Unified Butterfly Recorder

December 2013 | Senior Design Team 08 | Ryan Scheel, Julie Tillman, Curtis Ullerich, Cameron Whipple

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Introduction

Butterflies are a great *indicator species*: Their population levels serve as a first-warning of environmental changes. Researchers collect butterfly population data both to protect butterfly species and to track problems like global warming and dehabitation.

Problem Currently, data is usually collected with pencil and paper by following one of many *survey protocols*. Different protocols often produce incompatible data, and manual collection methods are inefficient. Storage and aggregation of this data is inconvenient, so research collaboration and large-scale observations are difficult.

Solution Unified Butterfly Recorder (UBR): An Android app for efficiently collecting data in the field for all major survey protocols.

- Automatic collection of location, time, weather, ambient brightness, and more
- Ability to take photos and view survey path on a map
- Simple, exportable data format
- Distribution through Google Play store
- Partnership with butterfly conservationists around the world throughout development

Requirements

Functional	Nonfunctional
• Automatically collect survey data: Path walked, start and stop time, weather • Automatically collect sighting data: Location, time, lighting level • Export data to CSV file on device • Export surveys to server • Support data points of all standard survey protocols • Allow manual entry of survey data	• Minimize clicks per sighting • Limit battery usage to 50% drain during a 4-hour survey • Adapt to all device form factors • Handle missing features (e.g. GPS hardware) gracefully • Be usable by first-time volunteers through PhD researchers • Operate in bright sunlight, with mobile users, in possibly networkless areas

