal of producing the most beneficial week of acclimating new students to Cal Poly's campus as well as its community. The structure for the program is as follows.

- Professional Staff: 2 full time employees hired to oversee every stage of planning.
- Executive Board: 6-7 students selected by the Professional Staff to serve for one entire year planning each event and the training of everyone below them in the tier.
- Team: 50-60 students selected by the Executive Board to serve both Winter and Spring Quarter as a trainers of the Orientation Leaders below.
- Orientation Leaders: 600-800 students selected by Team during Spring Quarter to guide the new students in the Fall.
- WOWies: Over 4000 new students placed into groups of around 15 assigned to 2 Orientation Leaders the week before school starts to better acclimate them to their new location.

### PROBLEM SUMMARY

Orientation Leaders utilize many tools while leading their WOWies, but do not have an official utility to aid them. The Android device is used by a large fraction of the Leaders, creating a perfect platform to test the usefulness of such a niche utility.

Leaders are constantly traveling around the city and nearby areas, but are also relatively new to San Luis Obispo. This means that they often rely heavily on maps located on their smart phones. Another commonly accessed item is the WOW Online Guidebook. This utility is the complete guide to each aspect of The Week giving them answers to almost all situations that arise. Currently this is accessed by going to the WOW Website to view each document. The WOW application aims to have the same functionality Google Maps and the website have to offer, but in one centrally located application for faster access.

Utilities that aren't easily accessible to Leaders are the ability to add all of their WOWie's contact information and budget for The Week digitally. These two functions will also be located in the same

application as the two online resources listed previously, completing the one-stop-shop Week of Welcome Application to be utilized by all Orientation Leaders with an Android device.

## **OBJECTIVES**

The mobile industry has advanced so far in the past decade that most smart phone users rely heavily on their device to function in their day to day lives. This fact leads to many companies offering their services on mobile devices because they know it will expand their products use. The Week of Welcome Application will be WOW's equivalent to providing its users with utilities that will better their experience which will in turn produce a better experience to the new students attending Cal Poly.

Because the style guides for the Android device are much less defined than with the iPhone, each Android application has a very different feel and a slight learning curve on what each component should do within your function. Because of that fact, the WOW application should be very self explanatory and not take the users any time at all to figure out. The point of this app is to save Leaders time and hassle during their Orientation Week, not add to their stress.

### III. ANDROID BACKGROUND

This Section will go over both the technologies used by Android and those of the highest competitor, Apple’s iPhone. Comparing both technologies and the circumstances at the time of the project give reasoning behind selecting the Android platform over other competitors.

#### OVERVIEW

The Android device platform is a relatively new and fast expanding Linux based operating system stack specializing in devices with limited memory and processor resources. The libraries that are supplied in the SDK support many features further discussed in Component Features below. The applications can be written in Java on the Dalvik VM that attempts to optimize memory, processor speed and power (Hashimi).

Google purchased the newly created Android Company in 2005 and had its first official device based on the Android platform released in 2007 by T-mobile. Since then, Android has continued to spread to many different device producers around the world.

The main difference between Android and its main competitor, Apple’s iPhone, is the freedom it allows its users. On Android, users are able to choose which components they want to utilize, not locking them into using the native applications provided at purchase. Google has a very open and free mindset in regards to its products and what access it gives to its users and developers. This was a very new concept in the mobile world, leading to the innovation of many revolutionary 3<sup>rd</sup> party apps.

#### COMPONENT FEATURES

The following section lists the main features and relevant factors for the Android Device to this project.

