



Unified Butterfly Recorder

butterflies.ece.iastate.edu | butterflies@iastate.edu | Dec13-08



Team Butterfly



Cameron
Whipple



Curtis
Ullerich



Julie
Tillman



Ryan
Scheel

Seniors, Computer Engineering



Team Butterfly



Nathan
Brockman



Anita
Westphal



Dr. Diane
Rover

**REIMAN
GARDENS**
IOWA STATE UNIVERSITY

IOWA STATE UNIVERSITY
Department of Electrical and Computer Engineering



Background

- Butterflies are a great indicator species
 - Climate change
 - Habitat restoration programs
- Varied surveyor experience
- Different survey protocols



- Protocols designed to answer specific questions
 - Disparate storage and collection formats
 - No common storage location or method
- Large-scale observations are hard



Goals

- Create an app for data collection during butterfly field surveys
- Streamline and standardize
- Facilitate data centralization

"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*



Timeline (*All dates are 2013*)

- Mar 1 Survey responses aggregated & requirements set
- Apr 1 Divide tasks among team members; begin prototype
- May 10 Finish Android app skeleton
- July 31 Complete Android prototype
- Aug 15 Review app testing and feedback
- Oct 18 Major feature expansion complete
- Dec 2 Public release
- Dec 10 Poster and presentation finalized



Work Breakdown

- Team
 - Research, planning, requirements
- Lead Roles
 - GPS: Curtis
 - Database: Cameron
 - User interface: Ryan and Julie



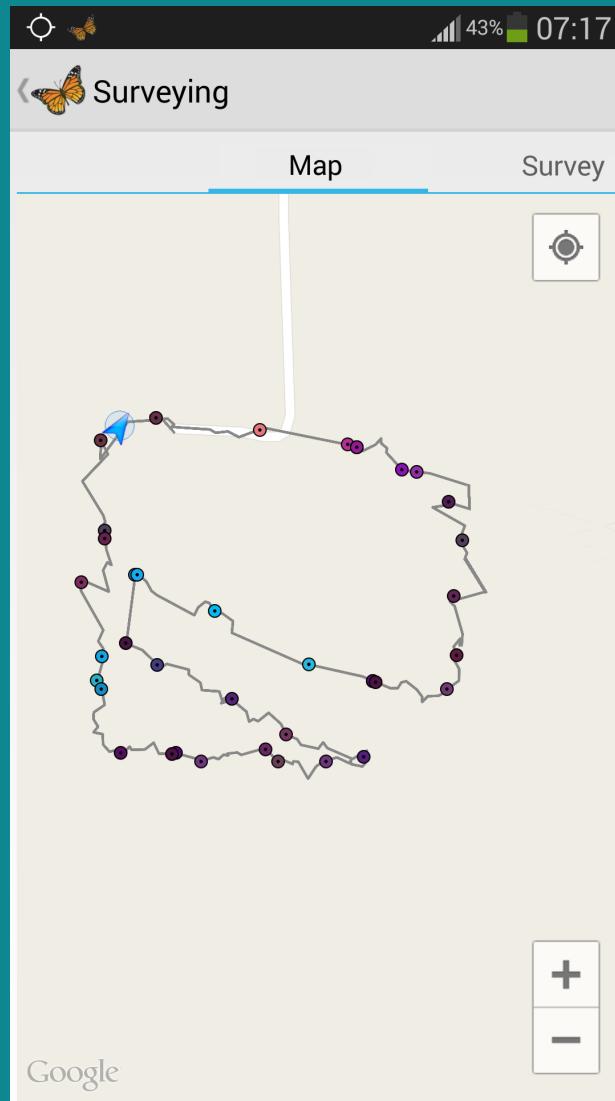
Survey Explorer

The screenshot shows the Survey Explorer app running on an Android device. The top status bar displays various icons including signal strength, battery level (79%), and the time (5:41 PM). Below the status bar is the app's header with a butterfly icon and the text "UBR". To the right of the header are four buttons: "NEW SURVEY", "EXPORT DB", and "ABOUT". The main content area is a list of survey entries, each consisting of a location name, a sampling method, and a timestamp or status indicator. The entries are:

