

UNIVERSITY OF Nebraska Lincoln

Spaceport Command and Control System Software Development

Jonathan Mahlin

Kennedy Space Center

Major: Computer Science

2017 Spring Session

Date: 06 04 2017

Spaceport Command and Control System Software Development

Jonathan N. Mahlin¹

University of Nebraska Lincoln, Lincoln, Nebraska, 68588

Nomenclature

GUI	= Graphical User Interface
KSC	= Kennedy Space Center
LCC	= Launch Control Center
LCS	= Launch Control System
NASA	= National Aeronautics and Space Administration
SCCS	= Spaceport Command and Control System
GSDO	= Ground Systems Development and Operations
SLS	= Space Launch System

I. Introduction

There is an immense challenge in organizing personnel across a large agency such as NASA, or even over a subset of that, like a center's Engineering directorate. Workforce inefficiencies and challenges are bound to grow over time without oversight and management. It is also not always possible to hire new employees to fill workforce gaps, therefore available resources must be utilized more efficiently. The goal of this internship was to develop software that improves organizational efficiency by aiding managers, making employee information viewable and editable in an intuitive manner.

This semester I created an application for managers that aids in optimizing allocation of employee resources for a single division with the possibility of scaling upwards. My duties this semester consisted of developing frontend and backend software to complete this task. The application provides user-friendly information displays and documentation of the workforce to allow NASA to track diligently track the status and skills of its workforce. This tool should be able to prove that current employees are being effectively utilized and if new hires are necessary to fulfill skill gaps.

¹ NIFS Intern/Software Development, Software, Kennedy Space Center. Attends University of Nebraska Lincoln

II. Preparation

Prior to the start of the internship, I had no experience with the expected language and framework for this project, therefore I began to study the frameworks in use before coming to Kennedy Space Center. There were a few online safety requirement assignments that I was able to complete before the internship initiated. By the start of the internship, I had cursory knowledge of the skills required for the project. General training was the first task to be done upon the start of the internship, where I completed general hazards and safety training, which ranged from general knowledge to required procedures for network and computer security. I completed a long tutorial course over the development framework which consisted of learning the architecture by creating a simple test application.

Introduction to our general department occurred each morning in our tag up meetings, where we participated in detailing our daily activities. Those meetings also introduced us to the department culture, status, work load, and acronyms. Occasionally we had in-person training sessions and meetings to gain user access to required software. Those meetings were very important for future access to agency wide software. The most important exercises that related to daily work were the training sessions that our mentor Andy Davis held before we got started on our project. Together the team interns and our mentor created a sample application where he went over the framework and practices in person. He helped us learn the ins and outs of the framework we were using and familiarized us with the workflow.

III. Approach

Given that I had no experience with any of the frameworks or software that would be used, I had a lot that I needed to become familiar with. Immediately after the start of the internship my coworkers and I started completing the required training courses and meetings. We then began the code language and framework training, completing a framework course on our own and supplementing it with several meetings with our mentor where we developed a practice application, which helped immensely. Many of the concepts were familiar to us from prior coding assignments we had done in school, but the specific implementation had to be learned.

After our training was complete we met with our project customer and discussed the requirements and goals for our assigned project. The design and implementation for our application was largely done by our intern team and we worked closely together to divide work. Every day we discussed what we were doing and had a series of tasks that needed to be completed to make progress on our application. None of our team had much experience with any of the tools being used so a lot of guidance was necessary. It was easy to make design mistakes that created issues down the line that would have to be fixed. We collaborated closely with our mentor each day to discuss design decisions and problem solving throughout the

course of our development. Every few weeks we had a meeting with our customer to show off what we had completed so far and receive guidance for what the project should be. Those meetings were very important for the continuing growth of our design and implementation. Every week we also had division intern meetings and every other week we documented what we had done for that time period.

During our tenure here we attended many team building activities. Some of them involved tours from many areas of KSC, including Swamp Works, the Cryogenics lab, the LCC, and a virtual reality and modeling setup. It's amazing how many projects are simultaneously ongoing here that involve operations and development. Occasionally we had teambuilding activities that involved many of my coworkers that I don't usually see where we connected and solved problems together. Upper management often attended those activities and we were able to ask questions and network.

IV. Conclusion

Our team was able to complete the tasks assigned and create a user-friendly software application that improves employee management. This tool should be able to give managers a better idea of what their workforce is doing and aid them by documenting data. There are always improvements to be made to software, and this is no exception, but all core functionality has been completed to create a functional and user friendly application. The tool that we made should be able to help the center achieve its goals and it feels great knowing that.

I've had an amazing experience during my time as a software developer here at KSC. This was my first experience working in a professional environment and I've had a great introduction to life outside of school. Entering into such an established and developed culture is an overwhelming experience and it took me some time to adjust. I saw many different departments and ongoing research projects through tours kindly provided. Prior to coming here, I did not understand just how large this center was; it's like its own city. There are many different interesting locations and gift shops all over the place. KSC has many different assets that don't exist anywhere else in the world; there's nowhere else I could go and see huge engineering feats such as the huge crawler transporter or Vehicle Assembly Building. As the world's premier multiuser spaceport, every few weeks there were rocket launches and even sometimes landings. I saw a variety of different rocket systems launch, such as the Delta IV, Atlas V, and Falcon 9. Every launch I was miles away and could feel the ground shake and air shatter by the immense power output. Even hours after launches I could feel it in my body; I've never experienced anything like it.

Acknowledgements

I have many people to thank for my amazing experience here at KSC. I would like to thank my mentor Andrew Davis for being incredibly helpful and being a great teacher. He was able to help us overcome all of our software related issues and guide us through learning a completely new framework and language. Our learning process wouldn't have been possible without him and he was there every day to help us with our work and teach us. My boss Oscar Brooks was available to help me anytime I needed it and helped guide our experience at KSC. My intern coordinators Caylyne Shelton and Jamie Szafran have been available to answer any questions we've had over our job. They also helped us with many career questions and reviewed résumés to assist us in our future endeavors. It was a great help to have a day-to-day point of contact that wasn't directly related to my programming work. My learning experience here wouldn't have been possible without my fellow team interns Jacob Moore and Jonathan Kessluk. We made a great amount of progress on our projects and learned a great deal. It greatly helped to be working in a team of my peers with us all learning and performing to the best of our abilities. Before this experience I had never done any projects like this and I didn't know anything about web development, but now I am far more confident as a software developer.