ParkWizard: Street Parking Android App

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Abstract

A good day begins with a good parking. Finding a parking spot rather than ending up with a ticket is one of the daily struggles faced by millions of drivers worldwide, however the problem is not lack of parking, rather most of the times drivers are simply not aware of parking spots.
Various apps have been developed in the past but with an intention of providing paid garage parking. In this project, we introduce *ParkWizard*, an user incentive based android app which crowdsources parking data and provides on demand search facility for hassle free parking.

Introduction

ParkWizard is an Android app that helps users find available street parking locations. It works on a score based system where users earn points by reporting parking locations and updating availability status. The users further spend their earned score back into the app to search for available parking spots when needed. This score-based system works well towards maintaining a smooth information flow between users(drivers) who want to find available parking spots and those(informers) who have information about them. At any point, a user can update as well search for parking locations on the app.

User Incentive & Working

Parkwizard does not contain any parking location data of its own. It aims to incentivize users to provide the app with latest and most correct information about parking locations in their knowledge in return of earning reward points on the app. The scoring scheme is as follows:

- A user is rewarded 10 points for reporting a new parking location. However, a user is not allowed to report a parking within 50m of an already existing parking to avoid duplicates.
- A user is rewarded 2 points for every update they provide about an already existing parking location. To limit the misuse of the update feature, we limit a user to make a maximum of 5 updates per day. These updates can be made for parking locations within 100m of the user device location.
- For updating false information such as suspiciously high number of parking spots or fake information, a user is penalized 2 points.

