



find parking... *fast*

tritonPARK

Gregory Marchese
Yasmine Kotturi
Jaysen Parmar

COGS121
Professor Weibel
Spring 2014

The Problem

The Problem

- Parking is hard to find
- Spots / Lots are not clearly identified
- Rules are complex, and difficult to understand.
- Campus is massive, which compounds the problem.

Summary of Requirements

Summary of Requirements

- Predictive Model of Parking Spot Availability
- Biasing based on Realtime Data
- Minimal Distractions in Interface
- Stable, to absolutely prevent error states



tritonPARK

Motivation & Background

Motivation & Background

- Parking is a problem everywhere, and especially at UCSD
 - Horrifically slow to find spots, (30+ minutes at times)
 - User frustration, based on above.
 - Planning
 - Expense

Needfinding

Interview Questions

How long have you been parking at UCSD?

How much time do you usually spend on parking?

Where do you usually park?

What are your knowledge of all of rules in regards to parking?

What are your personal frustrations with parking?

What are some financial or emotional investments you make toward parking?

What are some strategies you use in regards to parking?

What's the most negative/worst experience you've had with parking? best?

User Profiling

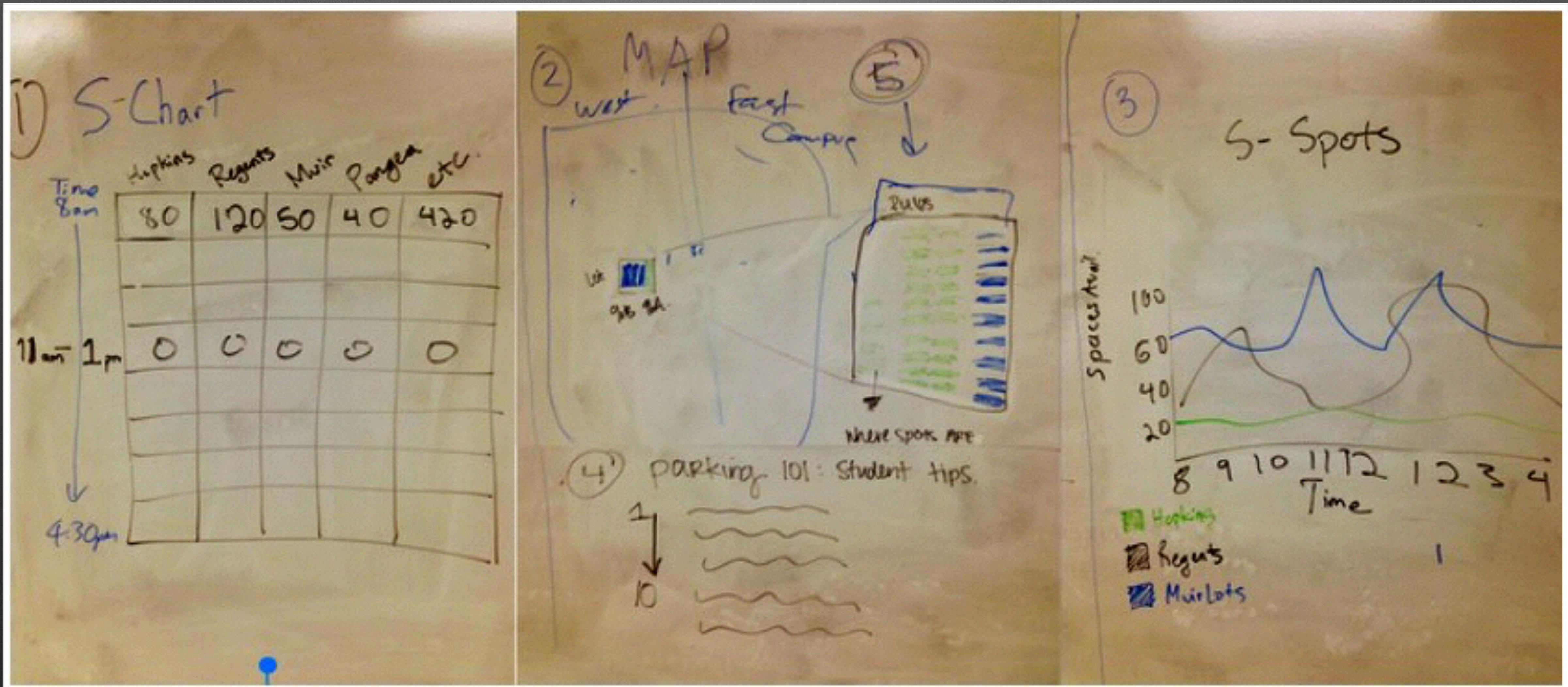


- 3rd Year
- Village Resident
- Female
- S Permit
- 1st time w/ car & permit

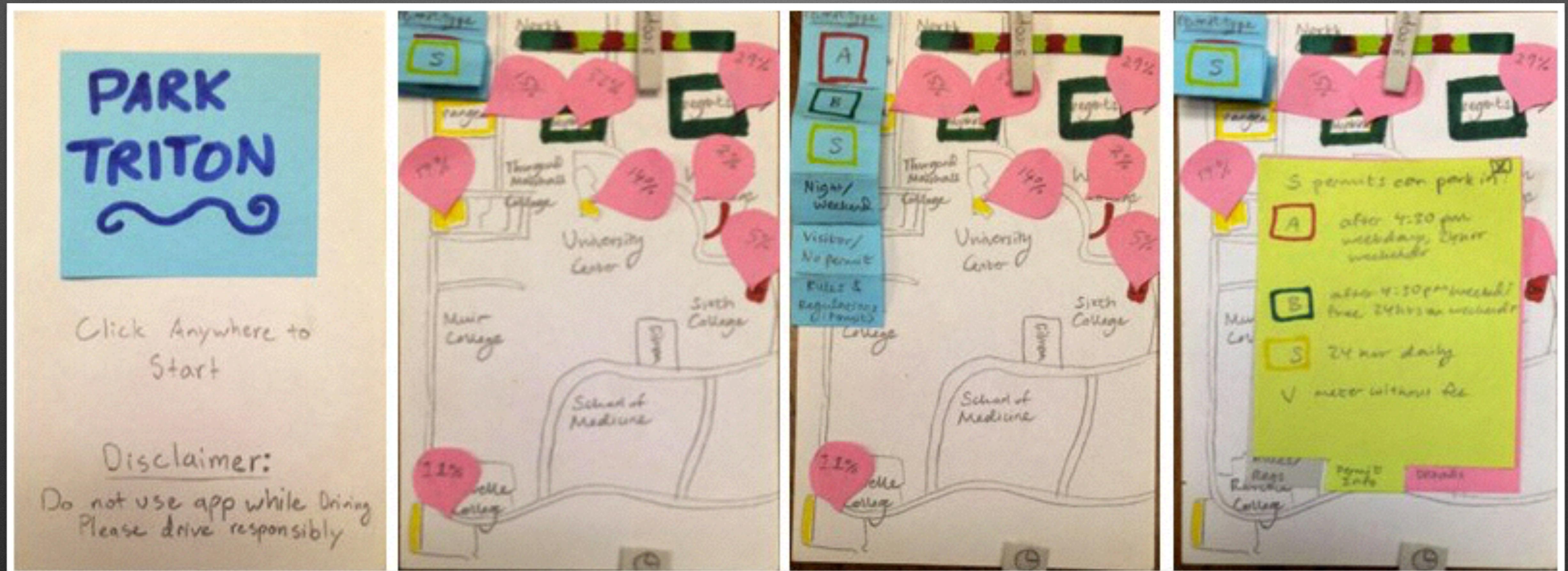
- Must move car after 2AM
- Checks Village, then Hopkins, then Pangea
- Wasted gas and money trying to find parking (from circling around campus)
- Financial investment to buy parking permit
- Emotional frustration at seeing other people get parking
- Best experience is finding parking straight away in Hopkins and Pangea on a weeknight (20/30%)
- Always uses permit to park on campus
- Considers herself as a new user
- Learned knowledge from old users
- Used to go to Pangea regularly but now mainly goes to Hopkins

