Paper ID: 27814
oral

66th International Astronautical Congress 2015

SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

Author: Mr. Lucas Bremond
Axelspace Corporation, Japan, lucas@axelspace.com

Mr. Hajime Fukuhara
Axelspace Corporation, Japan, fukuhara@axelspace.com
Mr. Yuta Nojiri
Axelspace Corporation, Japan, nojiri@axelspace.com

A WEB-CONTROLLED AUTONOMOUS OPERATIONS AND IMAGE PROCESSING SYSTEM FOR THE HODOYOSHI-1 MISSION

Abstract

Axelspace Corporation is a venture company based in Japan that has designed, and is currently operating, the Hodoyoshi-1 satellite, a 60 kg Earth observation agile micro-satellite developed in partnership with the University of Tokyo. Hodoyoshi-1 is a business demonstration project providing customers with satellite imagery at an unprecedented low cost, where as a first step we plan data utilization experiments with several corporate partners interested in future micro-satellite business. In an attempt to drastically reduce routine operations, an end-to-end automation system that makes extensive use of state-of-the-art web technologies has been developed.

Satellite operations are often time and resource consuming and very little fault tolerant as simple errors may dramatically impact the mission. After a successful commissioning phase, during which the satellite was mostly operated manually, an automatic system has been progressively deployed in order to deal with repetitive tasks. In addition, the Hodoyoshi-1 system is allowing different users to request imagery for a given geographical position within a given time window and to obtain resulting data as soon as available, without any human intervention within the request to product cycle.

This automated imagery requesting, mission planning, onboard system tasking and data processing system has been designed keeping a complete separation between frontend and backend. The frontend is fully web-based and can be accessed through any modern internet browser. This approach has the benefits of being fully platform independent, requiring no specific installation, enabling new features to be deployed instantly and allowing interface to be easily tailored to user privileges.

From a user perspective, the UI is only focusing on request input and data output, rather than on underlying processes. It has been designed to be as light and intuitive as possible, and mainly consists in an interactive map, onto which layers can be superimposed: requests coordinates, satellite ground track, weather predictions and a set of administration layers that allow operational tasks to be spatially rendered. Requests can be added by selecting a desired time window and clicking on the map.

On the server side, the backend system continuously collects requests, estimates satellite capture conditions from orbital and platform constraints, performs multi-objective optimization to maximize data return and deal with potential requests conflicts, converts required operations into satellite commands and uplink them. When the satellite is passing over a ground station, data is automatically and processed and products are released to the users.