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Abstract: Recent evolutions of the main VESPA search portal are described. The current version is optimized to support tens of data services and to make the search process more intuitive.

1 Introduction

The VESPA portal is the main user query interface in the infrastructure developed by the VESPA activity in Europlanet. The portal functions are to query data services accessible through a VESPA-designed protocol, to help refine selections of relevant data elements, and to dispatch selected results to display and analysis tools.
These functions rely on standard Virtual Observatory (VO) protocols, and in some cases on specific standards developed for VESPA – most notably the protocol to describe and access Solar System data: EPN-TAP. The tools used in this context are mostly existing VO tools, some of which were updated in Europlanet-RI2020 (CASSIS, 3DView, Aladin) or in collaboration with external developers (TOPCAT, etc…) to support Solar System data and their descriptions.

The VESPA portal is an optimized EPN-TAP client taking advantage of its underlying Data Model and standardized unit system. It is designed to provide easy user access to individual data services, but also to allow the user to send queries to all connected data services simultaneously – this function is rather unique in the VO, and is intended to help compare related measurements by several independent instruments, or observations and reference data. The portal also queries the main PDAP data services (installed in ESA and JAXA) at the level of datasets. The VESPA portal is therefore the basic entry point to VESPA-provided data services.

More traditional, low-level VO queries can also be sent from tools based on the EPN-TAP library implemented in CASSIS, 3Dview and AMDA. At an even lower-level, all standard TAP clients (TAPhandle, TOPCAT, Aladin…) can query EPN-TAP services, given due attention to units, dimensions, etc.

Since its first release, the VESPA query interface has been deeply reworked. The interface has been changed to improve ergonomics and efficiency, and to support an increasing number of data services together. As of writing, 44 data services responsive to the EPN-TAP protocol are available. New types of data are handled in order to quickly send them to external applications for display and analysis. The VESPA portal is a central piece connecting various services and tools, as illustrated in Fig. 1 (in orange: IVOA infrastructure; grey: GIS related elements; cyan: PDS/PSA data; blue: VESPA developments).
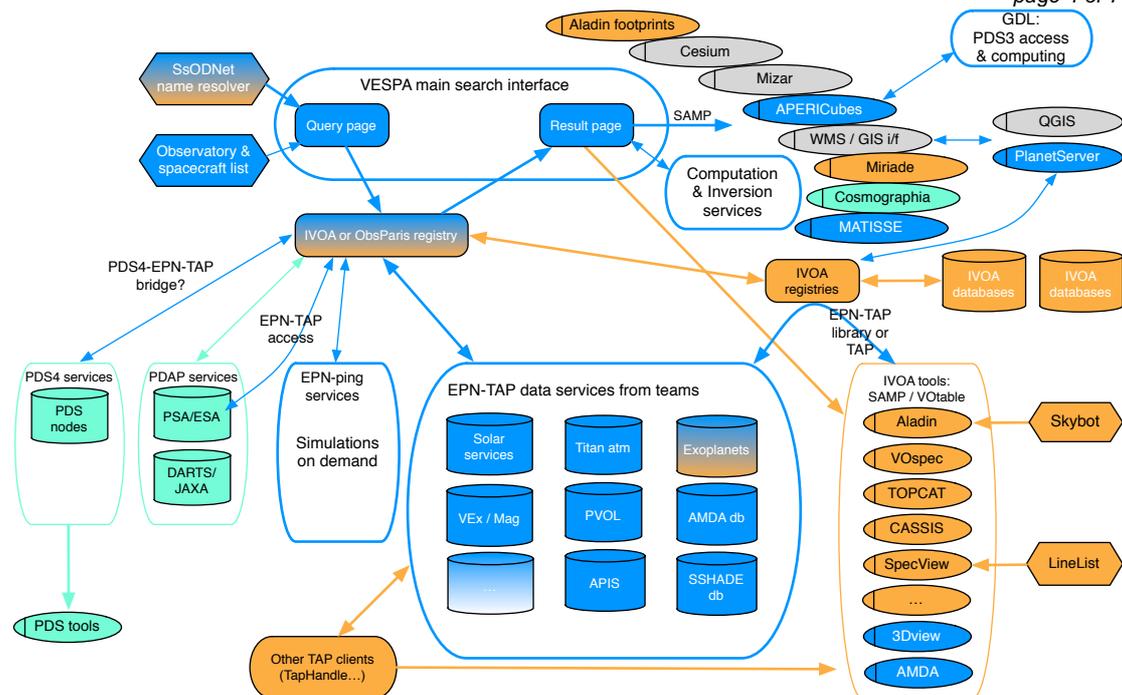
Fig. 1: VESPA environment, with the search portal as the standard entry point
(thin lines are connections in development)