Development

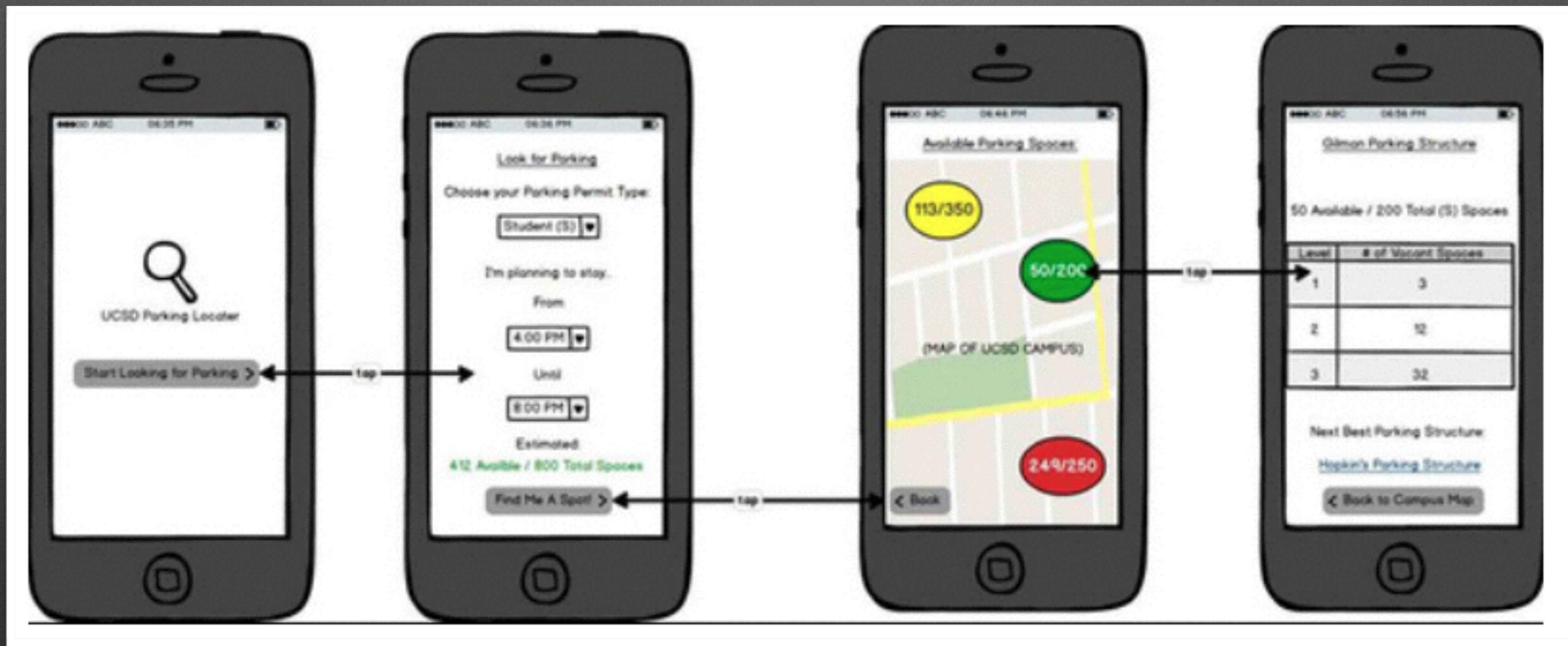
Whiteboard



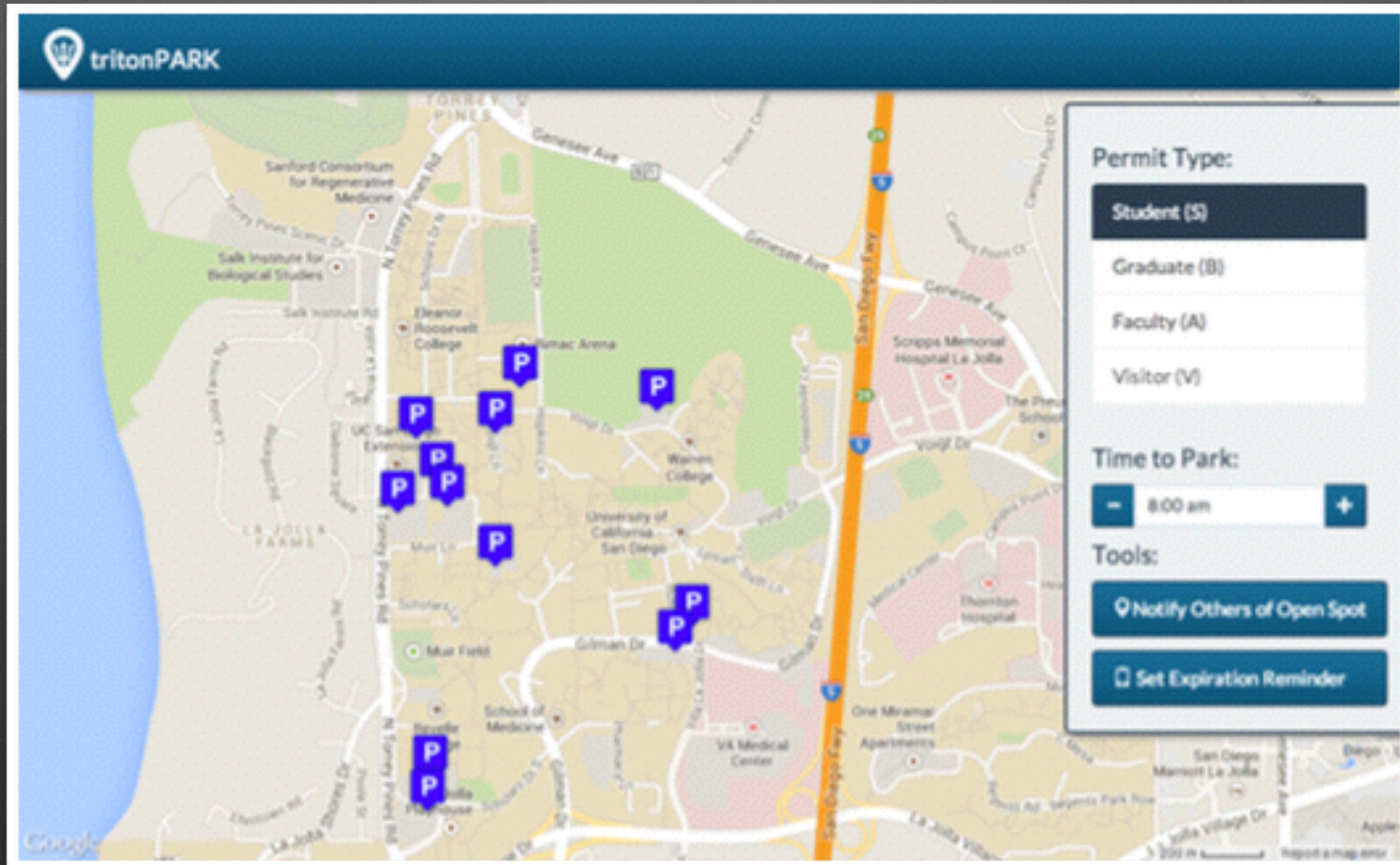
Paper Prototype



Balsqmiq Mockup



Final Design



tritonPARK

Permit Type:

Student (S)

Graduate (B)

Faculty (A)

Visitor (V)

Time to Park:

- 8:00 am +

Tools:

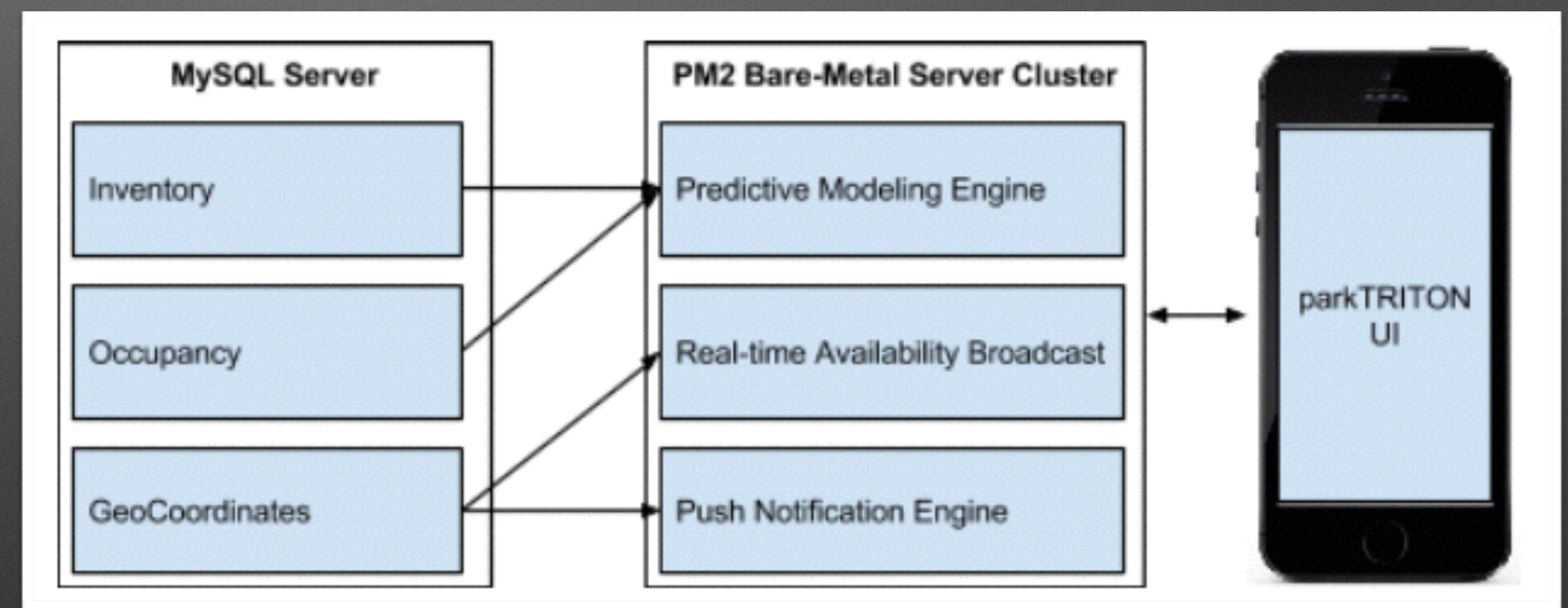
Notify Others of Open Spot

Set Expiration Reminder

Map showing parking locations (blue 'P' icons) in the San Diego area, including locations like the Sanford Consortium for Regenerative Medicine, Salk Institute for Biological Studies, Eleanor Roosevelt College, Scripps Memorial Hospital La Jolla, and the University of California San Diego.

