STUDENT SUMMER INTERNSHIP TECHNICAL REPORT

Development of Web Applications for Savannah River Site

DOE-FIU SCIENCE & TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

Date submitted:

October 17, 2014

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Submitted to:

U.S. Department of Energy
Office of Environmental Management
Under Cooperative Agreement # DE-EM0000598

FIU | Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

ABSTRACT

Nowadays, more and more people access the Internet with their mobile electronic devices such as phones and tablets than ever before. Therefore, software development is shifting more towards mobile web development rather than desktop application development.

For this project, I will be providing technical assistance in researching and developing two web applications and technologies for the DOE Savannah River Site. A web application is a web page that provides a certain service or functionality to its users. The goal is to implement existing on-site desktop applications that employees are already using on their computers and make them accessible on an online platform, where they can be accessed by any approved device connected to the site's Internet through the devices' Internet browser. The web applications under consideration include the Government Vehicle Registration application where employees can reserve the use of government vehicles and the electronic Hazards Assessment Program (E-HAP) which allows users to document hazardous situations. The project focuses on seamlessly integrating these web applications into the existing Savannah River Site's vast online system so as to uphold all of the site's Internet security and website policies. It also focuses on replicating the same look and functionality on the web that these applications have as desktop applications, making the transition to the web for the site employees as smooth as possible. This project will include the construction and maintenance of various web pages for each of the applications being transferred to the web. Furthermore, the project involves creating the database and server infrastructure that the applications will use in the back-end to service their users. The project requires programming in languages such as HTML5, CSS3, and JavaScript to build and maintain the web applications.

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1. INTRODUCTION

My project centers on developing web applications for the Savannah River Site. There are many advantages to online applications over traditional desktop applications. Two of the main advantages are availability and ease of use. A web page, once created and hosted, can be accessed at any time of the day, every day, so it's very easy for anyone to access and view from any device connected on the web. However, desktop applications are available only on the device they are installed on so if the user does not have his device, he/she cannot access the application. The project focuses on migrating two of the SRS desktop applications to the web. One application is used onsite to register for the use of a government vehicle. The application shows the user what government vehicles are being used and at what times and based on that information the employee can reserve an unused vehicle; this information is stored on the site's interval servers for record keeping and statistical purposes. The second application is the Electronic Hazards Assessment program (E-HAP). This application allows SRS employees to report and catalog hazardous conditions on the job. Both web applications will be built using the HTML, CSS, and JavaScript programming and markup languages. HTML provides the main structure of the application; CSS is used to visually enhance the application, adding colors and aesthetics to the sites; and JavaScript is a full programming language that is used to make the application dynamic and is also used to communicate with the server or databases behind the web pages. Moreover, Bootstrap is a front-end development library that will be used in the project. It adds ease of development by providing pre-built classes to make modern looking websites easier to design and build. It can also be used to develop websites that look good on any mobile device. Aptana, a third-party integrated development environment program, will be used to organize the programming code and also to test the code in the browser. Finally, JQuery a JavaScript library will be used to facilitate the website dynamics and also the communication between the websites and the database servers.

2. EXECUTIVE SUMMARY

This research work has been supported by the DOE-FIU Science & Technology Workforce Initiative, an innovative program developed by the US Department of Energy's Environmental Management (DOE-EM) and Florida International University's Applied Research Center (FIU-ARC). During the summer of 2014, a DOE Fellow intern Steve Noel spent 10 weeks doing a summer internship at the Savannah River Site under the supervision and guidance of Dr. Marry Harris. The intern's project was initiated in June 3, 2014, and continued through August 9, 2014 with the objective of working together with SRNL's division of computing sciences to migrate two on-site desktop applications to the web.

3. RESEARCH DESCRIPTIONS

The Savannah River Site has vast intricate computer network architecture. However, many of the software applications using the network are desktop applications. The site's employees use desktop applications for many of their day-to-day activities such as using the calendar, email, instant messaging, chat, as well as some government functions like reserving government vehicles and assessing hazardous conditions. In particular, the site uses Lotus Notes, a desktop application created by IBM, for a large portion of its computing needs. Lotus is also a platform used to develop applications and has its own programming language and built in functionalities to integrate applications with its capabilities.

