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EECS 392 – Final Project
Project Description

What do you want to develop?

Waiting sucks. Nobody likes walking into an overly-crowded place, whether it's a gym, library, or dining hall. It is an inconvenience when Kelvin Smith Library has no seats, the dining halls are packed and every table is taken, and there's no room in the gym to do your workout. When these places are busy, students cannot accomplish the tasks that made them visit in the first place. Currently, CWRU does not have a good way to gauge how busy campus buildings are without going to one yourself. Because of this, students often end up wasting time.

Is there a good solution?

Introducing *CWRUded* (pronounced "crowded")! *CWRUded* is a service that allows its users to see how busy campus buildings are in real-time, saving them time and frustration. The service will report the real-time "busyness" for various locations around campus. It does this by estimating how many people are in a general location at any point in time.

CWRUded users will be able to "know before they go." The service aims to improve upon student-life by allowing students to plan ahead of time. It will eliminate the inconvenience of arriving to a campus building only to find that it is packed. *CWRUded* will save students' time and frustration.

CWRUded estimates how many people are in a general location. It does so by passively listening to network signals given off by wireless devices. Sensors will aggregate a set of distinct devices that have been recently active on the wireless network. If signals from a device have not been recently detected, then the service suspects that the device has left the building. Device specific data is anonymized as soon as it is collected which helps anonymize student movements around campus. From these results, we can derive an estimate for how busy a certain location is in real time.

Will it be free or you want to sell it (business model)? How much is your cost (e.g. time), will you be able to recover the cost? What is your expected profit within one year of your release?

CWRUded will be a free service for students and is currently sponsored by U[Tech]. The only costs associated with the application are from hosting the server. However, U[Tech] has agreed to host the server from within their own department which means that I will not accrue any costs as the developer. I expect to make zero monetary gains from this project because I intend for it to be as accessible as possible to all CWRU students. Selling the application would deter many students from using the *CWRUded* application.

What are the main functionalities of your application?

As previously mentioned, *CWRUded* estimates how many people are in a general location. It leverages the Cisco Prime Infrastructure API that manages the CWRU wireless network. One of the API commands exposes how many clients are connected to an access point at the given polling time. These results are aggregated by the *CWRUded* server and then sent to *CWRUded* clients upon request.

The application opens and immediately starts a scheduled job that repeatedly queries the server for updated location data. Upon a successful server response and data parse, the application loads the "home" tab. The page consists of a table view that shows all locations and a special section for favorite locations. Clicking these table cells will navigate the user to the location information page where further location information can be seen.

On the location information view, each sub-location's current busyness statistic will be displayed using the assumed value collected from the Cisco Prime Infrastructure API. The application will also leverage a graphing framework to graphically show the location busyness history over the last N samples collected. Below the graph will show an options menu to either favorite or hide the location as well as get directions to the location by opening the maps application.

The next tab is the "map" tab. The map tab is initially centered over the middle of campus and shows an annotation hovering above the coordinates for each location. Upon clicking on the annotation, a detailed view appears that will take the user to the location information view just like the table cells did in the home tab.

The third tab is the "settings" tab. From this tab, players can choose to set a refresh rate of the application. Allowing the users to choose the refresh rate will enable them to limit the amount of cellular data that the application attempts to consume while the application is active. Other setting options will allow the user to favorite and hide locations.

The fourth and final tab is the "about" tab. This tab will present general application information to the user. This page discusses how the application works, if the application is tracking your data, and discusses the purpose of the application.

What are the main techniques of your application?

- The *CWRUded* application will leverage the Swift 4.2 programming language and XCode as an IDE.
- All functionality of this application will rely on the data that U[Tech] supplies the *CWRUded* NodeJs server. All client data is pulled through a single API endpoint to keep the updating process simple and efficient. The update process works over Https and relies on asynchronous callbacks to handle the error and success conditions.
- A third party library is required to display a line graph of a location's historical busyness trends. The SwiftCharts framework will be leveraged to do this task. However, because XCode does not currently work well with the Swift Package Manager, the contents of the framework will need to be directly included in my application's source files as opposed to being marked as a project dependency.

What is your time frame for this project?

I have been developing the *CWRUded* application throughout the semester and it is nearly complete. There are four final tasks that are required of me before I can consider application to be complete. The first task is to finish leveraging the SwiftCharts framework to display the graphical historical trends. The second and third tasks are to restyle the application and give it more color, and then to animate the loading screen with a custom made logo. The final task is to get community feedback and address potential issues.

What is the coordination plan?

I am the only member of my development team for this project. I will not be coordinating with any other member of the class for the remainder of the semester. I will be working towards finishing this project at the earliest convenience.