System Architecture

- Two Server Setup
- PM2 Bare Metal Server Cluster
- MySQL Server
- Bootstrap and JS based UI



Endpoint Directivity

- Extensive API
- Allows varying degrees of information specificity
- Dogfooding



MySQL

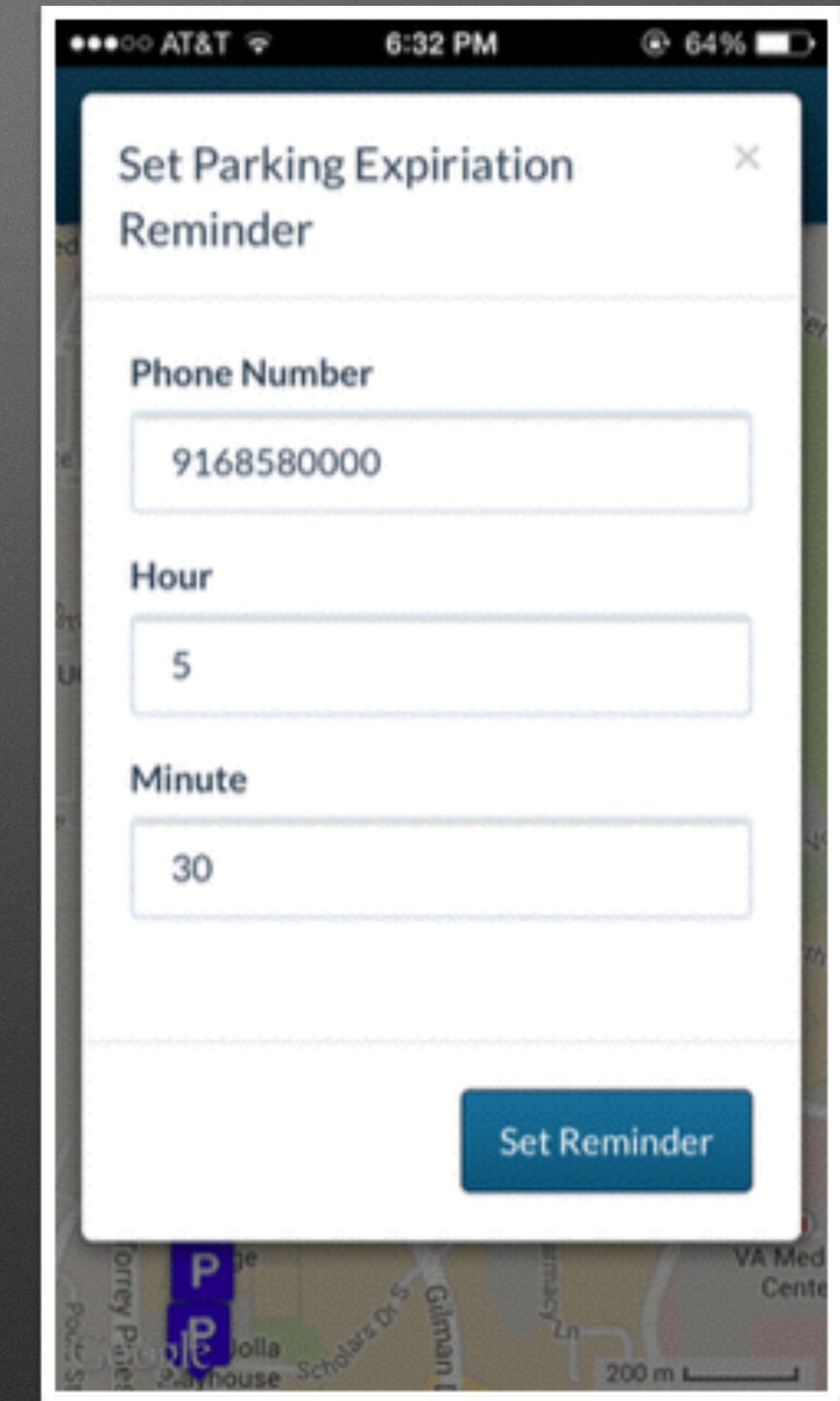
- Stores INVENTORY, GEO, OCCUPANCY DATA
- Only accessed via Node.JS backend server.
- Chosen because of strong JOIN'ing ability
- Chosen because of strongly typed, relational, static schema.

The diagram illustrates three MySQL tables: INVENTORY, GEO, and OCCUPANCY. Each table is represented by a vertical list of columns with a blue header bar.

- INVENTORY:** Contains columns for LOT (with values A, B, S, V), and status categories: RESERVED, ALLOCATED, ACCESSIBLE, UC, SERVICE, LOADING, TOTAL, and MOTORCYCLE.
- GEO:** Contains columns for LOT, LAT, and LON.
- OCCUPANCY:** Contains columns for LOT, TYPE (with values TIME8, TIME9, TIME10, TIME11, TIME12, TIME13, TIME14, TIME15, TIME16, TIME17), and TIME (with values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10).

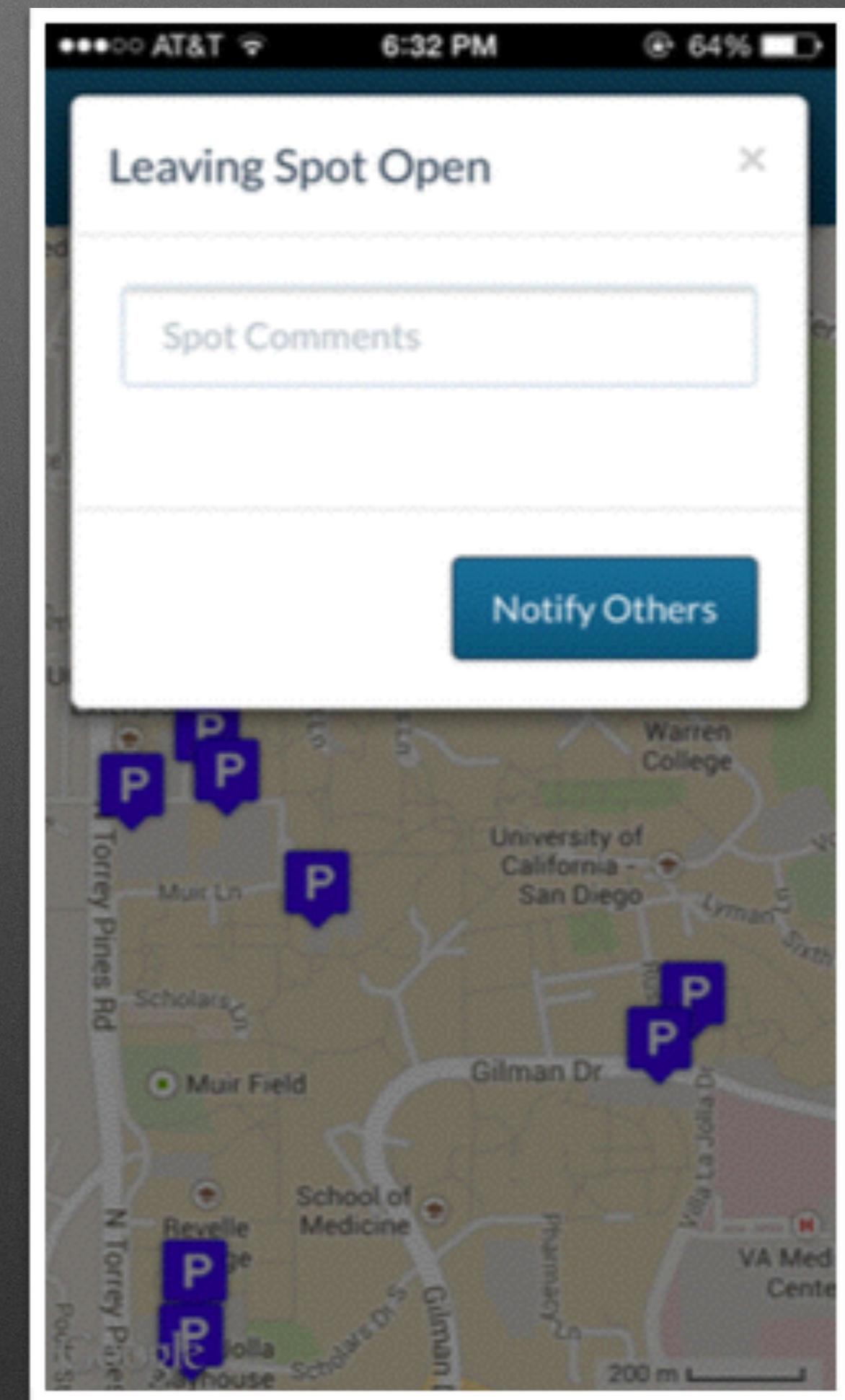
Twilio

- Used to send text message reminders to end users
- Most reliable service provider
- Easiest API



