Software Infrastructure on the publishing of planetary geological maps

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Introduction:

In the discussion for FAIR (Findable, Accessible, Interoperable, Reproducible) data it is fundamental to have solutions that serve the data consumer as well as the data producer through a suitable suite of standards, software, and workflows. The GMAP [1] project is deploying software systems to process and publish data to support an open community on the creation of planetary geological maps.

Software and Data:

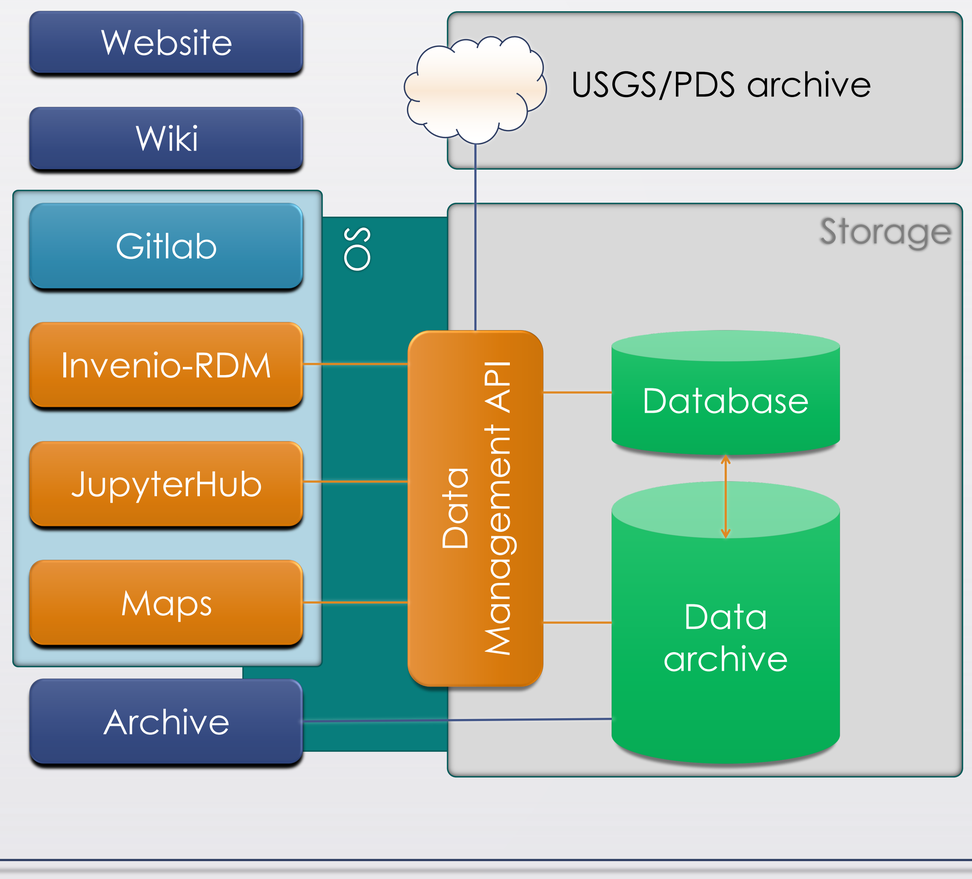
Handling the data and supporting the GMAP community, software deployed:

- JupyterLab: with GDAL, ISIS, and ASP toolsets through Docker containers to provide a portable and reproducible processing solution (see poster from Nodjoumi *et al*. [2])
  - https://jupyter.europlanet-gmap.eu
- InvenioRDM: to provide a data publication platform suitable for our data products, with geo-located metadata support
  - https://data.europlanet-gmap.eu
- Gitlab: to keep the database of users, providing a space for users and authentication for other services
  - https://git.europlanet-gmap.eu
- Maps: interactive access to geo-located data
  - https://maps.europlanet-gmap.eu

Custom developed data processing tools:

- Mappy: a QGIS Python plugin for easy map geometries edit [3]
- GPT: a Python library for geo-planetary data handling, USGS/PDS/ODE query, download, processing [4]
- Exemplary Jupyter notebooks making use of these and third-party software material for our community [5].

System Architecture:



Future steps:

The GMAP system is in constant and active development, it aims to provide a one-stop solution for planetary data scientists and is implemented having portability and easy-of-use as guidelines. We are working on integrating file object stores to our JupyterHub as well as increase the number of data provider APIs (e.g, Astropedia) so to improve the overall availability of ancillary data on the analysis and making of geological maps.

References:

[1] Nass A. *et al*. (2021) *GMAP – European Mapping efforts for Geologic Mapping of Planetary bodies,* European Planetary Science Congress 2021, https://doi.org/10.5194/epsc2021-383 .

[2] Nodjoumi G. *et al*. (2022) *Open-Source Planetary Data Processing Environments Based on JupyterHub and Docker Containers*, Planetary Science Informatics and Data Analytics Conference 2022.

[3] Penasa L. *et al*. (2020) *Constructing and deconstructing geological maps: a QGIS plugin for creating topologically consistent geological cartography*, European Planetary Science Congress 2020, https://doi.org/10.5194/epsc2020-1057

[4] *GeoPlanetary Tools* code repository, https://github.com/chbrandt/gpt

[5] GMAP/BasemappingUtils: exemplary notebooks on raster data access, processing and visualizing, https://doi.org/10.5281/zenodo.6655289

GMAP Geological Mapping

Visit **https://europlanet-gmap.eu/partners** for the complete list of partners involved in GMAP

Europlanet 2024 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149