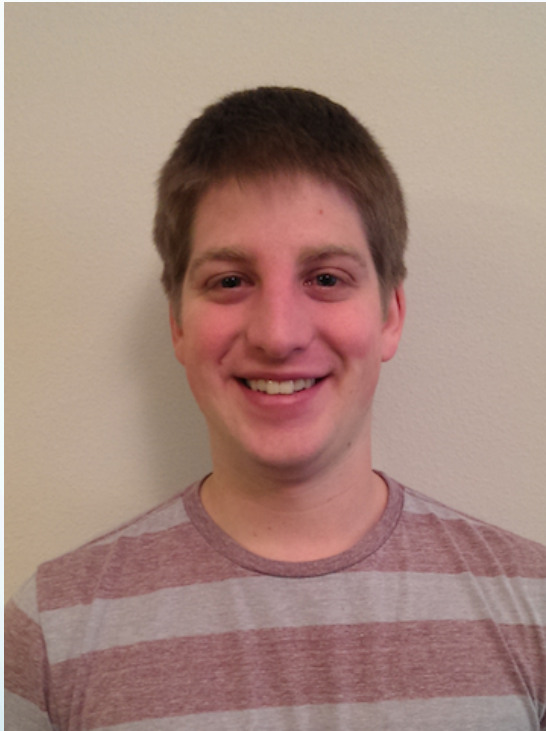# Unified Butterfly Recorder

iOS Development Team (Group 16)

UBR Team - Development

Eric Larssen

Sean Shickell

CJ Mankin

UBR Team - Client & Advisor

Nathan Brockman

Anita Westphal

Dr. Diane Rover

Background

- Butterflies as an indicator species

- Butterfly Recording Protocols
  - Pollard Walk
  - Distance Sampling
  - Presence-Absence
  - Meandering

Cite: http://upload.wikimedia.org/wikipedia/commons/3/3d/Charaxes_brutus_natalensis.jpg

Problems

- Different protocols capture different data

- Paper & pen surveys, with weather instruments

- Surveyor experience will vary

Cite: http://upload.wikimedia.org/wikipedia/commons/5/59/GPS_Receivers_2007.jpg

Creation of UBR

- Addressed many issues

- Simplified the process

- Makes full use of mobile computing

- Strategically divided into protocols

- Easily share information

"This app is a paradigm shift"
- Nathan Brockman, Reiman Gardens

"This app will help standardize the collection of data and has the potential of impacting conservation efforts both nationally and globally."
- Anita Westphal, Reiman Gardens

Status of UBR

- World-wide availability

- UBR exposure
  - Presentations, DNR usage, Google Play Store

- Reiman Gardens classes and training

- User feedback

- iOS development

Unified Butterfly Recorder
ubrdev - March 27, 2014
Tools

Install | Add to Wishlist

★★★★☆ (👤 2)

g+1

Cite: http://upload.wikimedia.org/wikipedia/commons/4/4d/IowaDNR.jpg

Timeline – Spring 2014

- January 30: Met with Client/Advisor, begin researching portability, learning Obj-C