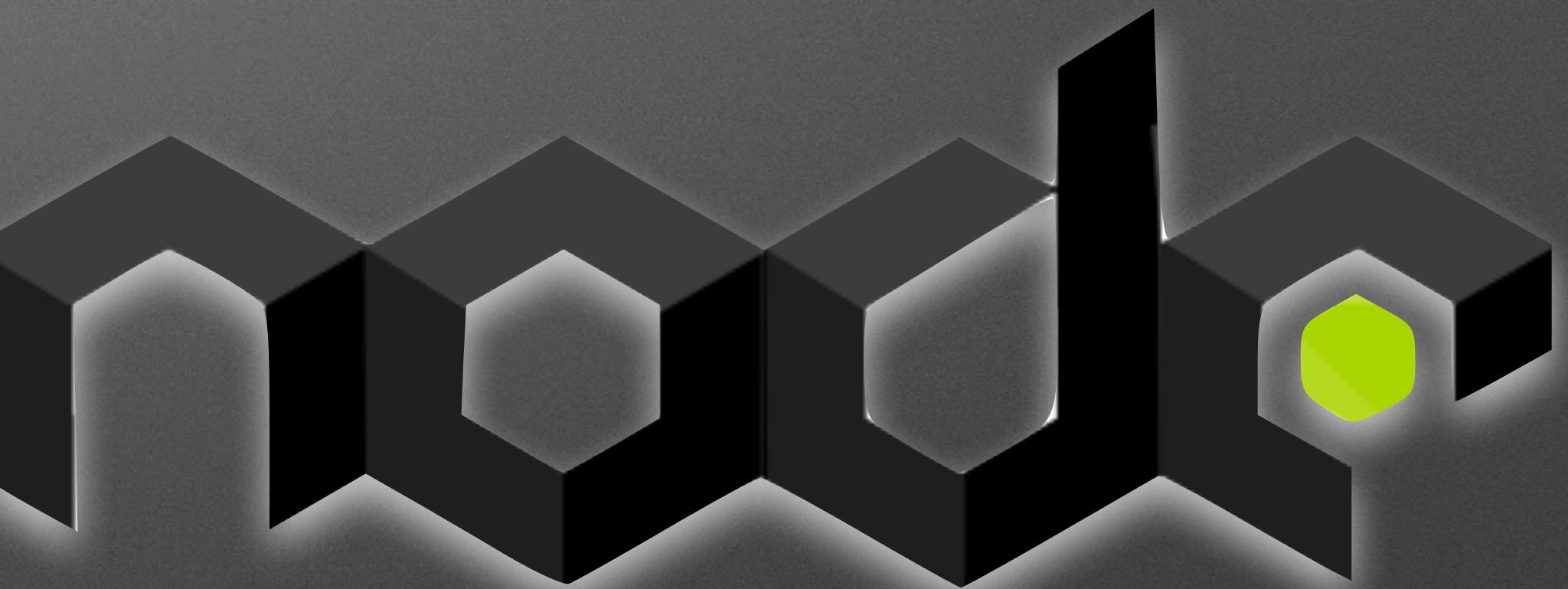
Socket.IO

- Realtime parking spot notifications
- WebSockets
- Long Polling HTTP Socket



Node.JS

- Fast
- Nonblocking Communications
- Low Memory Usage
- High Concurrency
- Programmer Familiarity

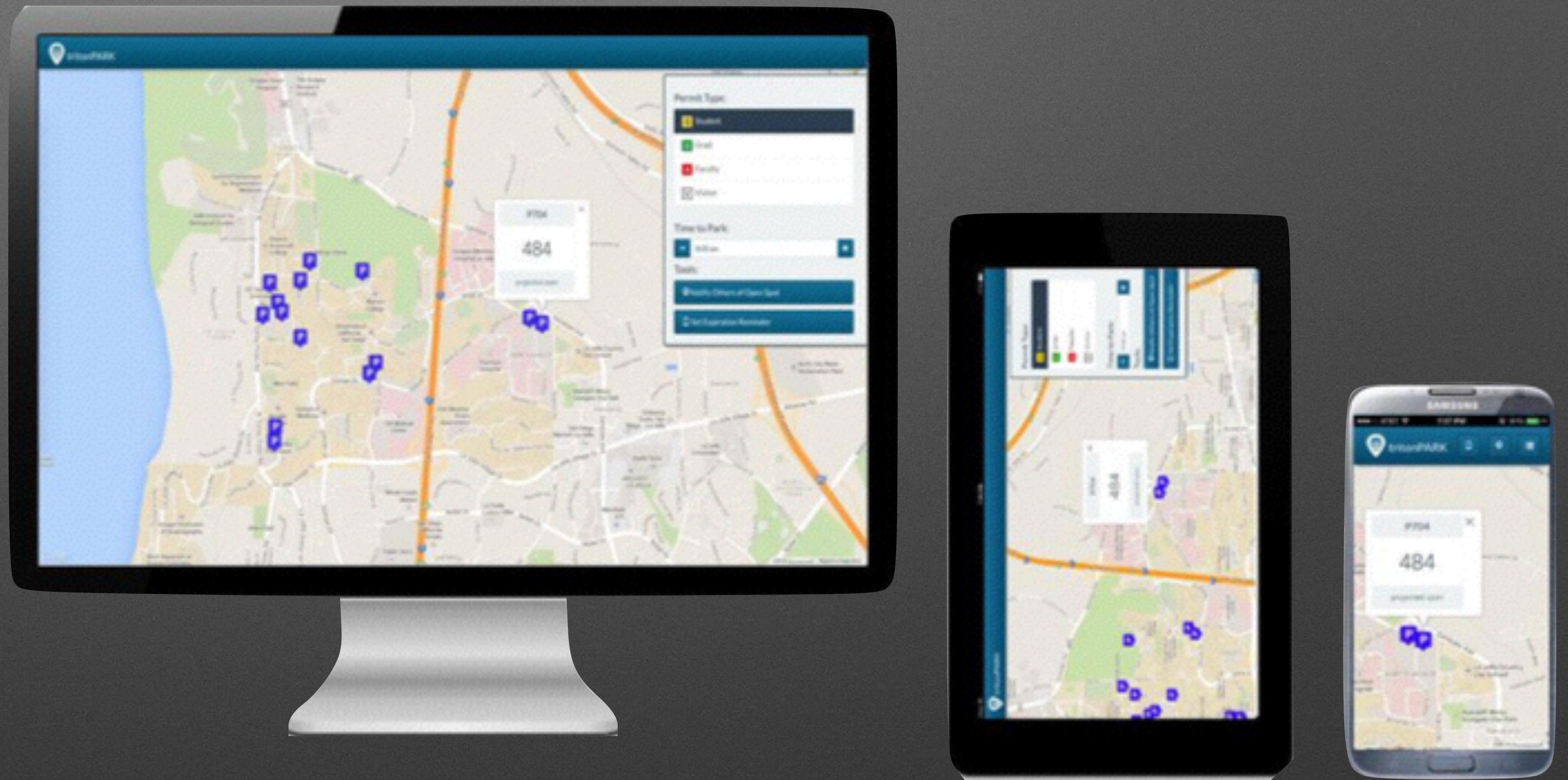


Scheduler

- Custom text message scheduling API
- Could be extended to allow up to millisecond level precision
- Could be extended to handle other task scheduling

