CLOUD-BASED DIGITAL HEALTH MONITORING PLATFORM WITH EU PRIVACY

Summary

The Customer was attempting to develop a system that would record a patient's activity and blood chemistry using wearable medical devices. This data and its analysis would be provided to clinicians to help them monitor and advise their patients. The Customer needed our help to develop the software so that data from the patients could be gathered, uploaded to a secure cloud infrastructure and made available to clinical organizations, with the data subject to European Union privacy rules and reliability guidelines, on a robust yet highly secure online system.
They had insufficient cloud infrastructure in place to start with, and their front-end technology was not capable of meeting their requirements. Essentially, they needed to quickly demonstrate progress to their investors to ensure continued funding for the project.

Name: Medical Information Technology Company
Industry/Sector: Digital health
Project Type: Regulated software medical device
Technology Used: Android, React native, OAuth, WAMP protocol (microservices), websockets, Redis, Haskell

The Project Requirements

There were many essential requirements for the project:
The data was to be collected by a variety of off the shelf, wearable devices.

- FP Complete had to ensure that the solution integrated with existing OAuth2 authenticated APIs to connect with off-the-shelf medical devices and other cloud services.
- Develop back-end services capable of receiving data from many connected devices.

The data was to be uploaded to a cloud-based infrastructure that was secure and scalable.

- It had to integrate with existing cloud analytics platforms.
- Develop data cleansing and parsing modules for raw device data.
- Implement custom machine learning modules to analyze the data.

Uploading was to be performed by publicly available smartphones that utilized major operating systems like Android and iOS. All the data collection and stored and transmitted would need to conform to stringent European Union mandated privacy guidelines. Finally,
the Customer needed secure web portals and mobile applications for authorized physicians to visualize and interpret a patient's data.

- FP Complete would need to develop web and mobile Customers for both patients and physicians.
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The Solution

Our full-stack solution was developed iteratively with the Customer. We delivered a custom software infrastructure applying Agile development practices to help them meet their development and financing milestones.

- We first worked with the Customer to expand on an existing data storage back-end
- We refined the initial code base to conform to software engineering best practices
- We developed a real-time web-based visualization front-end for the Customer's demo days
- We developed a REST API to access the stored data using high-performance Haskell code
- We integrated statistical analysis using the R language into the custom back end
- After successful Customer demos, we expanded the system's data processing abilities to a scalable cloud architecture
- We created additional secure mobile front-end apps using React Native
- We developed a custom and secure WebSocket protocol for data transfer from the back-end to the front end.

New Challenges for FP Complete

During the course of development, a number of hurdles needed to be overcome, including:

- Integrating statistical packages (R, Python) into a Web API
- Creation of a queue-based messaging system to allow for multiple physicians to receive real-time data
- DevOps automation targeting multiple cloud providers
- Develop secure and performant data transmission using cryptographic protocols

Conclusion

We accomplished the project goals on time, and the Customer has since secured additional funding to continue developing the platform. We have also provided training to the Customer's engineering department—educating them on state-of-the-art engineering practices—and have provided documentation and tools enabling them to expand their team. Our mathematicians on staff have advised the Customer on advanced machine learning techniques and developed custom modules. Our DevOps team has delivered to the Customer a cloud-based solution hosting a custom REST and WebSocket API for transmitting the data- and the solution includes extensive DevOps automation to ensure the Customer will be able to accommodate additional demand. Throughout the engagement, our Customer was consistently satisfied with our ability to rapidly prototype solutions, and then ramp up development in business-critical areas. All of our goals were accomplished under budget, demonstrating our ability to deeply embed with a Customer to deliver an IT solution. The Customer continues to use our services, advising on technology, and delivering custom software enhancements.