- February 15: Original Project Plan and Design Document

- April 1: Database schema defined, working knowledge of Obj-C

- April 10: Shared repo established, coding began

- May 30: Minimum Viable Product released

System Architecture

- Focus on creating iOS application
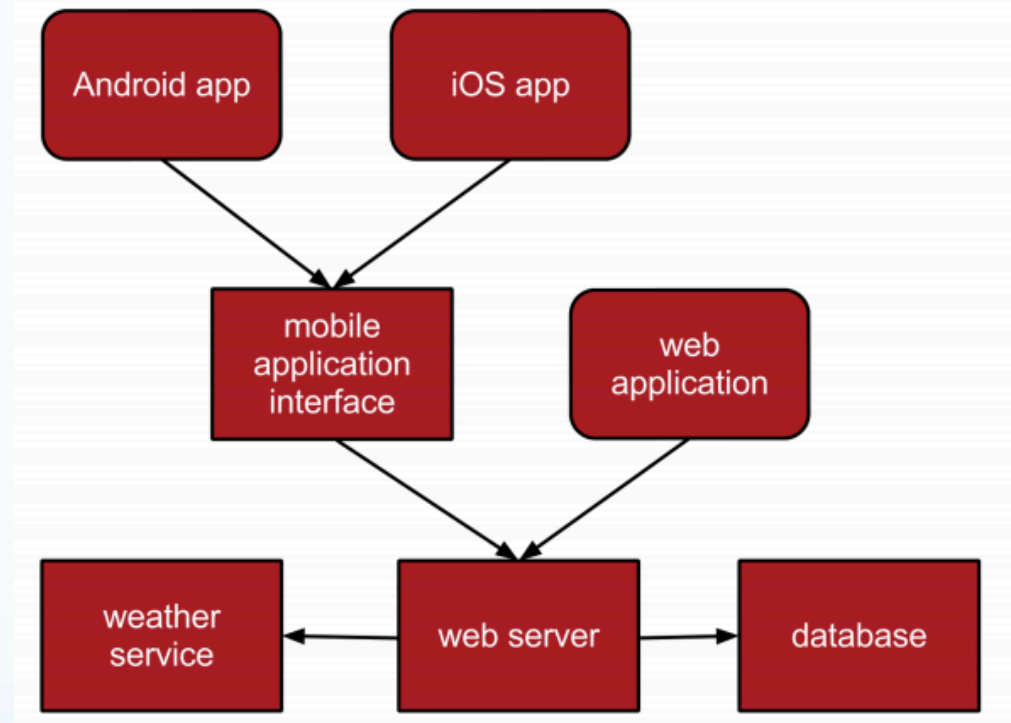
- Need to match interface

Diagram copied from Senior Design team DEC13-08
Design Document: http://butterflies.ece.iastate.edu/files/butterfly-design-doc.pdf
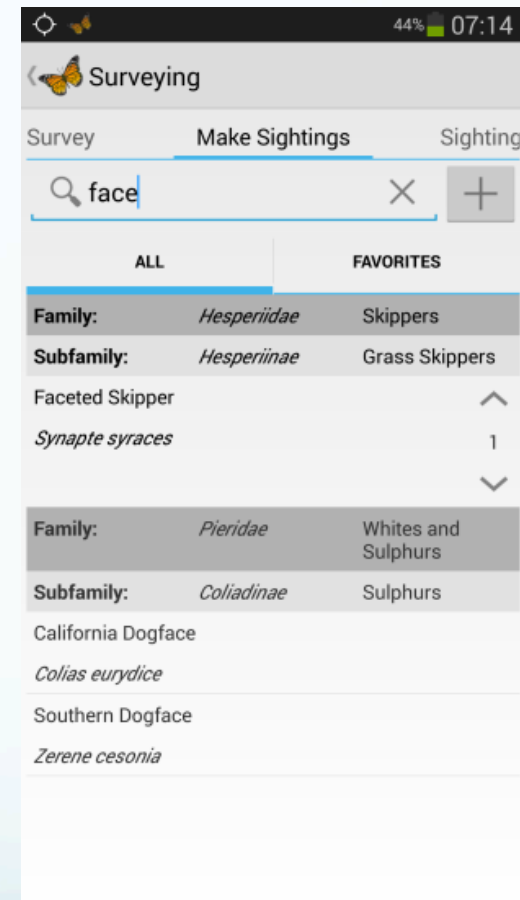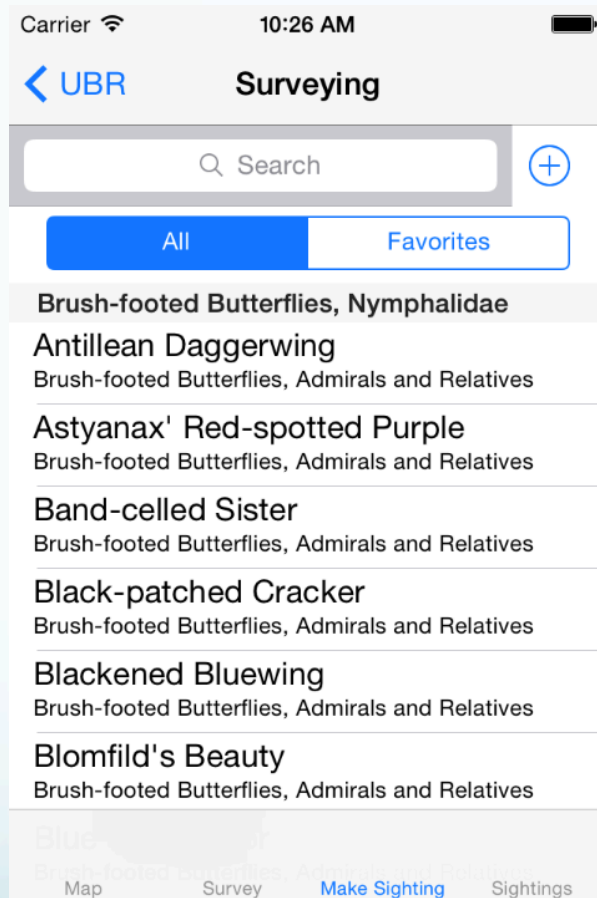Page 9, Spring 2013

