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Bachelor of Science, Computer Science

Course #: CECS-397

Summer 2019 Internship

METECS, Software Engineering Contractor Intern

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Internship Evaluation Report

I interned over the summer as a Software Engineer at METECS, an American engineering-services company that does a majority of their work for the National Aeronautics and Space Administration (NASA). Their headquarters are in Houston, Texas about a mile from NASA's Johnson Space Center (JSC). METECS has a lot of projects that they work on as a company, but I worked as a member of the RFID-Enabled Autonomous Logistics Management (REALM) Project. The main focus of the project is to use Radio Frequency Identification (RFID) to create a fully-automated logistics management system for all of the items on the International Space Station (ISS). I worked as a NASA Contractor Intern on this project.

The REALM Project consists of an entire building of people, some of whom are employed by NASA and some are contractors employed by METECS. The NASA people handled the overhead for the project, the logistics, implementation of the project on the ISS, and served as the interface between METECS and Mission Control. When astronauts are unable to find an item on the ISS, Mission Control contacts the NASA people working on the REALM Project with the item's identification information and then we use the information gathered by our RFID system to locate the item and relay that to Mission Control. METECS is in charge of the management, development, and application of REALM. These two "sides" of the project met weekly to discuss any issues that had come up and to keep track of any new developments. The team structure on the METECS side was very loose, with people focused on specific parts of the project rather than working in specific roles. Adam and Frank were my mentors this summer, both of them worked together as the leaders of the project and were in charge of the tasks everyone worked on as well as the future path of the project. Nick was in charge of most of the web development for METECS, and helped me out in the second half of my internship. There were seven other METECS employees who worked on REALM, developing and testing the hardware and software we used. NASA also employed many people on the REALM project, most notably Pat Fink who was the project lead on the NASA side.

I came into this team as the only intern, as the other interns that METECS hired worked on different projects at NASA. I attended REALM Project team meetings every Monday**,** keeping everyone up-to-date with what I was working on, and giving my insight on problems that arose. Pat Fink and my mentors made most of the decisions for the project, but everyone on the team, including myself, had input on all of the decisions made. Everyone on the team contributed solutions to obstacles that arose, as everyone assisted each other with their problems. To keep track of everyone's roles and tasks in the team we used a website called Redmine, an online tool to track issues and goals for a team. We also used an online software called GitLab, developed by GitHub, to allow the entire team to work on the same software and track all changes dynamically. GitLab is a code-management software that keeps track of everything coded by everyone on the team and is similar to GitHub. Slack was used to communicate with the entire team. We also used it to track currently running software by automatically sending messages to certain channels when an error occurred, such as a system going offline, or to stay updated on any new items that may have been seen by the RFID system.

My job on the team was to create a web-based tool for Inventory and Stowage Officers (ISOs) and REALM team members to speed up the process of finding lost items on the ISS. My webtool, called MITT (Missing Item Tracker Tool), aggregated data about missing items from multiple databases and displayed all of their information in a highly detailed table on a website.

The first half of my project involved developing a backend Python script to collect and store the necessary item data. The backend uses a Linux crontab to automatically run every four hours. First, it connects to the manually-updated NASA Inventory and Management System (IMS) MicrosoftSQL database. It queries this database for every item that has been marked "LOST" by ISS Astronauts and/or ISOs, then stores basic information about those items in a Python matrix, such as the item's barcode and the date it was marked as missing, and finally it safely disconnects from the database. Second, it connects to the automatically-updated METECS Complex Event Processor (CEP) PostgreSQL database. It queries this database for all of the RFID information about each item such as when it was last "seen" and how many times it has been read in the last week, saves it in a separate Python matrix, then safely disconnects from the database. Third and finally, it combines the two Python item matrices and formats it into a JavaScript Object Notation (JSON) object so that it can be inserted into a MongoDB database. I developed all of this code in PyCharm and Vim Text Editor, which is still running on a METECS-owned server at Johnson Space Center.

The second half of my project was used to develop a frontend for MITT. METECS already had a website that we called ComLabs. It was developed using Angular and NodeJS by Nick, and was already being used to submit requests to generate an estimated location for input barcodes. I created my own page on this website that displayed two tables. The first was a status table that showed the last time the IMS and CEP databases were updated, as well as the last time my script ran. The second table displayed all of the missing items on the ISS, with all of the information collected and stored in MongoDB by my backend script. Creating this website required full-stack development, as I had to add: the new REST API requests that connect the website to MongoDB, the interfaces between the REST API and my webpage code, and the TypeScript and HTML code that was actually displayed on the website.

During the course of my internship, I learned all about databases- how to connect to and query them from within a Python script, and how to properly structure them in such a way that they are accessible and convenient. I learned a lot about Bash and Python scripting along with how both languages work, their capabilities, and their syntax/structure. I also learned all about full-stack web-development and how I do not want to do it for a living. I studied the Angular full-stack architecture and learned how to code in HTML and TypeScript.

This internship was basically my dream job. Most of what I did during my internship involved software programming, which is extremely relevant to my educational and career interests because I intend to program full-time after Embry Riddle. I am working towards a Bachelor's Degree in Computer Science and a Master's degree in Software Engineering, and my ultimate career goal is to become a Software Engineer for an organization whose primary purpose is space exploration (SpaceX, NASA, etc.). In addition to programming, I got to spend much of the summer exploring. I lived in Houston for three months, meeting hundreds of new people, touring the coolest buildings at JSC, hearing talks from current and past Astronauts, and celebrating the 50th Anniversary of the First Moon Landing by the Apollo 11 Crew. My experience this summer has helped me grow as a person and as a programmer, helping me become a better team player and realize my talents.

I enjoyed spending my free time meeting the hundreds of other interns at JSC, learning about their projects and playing board games or Dungeons & Dragons with them every week. I unwinded at the Ultimate Frisbee practices and games every week, and am now going to join the Embry-Riddle Ultimate Frisbee Club because of my experience with the sport this summer.

This internship showed me that I really enjoy coding, not just coding in class but also real-world software development. I think I enjoy it so much because I love solving problems, and the culture at NASA revolves around problem solving and pushing back the frontiers. I also learned that I love Ultimate Frisbee and want to continue playing. I had an incredible amount of help from all of my mentors, and created amazing relationships with people in and out of the workplace that I will take with me forever. I am extremely appreciative of the opportunity I had this summer and really enjoyed working with everyone at NASA and METECS. I felt welcomed, learned a lot, and realized my passion for completing valuable programming work.