Team City of Grand Rapids: Interactive Parking Locator Application

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Client: Grand Rapids Department of Data Science

Abstract

Our team sought to create a web-based solution to allow Grand Rapids citizens to monitor downtown parking. This features an interactive map implemented with modern navigation and a mobile friendly design. We used various city parking vendor APIs for current parking information which is then coupled with powerful map visualization libraries. In addition to the web application we used a hybrid mobile development framework to allow for deployment as a cross-platform mobile application.

Technology Stack

- .NET Core 2.2

.NET Core is a popular framework for backend applications and offers excellent versatility for the centralization of our data.

- Angular 8

Angular 8 is a modern frontend framework that allows for mobile friendly highly customizable Single Page Applications.

- Xamarin Forms

Xamarin Forms allows developers to build Android, iOS, and Windows applications from a single shared codebase.

- Mapbox

Mapbox is an open source mapping platform for custom designed maps.

- Material Design

Material Design is a component library that Google developed in 2014. Material Design uses grid-based layouts, mobile responsive animations and transitions, and depth effects such as lighting and shadows.

- Ngrok

Ngrok is development tool and debugging tool that creates secure tunnels to local web applications.

- Postman

Postman is a collaboration platform for API development. Postman enables automated testing, sharing testing suites between developers and a rich feature set for endpoint debugging.

- Git/Github/Sourcetree

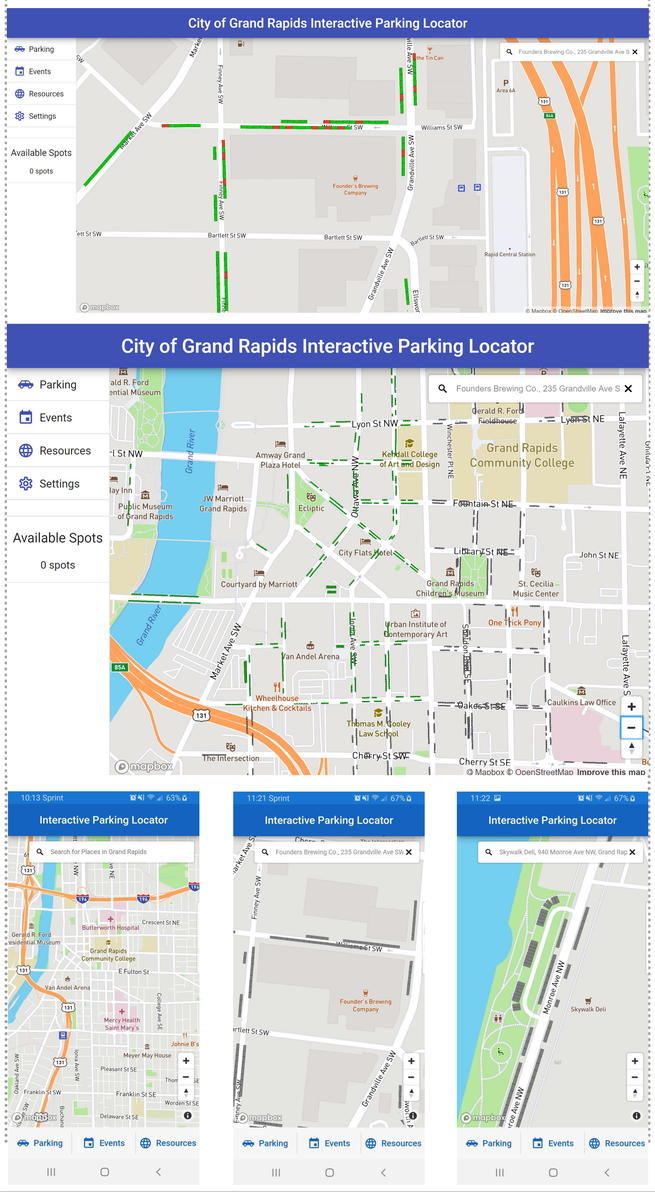
Git is a distributed version-control system for tracking changes in source code during software development.

Github and Sourcetree utilize Git to provide collaboration features for team-based development.

Visualizing Parking Data

In order to visualize active parking spaces we used session data sourced from Passport, Flowbird, and Socrata. This was then compared to a master list of coordinates for parking spots within Grand Rapids using a GeoJSON specification.

Screenshots



Handling Parking Enforcement

City parking data contains a wealth of information on the current state of a parking space. This includes information for operational days, daily enforcement times and session expiration. When generating layers for our map we had to carefully process all city guidelines and operational information. Our screenshots display a zone near Founders Brewery during active times and unenforced times.

Hybrid Mobile Development

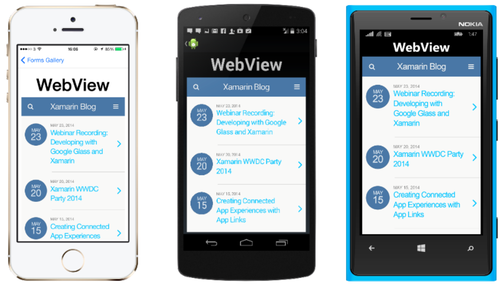
Utilizing Xamarin Forms our team was able to create a cross-platform solution that worked on Android, IOS, and the Universal Windows Platform.

Libraries such as Material Design offered us mobile friendly components to build our application.

Angular 8 offers robust functionality for our application to fit to all screen sizes including tablet and mobile.

Mapbox is a modern, highly customizable mapping library which has excellent support for mobile interactions and gestures.

We wrapped our mobile application using Xamarin Forms WebView which enabled seamless integration on each platform.



A Learning Experience

- Scheduling can be the most difficult part of the project.
- Learning a new technology stack is fun but challenging.
- Doing more research upfront into available options can go a long way.
- Without communication nothing gets done.
- Always reach out if you find yourself spinning your wheels.
- Creating solid documentation is important when working with many authentication patterns.

Future Work

- Integration with City of Grand Rapids DASH lots and parking garages.
- Integrate with off street parking.
- Provide routing and trip duration based on current location.
- Operational dashboard for inter-city planning.
- Standardize coordinates to reduce misshapen geometries.

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