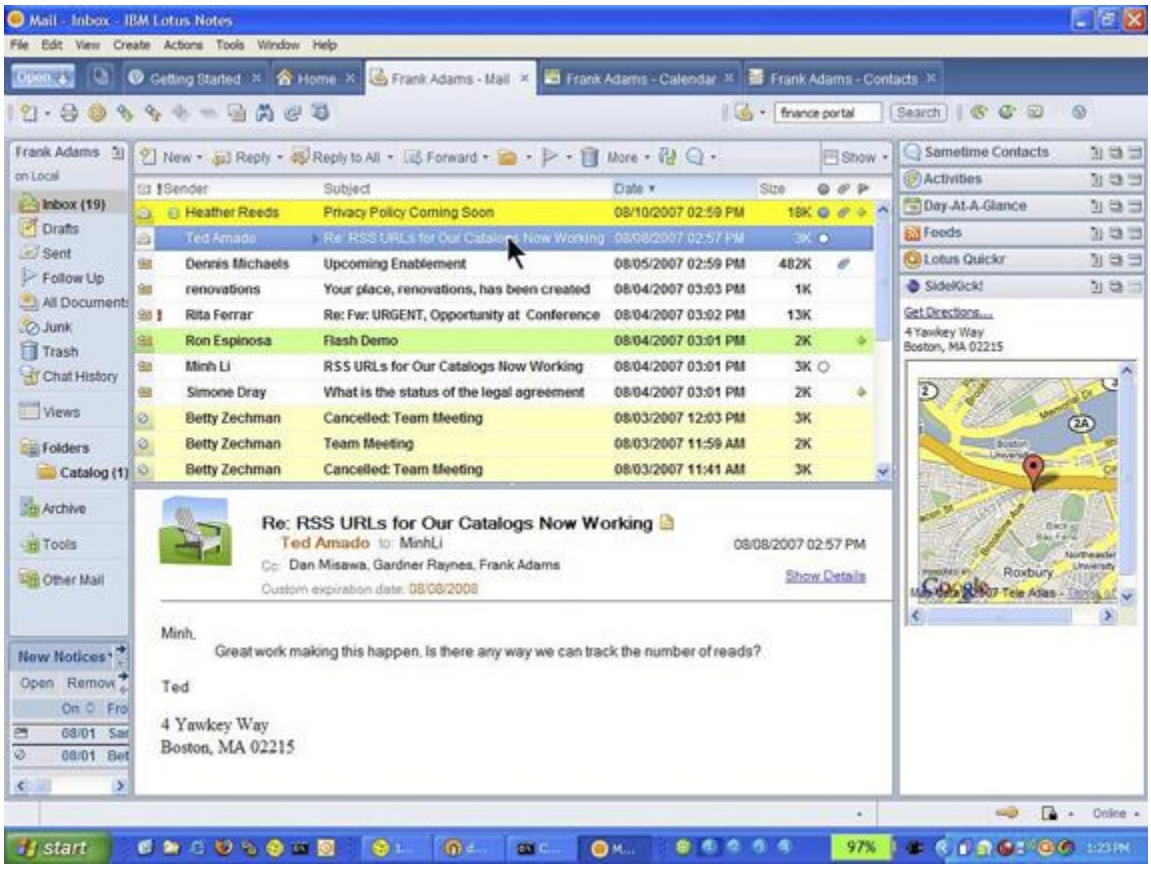

Figure 1. A Lotus Notes email page.

Lotus Notes is very powerful and customizable; however, the site is moving towards converting many of its applications to modern web applications. IBM's Notes user interface is a little outdated compared to modern applications and it is a desktop application that just recently created a mobile-friendly version for mobile users. Converting to web applications means that any app can be viewed on any size screen using media queries to style the web page based on the screen size of the device.