Architecture

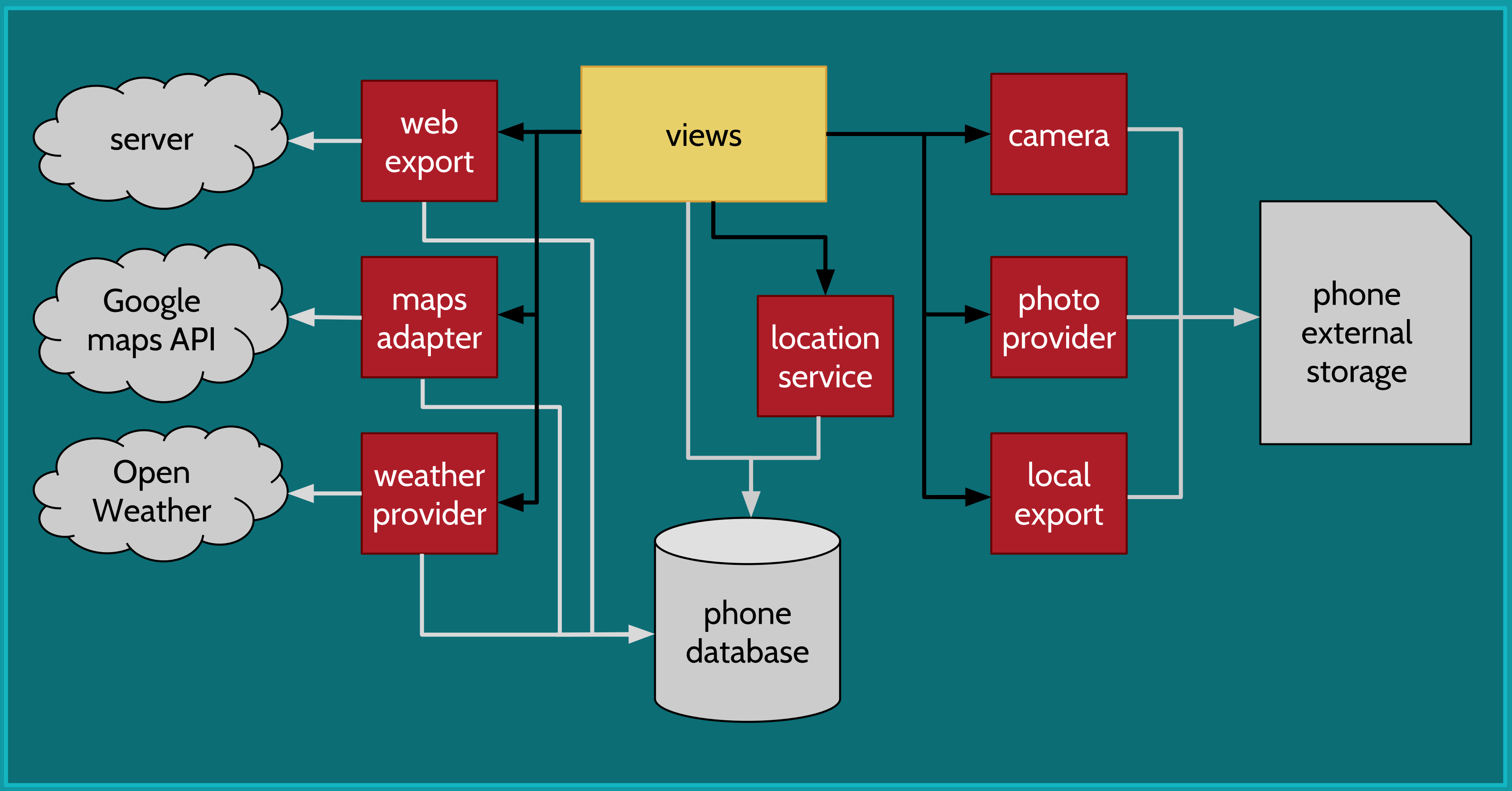
