

# GEOSPATIAL FOUNDATIONS FOR SPACE

WORK IS UNDERWAY TO FREE OGC STANDARDS AND TECHNOLOGIES FROM THEIR TERRESTRIAL CONSTRAINTS AND ALLOW GEOSPATIAL ANALYTIC TOOLS AND TECHNIQUES TO BE APPLIED TO OTHER CELESTIAL BODIES AND DEEP SPACE, WRITES **SIMON CHESTER**

As geospatial tools have grown in utility and popularity, so has the demand for geospatial data products, including those generated by assets in space. Both the public and private sectors have responded to this demand, resulting in a dazzling array of space-based Earth observation products available for a myriad of purposes: disaster management, agriculture, navigation, climate and insurance, to name just a few.

This has formed a fertile relationship between the fields of geospatial and space – the tools created in geospatial increase demand for and utility of the data products coming from space, while the data products from space enhance the capabilities and utility of the tools and technologies underlying geospatial. As such, there is a notable overlap between the two communities, with space-related organisations such as ESA, NASA, NGA, Airbus, Maxar, Satellogic, Planet, and more being counted among the membership of the OGC.

More recently, due to humanity's growing presence in space, there is increased demand for geospatial products concerning space and celestial bodies other than the Earth.

Recognising the opportunity that the “final frontier” brings, members of the OGC community and wider geospatial industry alike are developing new and adapted solutions that address the

geospatial challenges faced by the growing commercialisation and continued exploration of space.

These challenges include

- Enhancing space situational awareness (SSA), including: space surveillance and the tracking of artificial objects to aid in collision avoidance; monitoring and forecasting space weather; and monitoring near-Earth objects.
- Enabling mapping, charting, geodesy and navigation for the Moon and Mars at the same level of accuracy and fidelity as provided on Earth.
- Enabling the identification, tracking and rendezvous of one space object by another.
- Calculating the current, past, and future locations of a space object based on gravitational fields, space weather and object velocity.
- Supporting accurate interplanetary navigation.
- Supporting the planning, construction, maintenance, and decommissioning of manned infrastructure on the Moon and Mars.

## Geo in space

As the largest formal community of geospatial experts, and with decades of experience developing Standards and technologies relevant to space, OGC is hosting a “Geo In Space Workshop” this July. The workshop will bring together representatives from the geospatial and space industries to understand current status, gaps, disparities, and interoperability requirements. Outcomes of the workshop will help set a baseline of what works well and where the gaps remain in the expanding, commercialised, and federated space exploration industry.

Discussions at the workshop will include the relevance of existing and emerging geospatial computing standards, tools, and pilots to space as well as the management, tracking, and optimisation of space resources and assets. Such discussions will inform future work for OGC and accelerate the development of geospatial solutions that will address interoperability issues in space before they become a problem.

THE GEOSPATIAL TOOLS, TECHNIQUES AND FOUNDATIONS GENERATED THROUGH DECADES OF WORK ANALYSING DATA ABOUT PLANET EARTH ARE NOW BEING TESTED AND UPDATED TO WORK IN SPACE





There is now a need for mapping, charting, geodesy, and navigation for the Moon and Mars at the same level of accuracy and fidelity as provided on Earth.



Geospatial standards have an important role to play in the management of space-based assets and resources.

OGC's Testbed-18 initiative, for example, evaluated current standards for the exact positioning of sensors at any location within the solar system as well as their corresponding data streams.

Additionally, this year's Testbed-19 initiative includes "Geospatial in Space" as a task. The task aims to free OGC standards and technologies – such as Coordinate Reference Systems, Moving Features, GeoTIFF, GeoPose, and others – from their terrestrial constraints and allow geospatial analytic tools and techniques to be applied to other celestial bodies and deep space.

OGC members also continue to work on the related challenge of managing the vast amounts of geospatial data coming from space-based assets. Technologies such as cloud and edge computing, artificial intelligence/machine Learning, geo data cubes, big data practices and more have proven critical for EO service providers as they respond to the demand for better and more frequent updates to their products. OGC standards for these technologies help maximise the value and utility of EO and space data products & services by ensuring that they remain Findable, Accessible, Interoperable, and Reusable (FAIR) even as they scale to meet this demand.

**Unanswered questions**

Of course, there remains many unanswered questions regarding the suitability and adaptability of existing geospatial standards and technologies for use in space. And as space-based technologies and applications continue to evolve and emerge, new questions, challenges, and opportunities will arise alongside them. As such, the OGC

community's deep pool of knowledge and expertise, as channelled through OGC's COSI and Standards programmes, will continue to respond to emerging questions, challenges, and opportunities as they arise.

As humanity's journey to the stars continues, so does the need for better and more accurate information about space. The geospatial tools, techniques and foundations generated through decades of work analysing data about planet Earth are now being tested and updated to work in space. Thankfully, OGC's community of experts, body of knowledge and neutral playing field for innovation continue working to help address those challenges that arise within that fertile area that exists where the space and geospatial communities overlap.

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For more information on the outcomes of the Geo In Space Workshop, as well as the discussions held at the June OGC Member Meeting, visit [ogc.org/news](http://ogc.org/news)



Our growing presence in space has increased demand for geospatial products concerning space and celestial bodies other than Earth.

This, of course, isn't the first time that OGC has turned its eyes to the skies and sought to apply our geospatial expertise to the challenges of space exploration and commercialisation. OGC's February 2023 Member Meeting was held at ESA's ESRIN in Frascati, Italy, with the theme "Geospatial in Space"; the June 2023 Member Meeting also ran a dedicated "Space Standards" session as a first step towards developing a Space Domain Working Group.

Relevant work is also being undertaken in OGC's Collaborative Solutions and Innovation (COSI) programme – OGC's agile R&D lab, where members collaborate to build and test innovative prototype solutions to challenges put forward by other members. Last year,