For the project, the vehicle application has two main parts: the visual or front-end of the site and the back-end or the back-end aspect of the application. The front end is the visual aspect of the site, the content that is seen on the browser when the user logs onto the site. HTML and CSS are the languages used to design this part of the website. Again, Bootstrap will also be used to help design and create the actual look and feel of the web app. Also, the site will feature a calendar as a main focal point to allow site employees to see the times that vehicles have been requested with a form to create a vehicle reservation and a form to modify an existing reservation. Using the calendar, employees will be able to see all vehicle reservations already in place through the calendar events.

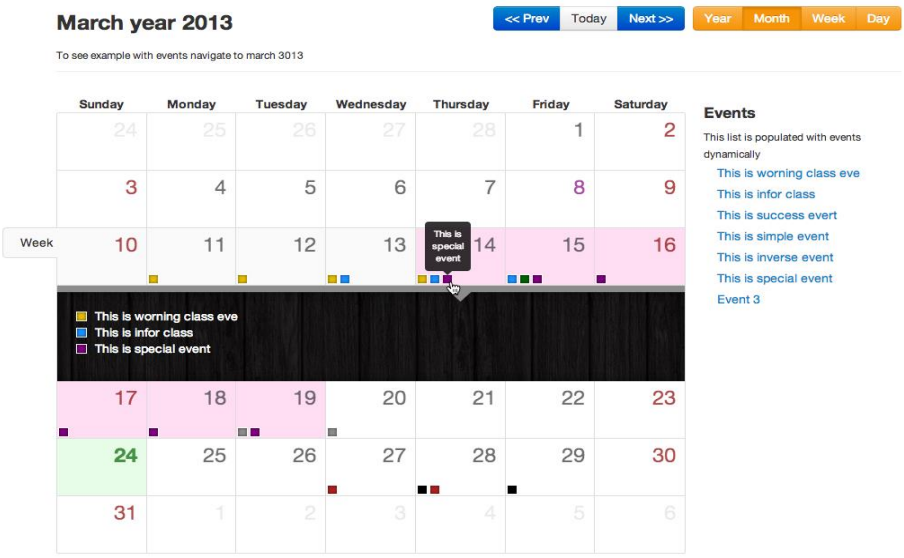

Figure 2. Sample Bootstrap-Calendar site.

The calendar, similar to the one shown in Figure 2, will be a crisp full-view calendar with month, day, and year views and a sleek user interface. In addition, the calendar is extremely reusable and is template-based for ease of styling and setup. The employee will be able to switch the calendar views from month to day to year to better see the vehicles already reserved by other employees on specific days and times which will be displayed as events on the calendar. In order to show all of the vehicle reservations, a call to the server must be made to request this information from the database. For this, JavaScript and JQuery will be used to make the request and handle the data once it has been sent by the server. The server-side implementation, or the back-end, will be developed by the IT department of SRS for security reasons. They will develop the application programming interface (API), which is an interface that exposes all the necessary features of the application on the server. This API will also handle the sending of new vehicle reservation requests from the user's computer to the server when a user submits a vehicle request on the site.

The E-HAP application will consist of various different pages and forms that the user will be able to view and, based on their inputs, the pages may change and present different options based on the input. The most important of these pages will be the E-HAP report

page where the user will be able to fill out an E-HAP form and submit it to the server. The site will also have a page to view all the current E-HAP reports in the system and a help section with help videos and an email functionality to help users learn how to use the web applications. Similar to the vehicle application, Bootstrap will be used for the aesthetics and design of the website, JQuery will be used for the dynamic nature of the application and Aptana as the coding environment for the site. This application will be a long term project spanning many months of planning and development. The work performed for this application is incomplete and will require significant additional development and testing before the site can be operable and open to SRS employees.

The research for this project will be development and testing based. The applications listed will undergo all the phases required for a software project (Figure 3).

