EPSC Abstracts
Vol. 15, EPSC2021-398, 2021, updated on 09 Dec 2021
https://doi.org/10.5194/epsc2021-398
Europlanet Science Congress 2021

Multi-mission Information System at DLR: A prototype for Planetary Research Data and Publications

Andrea Nass[1], Martin Mühlbauer[2], Mario d'Amore[1], Thorsten Heinen[2], Matthias Böck[2], Robert Munteanu[1], Torsten Riedlinger[2], Thomas Roatsch[1], and Günter Strunz[2]
[1]DLR / Institut of Planetary Research, Planetary Geology, Berlin, Germany (andrea.nass@dlr.de)
[2]DLR, German Remote Sensing Data Center (DFD), Oberpfaffenhofen 82234 Weßling, Germany

Introduction: In the recent years, discussions and demands came up to push the sustainability, reusability and, last but not least, the interoperability of research data within different scientific disciplines. In order to provide platforms to a) facilitate use and reuse of data in a transparent and sustainable way and to b) comply with recommendations and guidelines, research initiatives such as [1-3] have been established. Besides this, [4-6] were founded in order to provide the scientific community with platforms to archive sharable, discoverable and citable research data. Furthermore, initiatives like *Nationale Forschungsdateninfrastruktur* (NFDI) on a German national and the *European Open Science Cloud* (EOSC) on a European level were established in order to provide a trusted and virtual environment that cuts across borders and scientific disciplines. All these initiatives are based on the FAIR principles in order to create **f**indable, **a**ccessible, **i**nteroperable and **r**eusable data [7].

Within missions e.g. to Mercury (BepiColombo), the Outer Solar System moons (JUICE), and asteroids (NASA`s Dawn mission) one way of scientific analysis is the systematic surface analyses based on the numeric and visual comparison and combination of different remote sensing data sets, such as optical image data, spectral-/hyperspectral sensor data, radar images, and/or derived products like digital terrain models (here: primary research data). The long-term storage of this mission data is guaranteed through the *Planetary Data System* (PDS) and *Planetary Science Archive* (PSA). Conditioned by the spatial component, the analyses mainly result in derived research data such as map(-like) figures, profiles/diagrams as well as models, and finally serve for describing research investigations within scientific publications. Hence, cross-links between different missions, surfaces, bodies and topics are possible and thematical analogies could be extracted by the spatial context. This includes a great potential to create a sustainable reuse of historical, current and future information.

Aim: We here present a project that aims at a prototypical system for the structured storage, accessibility and visualization of planetary data compiled and developed within or with the contribution of Institute for Planetary Research (PF) at German Aerospace Center (DLR). The goal is to enable different user groups (currently limited to DLR) to store and spatially explore derived research data centrally, sustainably across multiple missions and scientific disciplines in planetary science for future investigations.

Method and Implementation: Technically, the prototype is built upon well-established stack of

open source software [8-10]. Furthermore, standards like [11] and [12], developed by the Open Geospatial Consortium (OGC), serve as communication between user interface and the server.

This software and standards are already combined within two software frameworks developed at the German Remote Sensing Data Center (DFD): 1. data storage and management capabilities as well as OGC-compliant interfaces for collaborative and web-based data access services (EOC Geoservice) [13]. 2. UKIS (Environmental and Crisis Information Systems), a framework developed at DFD or the implementation of geoscientific web applications [14].

Starting the development of the prototype, as *first* step a user analysis and inventory of the available data and information diversity in PF is needed (cf. requirement analysis).

The *second* step will be the data storage and management within EOC Geoservice which combines a PostgreSQL database and a data management via GeoServer. Therefore, a representative and exemplary data collection is used, based on a recent approach developed within PF [15]. Here, an existing database established at Planetary Spectroscopy Laboratory (PSL), handling different kinds of spatial data, meets a vector-based data collection of thematic, mainly geologic and geomorphologic mapping results [e.g. 16, 17], and raster-based global mosaics in different resolutions [18, 19]. This data merging enables a multi-parameterized querying across different data types, multiple missions and scientific disciplines in planetary science.

The *third* step will be the implementation of a geospatial information system based on UKIS. Within this, the visualization and utilization of the exemplary data package will be realized in an interactive, web-based system that displays all different datasets within the individual spatial reference system. For the already existing framework of UKIS this means an adaptation for planetary usage. With the integration of a user management system, the prototype could also integrate rules for data access restriction, needed for ongoing missions.

The *fourth* and currently final step is to configure generic interfaces. These will enable a connection to other DLR systems and databases like the *electronic library* (ELIB) on the one hand. On the other hand, other archives and repositories outside DLR, which are substantially related to the internal stored data, could be linked.

Summary: UKIS, as DFD-developed software framework for web-based geographic information systems, together with a geospatial data access and data management services, such as the DFD-hosted EOC Geoservice, are the ideal basis for such a spatial platform due to their stable architecture. Both can adapt to other spatial reference systems, as well as provide and visualize the planetary data after individual system configuration. A research data information system of this kind is essential to ensure the efficient and sustainable utilization of the information already obtained and published by previous research. This is considered a prerequisite for guaranteeing a continuous and long-term use of scientific information and knowledge within the departments, the institute and potentially also outside of DLR.

References: [1] *RDA*, www.rda-alliance.org; [2] *GoFAIR,* www.go-fair.org; [3] *CODATA,* www.codata.org; [4] *figshare*, www.figshare.com/; [5] *zenodo*, www.zenodo.org; [6] *pangea* www.pangaea.de [7] Wilkinson M. et al. (2015) Scientific Data, 3. 1-9, doi:10.1038/sdata.2016.18, [8] postgresql.org/, [9] geoserver.org/, [10] ecma-international.org/publications/files/ECMA-ST/Ecma-262.pdf, [11] opengeospatial.org/standards/wfs, [12] opengeospatial.org/standards/wms, [13] Dengler, K. et al. (2013) PV 2013, elib.dlr.de/86351/, [14] Muehlbauer, M. (2021) dlr.de/eoc/en/desktopdefault.aspx/tabid-5413/10560_read-21914/, [15] Nass, A. et al. (2017), [16] Nass, A. and the Dawn Science Team (2019)EPSC #1304, [17] Williams D.A. et al. (ed.), 2018, Icarus, 316, 1-204, [18] Roatsch et al, (2016) PSS doi:10.1016/j.pss.2016.05.011, [19] Roatsch et al., (2017) doi:10.1016/j.pss.2017.04.008