A Brief Summary of the BlueSat Payload System

*J. Aiden Rohde*

The purpose of the Payload System (PS) is to serve as a base for any useful and novel functionality, which might be implemented using the BlueSat system. So far this consists of a microcontroller, a Linux kernel, and a boot loader to set-up and insure the kernel is functional. This system was designed and coded by Matt Brindley, and for a more detailed summary refer to his thesis.

The hardware basis of the Payload System is a Philips ARM 9 microcontroller. This microcontroller is compatible with the chosen operating system as well as satisfying our other requirements. It has enough GPIO pins to communicate with twoGaussian Minimum Shift Keying (GMSK) modem modules (one primary, one backup) which receive digital communications. It has an I2 C bus for communications with the Critical Systems Computer (CSC). Finally it has ports to interface with the external RAM and flash memory required to support the operating system and to provide space for experimental data and programs.

A SeL4 Linux kernel will be the base OS for this system. This kernel has been extensively tested and is proven to be stable and thus is ideal for our sensitive system. However, for safety, the PS needs to have the ability to check the integrity of an OS image and load a backup image if errors are found. It also needs to be capable of receiving and loading a new OS image.

This is job of the boot loader which has yet to be completed, but will be based off of the open source boot loader U-Boot. The protocols and drivers that the boot loader will need to support included, a radio switching protocol, I2 C for the CSC to restore the system, Ax.25 for the transfer of OS images, and the hardware interfaces for the GMSK modules. Once it has these capabilities the U-Boot Download Mode will need to be further modified to handle image checking, download, and management.

Finally for the PS to be functional a standardized method for communicating with all third party experiments and devices will need to be implemented. Because this depends entirely on what sort of third party functions are taking place through BlueSat this protocol is not currently under development.