2 Interface

The VESPA user interface is a web form available at: http://vespa.obspm.fr/
- the updated version is currently installed at:
http://voparis-europlanet-dev.obspm.fr
It will be migrated early January 2019 to replace the older version.

Many small interface improvements have been implemented from user feedback via the helpdesk, and from the VESPA review board. For instance, contextual help is now available on mouse-hover over search parameters in every display mode. The user interface has also been made more intuitive by using the *boostrap* library. This impacts the style of all elements in the web page: menus, input fields, buttons etc…

Most importantly, the *query* and *result* pages have been merged in order to give the user the ability to see the results of a query immediately when changing the data selection parameters. In practice, this is a major improvement to help define a consistent query when discovering new data.

In Fig. 2, the query form is on the left panel, while the result panel appears in the central area. This panel displays either the number of results in each data service (Fig. 2a), or the detailed matches in a selected service (Fig. 2b). The query form is always visible and accessible to the user even when displaying long tables or long lists of services. In all cases, the right panel provides links to the most usual VO tools, to the help page and to some examples.
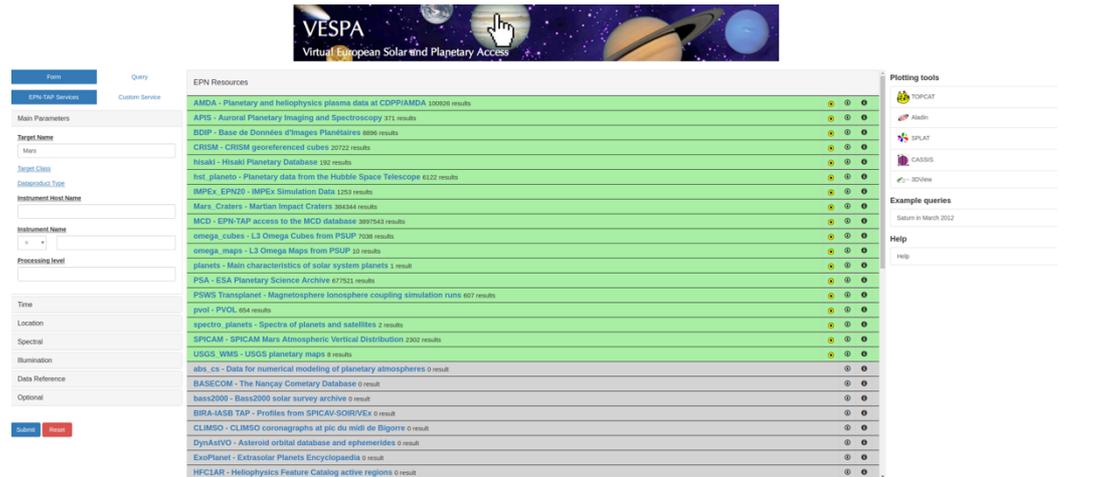
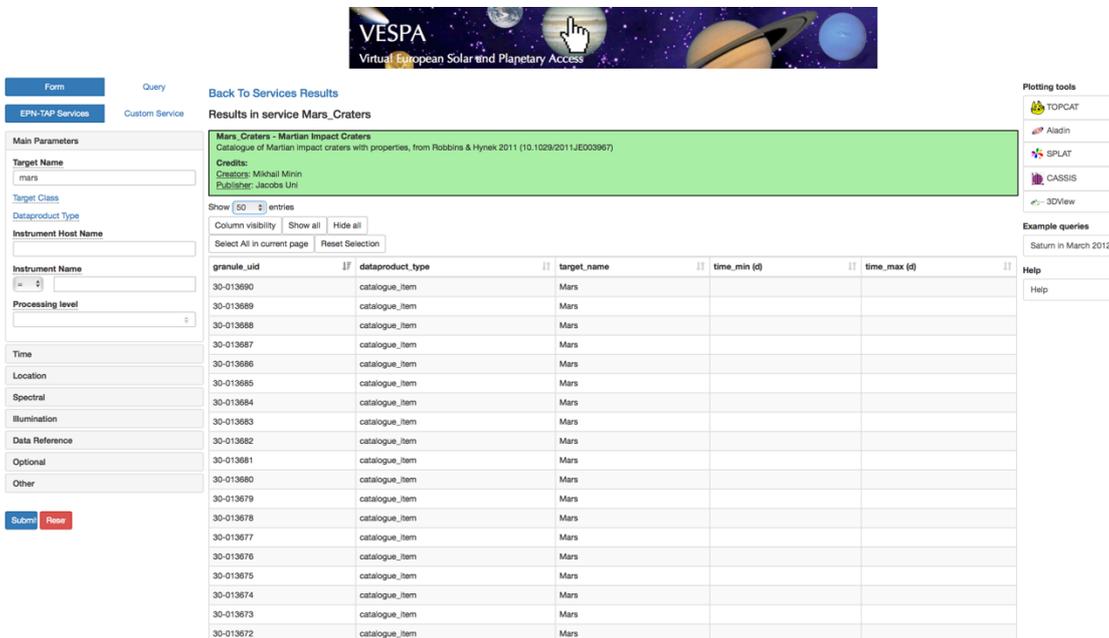Fig. 2a: new VESPA portal interface, global results mode