App Migration

- Atypical design challenges

- Differences in iOS / Android architectures

- Difference in device capability
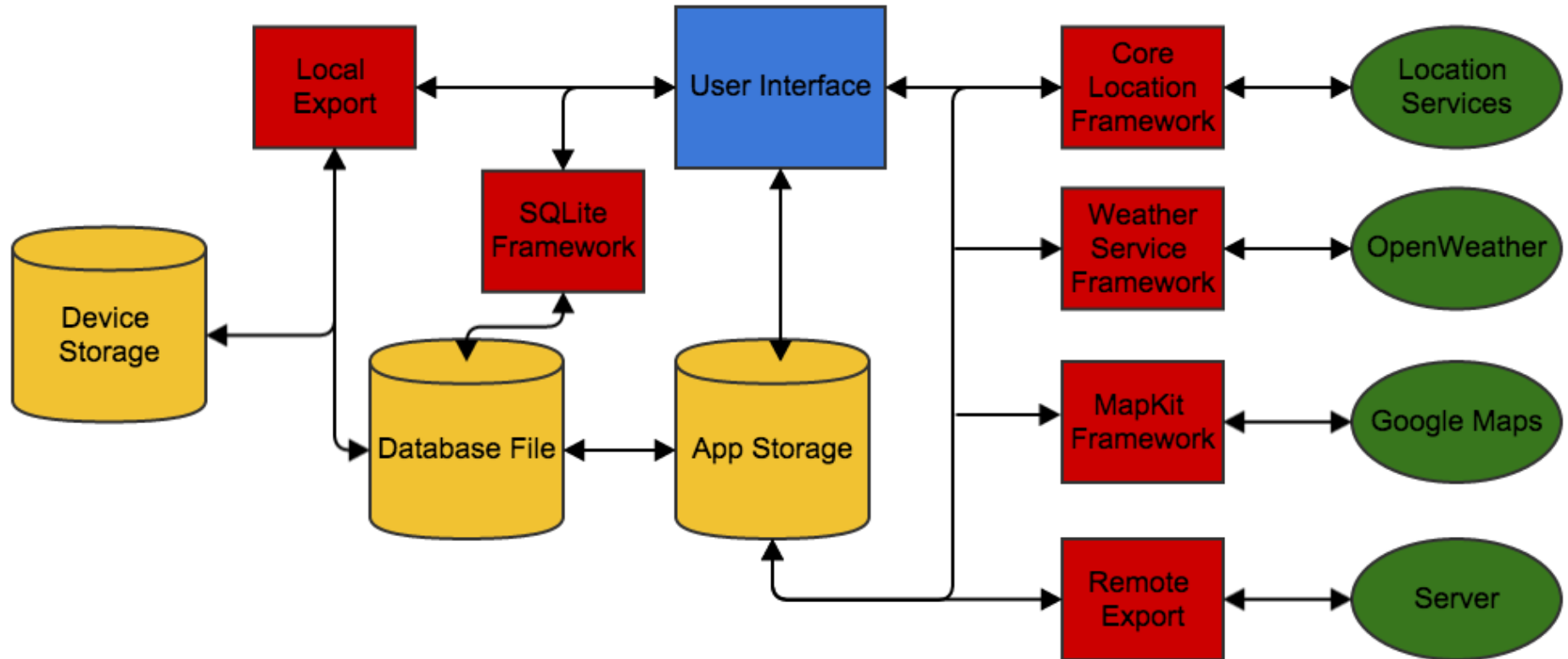

