Implementation of an EPN-TAP Service to Improve Accessibility to the Planetary Science Archive

Alan Macfarlane (alan.macfarlane@sciops.esa.int)
and the PSA team
ESAC Science Data Centre (ESDC) – Madrid, Spain

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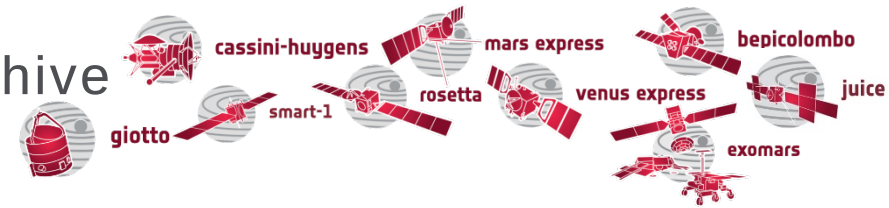
Planetary Science Archive (PSA)

The PSA presented earlier by Claire Vallat (EPSC2017-574)

→Repository of ESA's missions for exploration of the Solar System

→Multi-mission, multi-instrument archive



→76 instruments (44 in-coming),

45 TB of data

and approx. 12 million products

→Archived data format follows the Planetary Data System (PDS) standards ➡ PDS3 and PDS4

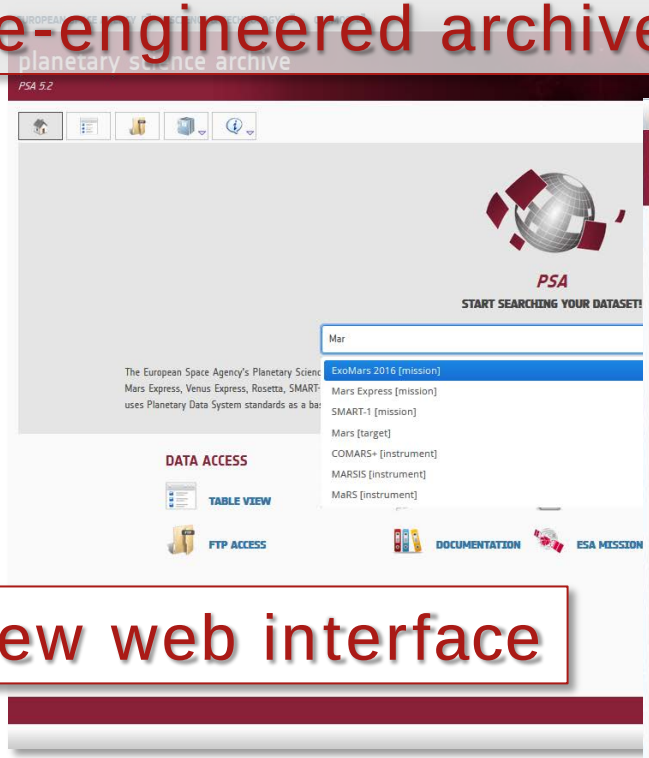
→Also SPICE

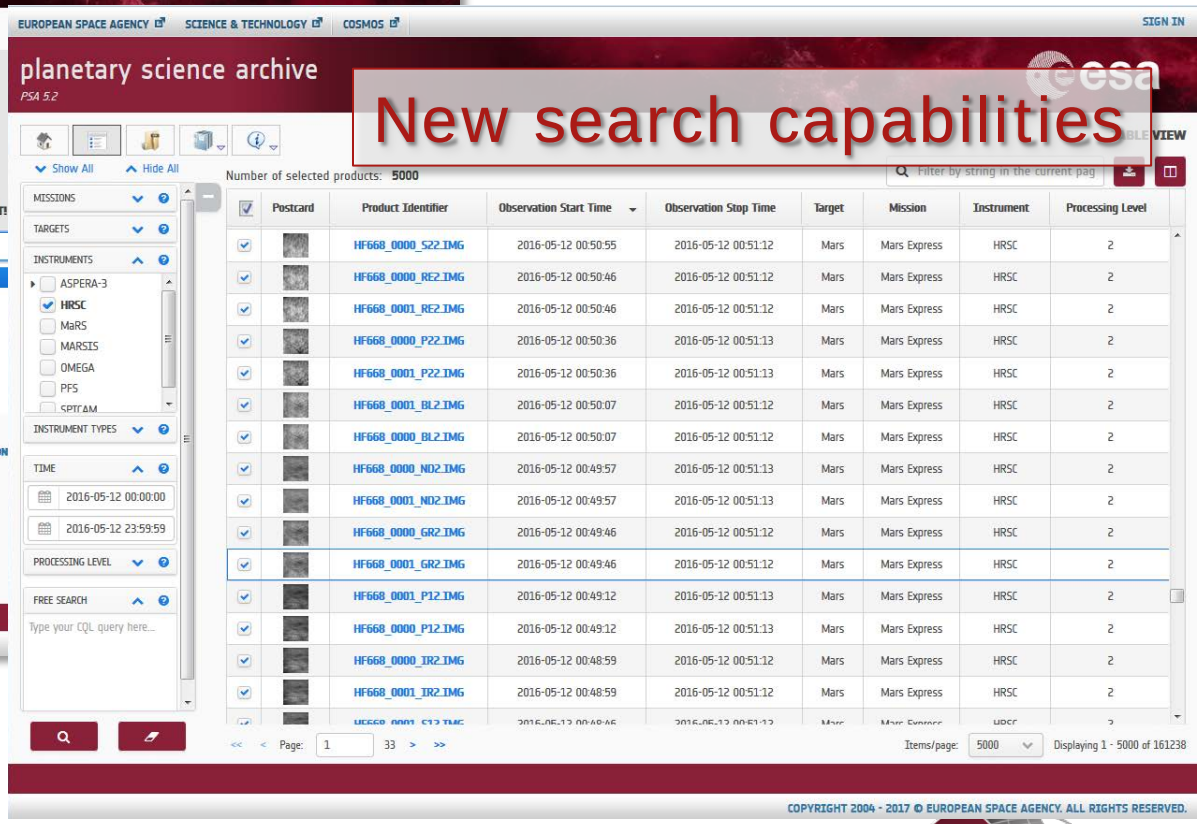
Improved Interfaces to the Archive

Re-engineered archive

New search capabilities

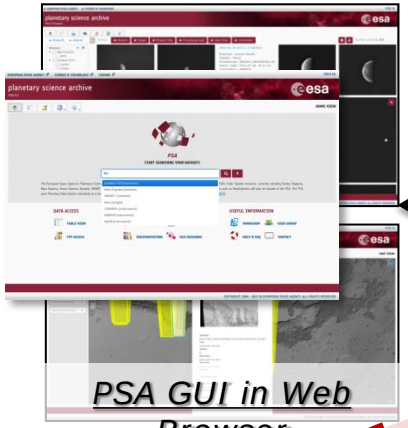
New web interface





Aim: improved user experience and data accessibility

Improved Machine Interfaces



PSA GUI in Web Browser

SERVER LAYER

Web Application

Data Retrieval

PDAP

EPN-TAP

PSA DATABASE

PostGIS

PSA FILE REPOSITORY

FTP SERVER

Other Clients

Accessible by:

- External applications
- User scripts

Machine Interfaces:
PDAP (*Planetary Data Access Protocol*)