##### Main Features

This is a list of the current main features that Android offers according to the Android Operating System described on Wikipedia. These features were also cross checked with the Android Developer site to prove accuracy.

| SDK Support                  | Hardware Support           |
|------------------------------|----------------------------|
| Android API libraries        | 3G                         |
| Application framework        | Accelerometers             |
| Customizable Device Emulator | Bluetooth                  |
| Debugger                     | EDGE                       |
| Java core libraries          | GPS/Compass                |
| Memory/Performance profiling | Gyroscopes                 |
| Multitasking                 | Magnetometers              |
| OpenGL ES 3D graphics API    | Proximity/Pressure sensors |
| SQLite database              | Touch screens              |
|                              | Video/Still cameras        |
|                              | WiFi                       |

Table III - 1. Android Features

## Relevant Factors

Table III - 2 below lists the features that were the most relevant in the comparison between Android and its main competitor, iPhone.

### Android Factors

|                      |                         |
|----------------------|-------------------------|
| Programming Language | Java                    |
| Development Fees     | \$25 onetime fee        |
| Programming Hardware | Mac OS X / Windows      |
| SDK Fees             | Free                    |
| Market Fees          | 30% of profit to Google |

Table III - 2. Android Factors

## COMPETITORS

The following section lists the main features and relevant factors for the Android Device to this project.

### Main Competitor

Apple's iPhone currently stands as Google's largest growing competitor, especially in the United States. Within the scope of this project and the tools available, the iPhone will be used as the only other alternative to an Android device. According to ComScore, the following chart represents recent cellular subscribers in the U.S.

|   | Share (%) of Smartphone Subscribers |        |              |
|---|-------------------------------------|--------|--------------|
|   | Sep-10                              | Dec-10 | Point Change |
| <b>Top Smartphone Platforms</b><br>3 Month Avg. Ending Dec. 2010 vs. 3 Month Avg. Ending Sep. 2010<br>Total U.S. Smartphone Subscribers Ages 13+<br>Source: comScore MobiLens |                                     |        |              |
| <i>Total Smartphone Subscribers</i>   | 100.0%                              | 100.0% | N/A          |
| RIM   | 37.3%                               | 31.6%  | -5.7         |
| Google  | 21.4%                               | 28.7%  | 7.3          |
| Apple   | 24.3%                               | 25.0%  | 0.7          |
| Microsoft   | 9.9%                                | 8.4%   | -1.5         |
| Palm  | 4.2%                                | 3.7%   | -0.5         |

Table III - 3. Smartphone Distribution



**Relevant Factors**

Table III-4 below lists the features that were the most relevant in the comparison between Android and its main competitor, iPhone.

**iPhone Factors**

|                      |                        |
|----------------------|------------------------|
| Programming Language | Objective C            |
| Development Fees     | \$99 per year          |
| Programming Hardware | Mac OS X               |
| SDK Fees             | Free                   |
| Market Fees          | 30% of profit to Apple |

Table III - 4. iPhone Factors

**POSITIVES VS NEGATIVES**

At the start of this project, Android seemed like the best approach due to the resources readily available to me. A list of pros vs. cons created during the planning stages of the project can be seen in Figure Table III-5 below along with an explanation of the relevant key factors.

| Android Device              |                    | iPhone                           |                           |
|-----------------------------|--------------------|----------------------------------|---------------------------|
| Pros                        | Cons               | Pros                             | Cons                      |
| Language - Java             | Do not own device* | Own an iPhone                    | Language – Objective C    |
| Have taken an Android Class | Debugger           | Developer tools- Xcode, Debugger | Do not own an OS X system |
| \$25 flat developer fee     |                    |                                  | \$99/year developer fee   |
| Faster growing market       |                    |                                  |                           |
|                             |                    |                                  |                           |

Table III - 5. Pros vs. Cons

\*Devices are readily available for the Android Platform with request to Dr. Janzen at Cal Poly

Four years of owning an iPhone makes the idea of producing an application for this platform much more desirable, under the right conditions. In order to feel comfortable creating apps for a certain device, you have to have some familiarity with its functions and capabilities to best cater its users. The timing and conditions at the time of this projects proposal, however, led to creating a program based on hardware I had readily available and a programming language I was much more familiar with.

The main factor in making the decision to use Android stemmed from the opportunity to learn more about one leader of the app market rather than spreading myself too thin. At the time of the project proposal, I had recently enrolled in the Android Class at Cal Poly. Because I was taking a formal class for the platform, I decided to temporarily hold back iPhone development to further my understanding in one before the other.