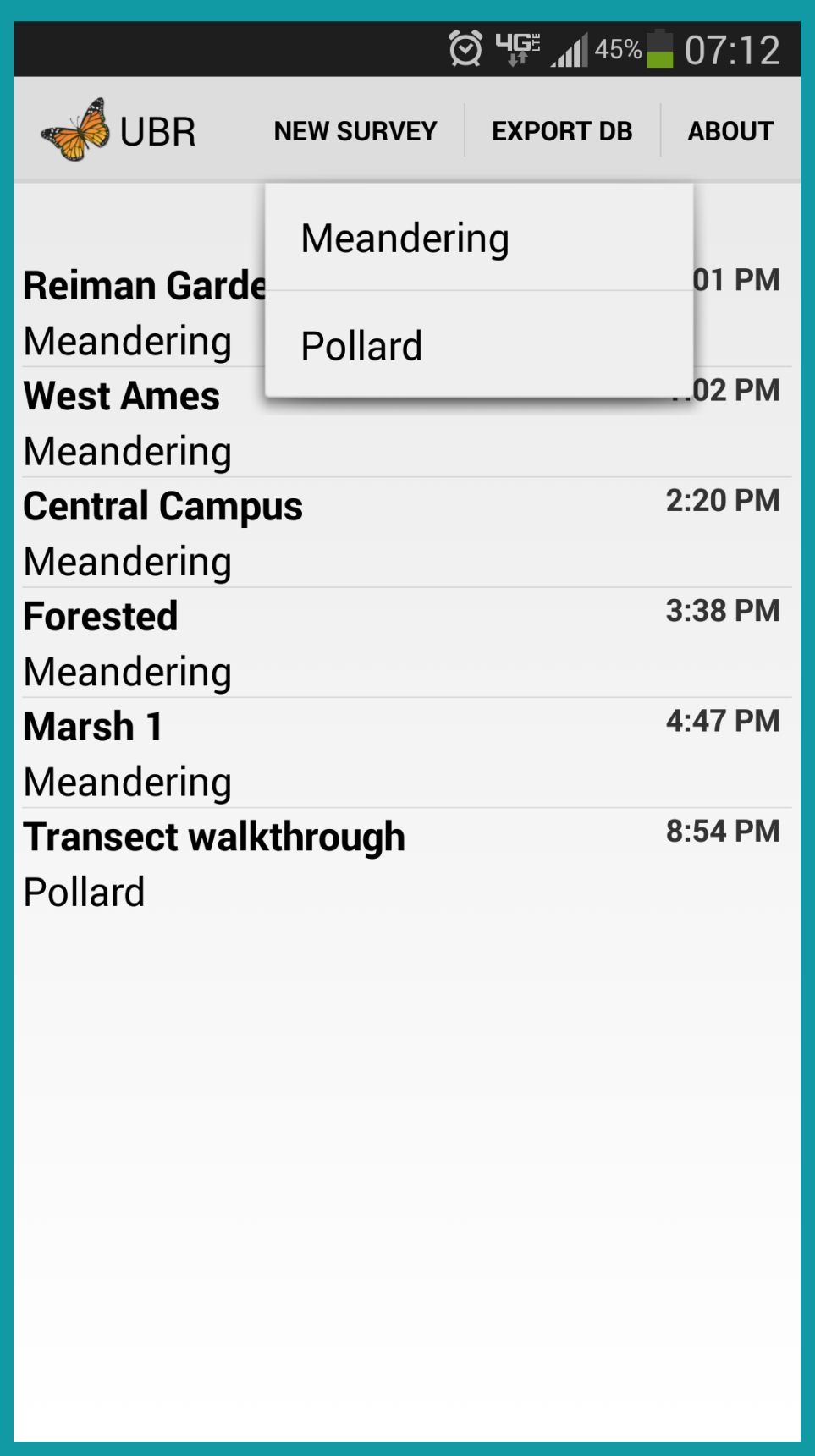