Location	Method	Timestamp/Status
Reiman Gardens	Meandering	M
West Ames	Pollard	M
Central campus	Mark-Recapture	M
Forested	Presence-Absence	M
Transect walk through	Distance Sampling	7:38 AM
Marsh	Pollard	11:38 AM
Ames	Meandering	12:40 PM
	Meandering	in progress



Map



Survey Details

The screenshot shows a "Survey Details" form. At the top, there's a navigation bar with icons for location, battery (86%), signal strength, and time (6:01 PM). The title "Surveying" is at the top left, and "END" is at the top right. Below the title, there are three tabs: "Map", "Survey" (which is selected), and "Make Sighti". The "Survey" tab contains several input fields:

- Survey name: Ames
- Start time: 2013-12-09 12:40:00 PM (with an "Edit" button)
- End time: (empty field with an "Edit" button)
- Number of surveyors: 1
- Names of surveyors: Ryan Scheel
- Location name: Ames
- General comments: General comments
- Habitat type: (empty field)
- Habitat condition: (empty field)



New sighting

Searching

Surveying

Survey Make Sightings Sighting

Search bar: face

Filter buttons: ALL FAVORITES

Family: Hesperiidae Skippers

Subfamily: Hesperiinae Grass Skippers

Faceted Skipper

Synapte syraces

Family: Pieridae Whites and Sulphurs

Subfamily: Coliadinae Sulphurs

California Dogface

Colias eurydice

Southern Dogface

Zerene cesonia

Surveying A

Surveys Make Sightings Sighting

Search bar: tr

Filter buttons: ALL FAVORITES

Family: Hesperiidae Skippers

Subfamily: Hesperiinae Grass Skippers

Tropical Least Skipper

Ancyloxypha arene

Family: Lycaenidae Gossamer-wing Butterflies

Subfamily: Theclinae Hairstreaks

Orange-banded Hairstreak

Satyrium ledereri

Moroccan Hairstreak

Tomares mauretanicus



Sightings



43% 07:17

Surveying

Sightings	Sightings
	<i>Euphyes arpa</i> Palmetto Skipper
	<i>Unknown</i> Unknown
	<i>Thymelicus hyrax</i> Levantine Skipper
	<i>Thymelicus acteon</i> Lulworth Skipper
	<i>Thespies macareus</i> Chestnut-marked Skipper
	<i>Synapte syraces</i> Faceted Skipper
	<i>Synapte salenus</i> Salenus Skipper
	<i>Synapte malitiosa</i> Malicious Skipper
	<i>Decinea perciosius</i> Double-dotted Skipper

