NASA KSC/Intern Abstract – 2018 – 07/5/2018

Spaceport Command and Control System

Network Engineering

Student Name: Katherine Mackh
Academic Level: Junior
Academic Major: Computer Science
Academic Institution: Bradley University

Mentor Name: Allan Villorin
Mentor Job Title: Computer Engineer

Org Code/Branch: NE-XC (Computer Systems Branch)
Division: NE-X (Exploration Systems)
Directorate: NE (Engineering)

1.0 Introduction

The Spaceport Command and Control System (SCCS) project's goal is to facilitate the checkout and launch of NASA's next generation SLS vehicle in order to enable human exploration through deep space. SCCS is made up of complex software that will control and monitor the Space Launch System rocket and Orion spacecraft. Once it is fully developed, SCCS will be a large improvement to previous software since it takes advantage of modern computers and information making it faster and more reliable than the software used previously on the Shuttle program. The software will be tailored to the specific needs of the Space Launch System (SLS) and Orion spacecraft. These three projects will be brought together for the launch of Exploration Mission-1.

One integral sub-team of this large multifaceted project is the Network/Firewall team. This team's role is sustaining the network design of the project. This internship focused on assisting full-time engineers in the configuration of networking system, as well as network documentation and supporting software sustaining duties as needed. Since this is a complex real-time system that is still under development and validation, I supported Network Engineering tasks related to the SCCS project as they arrived.

2.0 Detail

2.1 Training

Before I could start contributing to the project, I had to complete a training process. Although I have previous experience in programming, I did not have much exposure to network engineering. As such, I trained in Unix/Linux as well as computer networking principles. I completed four training modules on the topics of Unix history, managing files and directories, security, and network administration. More specifically, I learned about command execution, creating and managing files and directories, Unix system security, TCP/IP networking, and other key topics. This training was completed using the System for Administration, Training, and Educational Resources (SATERN) and consisted of watching videos and taking skill check quizzes. My mentor, Allan Villorin, assisted me in this process by serving as a point of contact for any questions, and ensuring that I gained the knowledge necessary to be a contributing member of this project.

2.2 Application of Skills

After completing all of the training modules, my next task was to demonstrate my knowledge, which tied in closely with the learning process. This served as a test to ensure that I grasped the necessary concepts and feel confident using Unix/Linux. I was given several tasks to complete in Linux using only the terminal. After downloading VirtualBox I was tasked with assigning the virtual machine four IP addresses, restoring internet access, changing the default browser, and writing a shell script. Once again, Allan Villorin played a role in this process by answering questions and offering guidance. When I completed the labs, he reviewed my work and gauged if I was prepared to work on the SCCS network architecture. Overall, both the learning portion and training/labs took about one month.

2.3 Assignment

After completing both the training and the labs I was assigned a project to work on with another intern. The end goal of the project was to write a script on a processor so that a user could manually input a new network latency value, or how much time it takes for a packet of data to get from one designated point to another, on the device. In addition, we had to create a 3D printed case for the processor so that it could be transported safely.

2.4 Procedure

The first step was to use the processor, a switch, and two computers to replicate the existing network between the Launch Control Center (LCC) and launch pad. In order for the two computers on opposite ends of the network to be able to ping each other, we had to configure the processor as a bridge. We then wrote a command line argument that changes the network latency from the terminal. At this point in the project, my partner and I decided to split the work based on our skill sets, so I worked on the app and he worked on the 3D printed case. In order to create the script on the processor I taught myself how to create widgets, studied existing scripts on the device, and read tutorials online. After creating a widget with a spin box and slider and testing it in a terminal, I transferred the files to the processor, and wrote a script that would call the program files. Finally, I wrote script that would insert the user inputted value into the latency function and update the latency accordingly.

3.0 Conclusion

Overall, this internship has been an incredible experience and will play a very important role in my future career as a computer scientist. I started this internship with little experience in network engineering, and now have an intermediate/advanced understanding of the Unix/Linux operating systems and networking principles. My experience working at the Kennedy Space Center allowed me to get a taste of life working for NASA and grow as a professional. Furthermore, this internship allowed me to explore one of the possible areas my computer science degree could take me and gave me an idea of one of the branches of computer science that I am interested in making a career out of.

4.0 Acknowledgements

I would first like to than my mentor Allan Villorin for giving me such an incredible opportunity to learn and gain experience at the Kennedy Space Center. I am thankful for the challenging assignments he gave me and his willingness to answer my questions and spend time debugging my programs. I would also like to thank Mark Barbaro and Kelvin Ruiz for answering my questions and showing me how it's done in the LCC. Finally, thank you to everyone in the LCC who let me in the gate so I didn't have to wait outside in the heat.

5.0 References

"Spaceport Command and Control System," Kennedy Space Center Fact Sheets [online database], URL: https://www.nasa.gov/sites/default/files/atoms/files/spaceportcommandcontrolsystem.pdf [cited 21 May 2018].