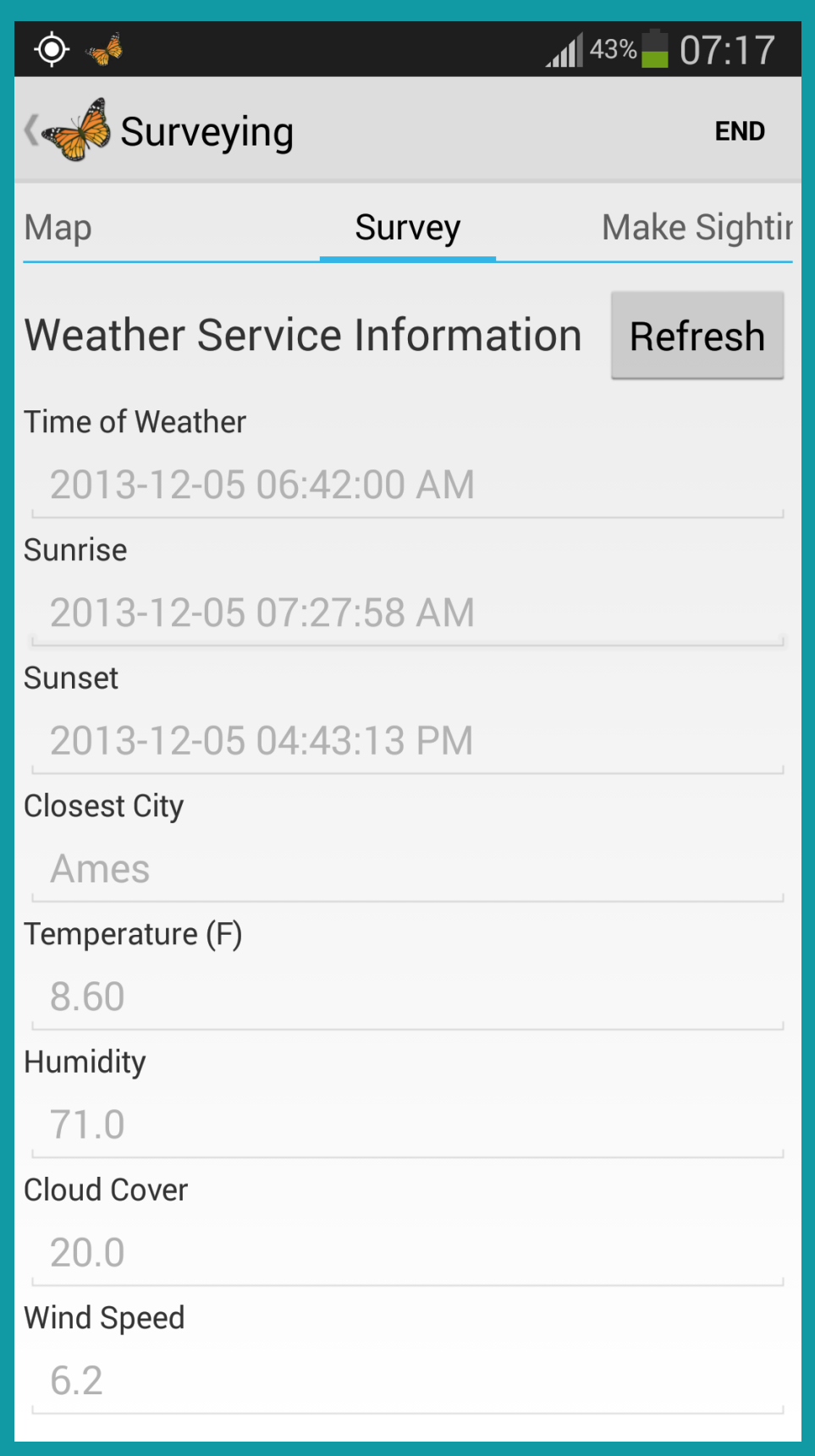
Fig 1. Architecture diagram. In most cases, UI events (e.g. button presses) from a view trigger actions by services, adapters, or providers, that all interact with data. These components write directly to storage or a database. Views use the Observer pattern to reload their contents in response to data changes.