Bootstrap

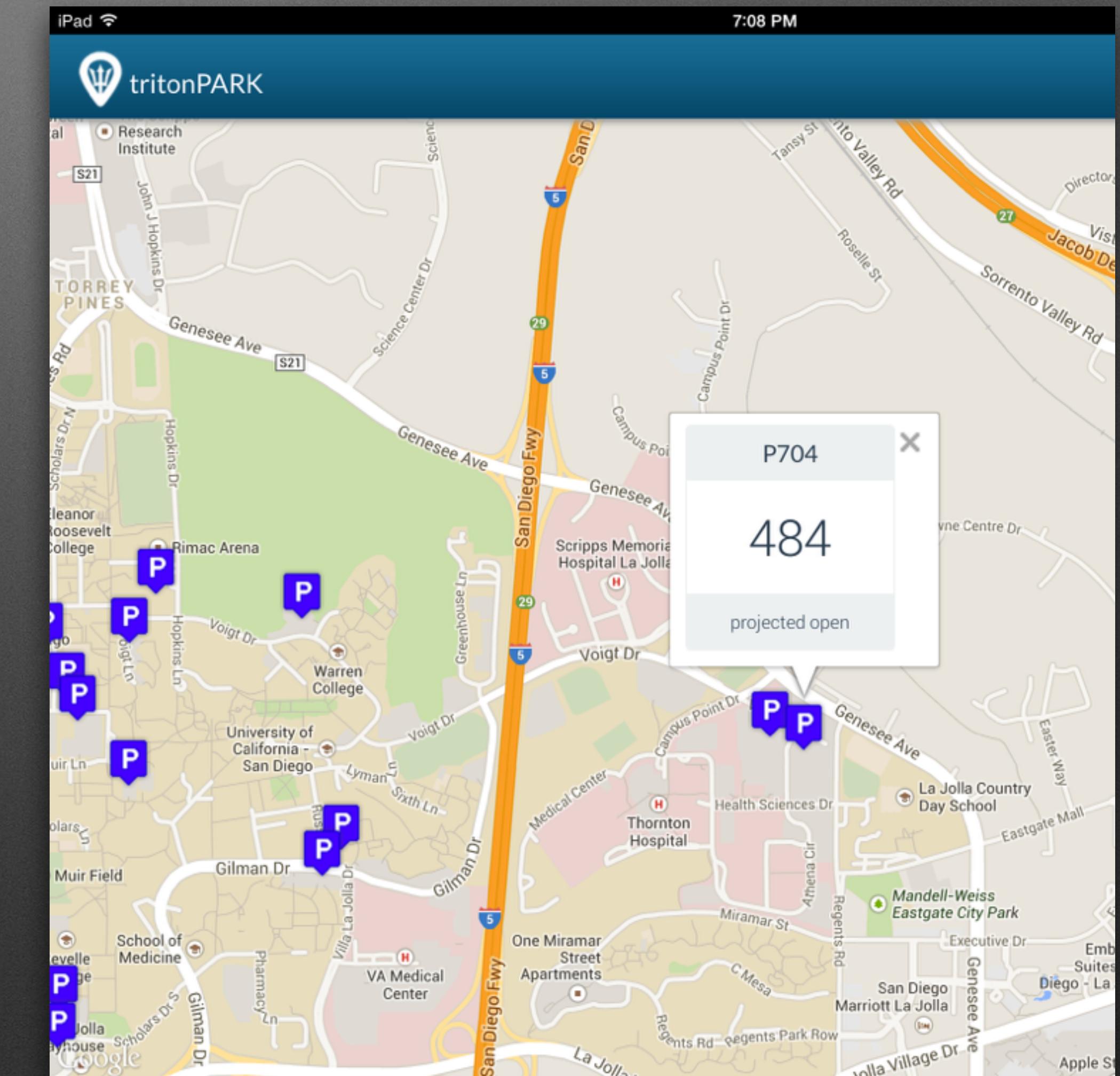
- Powerful theme framework
- Responsiveness is baked in
- Low/no image usage



Key Features

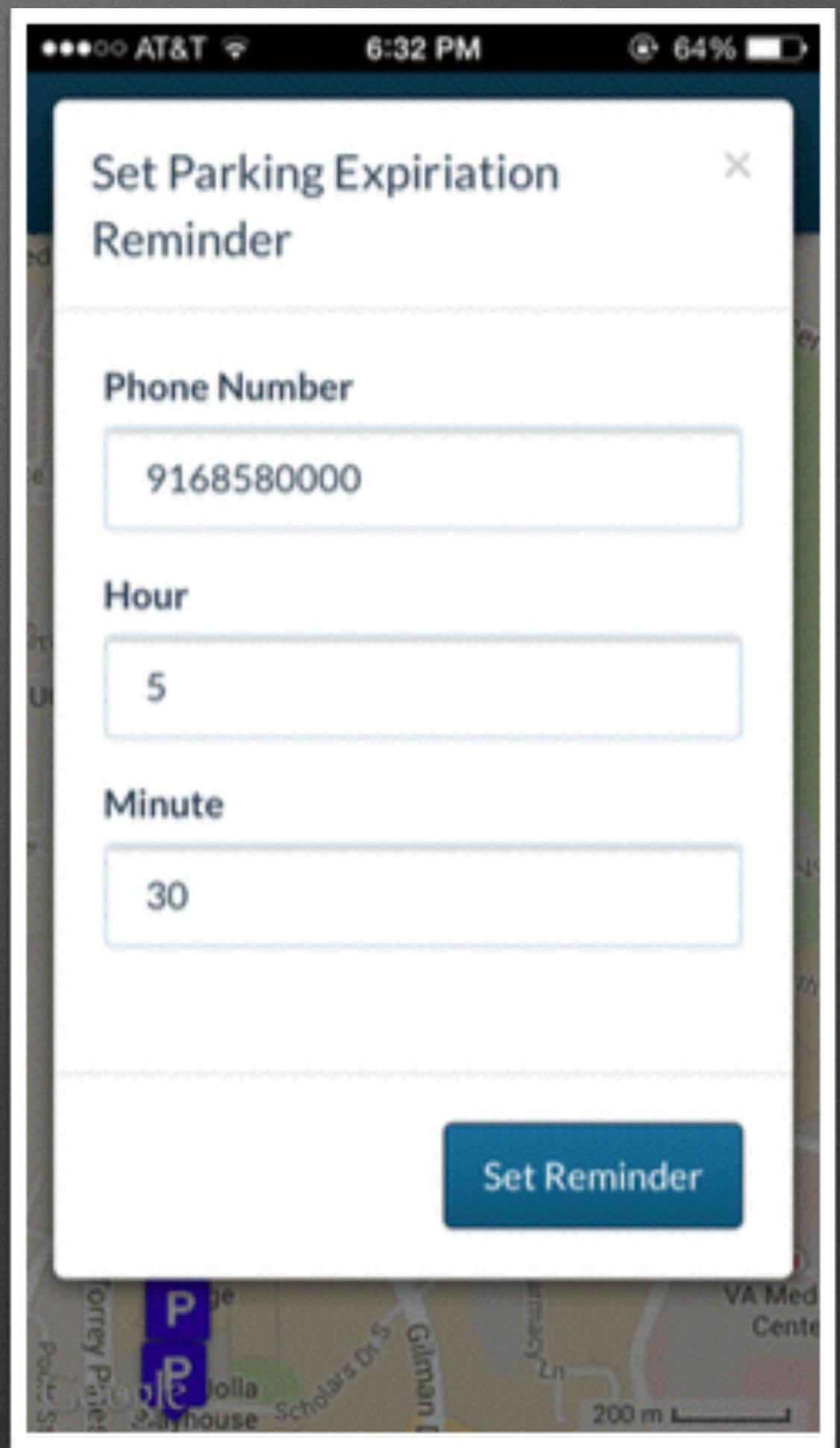
Detailed Campus Map

- Where most of the user interaction takes place
- Details parking locations around campus
- Reflects realtime updates from our other features



