Hydro Citizens

Citizens Science Mobile App for Hydrology Reporting

Mentors: Dr. Eck Doerry,
Dr. Benjamin Ruddell

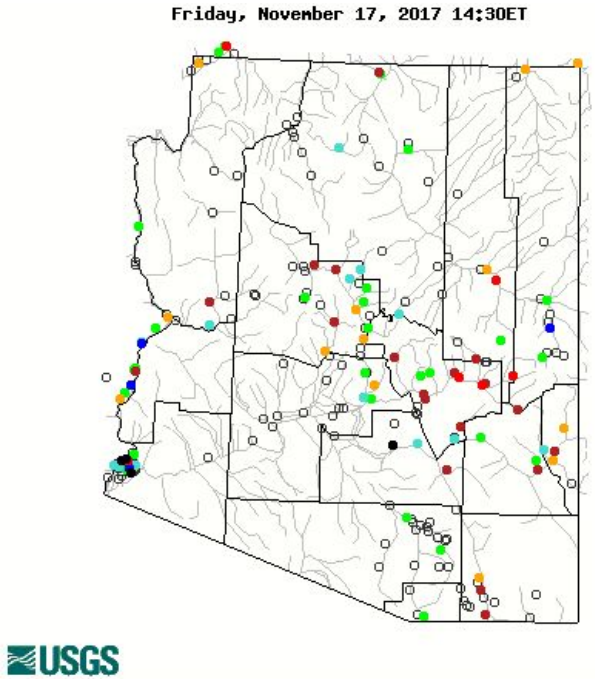
Client: Dr. Benjamin Ruddell

Luis Arroyo, Logan Brewer, Ryan Ladwig,
Kelli Ruddy

Why Hydrological Data Collection is Important

- Flood Prevention
  - Better warnings
  - Flood preparation
- Water Management
  - Measure river flow, runoff levels
  - Infrastructure design
- Public Education Knowledge
  - Influence how community votes for public officials based on how important they think water management is
  - When to evacuate

What's Wrong With The Current System?



- USGS - United States Geological Survey
- The USGS installs stream gage sensors that monitor water level
- Works with the National Weather Service to provide emergency flood data

Current Implementation

- Dr. Benjamin Ruddell
  - Associate Professor at NAU
  - Complex Systems Informatics Laboratory
- Dr. Robert Pastel
  - Associate Professor at Michigan Tech

- Very basic data collection
  - Build a station
  - Take a picture with their phones
  - Upload the picture to the website
- Drawbacks
  - Only works on the website
  - Requires an internet connection
  - No instant feedback
  - Slow process

Key Requirements

- Mobile
- Offline Functionality
  - Access graphs
- Geolocation
  - Pull users location
- Image Processing
  - Calculate water height on phone
- Database Management
  - Store collected data and images
- User Accounts
  - Option to create account
- Gamification
  - Notifications and data visualization

Our Solution Overview

- We are creating a mobile app that creates a fast way for users to collect hydrological data from stations that are set up in small or ephemeral waterways

- Key features
  - Works on mobile
  - No internet connection required
  - Instant display of data on collection
  - Quick process