Usage



Reiman Garde… Meandering …01 PM
West Ames Meandering …02 PM
Central Campus Meandering 2:20 PM
Forested Meandering 3:38 PM
Marsh 1 Meandering 4:47 PM
Transect walkthrough Pollard 8:54 PM

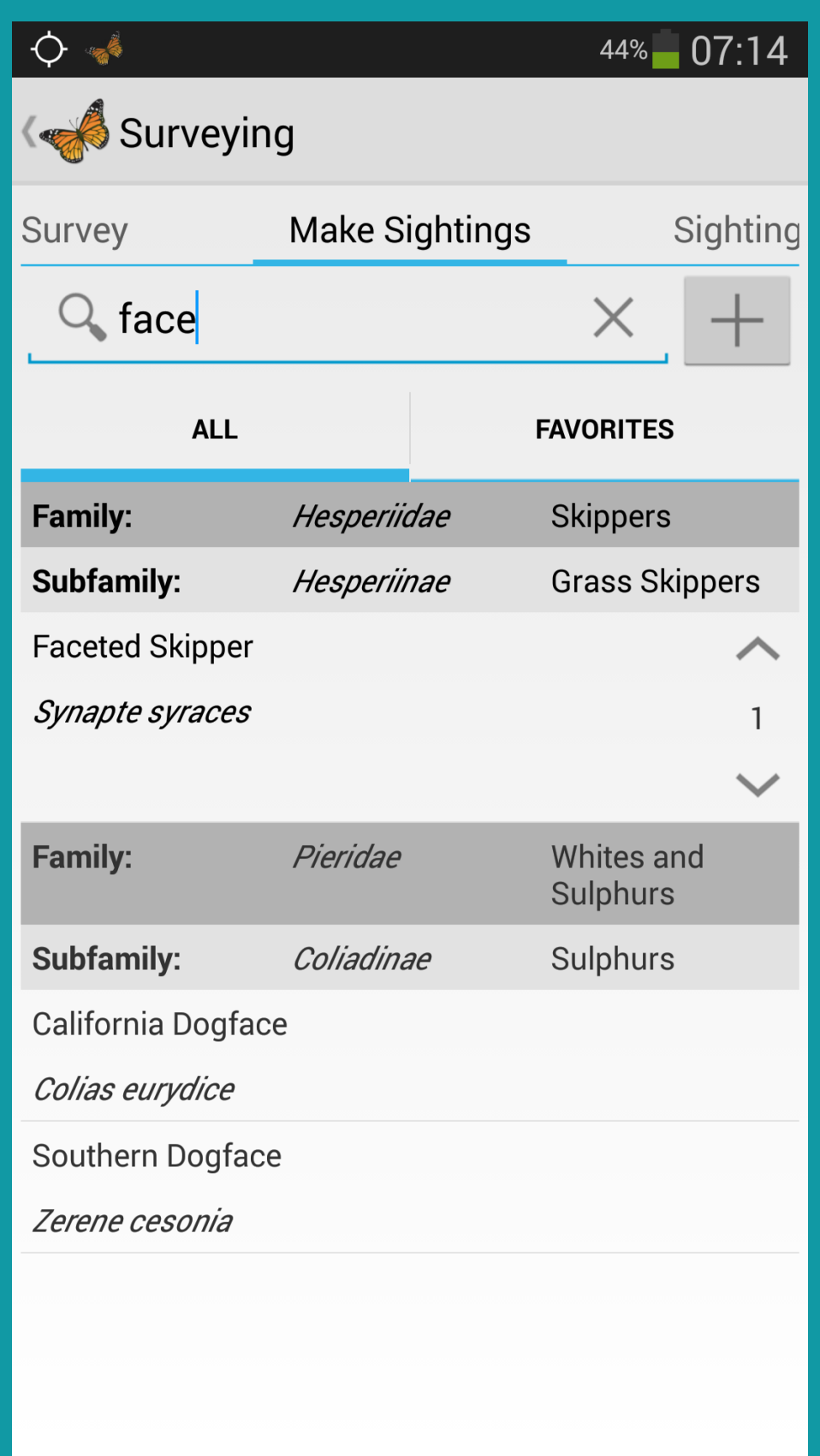
Fig 2. Start a new survey by selecting the protocol from the dropdown.