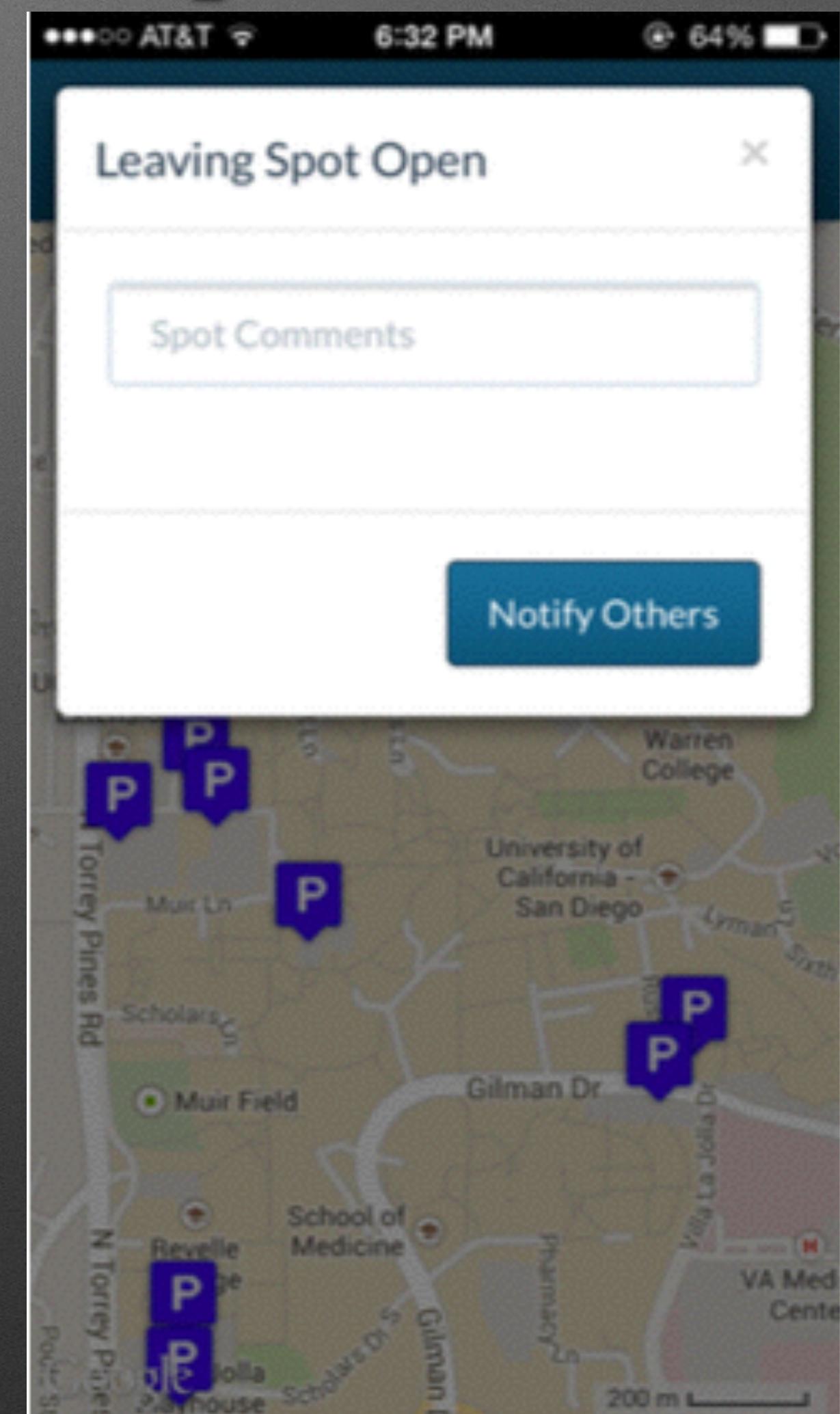
Parking Expiration Reminder

- Scheduled Text Message Alert System
- Keep track of what time a visitor's pass is about to expire



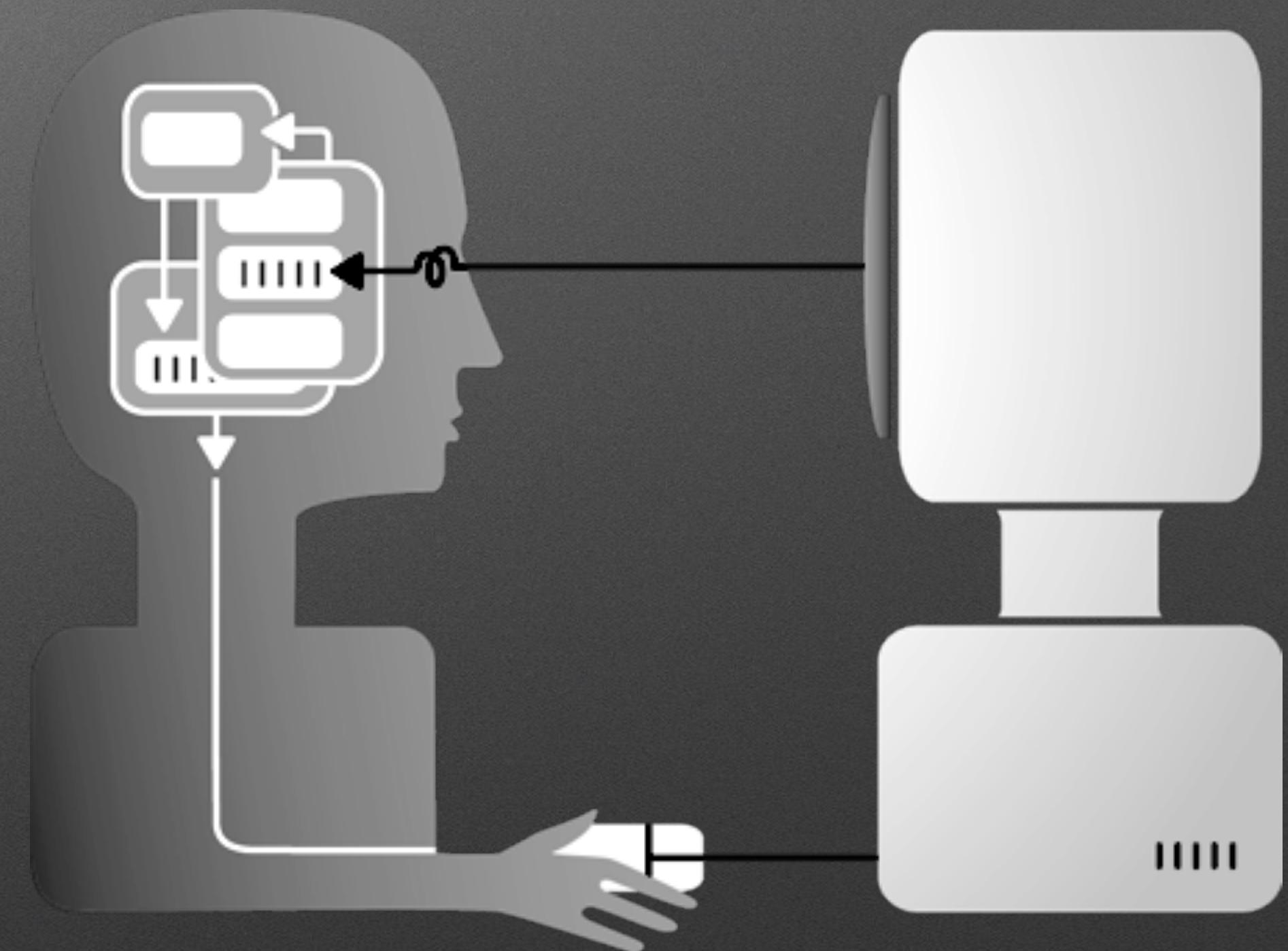
Leaving Spot Open

- Allows users to broadcast their location in realtime to notify other users of an empty parking space
- Pin is dropped on the map at the user's location with a comment

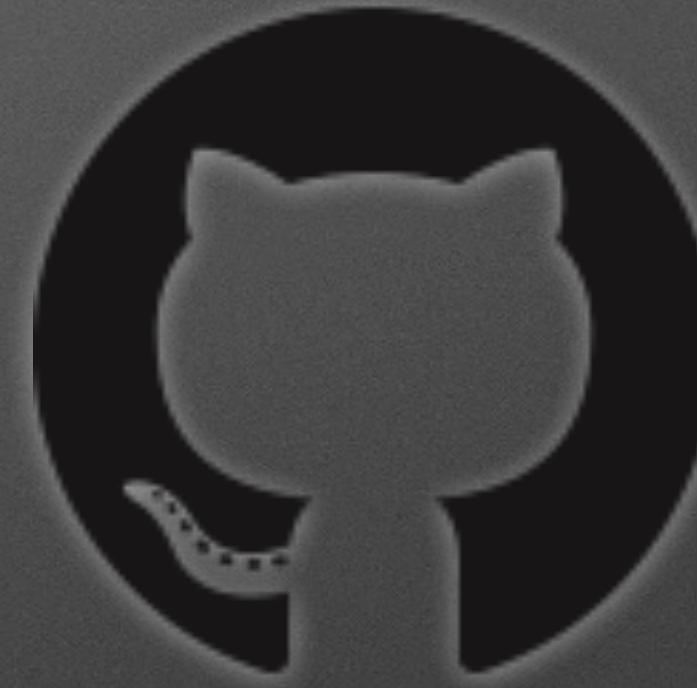
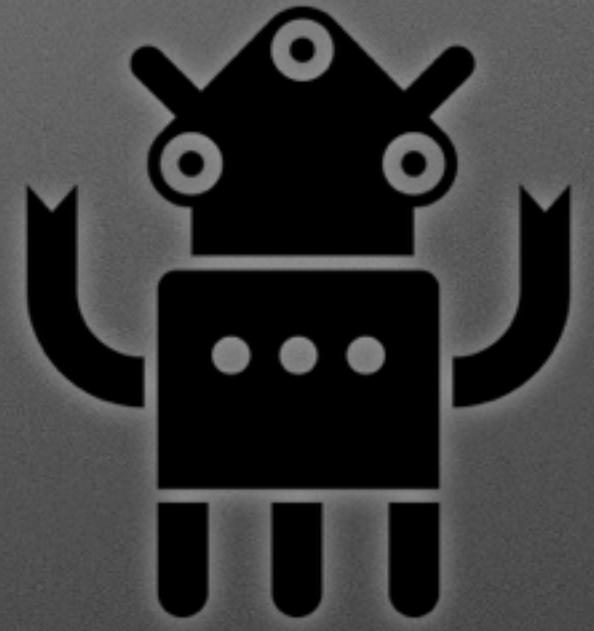


