PUBLISHING PLANETARY DATA IN THE VIRTUAL OBSERVATORY: VESPA (VIRTUAL EUROPEAN SOLAR & PLANETARY ACCESS)

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Introduction: VESPA (Virtual European Solar and Planetary Access) has been focusing for nearly 10 years on adapting Virtual Observatory (VO) techniques to handle Planetary Science data [1] [2]. The objective of this activity is to build a contributive data distribution system where data services are located and maintained in research institutes, as well as in space agencies and observatories.

VESPA provides research institutes with a simple solution to distribute data associated to publications according to FAIR principles — a handy and economical solution to Open Science challenges in the field.

VESPA relies on the architecture of the astronomy VO, incorporating concepts and standards from other areas (Earth observation, Heliophysics, etc): data services are installed in any location but are declared in a system of harvested registries with identifiers, endpoint (URL), mention of supported access protocols, and rough description of content. Such services are interoperable via clients and tools, which also provide visualization and analysis functions.

Data description: VESPA has adopted the Table Access Protocol (TAP) from the International Virtual Observatory Alliance (IVOA). In addition, the EPNCore vocabulary has been designed to provide a uniform metadata system describing observational, instrumental, and physical parameters with fixed names, scales, and units. EPNCore encompasses all fields of Solar System studies and supports simulations and experimental data as well as observational ones. It can be extended whenever required.

ENPCore is both a project study of the International Planetary Data Alliance (IPDA), and an emerging standard of the IVOA (currently under review to become a proposed recommendation [3])

Data access and tools: VESPA data services can be queried by all TAP clients – either web interfaces, java tools, python libraries, Jupyter notebooks, etc.

The VESPA portal (http://vespa.obspm.fr) is a dedicated web interface oriented towards data discovery that queries all public EPN-TAP services simultanously, and will support the PDS4 registry when available.

Query results can be sent to VO tools for visualization and analysis: TOPCAT, Aladin, CASSIS, SPLAT-VO, etc (respectively for tables, images and spectra. Aladin provides access to planetary HiPS, which are multiscale versions of the most recent planetary maps distributed by USGS and other institutes.

Data services: 62 public data services currently have an EPN-TAP interface, including ESA's Planetary Science Archive, and the outcome of several EU funded projects and space experiments: SSHADE for experimental spectroscopy of solids, PVOL for amateurs images, AMDA for plasma-related data, several archives of radio observations and solar data, planetary observations by HST, the VizieR database of astronomical catalogues at CDS, etc.

Contributing: An installation procedure is identified and a validator available, so that any team can publish their data and benefit from the infrastructure. Contributed services can be maintained on a gitlab platform for sustainability and maintenance. Authentication is provided by GÉANT/eduTEAMS, and services stored in the gitlab can be deployed on the new EU-funded European Open Science Cloud (EOSC), with support from the EGI consortium.

References:

[1]   Erard et al (2018) PSS 150, 65
[2]   Erard et al (2020) Data Science Journal 19, 22
[3]   https://ivoa.net/documents/EPNTAP