Orion FSW Code Coverage

Johnson Space Center NASA Intern Abstract

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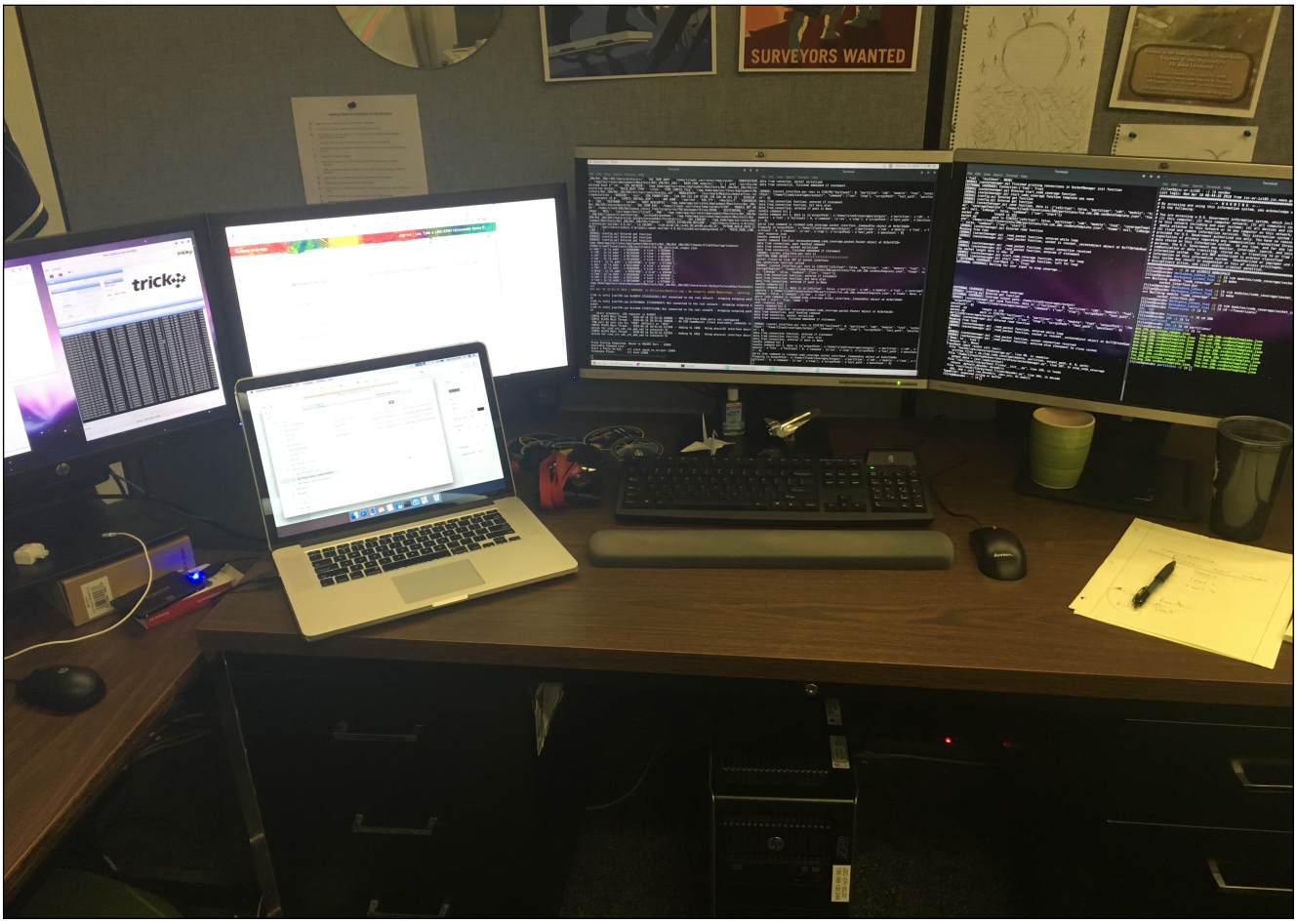

Abstract

As with any manned space craft, assuring complete functionality of the vehicle is exponentially more critical, a daunting challenge in the modern age of flight software abstracting the vast majority of vehicle operation. Certification of such complex systems are done in two independent procedures: verification and validation. Verification requires successfully fulfilling the design requirements while validation demonstrates the operational needs of the client are met.

The Orion Multi Purpose Crewed Vehicle verification involves a simulated platform known as SOCRRATES which is adaptable in emulating the flight, communication, and display hardware cores. This simulated platform provides cost benefits over running on the flight hardware as well as heightened efficiency for performing software tests.

The Orion flight software (FSW) code coverage project (DRACO) was developed as a verification tool to assist in understanding the results of each test script, insight that can diagnose causes for passes and failures. The continued development and maintenance of the DRACO tool was the focus of my internship at JSC in conjunction with developing reports for various Orion FSW partitions.

Due to the intricate nature of the software aboard Orion, the initial phase of my internship involved gaining a fundamental understanding of the testing environment and toolsets previously developed. However, for technical reasons, the code had been shelved for several months and needed to be modified in order to function properly with the current Orion FSW.

Via piecing together software components from various contractors and NASA, I developed two up to date workspaces for simulating the Orion operating system: a barebones headless environment and a Lockheed Martin proprietary abstracted model.

After ensuring proper functionality of the new environments, I began implementing the Draco Utility to generate the desired reports for Orion personnel. This phase proved challenging as the tool module hierarchy was poorly documented and required several modifications to operate properly, the primary of which was a socket connection issue between the simulation server and the DRACO tool running externally.

In bringing the system up to speed, I wrote a detailed python script on top of the DRACO client that can be used to start and stop the code coverage which was ultimately incorporated into a test automation script within the barebones workspace.

For the proprietary Lockheed Martin setup, I created a method of enabling and disabling the DRACO toolset while still permitting future upgrades of the Lockheed Martin workspace or code coverage utility.

The final major task of the internship was the documentation and organization of the overall user workspace to best reduce the steep learning curve required. By creating a standard set of environment variables, portable set up files, and a baseline simplified home directory, the next wave of interns will be exceptionally prepared to perform their tasks. The wiki utilized for information passage has also been appreciably updated to provide a clear depiction of the global Orion tool set.

This internship greatly augmented my coding skill set, expanded my space systems knowledge, and taught me many valuable life lessons in communication and team interaction with differing personalities. Looking forward in my career, this internship has illuminated me on the meaningfulness of pioneering of human advancement and provided a solid foundation for continued contribution.