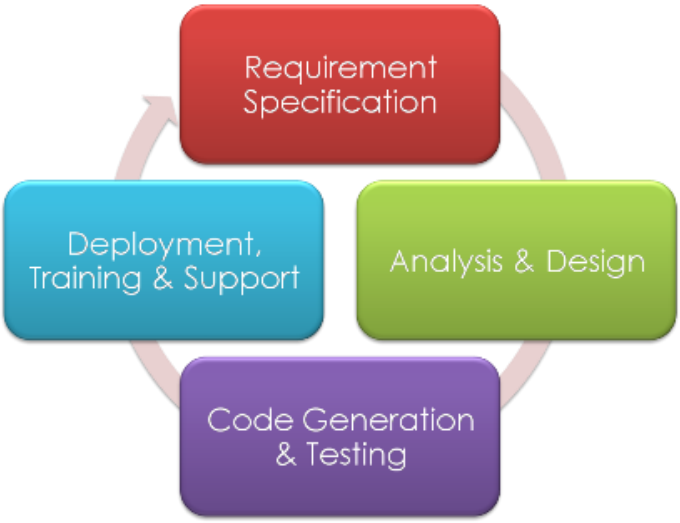

Figure 3. The software development cycle.

The applications will first undergo a specification phase where the required functionalities that must be present in each application are mapped out and the problem domain is clearly defined. This phase of the software engineering development cycle involves analyzing the requirements needed for the software project and creating a software requirements specification. This specification is a detailed description of the software system, laying out functional and non-functional requirements of the system. A functional requirement is a feature the system must have while a non-functional requirement is a constraint put on the design or implementation of a system, such as performance requirements, quality standards or design limitations. Then, the applications will undergo the development phase, the design and actual implementation of the the web sites. This is the phase where the design of the application and the actual coding and implementation of the application is accomplished using the programming languages and markup languages such as JavaScript, HTML, and CSS. During the development, there may be some constraints and modifications to the original system design and object design that are all part of the software engineering process. Finally, the applications will

go through a testing or validation phase of software engineering. The applications will be tested to make sure all of the functionalities specified in the design phase of the creation process are working correctly and the application does not have any bugs or errors.

4. RESULTS AND ANALYSIS

Development on both applications was initiated during the summer internship. The government vehicle reservation web application was started first. It's front-end, or the aesthetic aspect of the site that the visitors will see, was constructed using HTML and CSS programming. Initially, there was no agreement on what calendar application should be used for the site. Many different calendars were discussed for the site; however, in the end, since Bootstrap was already being used on the site, the Bootstrap-calendar was chosen for its compatibility with the existing system. The back-end of the system, however, could not be fully completed by the end of the summer internship. The API was designed; however, it could not be fully developed by the end of the summer internship. While a significant portion of the front-end development was complete, further development and testing are needed to fully finish this task. Development on the vehicle reservation application is ongoing at the site but not at FIU for security purposes. Upon completion, the vehicle application will be used onsite for SRS employees only.

Similarly, the back-end, or server-side development, for the E--HAP web application could not be fully developed and tested in the time provided by the summer internship. All server-side code at SRS must be done and approved by the site's division of IT which was not able to fully complete the development and infrastructure for the application. The front-end, or the aesthetics of the website, was also incomplete by the end of the summer internship. The main structure or interface was mapped out and developed as it pertained to the structure of the main web page. Development of the remainder of the application continues at SRNL by the division of computer sciences.

5. CONCLUSION

The web application development tasks were a successful collaboration between Florida International University and the Savannah River National Laboratory. Two of SRS's desktop applications began the transition to web applications. The vehicle reservation application allows for government employees to reserve the use of government vehicles and modify their existing registrations on an online platform. The E-HAP, or electronic hazards assessment program application, allows SRS employees to file a hazards report on an online platform. Throughout the summer internship, much was learned from this collaborative effort and many friendships and bonds were made. We hope to continue to work on projects together with SRS, fostering teamwork and knowledge in the process.

6. REFERENCES

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APPENDIX A

Bootstrap	Front-end development framework for web development
JQuery	Cross-browser JavaScript library
E-HAP	Electronic Emergency Assessment Program
FIU	Florida International University
SRNL	Savannah River National Laboratory
Front-end	The visual elements of a software application or website.
Back-end	The non-visual elements of a software application or program.
CSS	Cascading Style Sheets - a style sheet language used for describing the visual look of a web document.
SRS	Savannah River Site