Implementation Overview

Platform
Android, iOS

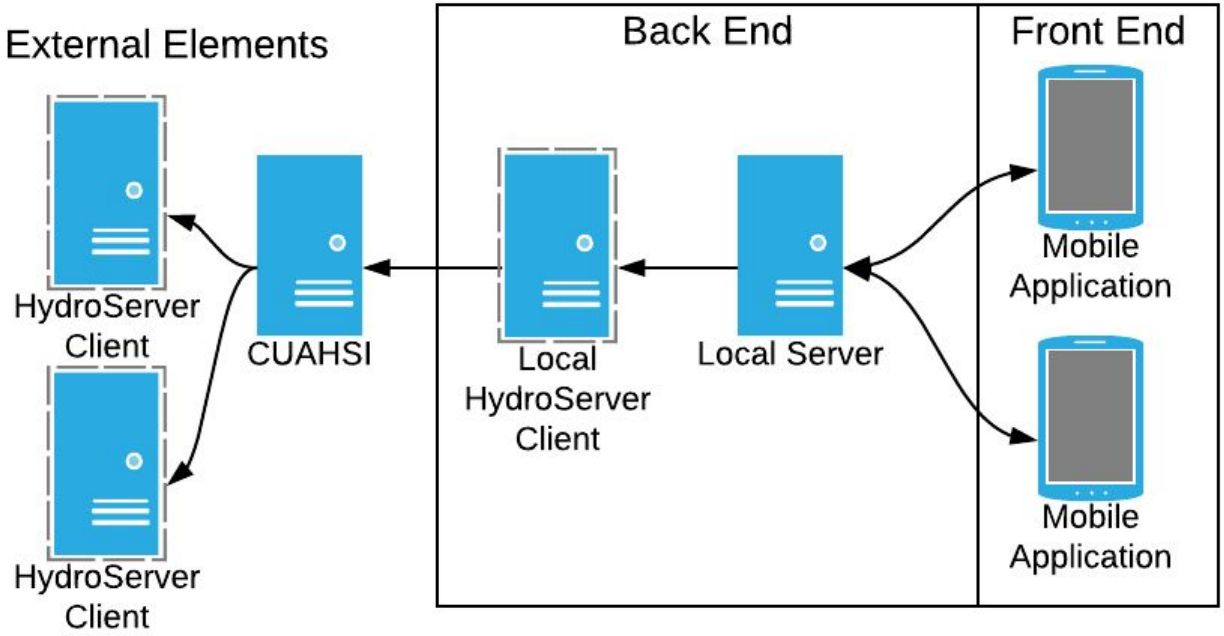
Application Framework
Meteor, PhoneGap, Android Studio

Gamification (Notifications)
Firebase, ***Twilio***

Gamification (Visualization)
Charts.js, D3.js

Database
MongoDB, MySQL, Apache Cassandra

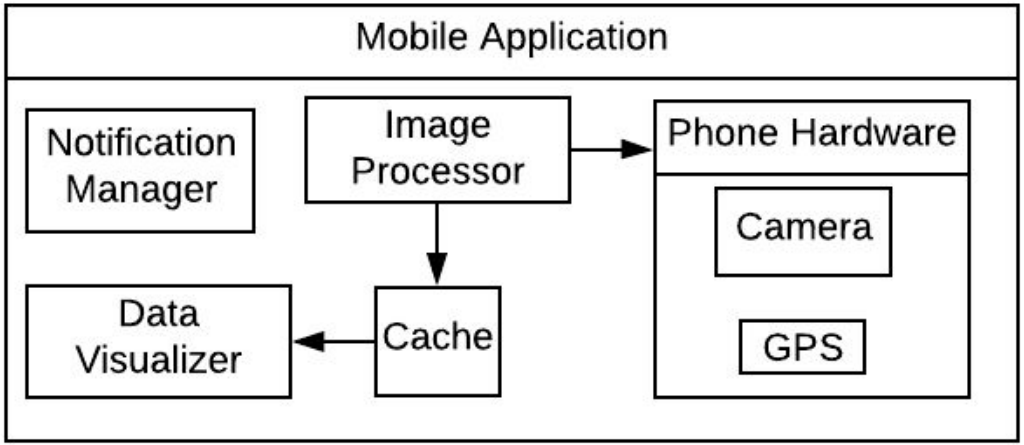
Computer Vision
OpenCV, Tracking JS, JS Feat



Architecture Overview (Mobile Application)

Key Design Features:

