



Camosun College Capstone Project

Project Wayfinder

Final Report

Prepared for
Saryta Schaerer

Prepared by
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Memorandum

To: Saryta Schaerer

From: Dallas Richmond, Matthew Logan, Tyler Maloney

Date: August 4th, 2023

Re: Wayfinder Final Report

Please see the attached final report for Team Wayfinder's Capstone project.

The report provides an overview of the project, including its scope, deliverables, and challenges. It also highlights the dedicated efforts, growth, and exceptional teamwork demonstrated by each member of Team Wayfinder throughout the project.

We are excited to announce that Team Wayfinder has successfully achieved all its goals and requirements. Our application now guides citizens of British Columbia to essential services right from their personal devices, removing ambiguity between public-facing services operated by the provincial government and private offices listed on third-party platforms. We have also increased the value of the application by adding multi-language support using a fully scalable design that allows for integrating new languages with ease.

Please review the final report and provide any necessary feedback or additional instructions as needed.

Enclosed:

- Final Report (1 Copy)

Executive Summary

Sponsored by the Ministry of Citizens' Services, Project Wayfinder successfully completed its proof-of-concept design to improve public-sector map services in British Columbia. The application, built using the MERN Stack, is a Progressive Web Application designed to provide an intuitive interface, reduce cognitive load, and provide citizens with a reliable source of information for essential services.

Team Wayfinder was able to add out-of-scope features such as language support and an improved scalability design, along with comprehensive documentation. These additional features were met with great enthusiasm by the product owner, Robert Kobenter.

Each member of Team Wayfinder met their individual goals they set and improved in unexpected ways while working cooperatively as a cohesive team.

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Project Description

The Wayfinder project was made possible through sponsorship from the Ministry of Citizen's Services [a], an organization that provides a wide range of services to British Columbians across the province, both in person and online. These services include BC Services Cards, freedom of information, and information technology infrastructure.

Problem

Access to government services tends to fall into a broad range of categories, such as information retrieval, permits, and accessing social programs. Citizens seek access to government services through a diverse set of channels, including web-based search engines and the government's main web page, gov.bc.ca. Increasingly, citizens use their mobile phones as their preferred channel. Citizens may be required to access one of the over 65 ServiceBC locations to acquire help. Locating a ServiceBC office can be challenging. Citizens may use Google Maps, which may suggest addresses that are not open to the public. This can cause frustration for citizens' travelling to incorrect places.

Project Description

Wayfinder is a platform-independent application designed to improve public-sector map services in British Columbia. Citizens can use Wayfinder to find essential services using a reliable and verifiable source of information rather than relying on third-party applications such as Google or Microsoft.

Wayfinder is a full-stack Progressive Web Application that serves as a user-friendly location directory for the Information Management Branch. The MERN [2] stack is used to build our application, which includes MongoDB, ExpressJS, React, and NodeJS. Our team can build and maintain the application more efficiently by using TypeScript as our primary development language.

Deliverables

Team Wayfinder is pleased to announce that they have added additional functionality to the application beyond those proposed at the start of the project's kickoff.

Original Deliverables

The core deliverables of Project Wayfinder are the creation of a suite of common components and their respective documentation in the form of a Progressive Web Application [3] that can be reused or referenced by the department in future decision-making, planning, and development. The common components must include the following:

- An agile product support environment utilizing the IMB's preferred tooling.
- A knowledge and code repository containing the document's solution.
- A containerized solution deployed to the BC Government's private cloud environment.
- A suite of 'common components' that are self-describing to foster reuse.

Current Deliverables

Thanks to the sponsor's and scrum master's support, Team Wayfinder accomplished all the deliverables that had been set.

In addition to the original deliverables, Team Wayfinder added additional functionality for viewing past reports, letting designated users access stored analytic data securely, and adding support for multiple languages.

Research and Methodology

As Team Wayfinder continued developing the second half of the application, three main areas were left to research to complete our final product. These areas were the Service Workers [4], PowerBI [5], and offline mapping.

