

NASA KSC Intern Final Paper

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I am finishing up my internship with the Application & Simulation group at NASA Kennedy Space Center (KSC). During this internship I was working with the Plant Habitat development team. The Plant Habitat provides a large enclosed, environmentally controlled chamber designed to support commercial and fundamental plant research onboard the International Space Station (ISS). The work that I did was for the prototype of the Graphical User Interface (GUI) display. This display is used by the scientists to monitor the system health, start new experiment configurations, and get real-time information about the experiment as its being run. This display is developed using the Qt Framework Integrated Development Environment (IDE) and the programming language C++.

The display prototype was originally started by the intern that preceded me. He created a dummy display that conformed to the ISS display standards. My goal was to create a backend system that would translate data coming down from the ISS using a piece of software called the Telescience Resource Kit (TReK) and pass it to the front end of the GUI using TCP/IP. (See Figure 1)

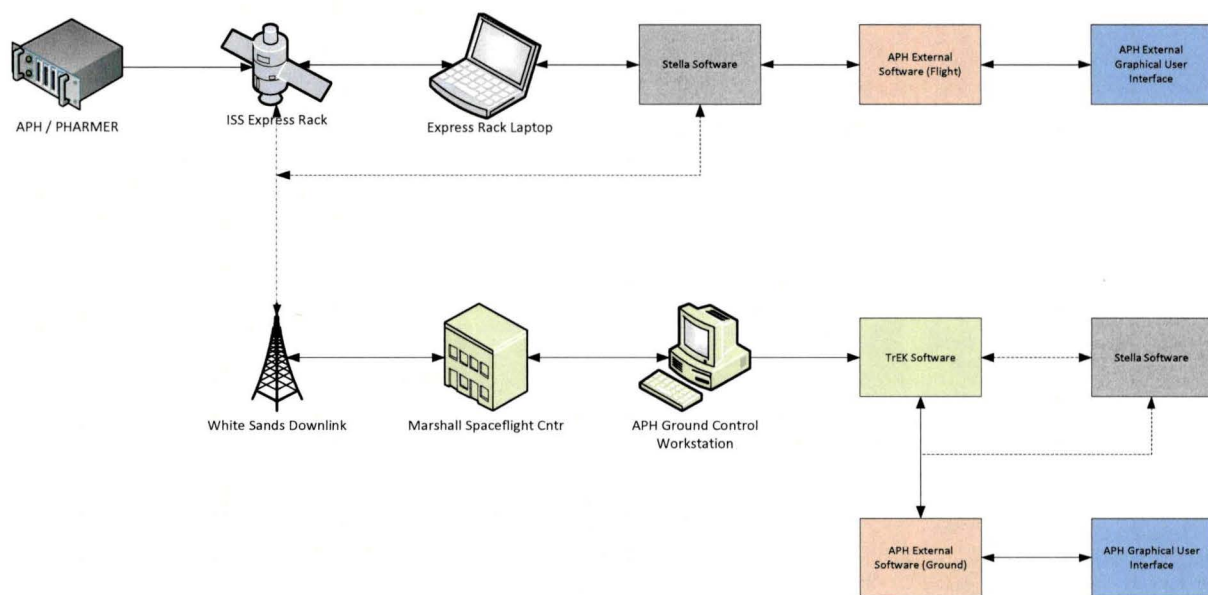


Figure 1: Basic Configuration of Software / Hardware

The first step in this process was to learn more about the Qt Framework. As I have never had to use this set of tools before I needed to dig into how it worked. I was able to use Amazon Kindle along with Books 24x7 to find material that allowed me to learn how to use the framework. My next step was to focus specifically on the TCP/IP connections. Qt Framework has a couple of libraries specifically for that function called QtNetwork and QtSocket. Using these two libraries I was able to open a socket between the Backend and the Frontend and transmit a continuous stream of packets that randomly changed the data within the GUI. (See Figure 2)