Human-Computer Interaction Principles

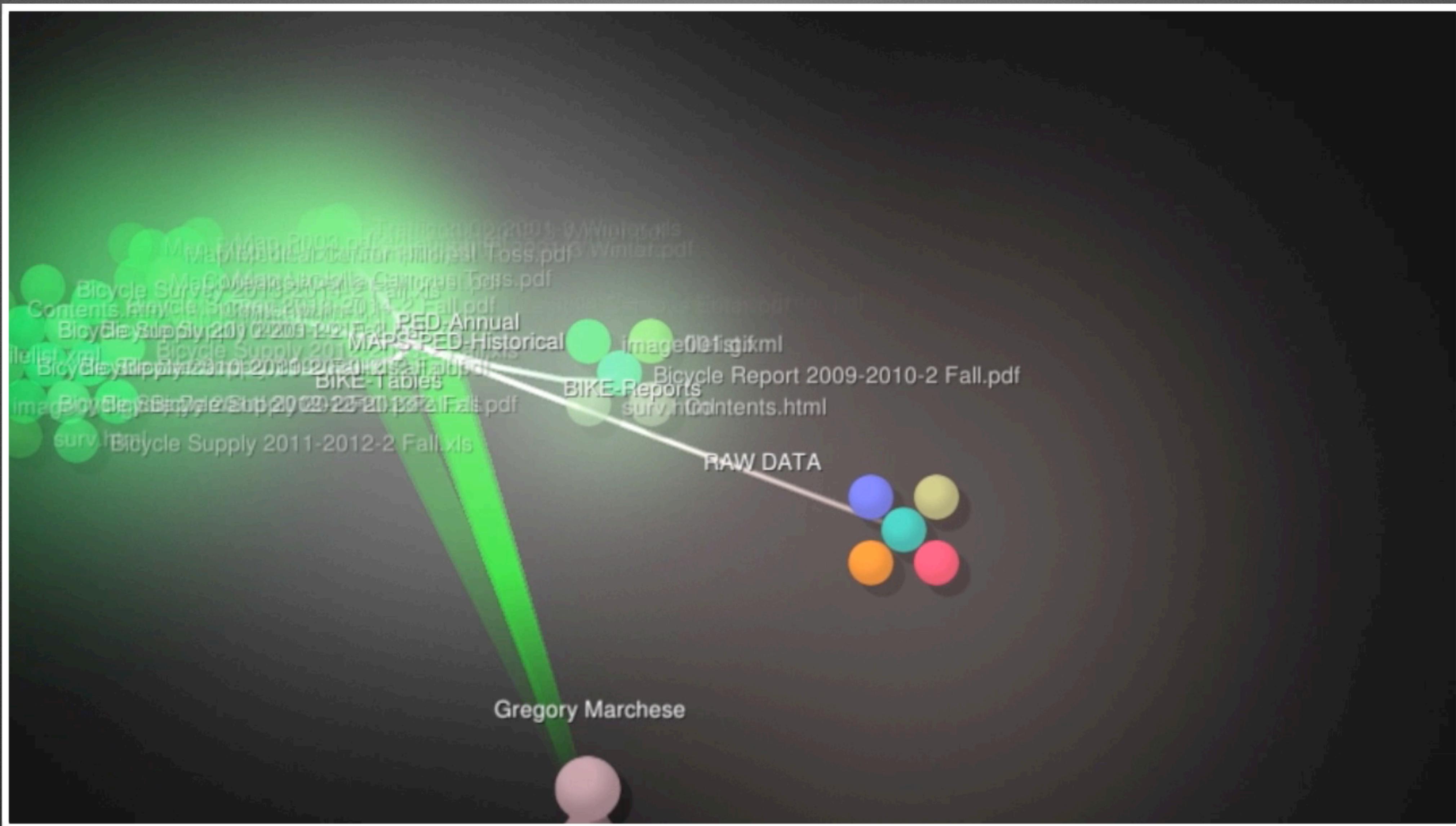
- Visibility
- Mapping
- Mental/Conceptual Models
- Affordance
- Constraints



Collaboration Tools



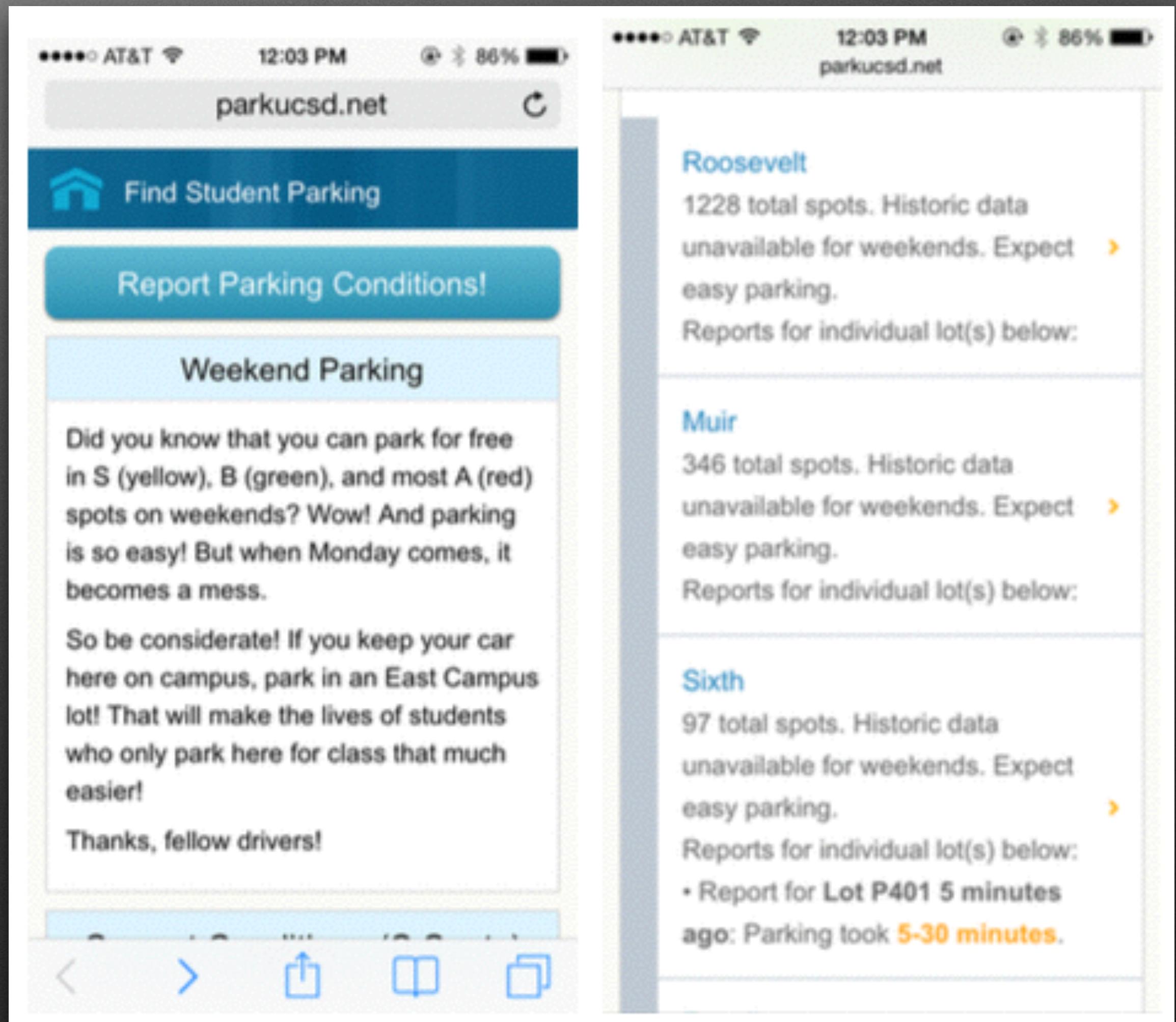
Repo visualization



Issues & Solutions

Poor Market Research until Late in Cycle

- Same Data Source
- Color Coded, but not useful
- Information Density is too high
- Mobile optimized, but not responsive
- Info located below the fold.



Future Roadmap

Future Roadmap - Tier 1

- Include data that goes back further than the last 3 years.
- Include Historical Inventory Data
- Increase the amount of parking locations selectable in our GeoLocation database
- Implement day/night mode CSS.