Service Workers play a vital role in enabling a Progressive Web Application to work completely offline. Without them, we wouldn't be able to offer the full offline experience desired by our product owner. During our research, we discovered a lack of documentation on Service Workers, leading us down a rabbit hole of misinformation to find a solution. In the last week of our Capstone, we were able to craft a solution through several days of trial and error using what little documentation we could find. This solution helped us overcome the challenges we faced in gaining control of the caches maintained by Service Workers.

We also had to learn PowerBI, a new tool for our team. The Product Owner wanted us to integrate it into our application because of its existing integrations with Microsoft Teams. Learning to use PowerBI was crucial to displaying meaningful reports based on the analytics captured from our application. While none of us had any background in Data Analysis, we managed to create a few simple, informative reports using the basic graphics in our supplied license. Fortunately, we were able to dedicate some time to learning by doing and filling in the blanks through online forums.

Offline mapping was another important aspect of the application. The product owner wanted Wayfinder to work anywhere, even in places with no internet access (dead zones). This way, people can still access the information they need. We realized that the application could be adapted to help workers in remote areas, like the forestry sector, find their way to specific locations. However, there were many challenges involved with implementing the offline maps. Not many existing packages supported it, and the hosting providers like Leafletjs [6] and OpenStreetMaps [7] did not want users fetching large data packages that would slow down their servers. So, through exploration, we were able to find open-source map tiles of British Columbia and package them up using QGIS, which would be served through our application.

Challenges

During the second half of development, we face a big challenge with the Service Worker. We wanted to give users the option to include or exclude map tiles (34 MB) in the application. However, the documentation for Service Workers was not very helpful, so we had to go through significant trial and error until we found a working solution.

Thankfully, by the end of the project, we had managed to overcome this challenge through a long series of trials and errors, testing various approaches from Stack Overflow and Mozilla Documentation. Now,

users can choose whether they want to have offline map data or not, which reduces the application size to 3 MB. This was a significant achievement for the team, and it improved the overall user experience of the application.

Accomplishments

All members did a fantastic job of pushing their boundaries and meeting their objectives. Team Wayfinder managed to raise the bar both individually and collectively.

Team

Service Workers

During the second half of the development phase, our team faced a challenge with using Service Workers. Our goal was to let users choose whether to include offline map tiles (34MB) in their installation, reducing the application's size and enhancing the user experience. Despite the limited documentation surrounding Service Workers, through trial and error, we experimented with different approaches to find our solution. Through research, pair programming, and plenty of trial and error, we were successful in implementing the necessary functionality. Through these efforts, users were able to remove offline mapping data, leading to a significantly reduced installation size (3MB), improving the user experience, and respecting mobile device data storage limits.

Individual

Team Wayfinder is pleased to share our achievements and individual successes. Together, we accomplished the goals we had set at the start of the Capstone project.

Dallas

During the initial two sprints, Dallas struggled with time estimation and task planning, leading to rushed work before each sprint's deadline and increased stress. To improve Dallas' performance, he proactively addressed these challenges and worked to enhance his time management and planning skills. Dallas' goal was to complete tasks more efficiently and eliminate the pressure of last-minute crunches. To achieve this, he prioritized his tickets on the first day of each sprint to increase his likelihood of completing them early as well as identify any potential blockers before they occurred. As a result of Dallas improving his understanding and time management, he started to complete assigned tickets ahead of schedule, oftentimes finishing early and taking on additional unplanned tasks. This not only relieved the pressure of the end-of-sprint crunch but also enabled him to routinely take on additional work from the backlog. Ultimately, this led to higher-quality work and allowed Dallas to be available for assistance to other team members if necessary.

Dallas successfully achieved his goal of managing Docker images and containers for the Wayfinder application. Collaborating with other IMB members, Dallas gained a deeper understanding of Docker, which was then applied to the Capstone Project. With the experience gained this semester, Dallas is

confident in his ability to meet his second goal of creating a Progressive Web Application of his own by the end of the year.