Details



43% 07:17

Edit Sighting

SAVE 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 Edit

Count
1

Time
2013-12-05 07:14:00 AM Edit

Behavior
basking

Gender
Male

Condition

Comments



Tablet Layouts

Surveying

Map / Survey

Make Sightings / Sightings

Survey name
Ames Butterfly Jamboree

Start time
2013-12-05 04:49:00 PM

End time
2013-12-05 05:02:00 PM

Number of surveyors
1

Names of surveyors
Cameron Whipple

Location name
Ames, ia

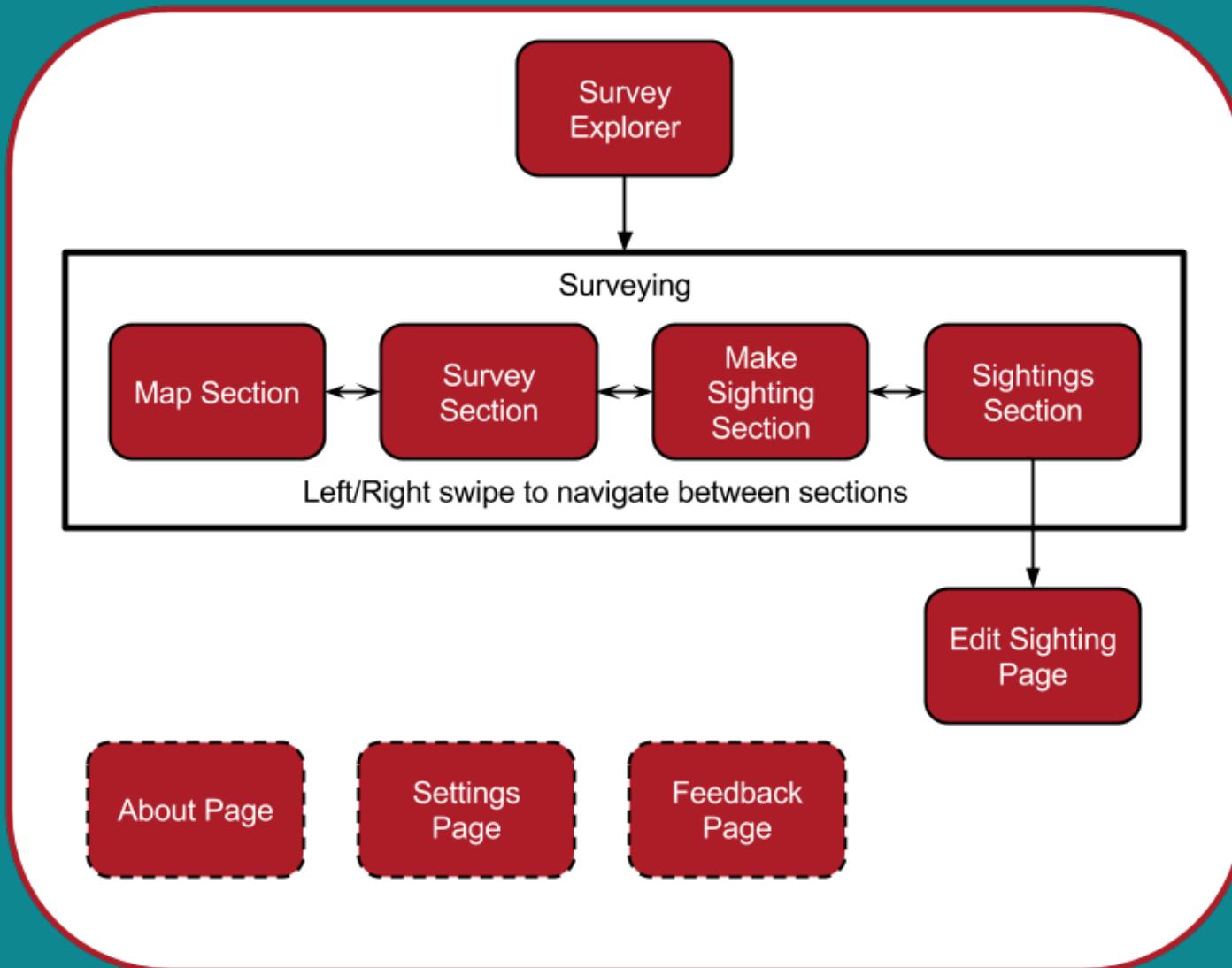
General comments
General comments

Map showing survey route and locations:

©2013 Google - Map data ©2013 Google



Screen flow





Market and Literature Survey

Challenge: Loosely defined original requirements

Butterfly Survey App Questionnaire

Responses to this survey will guide the specification for an Android/iOS app intended to make conducting butterfly surveys in the field easier and more standard. Thank you for your valuable input. Contact butterflies@iastate.edu with any questions.