Future Roadmap - Tier 2

- Implement GeoFencing, to allow the server to make smarter predictions of open parking, based on the users current direction of travel.
- Use routed distances vs. point-to-point distance
- Maintain a Universally Unique ID (UUID) based anonymized database of parking trends.

cocomo Cost Model

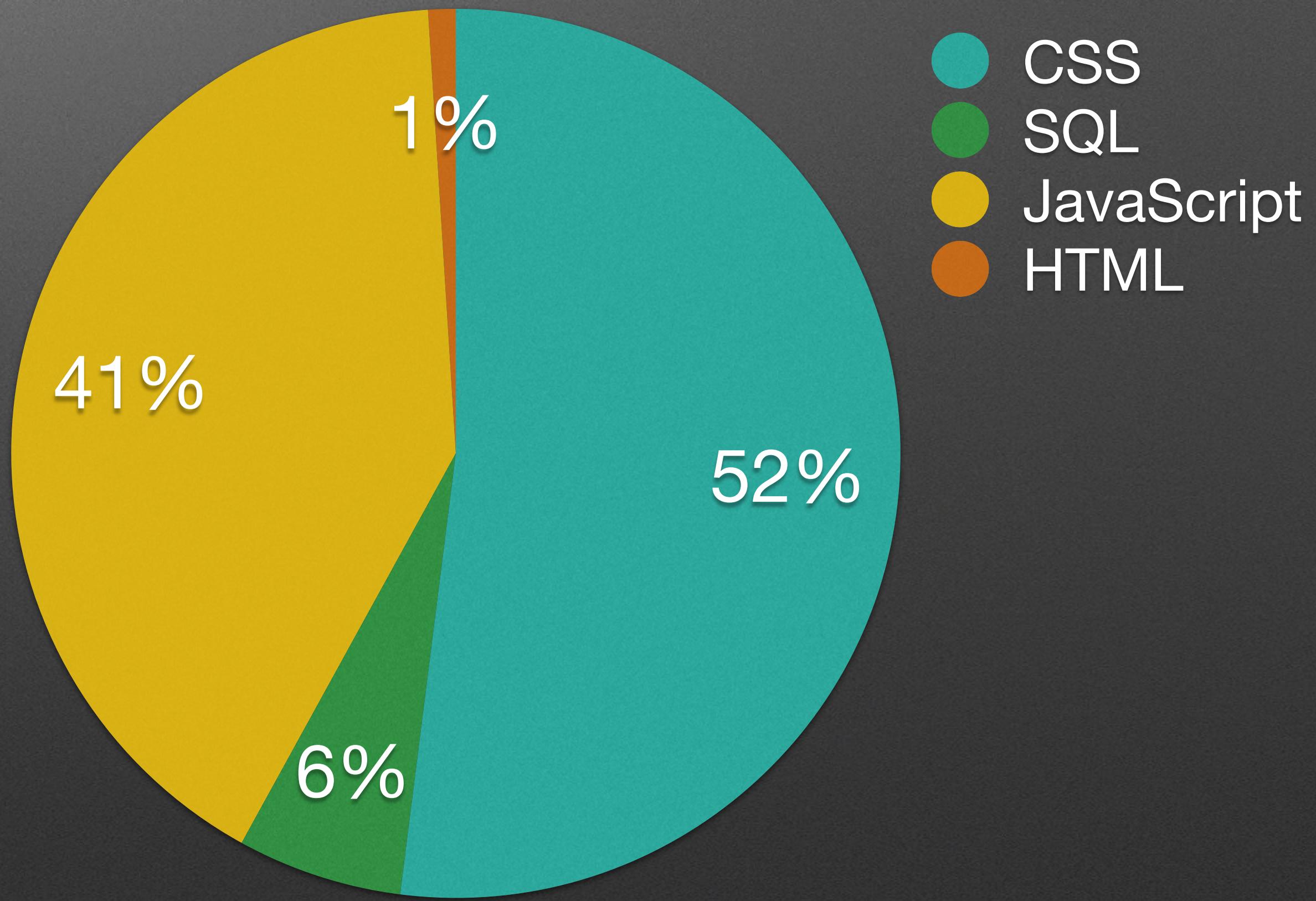
\$21,147

USING COCOMO MODEL

- *Student Developer Salary of \$23,000,*
- *SLOC = Logic Code Only (4,275 Lines)*
- *A: 2.4 - Organic Software Project*
- *B: 1.05 - Organic Software Project*
- *COST = sub(a)*(SLOC)^b*

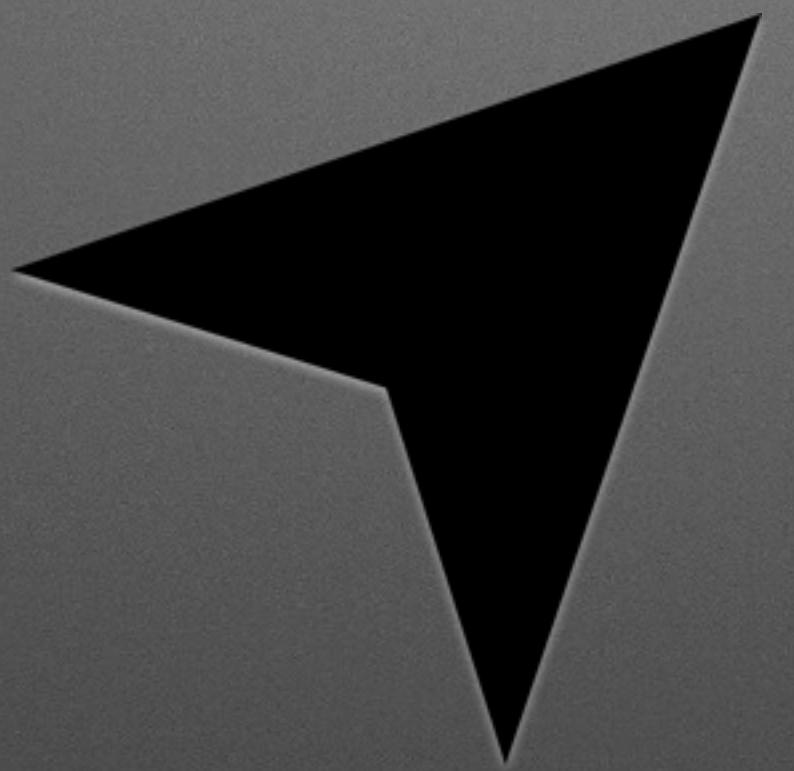
Code Analysis

10,498
standard lines of code





Responsive



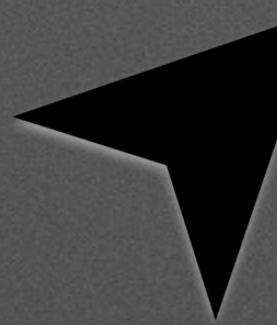
Geo-enabled



Realtime



Simple



We work the way you work.



Computer?

Tablet?

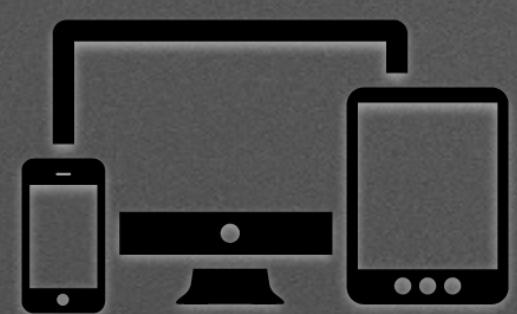
Smartphone?

No problem!

Why not?

We roll with that too!

Responsive



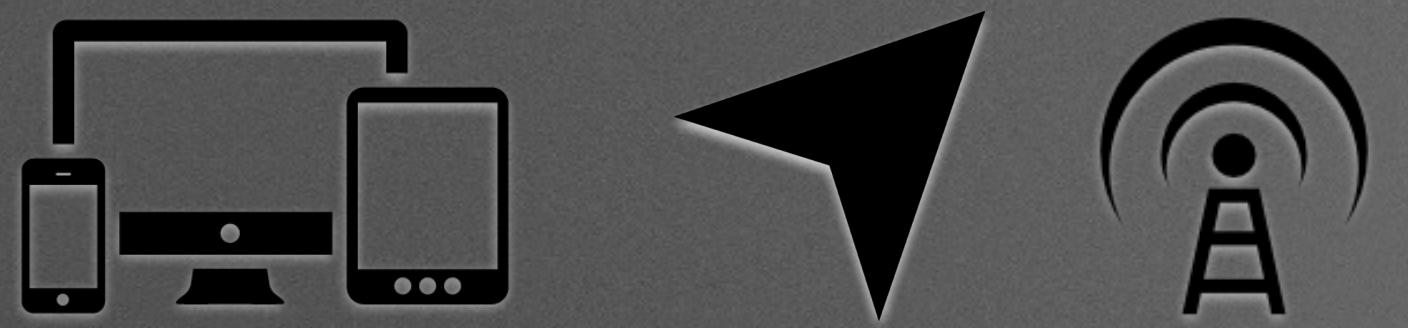
Geo-Enabled

*Wherever you
are, we'll be
there.*



Realtime

*You need info,
and you need it
now.*



1

Simple

*One goal, one app.
Get in, get out, get done.*

1



tritonPARK: *find parking... fast*



APP DEMO