- UI appearance and navigation

UI Comparison

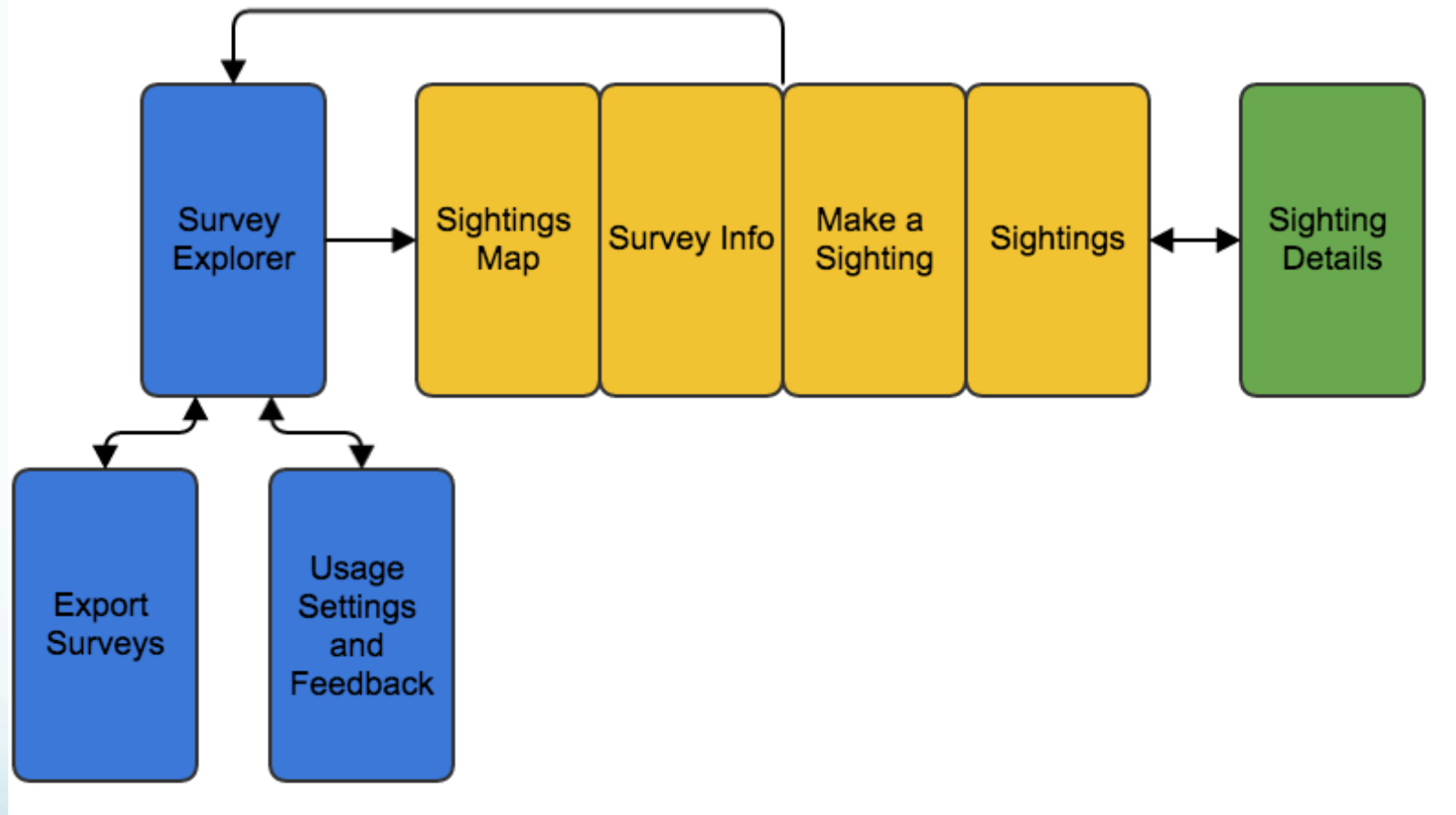iOS Unified Butterfly Recorder | DEC14-16