* Required

Name *

Email *

Organization

How often do you perform a Pollard survey? *

Examples: never, every week, 3 times per year

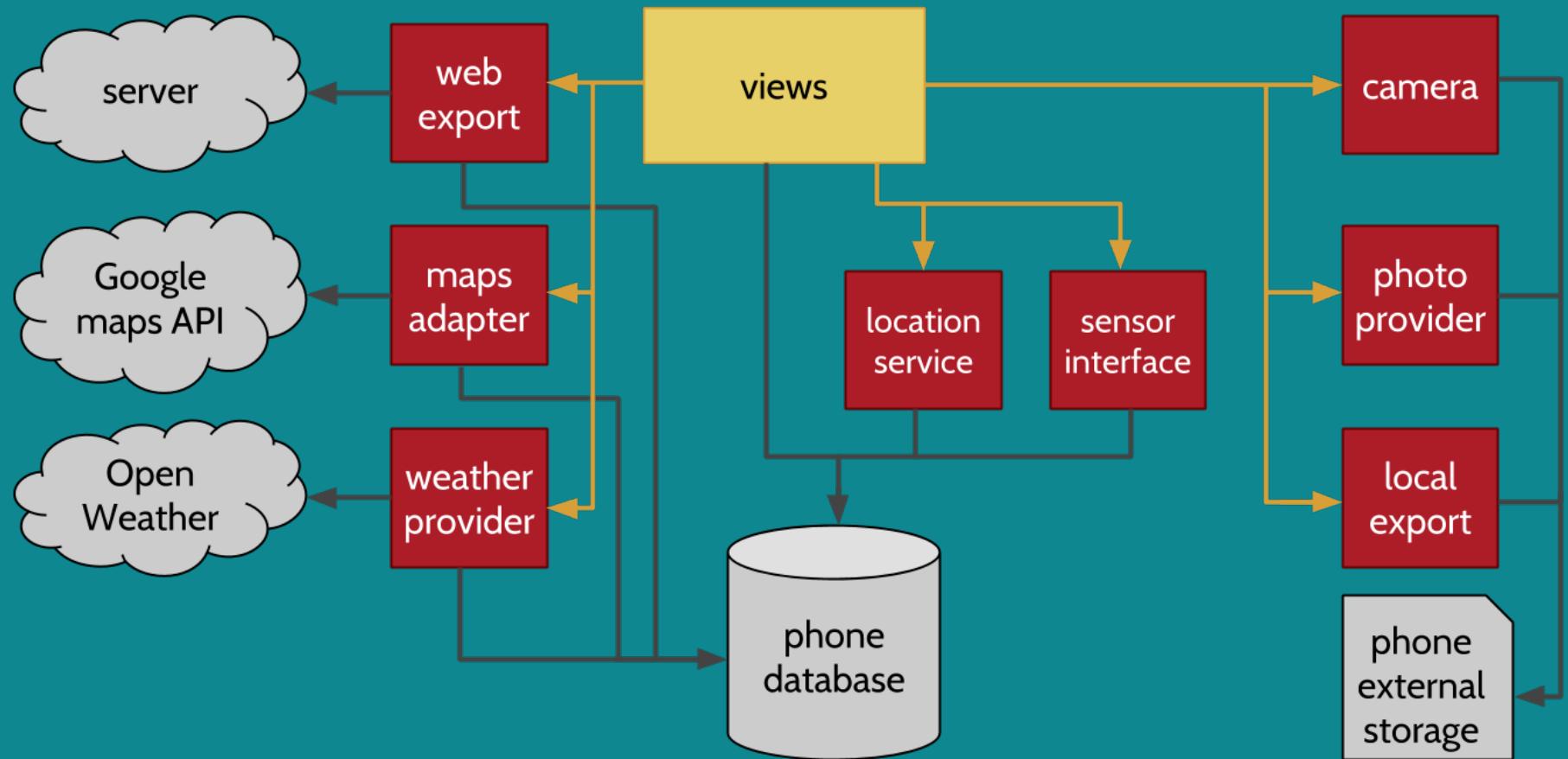


System Requirements

- Functional
 - Input butterfly sightings
 - Track location and environment
 - Export data
- Nonfunctional
 - Performance
 - Usability
 - Maintainability

