**SPACE SOFTWARE FOR UNDERGRADS**

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**Lowering the Bar**

When confronted with the prospect of acquiring reliable software for small satellites (SmallSats), university SmallSat teams — especially those that consist primarily of undergraduates — are often faced with a variety of challenges. Existing software solutions for SmallSats are prohibitively expensive and are targeted towards SmallSat companies, working professionals, or users with otherwise graduate-level academic knowledge and background. Additionally, these software solutions are most commonly designed for the specific architecture of off-the-shelf, on-board SmallSat computers — a luxury that also often finds itself beyond the budget of university teams.

As a result, such teams frequently write satellite software from scratch. This often leads to attempts to solve ill-defined problems and reinventing solutions to issues that have been solved many times over. This can be a long and difficult undertaking, as such software necessitates a certain level of complexity and typically has limited reusability mission-to-mission. The purpose of OpenSPA — an abbreviation of “open-source, Space Plug-and-play Architecture” — is to address these issues by providing an open and free-to-use SmallSat platform targeted towards the needs and ability of undergraduate students in engineering.

**Abstraction**

SPA is a mission-proven protocol that is frequently employed by USU’s own Space Dynamics Laboratory. Much work and research has gone into the foundations of SPA over the past ten years, and a wealth of academic information is available detailing the architecture. Absent from current public access, however, is an accessible implementation of the SPA architecture. The driving objective of our research, therefore, is to develop a working platform that provides university SmallSat teams with tools and infrastructure they need to achieve their mission objectives quickly and efficiently.

**What’s To Come**

OpenSPA is nearing completion of an initial “alpha” stage that is to be field-tested in the coming months as part of a series of six high-altitude balloon launches with USU’s Get Away Special (GAS) microgravity research team. The software will be responsible for ensuring the cohesive interaction of twelve separate components of a prototype SmallSat as it ascends to the stratosphere. This will allow us an opportunity to collect data on how the software and hardware perform together in a space-like environment while simultaneously testing the its mission-worthiness. Following these tests and further development, OpenSPA is intended to serve as the software platform for a low-earth-orbit SmallSat mission in 2018. For OpenSPA, the future looks bright, and the stars look brighter.

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**Diagram**: Messaging between three SPA components to provide real-time validation of barometric data

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**Image**: Cache Valley: as seen by a CubeSat prototype at 50,000 feet