



CS 401 Final Project: Quinn McHenry, Logan Lasell, Ashley Holen

Introduction

For our CS 401 Software Engineering and Design Spring 2025 course, our group decided to create a web based software application which assists the general public in navigating public transportation systems, specifically TheBus on O'ahu. Our website provides a user-friendly and accessible resource for users to quickly and easily find the bus which is of their best interest. We have three features of the website - locating the buses nearest to you, finding the buses based on address, and finding the nearest bus stops. Additionally, information about the company and the fares are listed along with our team's contact information. The feature that highlights our website is the 'Find My Bus' feature. This button takes the user to our Live bus Tracker, which displays where the closest buses are based on the user's location as icons moving in real time.

API

Our project uses Oahu Transit Services' TheBus API (https://hea.thebus.org/api_info.asp). Our Flask app receives JSON data from the API every 2000ms (2 seconds), which contains several fields related to real time bus locations. The fields that we use in the app are bus ID, latitude, longitude, stop number, and route number. The 2000ms tick rate allows us to show the location of buses on a map in real time on the "Bus Tracker" route. The rest of the fields for general information related to each bus is used in the "Real time arrivals" route.

Front-end Design

The front end was created off of a template from W3Schools, which can be viewed here: [W3Schools CSS template](#), and is labeled the Start Page Template. This was the basis of our design but it was highly modified and personalized to our project. Additionally, we used Bootstrap for components such as cards, the footer, and the image carousel.

The front-end of our website is designed in accordance with TheBus branding which is represented in both their logo and their current site. The primary color of the site is yellow, with accents of black and white to create a look and feel that is familiar to TheBus users. We chose simple fonts, Lato and Montserrat, in order to give a clean and informative look. The landing page has a hero that highlights our primary model, the Live Bus Tracker within the Find My Bus button. Additionally, we included a live clock titled Current Time (HST) in order to show the

current time in relation to the arrivals. The clock is designed in such a way that mimics the digital lettering on the buses. This was found from an external source and was implemented into our index.html. A small design detail included for the hero element is the palm tree background as an ode to Hawai'i, the home of TheBus.



The navigation bar includes four buttons: Home, Features, About, and Contact Us. The Home button has TheBus logo. The landing page also includes a carousel that shows 4 high quality images of TheBus in action around the island. At the bottom of the landing page and each page is a footer which includes the trademark of TheBus, the logo in the center which brings users back to the home page, and then the rest of the buttons: Features, About, and Contact Us.

The Features tab includes cards which display our three models with a short description and a button that locates the user to each individual feature. The about tab shows information about the bus such as the history and the number of buses and stops, as well as the fares. At the bottom of the page is another way to get to our models through a button. Lastly, our Contact Us page shows pictures and bios of all three group members.



Track Your Bus

See real-time locations of buses near you.

[Track Now](#)



Address Search

Search Buses by Address

[Search Now](#)



Live Arrivals

See arriving buses by stop number.

[See Stops](#)

Each of the models has their own page with its content, as well as the navigation bar and footer so movement between pages remains consistent. In all, the front-end consists of 7 html files: about, address, contact, index, map, models, stops. Predominantly, the styles were incorporated in-line within the html files, but we did also have a styles.css file.

Database

We decided not to use a database for this project due to the nature of the API and what we want to provide for the user. One of the required parameters for the API is “stop_ID” which represents a bus stop number on Oahu. This means that every request to the API returns only the buses that are near that stop, and we aren’t able to display the buses for more than one stop at a time. This actually matched pretty well with the end goal of allowing users to view the buses for *each* stop to find one that works. Secondly, the data returned by the API changes constantly, as bus latitude and longitude changes with movement. So with a manageable amount of data displayed at any time, and with that data constantly changing, it made more sense to store the bus data in local storage using javascript and discard it after the app terminates. No database is needed because limiting the return to one stop keeps memory manageable, and due to the constant change we only keep the most recently updated locations of each bus, and discard the previous.

Challenges:

The biggest challenges that we encountered throughout this project were the API parameters, as well as the data formatting through TheBus API. Due to the format of the API from the official TheBus website, it was difficult to incorporate the data into the map format. Also, another big challenge was the Address Search model and not only getting the address to populate on the map, but for buses to appear depending on the proximity of the address. Again, the original format of TheBus API was difficult to translate into the functions we were creating.

Future Improvements

Looking to the future of this website, we have many improvements that we would make. First, we would like to enhance the overall design of the website, adding more personalization and interactivity. Also, we would like to increase performance such as the response times for our maps, since there is a slight delay when loading the pages. Another feature that we would like to add to improve our models is to visualize the routes on the maps. Once the route is selected, a colored line following the route would appear, along with how many miles and the approximate time to the destination. We would also like to add more filters to the maps to increase the complexity and find the most effective route and bus possible for each user. Lastly, we would like to display alerts to users if their bus has been delayed.

Conclusion

In all, throughout the creation of this website, we applied all things that we learned throughout this CS 401 course. We used multiple programming languages, applied routes and worked with APIs, wrote html and css front end code, used pytest and flask, got everything to work together and then containerized through Docker. Throughout the entire project we used Git and GitHub.

We are proud of the website that we put together, and think that our concept would be successful as TheBus website hosted publicly, especially with our future improvements. This project was very beneficial and helped us create a real life example of all of the concepts we have been learning and their interactions.