Application Architecture

Application Screenflow

Work Structure

- Agile, Scrum-like Development Method
    - Regular meetings with Product Owner and Client
    - Two week sprints
    - Manage a backlog of tasks

Code Management

- GitHub Repository - Fork & Pull Model
  - Production Code is always working
  - Code Reviews are mandatory
  - Issues can be managed
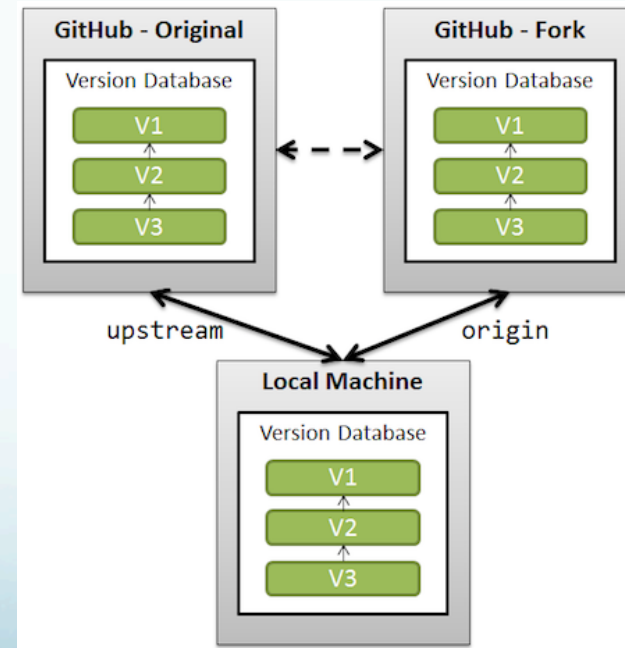
Development Tools

- Xcode 5
  - Provides Simulation Software

- OpenWeatherMapAPI
  - Given Lat/Long, provides weather info

- Google Maps

Prototype Implementation

- One survey protocol

- Location detection supported
  - Network required

- Local survey export

- Feedback form

Timeline – Fall 2014
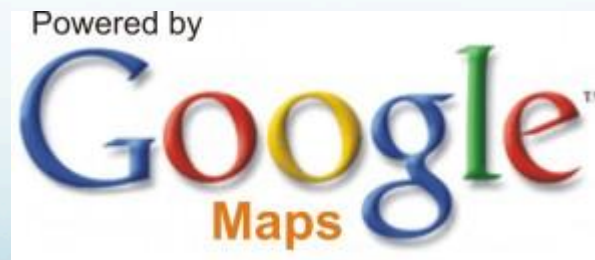
- Summer 2014: Monitor feedback, expand Obj-C knowledge

- August 15: Aggregate feedback and respond – Sprint 1

- Sept 1: Sprint 2/3 – implement remaining surveys

- Oct 1: Sprint 4 – Code cleanup and respond to feedback

- Oct 15: Sprint 5 - implement special features

- Nov 1: Gauge interest in data visualization

- Dec 5: Finalized presentation and poster

Questions or comments?

