

IAF SPACE OPERATIONS SYMPOSIUM (B6)  
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SPACECENTRE-2018: AN ADVANCED PWA-BASED GROUND STATION APPLICATION FROM  
FLATSAT TESTING TO MISSION OPERATIONS

**Abstract**

Progressive web applications (PWAs) are rapidly gaining ground today as a serious contender for the implementation of ground segment software. We first introduced SpaceCentre, our ground segment software developed using web technology, at the 11th IAA Symposium on Small Satellites for Earth Observation in April 2017. The advantages of the web-based approach were clear: full stack frameworks enabled code to be developed and deployed rapidly, unstructured databases are well-suited to the varying downstream requirements of our different satellite programmes, and the plethora of open-source community libraries available meant that the application was easily extensible and maintainable. By the end of 2017, SpaceCentre had grown into a feature-rich mission planning and control tool complete with a terminal node controller interface based on the CubeSat Space Protocol for the 2U Galassia nanosatellite. This has led to SpaceCentre becoming the de facto ground segment software at the National University of Singapore.

Despite the impressive maturity that SpaceCentre has reached in less than a year, development of the software started out as a mission planning tool in mind. This is contrary to the established practice of developing the FlatSat testing software in tandem with its subsystems, and then rescoping this software later to eventually become the ground segment software. Nonetheless, this was unavoidable given that the endeavor started during the in-orbit testing phase of the Galassia programme. We are looking to plug this gap as our institute begins gearing up for its upcoming programmes, keeping in mind the requirements of interoperability.

At IAC 2018, we share our progress and roadmap for SpaceCentre-2018 (SC18), the next iteration of our groundbreaking web application. SC18 comes complete with features for mission tasking and FlatSat testing - with SC18, subsystem engineers are granted low-level access to their subsystem variables for development and testing purposes. Access privileges are conveniently managed via the application's built-in accounts package. Robust, data-driven mission tasking is now possible using the scripted tasking module that supports the Python language, allowing complex missions to be fully automated based on telemetric feedback. Also updated is the mission tasking module for Earth Observation missions, where operators may define areas of interest on an embedded Google Maps widget and generate mission scripts for use with the scripted tasking module. We demonstrate the above features using a real optical imaging use case. Finally, we discuss our integration of SC18 with the ground segment hardware of the on-going

Galassia-2 programme.