Using Table III-5 and the reasoning listed above made choosing the Android platform a much better choice considering the time constraints, costs, and resources available to me.

## IV. REQUIREMENTS

The requirements listed below describe the minimum specifications to produce a successful Week of Welcome Application that meets the project's objectives.

### APPLICATION SPECIFIC

#### App Name

This Android project will have the name "Cal Poly WOW" because the Week of Welcome program is very well known under this name throughout the country as our Orientation Program. Anything longer would not have an appealing look, while anything less could get confused with a general Cal Poly App or one aimed towards World of Warcraft.

#### App Price

Once released into the market, Cal Poly WOW will cost users nothing to use. The whole purpose of this app is to aid Leaders through their Orientation Week and not to make a profit.

#### Target Platform

Because of device availability and familiarity, this application will be targeted from Android 1.6 and on. This gives the project a slight disadvantage to many of the classes available in newer versions, but also means that the app can target the majority of users.

#### Target Audience

This specific utility is designed to aid Week of Welcome Orientation Leaders specifically. There will always be room to expand the utility to the training of Leaders and Team members or to benefit new incoming students.

### FUNCTIONALITY

#### Access Online Guidebook

With an available internet source, either through WiFi or cellular network, the application will access WOW's online guidebook for user reference.

#### Add Contacts to One List

The application will be able to access the users contact list to add each of the contacts to a common list for easy access.

#### Call Contacts on List

From the application, users will be able to select a contact and call them directly rather than searching through their contacts in their address book.

### **Add Items to Budget List**

Users can add items to a list of purchases to keep track of their total spending to avoid going over budget. Each item will have an event name, purchaser name, and amount. The tally will be kept at the top.

### **Edit Contacts and Budget**

With both of these lists, you will be able to remove and edit the contents of each item to fix errors or update current information.

### **Access Google Maps**

The Google Maps API will be utilized to allow users to see their current location while traveling with their group. This will not be limited to San Luis Obispo, because users will often travel outside of the city limits for group activities.

## **USE CASES**

### **Preconditions:**

- There is an active network connection to internet.
- The user has understands the basic concepts Leaders are taught.
- The WOW Staff has made the necessary updates to the information online.
- The user has an Android device

### **Basic Flow of Events:**

- The use cases begin when Leader Enters group number on front login screen.
- Each of the following use cases are activated through the touch of a button on the home screen
- Use Case #1: Group Roster
  - User will meet with their group for the first time on the first day of the Week of Welcome.
  - After clicking the Roster option, the user will have access to an interface for adding each new student's contact information (name and phone).
  - Each new student added can be contacted through the application by selecting "Call" or "Text".
- Use Case #2: Maps
  - Google Maps
    - The purpose of the maps button is to function just as the Google Maps would.
    - The user will activate the map and GPS location of their device to show a current location in relation to the map image.

- Use Case #3: Guidebook
  - The orientation guidebook gives a complete guide of games, activities, processing questions, situational training, etc for the Group Leader give them access to training material on the go.
  - Upon clicking the guidebook button, the user will have access to a search interface.
  - The device will then display the results found by the search that they can select between.
  - The location of the information is located online, so an active connection to the internet is required.
- Use Case #4: Budget
  - Keeps track of all the expenses of the leaders.
  - Enables organization and efficiency with money
  - Gives totals for each leader to create even distribution of money

### **Alternative Flows**

- Unable to access the Guidebook with an active connection
  - This would most likely be an error on the WOW Website side of the application, which would need to be fixed by WOW's web team.
- Map not showing accurate location based on the GPS
  - Based on the type of device the user has, the application may not correctly display the right location on the Maps given in the application. If this occurs the application will continue to run, minus this functionality
- Unable to find the search condition given by the user
  - If the searched item is not found by the server, it should display a message and prompt the user to attempt a different search, but with continued functionality.