Algorithm

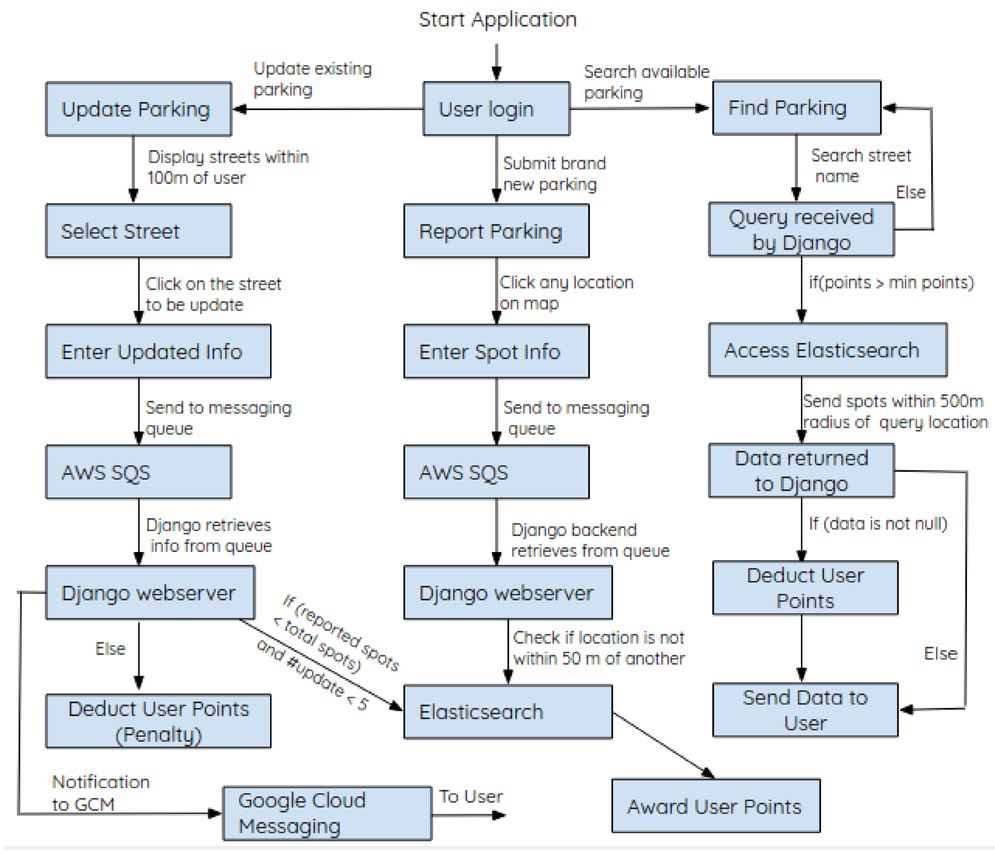

Figure 1: App State Transitions

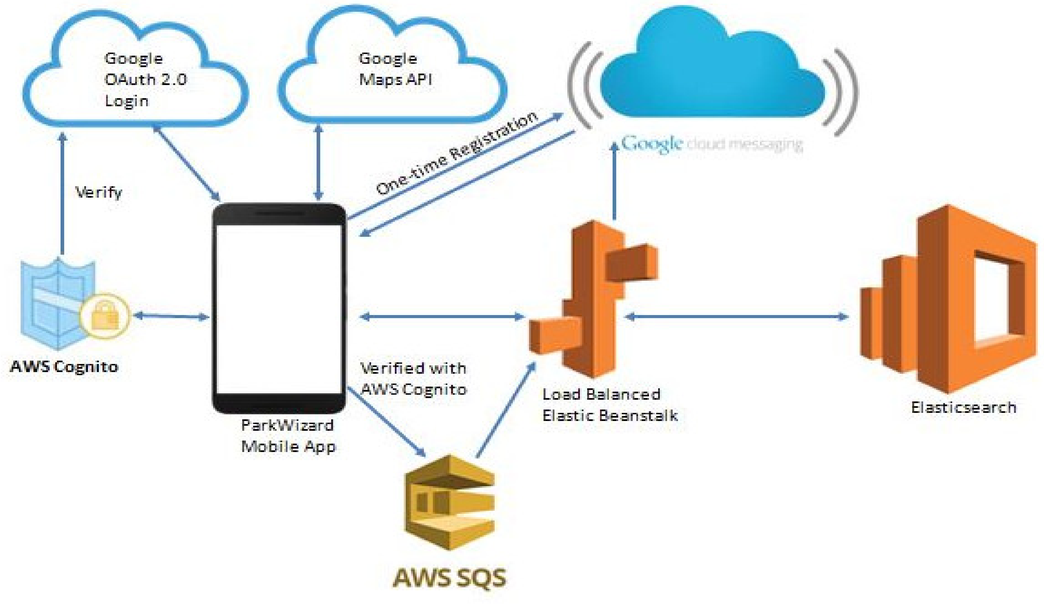

Figure 2: Architecture

- A user has to spend 5 points to search for parking locations they wish to find near their destination. By default the parking locations are shown within a 500m radius of destination.
- To encourage users to keep the parking location most up to date, the app rewards them back 2 points if they choose to use a parking spot from the search results.

Architecture

We make use of Google OAuth to facilitate user login through Google account. At the time of login we also utilize AWS Cognito to provide users with temporary security credentials to access our app's backend resources. We have built our backend with Django webserver that communicates with Elasticsearch(ES) to store and retrieve real-time parking information. When users report parking, the information is first enqueued to SQS queue from where it is dequeued by our Django server. This ensures reliable data delivery and efficient handling of load on the server side.
On receiving the reported parking information, Django server streams it to ES which stores the data in the (lat,long, #available spots, #total spots) format. The user information is also stored on ES in the format (userid, points). When searching for parking, Django server retrieves the data from ES based on (lat,long) provided by user and sends it back to the app. We deploy our Django server on a load balanced AWS ElasticBeanstalk. Django server sends notifications about operation's status to Google Cloud Messaging which redirects it to the user's registered device.

Conclusion

Parkwizard is an android app with a mission to mitigate the inconvenience suffered while finding street parking. It employs a crowd-sourcing, score-based approach where users earn points on reporting free parking spots and use those points to find parking when required. ParkWizard utilizes various cloud services to function as a scalable, reliable and secure application.