Weather Service Information

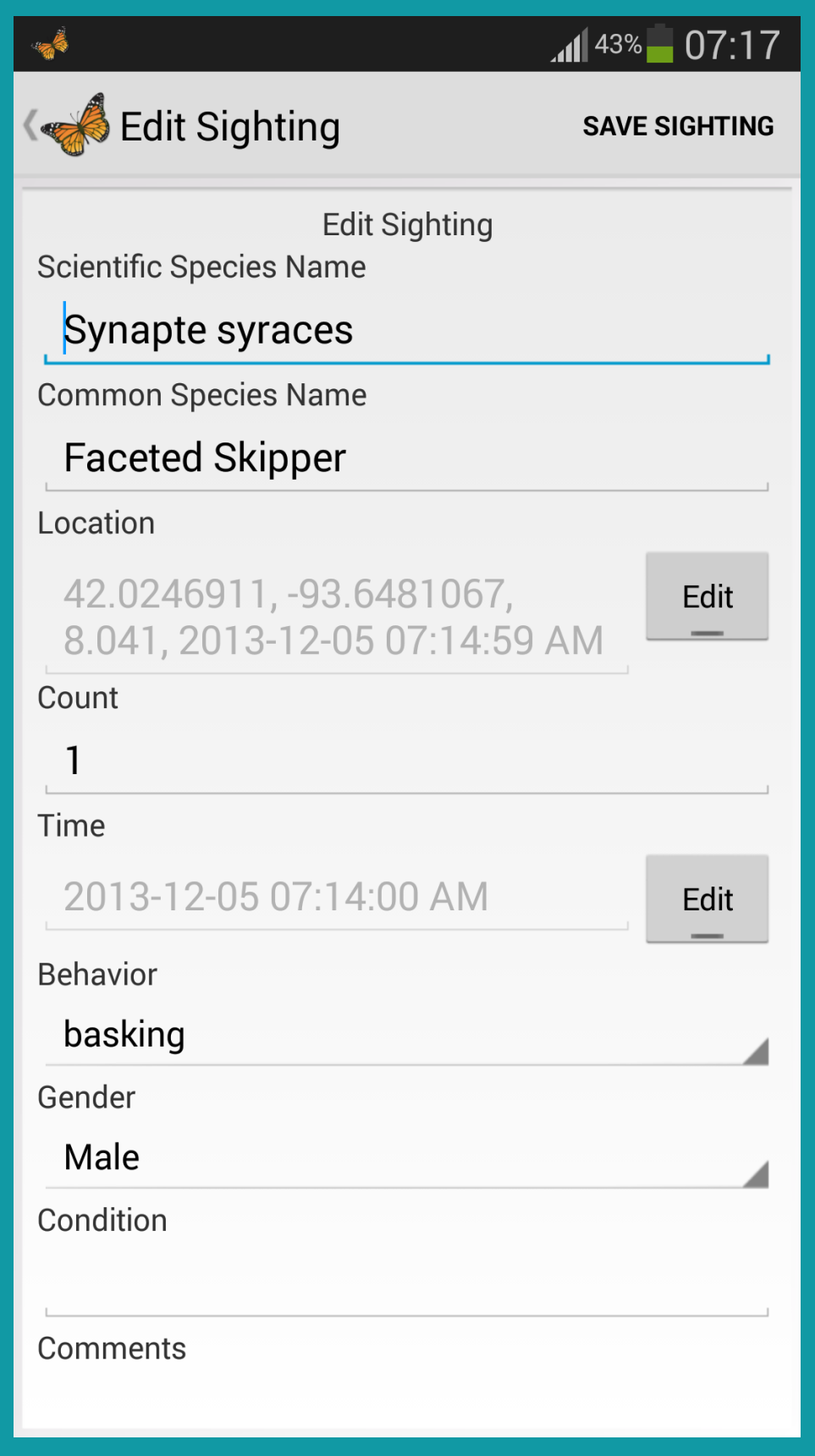
Time of Weather: 2013-12-05 06:42:00 AM
Sunrise: 2013-12-05 07:27:58 AM
Sunset: 2013-12-05 04:43:13 PM
Closest City: Ames
Temperature (F): 8.60
Humidity: 71.0
Cloud Cover: 20.0
Wind Speed: 6.2