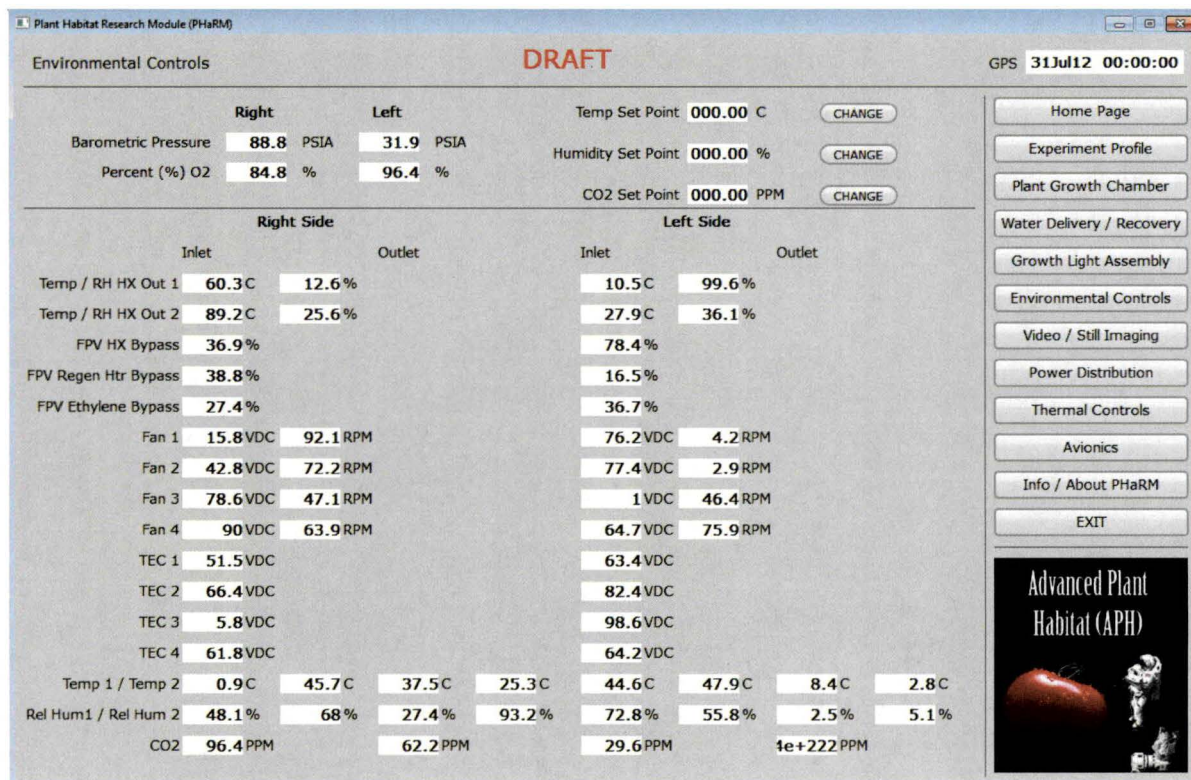


Figure 2: Random generation of output values

My final step was to create a dialog that allowed the user to command the Temp Set Point to a specific value. When a user inputs a correct value (incorrect values are restricted by the Qt Framework) the value is sent to the server and the GUI is updated to reflect that change. (See Figure 3 and Figure 4)

