Spaceport Processing System Development Lab

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The Spaceport Processing System Development Lab (SPSDL), developed and maintained by the Systems Hardware and Engineering Branch (NE-C4), is a development lab with its own private/restricted networks. A private/restricted network is a network with restricted or no communication with other networks. This allows users from different groups to work on their own projects in their own configured environment without interfering with others utilizing their resources in the lab. The different networks being used in the lab have no way to talk with each other due to the way they are configured, so how a user configures his software, operating system, or the equipment doesn't interfere or carry over on any of the other networks in the lab. The SPSDL is available for any project in KSC that is in need of a lab environment.

My job in the SPSDL was to assist in maintaining the lab to make sure it's accessible for users. This includes, but is not limited to, making sure the computers in the lab are properly running and patched with updated hardware/software. In addition to this, I also was to assist users who had issues in utilizing the resources in the lab, which may include helping to configure a restricted network for their own environment. All of this was to ensure workers were able to use the SPSDL to work on their projects without difficulty which would in turn, benefit the work done throughout KSC.

When I wasn't working in the SPSDL, I would instead help other coworkers with smaller tasks which included, but wasn't limited to, the proper disposal, moving of, or search for essential equipment. I also, during the free time I had, used NASA's resources to increase my knowledge and skills in a variety of subjects related to my major as a computer engineer, particularly in UNIX, Networking, and Embedded Systems.

I. Introduction:

The following details my experience working as an intern in the Spaceport Processing System Development Lab (SPSDL) and the rest of the System Hardware Engineering Branch (NE-C4) at KSC. The Spaceport Processing System Development Lab is built for the use of KSC employees to be able work on their own projects in a configured private/restricted network environment which has restricted to no communication with other networks. This allows users from different groups to work on their own projects in their own configured environment without interfering with others utilizing their resources in the lab. The different networks being used in the lab have no way to talk with each other due to the way they are configured, so how a user configures his software, operating system, or the equipment doesn't interfere or carry over on any of the other networks in the lab.

My job as an intern was to assist in developing and maintaining the lab and assist users with any issues pertaining to the lab and/or their project. When I wasn't working on this, I would instead take on tasks in other areas of the System Hardware Engineering Branch. I would also use the resources given to me in KSC to increase my knowledge and skills in subjects related to my major and possible future tasks.

II. Details:

As of now, the new and improved SPSDL is still being built and developed. It currently contains 24 computers running on different operating systems, including Windows, Red Hat, and Ubuntu. Servers have yet to be installed into the room, but the lab is close to being connected to the Kennedy Network.

Because the lab is still in development, its use has been limited. The SPSDL has yet to be actively advertised for use throughout the KSC, so there hasn't been notable activity in the use of the lab aside from setting it up, as other unrelated NASA employees are perhaps unaware of its presence.

Since there is inactivity in the use of the SPSDL, most times when I'm in the lab, it is to help set the lab up. I've helped move in equipment that have included cubicle walls that separate the lab into different sections and white boards now installed on the walls for workers to use freely. I've also assisted in replacing RAM (Random-access Memory) into the lab computers in order to increase their memory. Ultimately, because my work in the SPSDL is infrequent, most of my time is used to work on other different tasks.

One of the biggest work activities in NE-C4 has been the moving of the Control and Data Systems Division and all associated equipment from the Space Station Processing Facility to the Launch Control Center and Operations Support Building II. Even before I began my employment as an intern, NE-C4 had been preparing for the eventual move in October, which was later pushed to November. This resulted from a furlough in NASA lasting from October 1 to 16 of 2013 caused by the US government's temporary shutdown. To prepare for the move, I worked on different small tasks. This includes the dismantling of equipment and supplying crates to workers to help move their belongings and office supplies to their new cubicles. I also verified the cubicles, co-workers were moving into, were connected to the LCS Development Network (LCS DevNet) which differs from the Kennedy Network in that it's open only for the developers in LCS and not to the rest of KSC. This connection was verified by connecting a laptop to a DevNet port in each cubicle and checking if it could connect to the network. There were occasions where I also prepared computers for disposal, making sure their hard drives were removed. This was to make sure the hard drives were properly destroyed, preventing the possibility of any important data being leaked outside KSC.

When I'm not working on any tasks, I'm using NASA's resources to learn about subjects related to my major. Initially when I started working, I had minimal knowledge on UNIX operating systems. To compensate, I took a course on SATERN (System for Administration, Training, and Educational Resources for NASA) called "Introduction to UNIX". From the course, I learned about the history of UNIX, the types of UNIX that exist as commercial and open source products, and their uses. This has allowed me to better recognize operating systems being used in KSC and understand what they're being used for (which were mostly network servers).

Allan Villorin and Michael McDonald, coworkers in the NE-C department had also taken the time to teach me and other interns how to use a UNIX system. Along with giving us tasks to work on involving UNIX systems, they showed how to install and use a virtual machine on our computers. They also gave a brief lecture on how networking works in KSC.

One of the biggest projects I've worked on during my time in KSC has been the microcontroller. A microcontroller is a small computer on an integrated circuit capable of being programmed to perform a certain amount of functions. Currently, KSC is interested in microcontrollers to help develop a small satellite controller.

Before coming to KSC as an intern, I had some experience working with an Arduino microcontroller, which I had found an interest in using. Hearing of this interest, I was lent a chipKit UNO32 microcontroller along with PGM programmer/debugger and Basic I/O shield from Kelvin Ruiz, who had been teaching others how to use the microcontroller. Using slideshow lessons created by Ruiz and with no specific goal in mind other than to learn, I began to experiment with the microcontroller.

Compared to the Arduino, programming the chipkit microcontroller was more of a challenge. In order to program the microcontroller with code written in C language, an in-system programmer (chipKit PGM) was needed. In addition, I had to read the schematics of the microcontroller in order to know how to call on the devices installed on the board, particularly the light emitting-diodes (LEDs) and switches. There were also new functions I learned I was able to write and program onto the microcontroller. This included programming configuration bits which specify the operating mode of the microcontroller and timers and interrupts, which could control how the fast the microcontroller was running and its capabilities at multitasking.

Using what I learned, I began to upload my own code to practice. This helped to give me new ideas about what I could do with the microcontroller and what I could possibly want to do in the future.

At some point, I took the time to learn how to use the switches and organic light-emitting diode on the shield (an expansion board capable of expanding a microcontroller's capabilities). Currently, I've managed to create a program which, when uploaded to the microcontroller with the shield equipped, causes 256 combinations of 8 LED lights to blink while simultaneously printing the number of the LED combination out on the OLED.

III. Conclusion:

In conclusion, I was given the opportunity to work on other tasks outside of the SPSDL which gave me better insight on how my branch, along with the rest of KSC, ran as part of a government agency. In addition, I was able to acquire experience related to my major I wouldn't have been able to acquire in school with UNIX and embedded systems. Overall, my job has given me plenty to work on over the months and in return, it has taught me much.