

IAF SPACE OPERATIONS SYMPOSIUM (B6)  
Ground Operations - Systems and Solutions (1)

Author: Dr. Ed Chester  
Catena Space, United Kingdom, ed@catena-space.com

Ms. Tanya Boardman  
Catena Space, United Kingdom, tanya@catena-space.com

Dr. Adam Baker  
Catena Space, United Kingdom, adam@catena-space.com

Mr. Matthew Cosby  
Goonhilly Earth Station Ltd, United Kingdom, matt.cosby@goonhilly.org

A WEB SERVICES OPEN STANDARD FOR GROUND SEGMENT OPERATIONS AND WHY WE  
MADE IT

**Abstract**

This paper reports progress in the collaborative definition and delivery of a next-generation concept for user- and system- ground segment operations. The main focus is to take the sometimes cumbersome established approaches and to map them onto contemporary internet technology using formalised web services. A significant cost in implementing an instrument control centre or user facility is developing custom software and automated tools that can create, validate, transmit, and ingest the necessary suite of files needed for that specific instrument/mission. The design of such tools is mission dependent, customised every time, expensive, error- prone and sensitive to ICD changes.

Manufacturers of cubesats and their subsystems often co-design contemporary control systems, but rely upon extant ground segment networks and facilities for their operational phase. Our intention is to complement existing facilities through making them more accessible to multiple user types and especially those adopting the strong ‘as a service’ trend of internet infrastructure. New applications for science, earth observation, and education can exploit direct ‘internet ready’ data provision instead of facing the established barriers of legacy data stores and interface control documents.

Web services are used for machine-machine interactions, such as efficient data retrievals by mobile phones. These services inherently deal with security, authentication, and synchronisation of data across multiple machines in a seamless and robust way. Just addressing those three aspects for a space user ground segment requires dedicated teams and significant cost. This is not a unique proposition: some companies have advanced their own in-house ideas for ‘web enabled’ ground systems. Consolidation of different practices under the CCSDS green book ‘Mission Operations Services Concept’ (MO) is a key driver towards standardisation, improved inter-operability and the transition to a services-led mode of operations. Unlike CCSDS MO, our approach has been to start from the ground-up and consider the necessary tasks a user, owner, or operator needs to undertake, and how to most simply achieve them without regard for the transition or any legacy inheritance of requirements or constraints.

The concept and services specification and model is open source, ready to be improved upon by any interested organisation. This work has been supported by the National Space Technology Programme of the UK Space Agency.