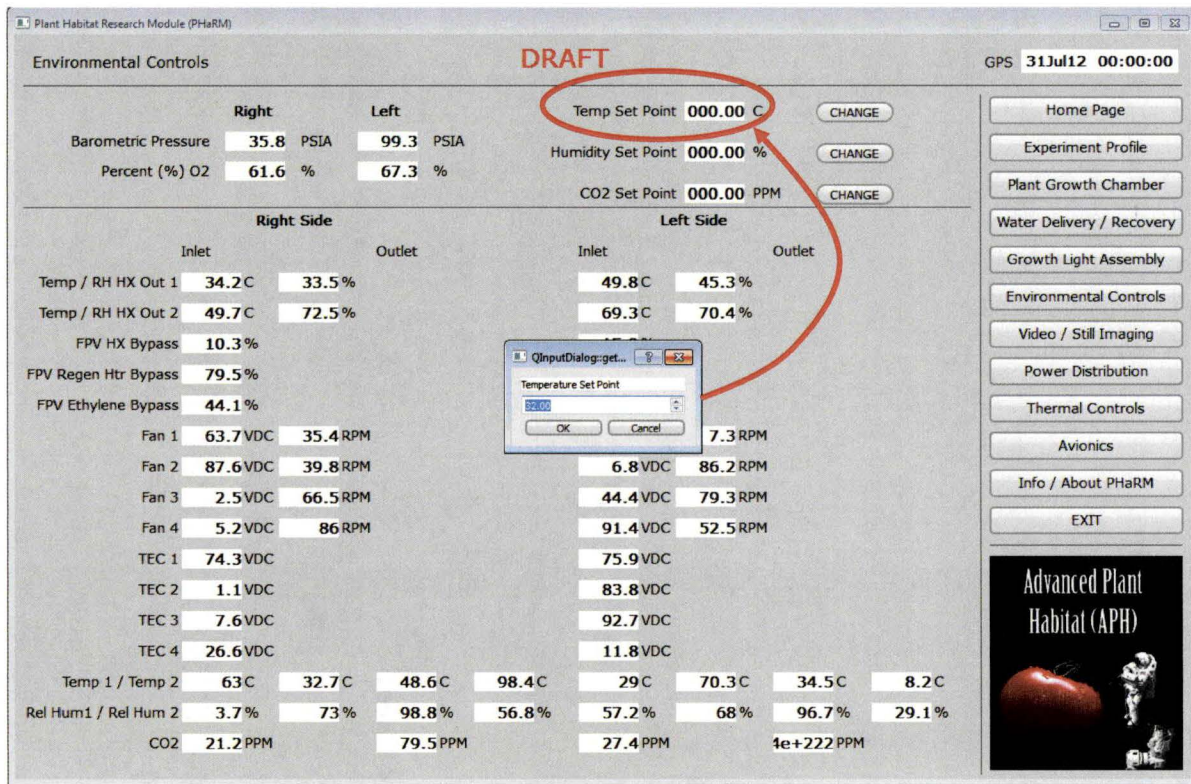


Figure 3: Input dialog box for Temp Set Point

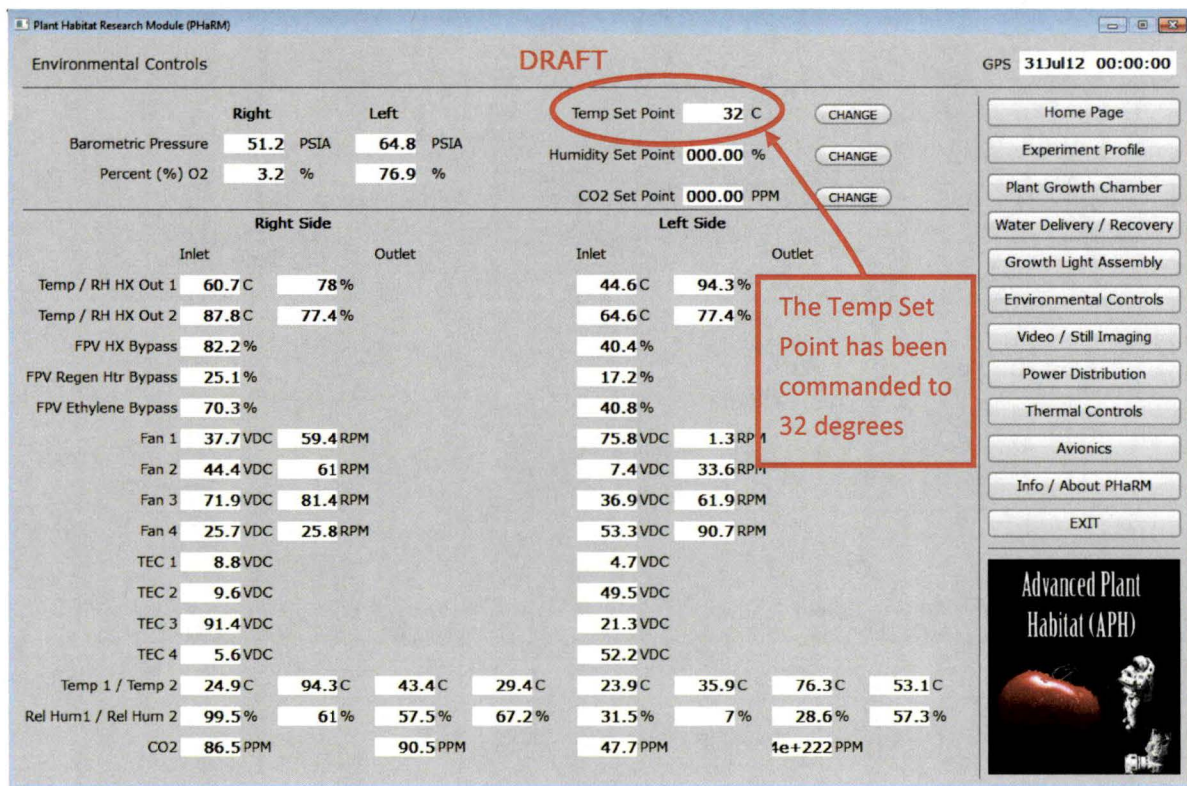


Figure 4: Screenshot showing updated Temp Set Point.

This was as far as I was able to go with this specific project as there were a few unanswered questions that needed to be resolved by the project's team before this prototype could be developed further. These questions included:

1. What is the packet definition (the specific order the measurements and values will be received in) for the information coming down from the ISS?
2. Have the future developers used a different set of tools for module development in the past that would work better?

Besides the GUI that I was developing I had a few other side tasks that I worked on. I helped review the Software Requirements Specification (SRR) and the Software Design Document (SDD). I attended multiple meetings during the internship ranging from software development meetings to avionics

meetings. I also participated in display development for the Launch Control System (LCS) for the Space Launch System. These displays will be used to replace the ground control and monitoring displays that were used during the Space Shuttle program.

I also was able to participate in many different learning opportunities. I was able to tour many of the facilities used here at KSC and how they are being refitted and changed for the next generation of space vehicles. Another learning activity that I was able to participate in were brown bag lunches, where different project leaders at KSC came in and talked to the Interns about what they were doing. Also I participated in multiple retirement activities for Discovery and Atlantis.

This internship opportunity overall was a huge learning experience. I was able to put to use the skills I learned at school along with learning new skills on the job. I got the chance to tour some amazing facilities that I never thought I would have the chance to see. This was a great once in a lifetime opportunity.