## V. DESIGN

The design of the project represents a majority of implementation. Choosing the style and layout the client will experience can alter the receptiveness of the application to its users. This section lists and describes the main flow of the program, as well as the interface that represents each key component.

### ACTIVITY DIAGRAM

There is a standard flow that the user will go through while utilizing the application. At each step of the way, the user will be able to go back to previous screens if need be. This creates a smooth flow between activities creating the feeling of one utility when in reality, the Cal Poly WOW application represents the combination of four separate features.

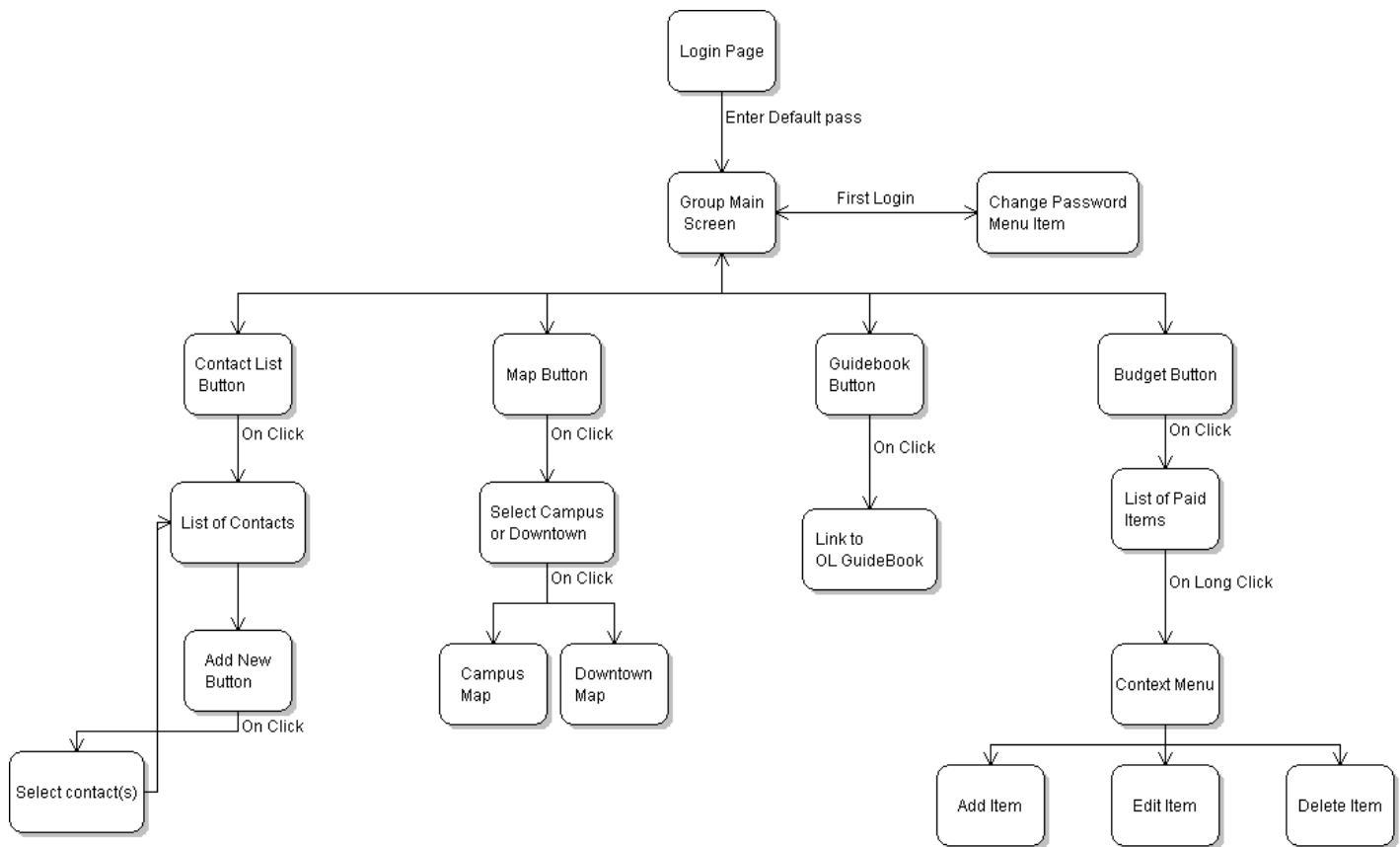