Fig. 2b: new VESPA portal interface, service results mode

Access to the various query modes have also been improved. In the standard query mode, the user adds filter in the web form fields and queries all services declared in the VO registry. A direct *query* mode is available for advanced users to enter ADQL requests. A *custom* mode allows reaching services which are on-line but not declared in the registry; this mode is intended either to test services prior to publication or to use private services, e.g. during a proprietary period.

Finally, due attention was paid to providing visible credits to data services. For instance, the service description (taken from the registry) is now displayed on top of the service results page (Fig. 2b).

3 Functionalities

The following functions have been implemented:

- All EPNCore version 2 parameters are supported.
- Data thumbnails, when available, are dynamically displayed when hovering the mouse over a data row (Fig. 3). This provides a very efficient way to help understand data content and to interactively refine data selection.
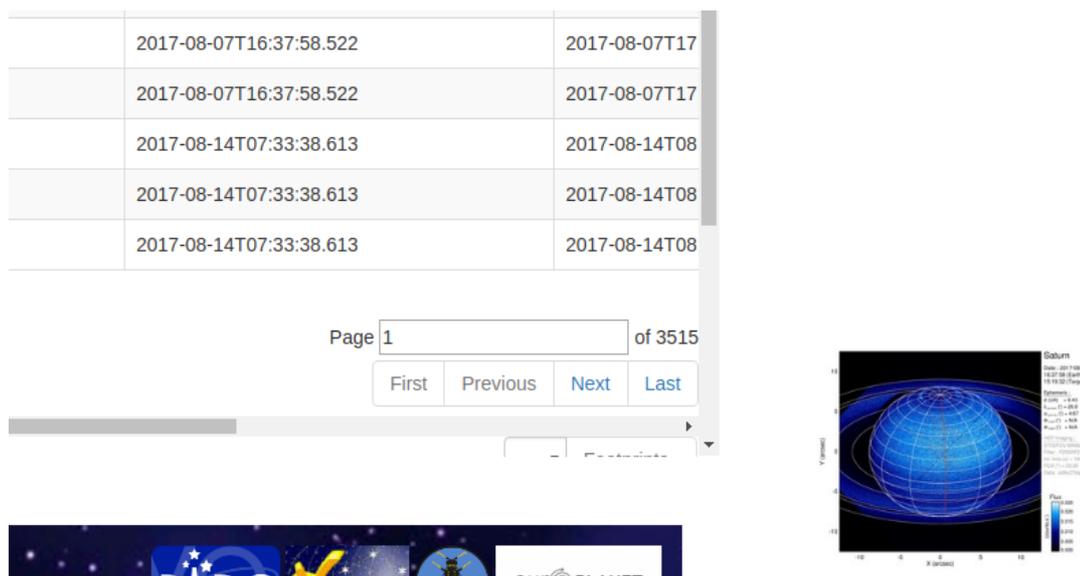