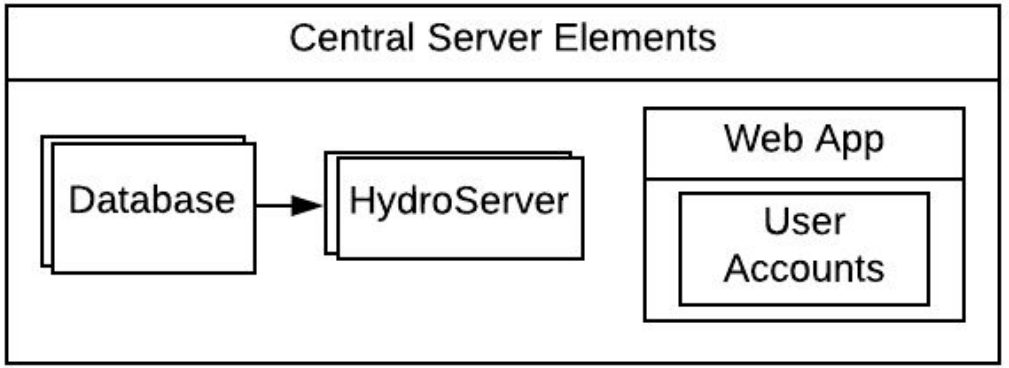
- Image Processing
- Notifications
- Data Visualization



Architecture Overview (Central Server)

Key Design Features:

- Data Distribution
- User Accounts



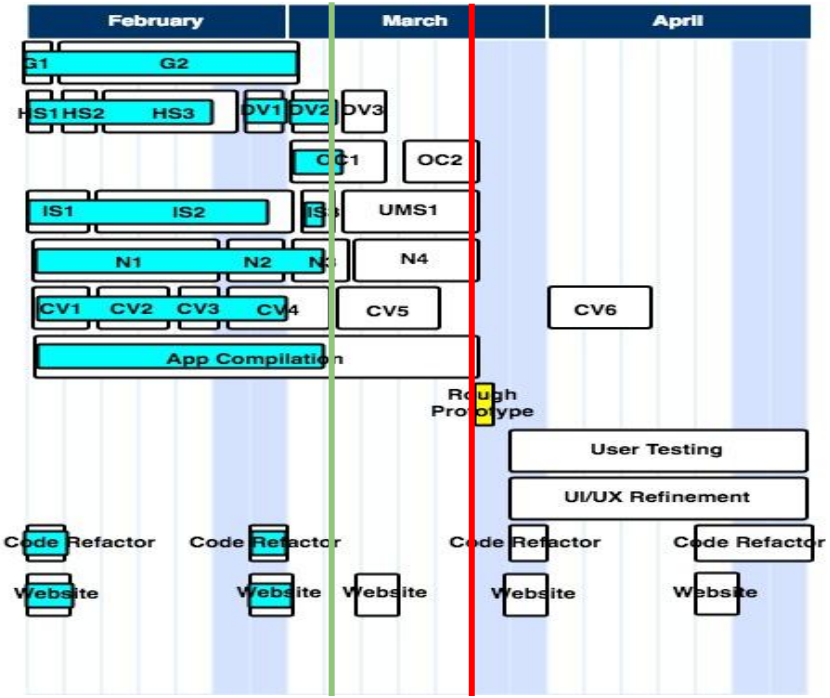
Challenges and Resolutions

- Previous Challenges:
  - MongoDB
    - Split the collection into pieces using GridFS.
  - OpenCV
    - Modify the build settings
  - Send offline and online notifications
    - Send SMS text messages.

- Current Challenges:
  - Meteor 1.6.1
    - Downgrade to Meteor 1.6
  - Image Uploading
    - Upload the image's information

Schedule

- Geolocation (G)
- HydroServer (HS)
- Data Visualization (DV)
- Offline Capabilities (OC)
- Image and User Information Storing (IS)
- User Management System (UMS)
- Notification (N)
- Computer Vision (CV)
- App Compilation



Conclusion

<u>Key Functionalities</u>

1. Mobile application
2. Offline functionalities
3. Data Visualization

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