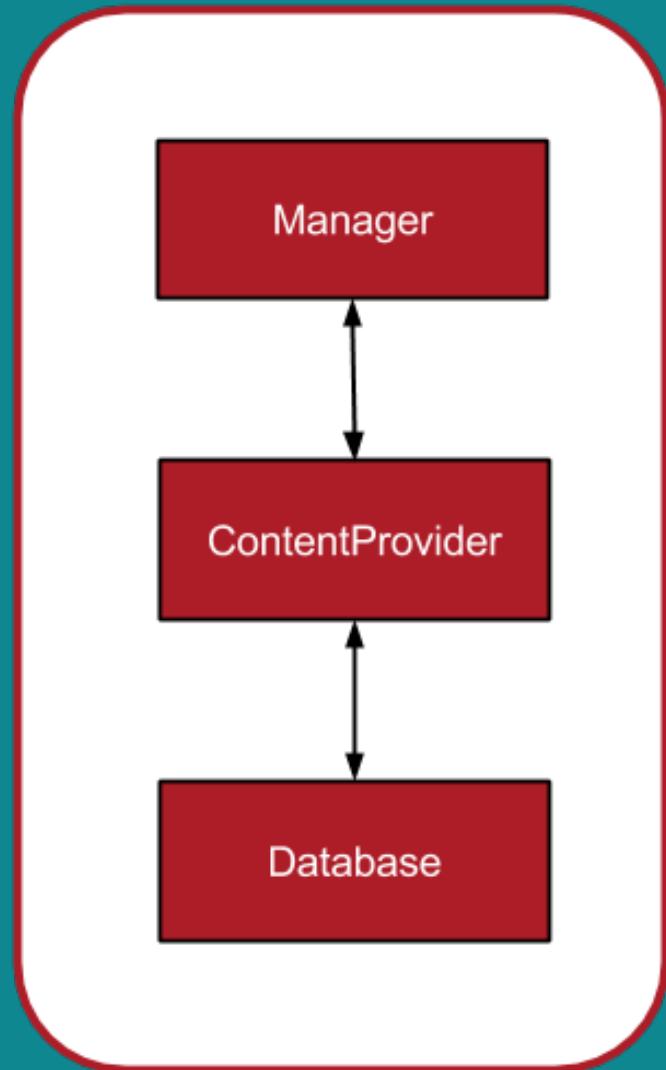


Architecture - System





Architecture - Database

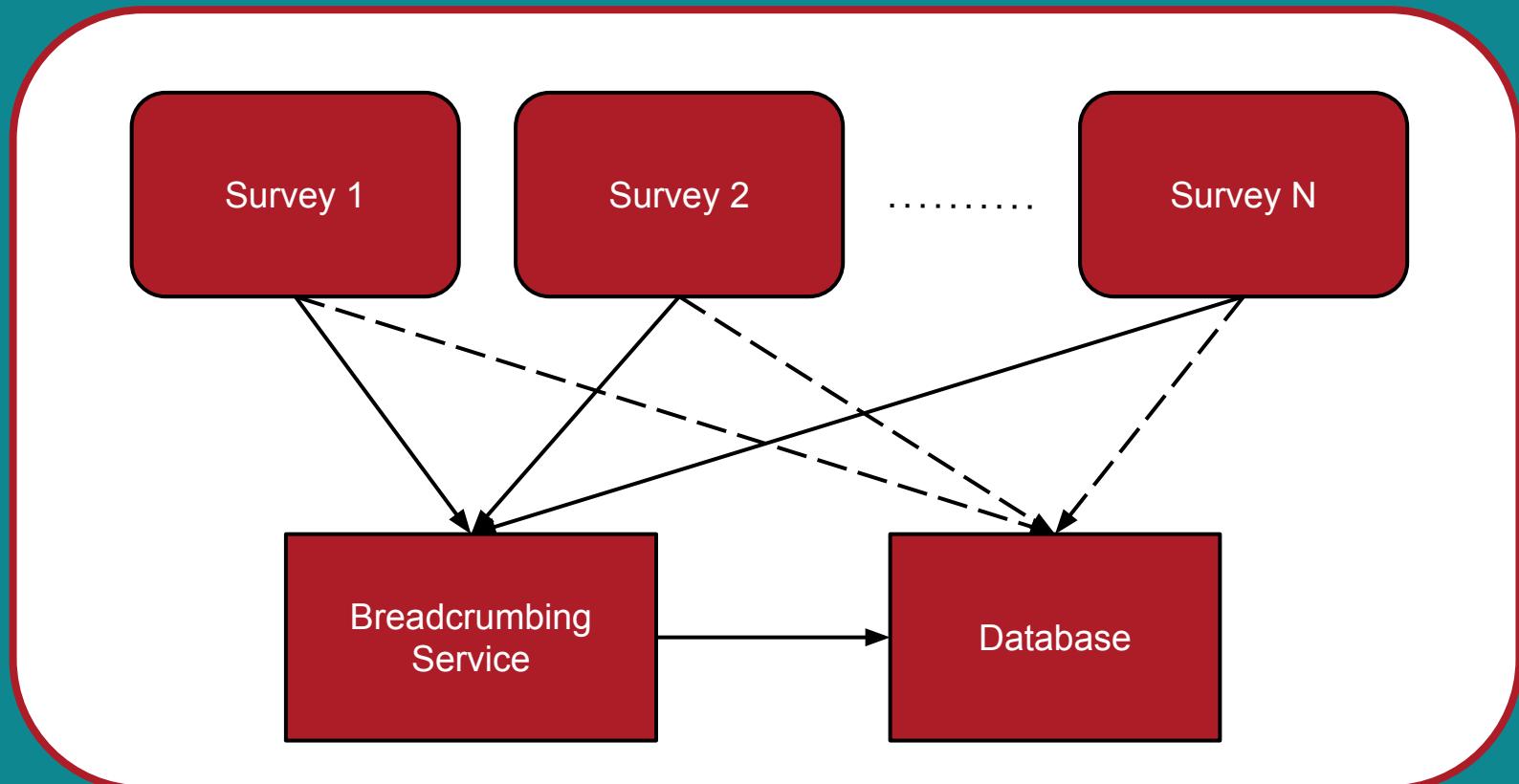


- Table per data type
- Abstraction
- Learning from mistakes
 - Upgrading schema
 - Pre-built SQLite file



Architecture - Services

Challenge: Asynchronous location tracking





Web Export

- Data sharing
- Proof-of-concept server
- Data warehouses are interested
 - BAMONA
 - eButterfly
 - Dutch Butterfly Monitoring Scheme



Prototype

- Completed Android UI with one protocol
- Local export
- Alpha release on Google Play Store
- Field testing



Testing

- Two-week sprints
- Scenario validation
 - Dev branch vetted in alpha before pushing to prod



Early Response

- 30+ installs in 3 countries since public release 1 week ago
- Disney scrapped their app after seeing our prototype
- Job offers from New Jersey
- Enthusiastic response at conferences



Future/Maintainability

- Modular code
- Github issue tracker
- Our team's future role
 - Bug fixes
 - Tweaks
- Next team
 - Major features
 - System expansion



Real World Challenges

- We need butterfly conservationists to want to use UBR
 - Polished
 - Attractive
- Android fragmentation



Impact

- Real-world release and benefits
- Help answer conservation questions
- Innovative interface
- Market penetration



Acknowledgements

- Nathan and Anita
- Dr. Rover



Questions or comments?

butterflies.ece.iastate.edu | butterflies@iastate.edu



Battery usage