Fig 3. Weather information is fetched in the background, Enter any other metadata.



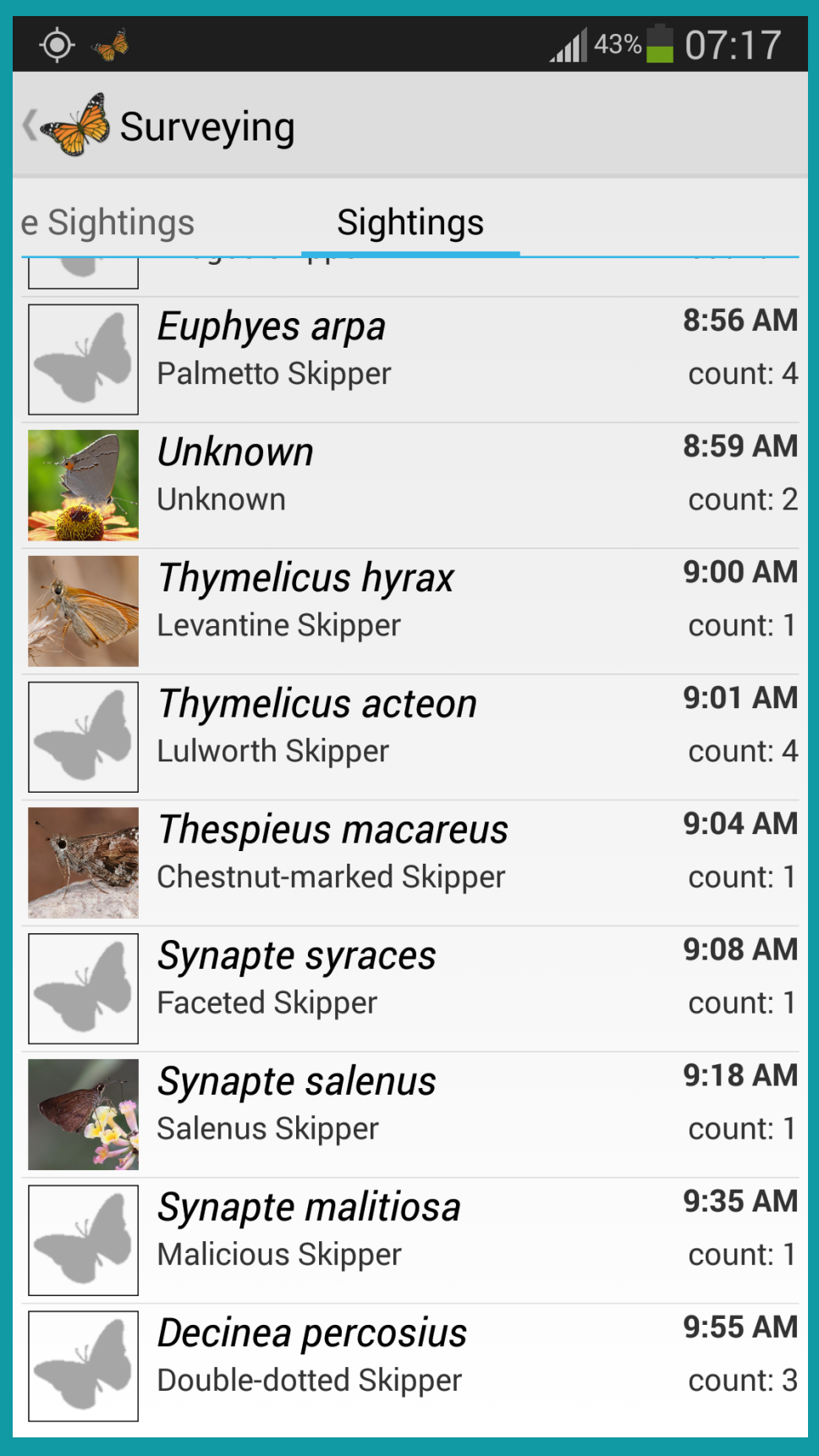
Family: *Hesperiidae* Skippers
Subfamily: *Hesperiinae* Grass Skippers
Faceted Skipper
Synapte syraces 1
Family: *Pieridae* Whites and Sulphurs
Subfamily: *Coliadinae* Sulphurs
California Dogface
Colias eurydice
Southern Dogface
Zerene cesonia

Fig 4. Search for the species name of any sighting, and tap it to create a sighting.



Edit Sighting
Scientific Species Name: Synapte syraces
Common Species Name: Faceted Skipper
Location: 42.0246911, -93.6481067, 8.041, 2013-12-05 07:14:59 AM
Count: 1
Time: 2013-12-05 07:14:00 AM
Behavior: basking
Gender: Male
Condition
Comments

Fig 5. The location, time, count, and name are filled automatically. Take a photo here if desired.



Euphyes arpa Palmetto Skipper 8:56 AM count: 4
Unknown Unknown 8:59 AM count: 2
Thymelicus hyrax Levantine Skipper 9:00 AM count: 1
Thymelicus acteon Lulworth Skipper 9:01 AM count: 4
Thespieus macareus Chestnut-marked Skipper 9:04 AM count: 1
Synapte syraces Faceted Skipper 9:08 AM count: 1
Synapte salenus Salenus Skipper 9:18 AM count: 1
Synapte malitiosa Malicious Skipper 9:35 AM count: 1
Decinea percosius Double-dotted Skipper 9:55 AM count: 3

Fig 6. Review the list of sightings for this survey.