Figure V-1. Activity Diagram

## MAIN SCREEN

The main screen is what users will see when they first open the application. Its design is very simple and show the group's number, Leader names, and four buttons. From here is where the user will choose which aspect of the program he/she will utilize.

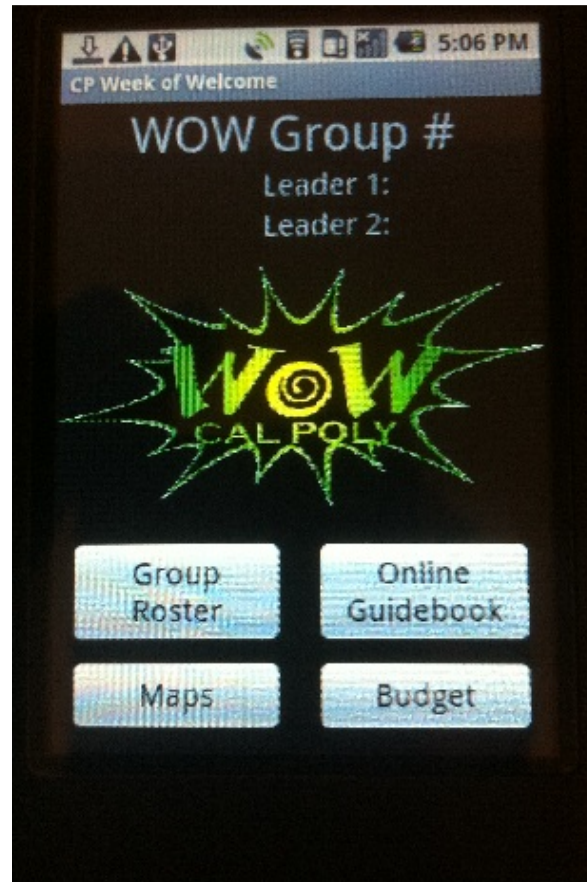


Figure V-2. Main Screen

## GROUP ROSTER

After clicking the “Group Roster” button, the contact list will be displayed for your group. Clicking the Back button will bring you back to the main screen, while the “x” button removes the item from the list. Clicking the “Add” button will take you to the contact selection view as shown in Figure V-3. Both screens are shown below.