Matthew

During the second half of the Capstone Project, Matthew further improved his ability to act as Team Lead for Wayfinder. With the support of the Product Owner and Scrum Master, Matthew guided the team through each sprint cycle, creating well-defined user stories and developer tickets in JIRA. Matthew's allocation of tasks reduced conflicts and dependencies, resulting in an efficient and well-coordinated team. The collective efforts helped bring Wayfinder to fruition, surpassing the initial project goals. Matthew's leadership enabled the team to impress the Product Owner by delivering additional out-of-scope features, creating a more well-rounded product.

Matthew successfully achieved his learning goal of improving his teamwork abilities by helping foster a collaborative environment within the team. Matthew worked to improve the team's organization to help team members work independently by providing clear and detailed tasks.

Tyler

As the Capstone Project progressed, Tyler's proficiency in TypeScript and React steadily improved, enabling him to implement various front-end components effectively. Tyler dedicated time to familiarizing himself with essential technologies like LeafletJS [6], the creation and storage of map tiles, and various device storage strategies. He also immersed himself in the creation of other reusable components to enhance his skillset. By investing time in researching and practicing, Tyler experienced an increase in his development speed and a reduction in errors. This led to more independence, showcasing his growing aptitude for TypeScript and React. Tyler's growing proficiency in TypeScript and React played a significant role in the success of the Capstone project by developing key functionality. Tyler's efforts contributed to his overall professional growth, making him a more capable and competent developer.

Tyler set a goal to enhance his familiarity with front-end development, along with improving his planning, programming, and soft skills. Through diligent efforts and the support of his team, product owner, and scrum master, Tyler successfully achieved his objective. Tyler's determination and commitment to personal growth have had a positive impact on his abilities as a developer.

Program Review

Camosun College provided us with a solid foundation, especially with teaching JavaScript, which we used across the entire application stack. Building on our knowledge of JavaScript, we took the initiative to learn TypeScript, a strongly typed version of JavaScript. Camosun's database-focused classes gave us the necessary skills to create an effective NoSQL database using MongoDB. In the networking class, we gained experience with Python, learning to set up environment shells for development, which later

proved helpful in creating both a web scraper and Extract, Transform, Load (ETL) procedures to populate our database with location information.

While we appreciated the preparation from Camosun College, we felt that more exposure to tools like Docker and deeper exploration of Continuous Delivery [8] would have been beneficial to our studies. Prior knowledge would have given us a stronger start at the kickoff of our project, as we were bottlenecked in trying to set these tools up for our developer environments. In addition, lessons regarding Progressive Web Applications [3] and Service Workers [4] would have been very beneficial because we found there was a lack of documentation on these topics.

Concluding Sequence

Team Wayfinder is proud to announce the successful completion of the project, which not only met the client's specifications but also exceeded expectations through additional features, including multi-language support, full scalability and growth strategy, and comprehensive documentation. Handing off the project to our Sponsor, Robert Kobenter, brings a sense of accomplishment, knowing it will serve as an exemplar for PWAs in the BCGov space and showcase our team's expertise on the BC Government GitHub.

Throughout this semester, our Sponsor has provided incredible support, dedicating time, effort, and resources to ensure our project stands as a testament to our skillsets, growth, and adaptability in tackling new challenges. This experience has helped pave the way for exciting opportunities in the technology sector.

In our Capstone program, we believe that combining in-class time on either the first or last two days of the week would improve students' time and focus on their projects. The current pattern of project day, class day, and project day slowed down our velocity by repeatedly separating school and development time. We recommend better organization and clearer assignments and expectations, as well as smaller section sizes for ICS290. As one of Camosun College's largest Capstone groups to date, it turned the classroom component of ICS290 into a mixed experience.

References List

- [1] M. of C. Services, "Ministry of Citizens' Services," Province of British Columbia, <https://www2.gov.bc.ca/gov/content/governments/organizational-structure/ministries-organizations/ministries/citizens-services> (accessed Aug. 5, 2023).
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- [4] MozDevNet, "Service worker API," Web APIs | MDN, https://developer.mozilla.org/en-US/docs/Web/API/Service_Worker_API (accessed Aug. 05, 2023).
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- [8] "Continuous delivery," Wikipedia, https://en.wikipedia.org/wiki/Continuous_delivery (accessed Aug. 5, 2023).