Fig. 3: thumbnail display in service result page

- New types of data can be sent from a data service to VO tools: CDF, PDS spectral cubes, and Das2stream series. This involves tweaking the SAMP protocol, and is discussed with the people maintaining it in the VO. In parallel, SAMP plugins have been installed in external applications (QGIS, MATISSE…) so they now accept data sent from the VESPA portal – this is for instance a part of the VO-GIS bridge developed in VESPA.
- Footprints can be sent for 3D plotting either to Mizar (bounding box) or Aladin (polygons along STC-S standard).
- The datalink protocol is now supported to access a web service defined by a data provider. Although still in test, this function allows connecting different data services together, e.g. observations and related simulations. Another application is to call ephemerides from a data service.
- The use of the target name resolver has been improved. Queries by target names are now enlarged to all alternative names of the target – this is particularly relevant for small bodies, but also for satellites.
- Navigation of long result tables now benefits from paginated access.
- The last column visibility configuration is recalled when the user goes to a service result page.
- html links are now displayed in the service result page for all parameters providing url.

- Form-based and direct query modes are now related. Upon submission of a form-based query, the corresponding ADQL query is visible by clicking on the Query menu. From there, it can be edited and refined, or copied and pasted to another application.

Finally, the portal code is available to advanced users upon request. The reason for this is that the public portal can only see services reachable on the internet, not those installed on non-connected Virtual Machines (VM), e. g. during development. It can now be installed in such a VM and called from the host machine. Another potential application is to access private service networks with a local registry, e.g. for an instrument in operation. For security reasons, and according to standard practices, the code is not publicly distributed.

4 Technical upgrades

The underlying libraries are regularly updated. As of writing:
- Django framework has been upgraded to version 1.10
- Boostrap library has been upgraded to version 3.3
- jQuery library has been upgraded to version 1.11
- jQuery Datatables library has been upgraded to version 1.10

5 Future evolutions

- More EPN-TAP services will be released in the future. It will be necessary to adapt the display to handle a large number of services. A possible evolution is to split service display into science themes, so that queries are restrained to a reasonable number of services.
- New helper applications will be connected, e.g. the name resolver for space missions and ground based facilities developed together with NA1.
- The PDAP interface may be dropped in the future, as this protocol is no longer evolving in practice and the corresponding services are more and more accessible through EPN-TAP. Instead, a major objective is to implement a direct connection to PDS4 services in NASA, ESA, and JAXA archives via a mapping with EPN-TAP.
- Add a Query Store where a user will be able to find and reuse the query he has built. Such query results will be assigned a permanent doi for citation.
- The next major evolution will be the development of a page mixing results from various services. This is challenging, and design issues are being addressed: e.g. the number of results must be kept reasonable (probably < 1000) to maintain good performances. This may require the setup of a local database to store temporary results on a single server, therefore efficient solutions are being sought.