

26th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Satellite Operations (3)

Author: Mr. Ran Qedar
Telespazio VEGA Deutschland GmbH, Germany

Mr. Guillaume Tanier
Telespazio VEGA Deutschland GmbH, Germany

Dr. Martin Shaw
Telespazio VEGA Deutschland GmbH, Germany

Dr. Jacopo Pellegrino
Telespazio VEGA Deutschland GmbH, Germany

CLOUD-BASED MODULAR E2E GROUND SEGMENT AUTOMATION

Abstract

In the age of small satellites becoming more commercial, mainly as part of a constellation for remote sensing, telecommunication and navigation, there is an increasing need to reduce the cost and time of ground segment operations. Most of the industry has been focused on automation between the space segment and the mission control software, to reduce the cost of needed human resources and to reduce the response time to anomalies, but so far little has been made in making automation across the whole ground segment. As part of a new development, research has been performed to evaluate current and future automation needs, which has been carried out in the context of NewSpace operations, with NewSpace use cases. One of the main results is the need for a full End-to-End (E2E) automation system that will automate all interactions between the different entities in the ground segment and abstract the operators from operational details. It aims at reducing both the response time between customer requests or spacecraft anomalies and the subsequent reaction by the planning, scheduling and operations tools. This paper will present the activities to establish an E2E automation system. The E2E ground segment includes at least the Mission Planning System (MPS), Simulator (SIM), Mission Control Software (MCS), Ground Station Scheduling (GSS), Flight dynamics (FD). The main goal of the E2E automation engine is to orchestrate nominal operations and handle events through all the various entities. The E2E automation is able to instruct the MPS to perform re-planning of activities, notify the SIM and GSS about the unavailability and update the MCS about the change. During the conceptual design of the system, two issues have been tackled: The need for commercial companies to have a short installation time and learning curve, and also to have a simplified configuration ability to update the ground/space configuration such as installation new on-board software or adding a new satellite to the constellation. The installation time is minimized by deploying the system on a cloud infrastructure that is accessible worldwide and does not require localized computing resources and without the need for installation. The ability to update the configuration, is realized by setting up a modular system where a customer can add, change and remove activities and rules through a user friendly graphical interface. The paper will also describes the benefits of such an approach, in particular the new automation strategies that it enables.