Back Slides

Background

- Indicator species
  - So, what makes butterflies so important, well they are an indicator species and according to research they are starting to get recognized as one of the best indicator species out there, according to Environmental News Network (http://www.enn.com/climate/article/45000) "butterflies can tell us almost everything we need to know about the health of an ecosystem". They can be used to show habitat restoration and can indicate climate change.
  - They make great indicators because of how they react extremely quickly to even minor changes in an environment (http://www.theecologist.org/blogs_and_comments/commentators/student-writes/1727812/why_we_all_need_to_worry_about_the_decline_in_native_butterflies.html)

- Protocols
  - Pollard walk: This is where a surveyor repeats an identical route different times over the course of a year or years
  - Distance Sampling: Record the distance of sightings from a particular point or line route, which allows people to estimate local distribution and abundance
  - Presence-Absence: simply recording whether or not a particular species is present or not in a certain area or region
  - Meandering: This can also be called the field trip protocol, and it involves individuals or groups walking an indeterminate path looking for as many individuals as they can

Problems

- Different protocols use different algorithms for how they capture information. Different organizations have different ways of collecting information.

- Paper and pen (or a digital form) is currently (before this app) the default, different weather instruments are used (mobile devices are definitely reducing the need for these), such as GPS device, thermometer, etc

- Hobbyist and citizen scientists vs researchers and conservation workers, needing to make a way to not intimidate novice users (both new to smart phones and/or new to wild life tracking), but still provide enough functionality to track environment information when the butterfly (ies) was sighted

Creation of UBR

- Addressed the issue of not being intimidating and yet with enough capability to satisfy the needs of researchers and global conservation efforts, along with a range of other issues, and this app can also be used to record other families of species (not just animal either, e.g. – trees)

- Replaces pen and paper (or typing on a digital form) with a few simply clicks

- Has a map view that maps where sightings were done and connects them with lines, which represent the path taken from one sighting to the next. after a survey is done, the GPS information is then used get weather information from over 40,000 available weather stations worldwide (openweathermap.org).

- Protocols divide up how the surveyor is going to collect information, which is genius because some protocols take very little set-up time (less than 10 clicks, and can less than usual if the admin sets up the devices a certain way) and will import local weather information like cloudiness, wind speed, temperature without any further involvement from the user except to finish the survey

- Data transferring, local and remote export, also able to email. In the future, we're hoping to get a centralized database where all these surveys can get dumped and then later queried to show mass migration patterns for many different species globally over long periods of time

Status of UBR

- On the Google play store (https://play.google.com/store/apps/details?id=edu.iastate.ece.butterflies)

- UBR exposure to the global conservation community
    - Getting used in the field this summer by paid technician that work for the Iowa DNR, Nathan and Anita have and will continue to demo the app to people at Reiman Gardens and to people from all over the world at different conservation conferences and presentations, many people from the Netherlands, Walt Disney, BAMONA, eButterfly, … are very interested in the app

- Reiman Gardens training and classes
    - Iowa Butterfly Survey Network training program
    - Class on May 9th, dedicated to showing and educating people on how to use UBR

- iOS development – Walt Disney works under the Florida Butterfly Monitoring System runs on Apple and so they will definitely be using this app once it's available on the App Store

Remote Database

- To be hosted by BAMONA
  - Butterflies and Moths of North America

- Working on getting an interface established for data export

- Could be ready any time during our project

Goal

- Create iOS counterpart to Android UBR

- Objectives
  - Support range of data collection, protocols, and exporting
  - Seamless transition
  - Stay true to iOS design

- Additional
  - Interface with BAMONA
  - Implement data visualization

System Requirements

- Functional
  - Input data pertinent to selected protocol
  - Collect location and weather data in background
  - Support local and remote export

- Non-Functional
  - Performance
  - Usability and transitivity
  - Data integrity

Market Research

- Previous team did survey for most common data fields and protocols used

- Used this data to determine collection scope of UBR

- From Android feedback, sense need for iOS equivalent
  - Several Apple-oriented companies, e.g. Walt Disney

Risks

- Loss of a third party service

- Varied device capability

- Possibility of functionality loss during updates

External Libraries

- OpenWeatherMapAPI

- Google Maps

Challenges

- Objective-C

- Matching data collection scope

- Device disparity
  - Screen resolution / size
  - Location services
  - Adapting layouts to dynamically fit device

- Providing seamless UI experience

- Allowing for listings by locality

Testing

- Software unit testing and code coverage
  - Xcode unit tests

- Use of iOS simulator to test UI elements before release

- Developer and surveyor field testing