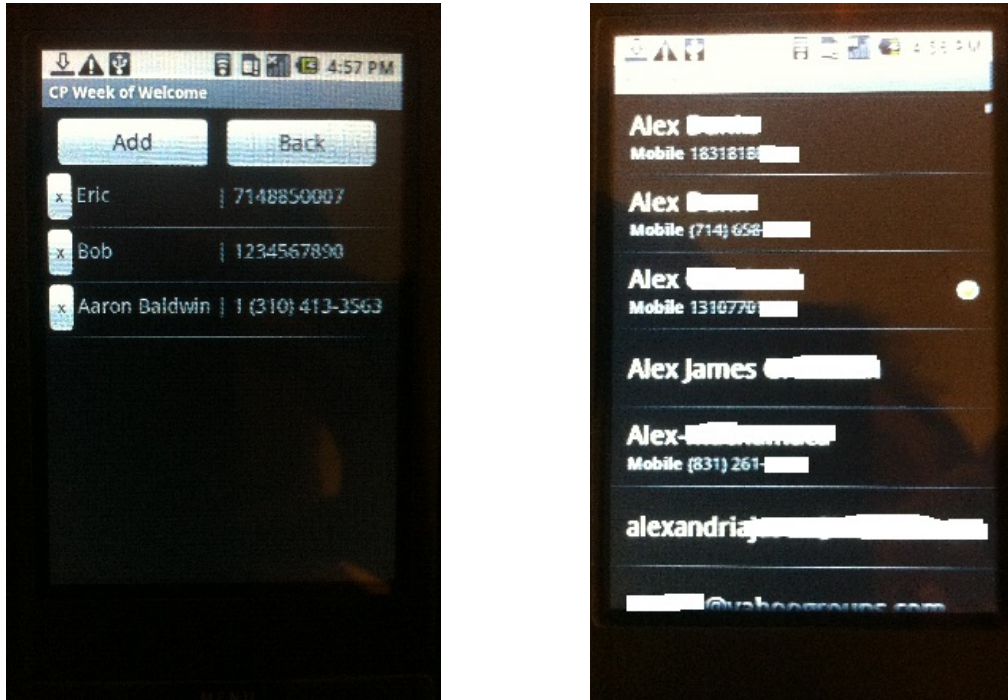


Figure V-3. Group Roster

## ONLINE GUIDEBOOK

After clicking the “Online Guidebook” button, the device's internet browser will be launched with the url of the online Leader Guidebook.

This url is <http://studentlife.calpoly.edu/orientation/olguidebook/> and can be accessed outside of the application. Once the browser is opened and used, the user can decide to go back to the main screen by pressing the back button on their device.



Figure V-4. Guidebook

## BUDGET

After clicking the “Budget” button, the budget list will be displayed for your group. Clicking the “Back” button will bring you back to the main screen, while the “Add” button adds a blank item to the list. Clicking the “Edit” button will allow the user to edit the contents of a cell, while “Lock” secures the contents and will add its price to the total at the top of the list.

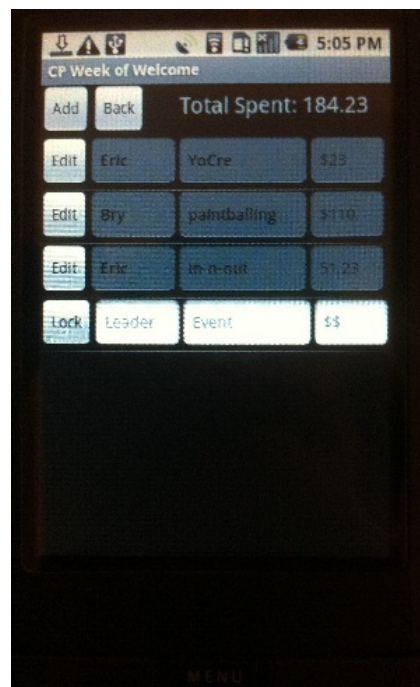


Figure V-5. Budget



## VI. DEVELOPMENT

The development of the project was broken down into key components that gave each portion of the application proper functionality. This section will cover the different development features and how they were used within the application. Each of the different components required to create a functioning application that met the project objectives required research along with trial and error. The following list was created after running through the different technologies and possibilities available throughout the project.

### GPS

GPS gives the map portion of the application the ability to show current location giving Google Maps the ability to find the user and show nearby locations. To get GPS working on a device, Android developers are required to do the following:

- Retrieve an MD5 fingerprint of the developer's debug.keystore. The process to do this is available by Google at their Google APIs information site. (Google Code)
- Next is to register the certificate with the Google Maps Service available in the same location as above. This will return an API String to add the project Manifest.
- Lastly, the project must also declare that it uses the Internet and Location in order to receive online information regarding location. These are added to the permissions list as `android.permission.INTERNET` and `android.permission.ACCESS_FINE_LOCATION`

### CONTACTS

In order to access the contact list of the users device, the `android.permission.READ_CONTACTS` permission must be listed within the Manifest. This allows the application to access the contacts and display them as a list view for the user to select from.