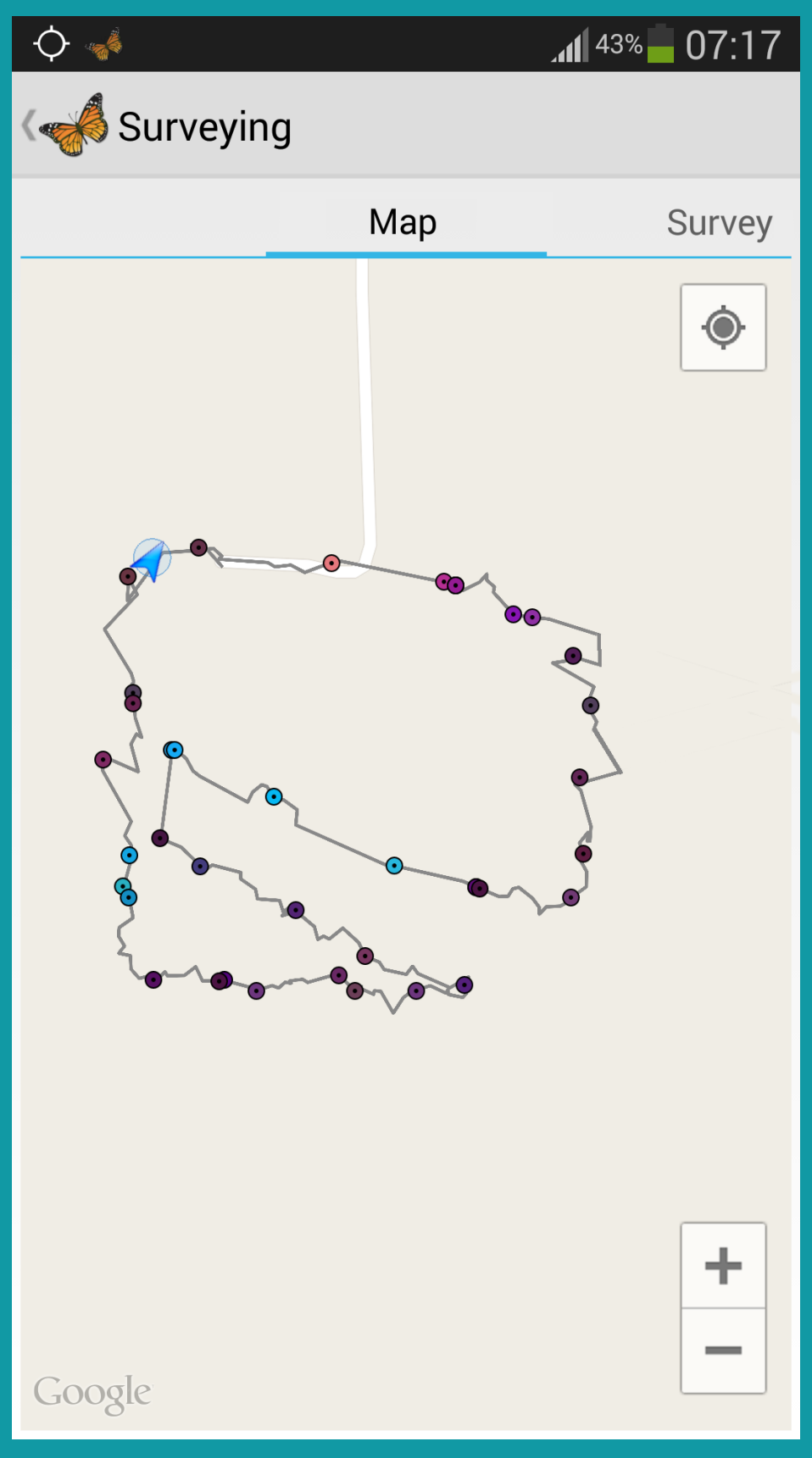


Fig 7. The map view shows the path walked during the survey and markers for all sightings.

Testing and Feedback

Fig 8. Reiman Gardens staff using UBR during a survey.

Connection to Users

- Google Play's alpha/beta release system
- Posts to our news feed after each dev sprint
- Crash/hang reports through Google Play
- Frequent discussions with users around the world

Scenario validation

- Simulated and actual surveys performed after feature additions
- Quick discovery of and recovery from regressions

Tools and Environments

- Android Developer Tools (Eclipse)
- Google Play Services: Fused Location Provider
- Google Play Store alpha/beta release system
- OpenWeather
- Google Maps API

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