Sampling Period (seconds)	battery drain per hour
5	7%
10	5%
15	4%
30	3%
60	2%



Schema

Breadcrumb Table

- key - ID
- Columns
 - Survey_ID
 - Time
 - Latitude
 - Longitude
 - Accuracy
 - Speed

Butterfly Table

- key - ID
- Columns
 - Generic_Name
 - Scientific_Name
 - Generic_Family
 - Scientific_Family
 - Generic_Sub_Family
 - Scientific_Sub_Family
 - region
 - Frequent
 - Custom_List
 - Source



Schema

Survey Table

- key - SurveyID
- Columns
 - ID
 - Survey_Type
 - Name
 - Start_Time
 - End_Time
 - Surveyor_Count
 - Surveyor_Names
 - Location_Name
 - Comment
 - Habitat_Type
 - Habitat_Condition
 - Wind_Speed
 - Cloud_cover
 - Temperature

- Engagement_Level
- Radius
- Uploaded
- Service_Temperature
- Service_Humidity
- Service_WindDirection
- Service_WindSpeed
- Service_Time
- Service_Pressure
- Service_Sunrise
- Service_Sunset
- Service_City
- Service_Country
- Service_MaxTemperature
- Service_MinTemperature
- Service_CloudCover
- Service_Rain
- Service_Snow



Schema

Sighting Table

- key - ID
- Columns
 - Survey_ID
 - Generic_Name
 - Scientific_Name
 - Generic_Family
 - Scientific_Family
 - Generic_Sub_Family
 - Scientific_Sub_Family
 - Location
 - Number
 - Temperature
 - Wind_Speed
 - Wind_Direction
 - Cloud_Cover
 - Time
 - Sex
 - Condition
 - Comment
 - Transect
 - Photo_Name → Links to the associated picture on device
 - Pressure
 - Ambient_Temperature
 - Illuminance
 - Relative_Humidity
 - Wing_Length
 - Mark_Found
 - Mark_Added