### INTERNET

As listed in the GPS portion above, internet access must be given to the application through the Manifest. Not only does the GPS require internet use, but the Orientation Leader Guidebook's contents are online. To have this information update and load within the app, the tag `android.permission.INTERNET` must be added to the permissions list.

### EXTERNAL STORAGE

External storage is needed to store information throughout accesses of the program. This gives the application the ability to close and start up with the same information. The use of external storage comes from adding the `android.permissions.WRITE_EXTERNAL_STORAGE` tag to the permissions list in the Manifest.

## **XML VIEWS**

XML views give the contents of the program a physical layout for the user to interact with. Each of the different functions within the application utilize different views, most of which are populated by .xml files. A list of the views used is as follows:

- main.xml
  - The main layout that is loaded when the application starts. The view utilizes both LinearLayouts as well as RelativeLayouts nested together as one.
- contacts\_list.xml
  - LinearLayout view containing the buttons and ListView for displaying the added contacts.
  - The ListView is made from a custom view titled contact\_view.xml that displays each contacts information according to the design pattern needed.
- budget\_list.xml
  - LinearLayout view containing the Buttons and TextViews at the top of the window. It also contains the ListView required to show multiple budget items.
  - The ListView is made from a custom view titled budget\_view.xml that displays each budget item according to the design patterns needed.

## **COMPONENT COMUNICATION**

Each Device communicates with each other using Intents. The main file titled LeaderMain.java populates main.xml and listens for any interactions from the user. Depending on which item the user clicks, the program launches a new intent which runs each utility as its own program. This also gives the user the ability to press the back button to return back from the calling Intent.

## VII. TESTING

### INITIAL TESTING

After initial implementation of each component within the Cal Poly WOW App, testing began with a small group of current and past WOW participants. Overall testing was done by a group of 5-10 individuals. The initial testing consisted of the following:

#### Uninformed

This testing consisted of giving the users a version of the WOW App and letting them test its functionality without having any information about what the goals of the app were. The point of this type of testing is to get an understanding for how intuitive the design and flow of the project is. From this testing I found that the general flow of the program worked very nicely and didn't seem to provide any problems.

#### Informed

The purpose of this testing was to get a better understanding of the actual functionality of the program over the flow. This meant that users would interactively test the program and speak openly with me to talk out issues and to come up with better solutions. This was very helpful because working alone often leaves obvious changes hidden behind personal opinions.

### FINAL TESTING

Final testing was very similar to initial testing, except for the uninformed participants. Because I used the same test subjects as before, they were all in some what informed as to what the project consisted of. Each of the participants analyzed the application based on UI, functionality, and overall completeness. The consensus is that for what the project aims to accomplish, the application follows through. Because this is more of a Beta release than anything, there are some areas of improvement that can still be made with overall layout and functionality, but these improvements are not needed to use the application for its intended use.

## VIII. CONCLUSION

The following section covers challenges, overall conclusions, and recommendations for future implementation of the WOW Application. The purpose of this section is to gain a greater understanding of many issues that arise while implementing a project from concept to product. Seeing the problems that occurred also give incite to the reason for many of the final design techniques.

### PITFALLS

This project had many different types of unseen setbacks that resulted in wasted time and efforts. Although many issues can be foreseen before implementation, working solo on a project leaves a possibility of large areas of oversight. These areas can be broken down into the following types:

#### **Design**

When starting the project, I never thought it would be so hard to design the best interface and functionality for user experience. As an engineer, I now see the importance of spending a greater deal of time planning out each interface before implementation because it will save a great deal of time attempting one solution, and deciding it doesn't quite work out. It becomes very frustrating when a lack of research and planning leads to wasted time implementing a portion of the project that is destined to fail. This type of difficulty showed most for designing the way the user would be able to add and edit contents within both the Contacts and Budget Lists.

#### **Implementation**

Lack of good design practices makes implementation worse overall, but the nature of working in new technological territories also creates issues especially when time is a factor. The Android SDK falls under the category of new technology for me even though it utilizes many practices I was familiar with. Each of the four utilities this application encompasses required a great deal of time researching the proper methods and techniques required to accomplish the stated objectives of this project. The main implementation issues came from the following:

- Budget - Designing a successful budget format was not as easy as it could have been. Keeping the editable option described in the requirements section made design and implementation very difficult. There was very little help to produce a stable table that was also editable.
- Contacts – The contact list proved difficult because of the version of Android I decided to support. Many of the Address Book APIs were improved on all newer versions of Android. This made a customized contact picker that had the ability to select multiple contacts at once to add to the list

impossible. By this point in the project, I was committed to sticking with my initial objective to stick with Android 1.6.

### **Time Constraint**

With the categories above, time was the main constraint to the project. The problem with fast deadlines and high learning curves are that any error that sets you back holds great significance to the success of the project overall. As I would learn things in the Android class, I would attempt to put that knowledge to use for the WOW Application. This was very beneficial for both the Guidebook and Maps portion of the app, but left two more aspects open for research.

## **OVERALL CONCLUSION**

Working alone on this project helped teach me many key lessons I hadn't previously learned from past classes at Cal Poly. Rarely are we given the opportunity to think of our own project and see through from start to finish. The quarter system keeps us on a very fast pace leaving out opportunity for long term projects. Computer Engineering Capstone and Senior Project give us the ability to work past the one quarter limitation to give proper time for brainstorming, researching, and implementing.

The Week of Welcome has been my passion all five years at Cal Poly, which sparked the idea of making an application to aid its Leaders in the first place. This being so, I didn't calculate the amount of time I would be spending on other classes to finish up my degree. Throughout both quarters of Senior Project I had many other projects, many of which being Android and iPhone applications. This led to spreading myself too thin and burning myself out on multiple projects. I never neglected any of them, but putting in the extra effort to implement the best possible solution often had to be put aside to complete something else.

In the end, I see the project as a success for many reasons, the largest being that it was allowing the WOW Program to expand into untapped areas of aid for its participants. WOW is always trying to expand and help its volunteers in any way possible, and with the advances in cellular technology in the past decade, a utility application makes the most sense. There will always be room for improvement and growth as the program itself expands.

Looking back over the course of this project, I wish that I had reduced the number of concurrent projects going on by combining the requirements of multiple classes into one implementation. I dug myself too far into a hole when I was creating many different applications from start to finish in both my Android and iOS class while also being fully submerged working for the Week of Welcome Program.

## **FUTURE DESIGN**

The future of this project contains much room for growth. After going through the hassle of working with older version of Android, I am very confident that this builds the foundation on which many improvements can be made. As stated earlier, newer Android versions contain improved API's that create a direct method for solving the functionality this app aims to provide.

Leaving aside the obvious improvements that can be made to current functionality, the WOW Application has room for expansion to aid Leaders through multiple other portions of their leadership:

### **Daily Location Sheet (DLS)**

The DLS is the main form of organization used within the WOW Program to manage Leaders throughout the Week of Welcome. There is one DLS per group filled out by their Leaders in conjunction with mandatory events added for them by the WOW Board. This sheet breaks down their day into 15 minute increments to keep track of every event groups participate in. The ability to use the DLS software offered on the internet from a personal cellular device would be much more convenient for last minute changes.

### **WOW Booth Communication**

All communication between Leaders, Lost WOWies, Faculty, etc goes through the WOW Booth. It is WOW's central hub or information booth designed to help anyone in need. Leaders often need to tell the Booth about DLS changes so that they have the most accurate information. Having the ability to fill out and email a form to the Booth would cut down on verbal communication leaving more time for our staff to get work done.

### **Random Game Generator**

Groups spend a good amount of times in line, or just relaxing getting to know each other. This is when Leaders utilize many of the fun aspects of training to get the group to participate in fun get-to-know-you games. Having the ability to randomly generate a game based on type would be very beneficial to those Leaders who are feeling a little less than creative on the spot to think of one on their own.

## APPENDIX A: BIBLIOGRAPHY

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