→PDAP – an IPDA standard https://planetarydata.org/standards/IPDA_PDAP_v1.0.pdf

→HTTP/REST-based requests:

Metadata Queries

http://psa.esa.int/pdap/metadata?...

Data Retrieval

http://psa.esa.int/pdap/download?...

→Standard query response is a VOTable (HTML also supported)

Machine Interfaces:
PDAP (*Planetary Data Access Protocol*)

→Query can be built using at least the following standard-defined keywords:

START_TIME | STOP_TIME | TARGET_TYPE | TARGET_NAME

INSTRUMENT_TYPE | INSTRUMENT_HOST_NAME | INSTRUMENT_NAME

Example:

http://psa.esa.int/pdap/metadata?**RETURN_TYPE=VOTABLE&RESOURCE_CLASS=DATA_SET&INSTRUMENT_HOST_NAME='MEX'**

→Optional **WHERE_CONDITION** for more complex or data model specific SQL-based queries

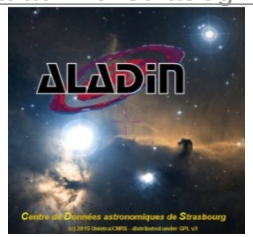
https://www.cosmos.esa.int/web/psa/faq

Machine interfaces: EPN-TAP

- Extension of the IVOA Table Access Protocol (TAP)
- HTTP/REST-based interface
  - allows synchronous and asynchronous queries to the archive
- TAP defines how to query the metadata
- TAP is already commonly used in Astronomy
  - relies on Astronomical Data Query Language (ADQL)
- VO clients – TAP compatible

TOPCAT
http://www.star.bris.ac.uk/~mbt/topcat/

http://aladin.u-strasbg.fr/aladin.gml



http://vespa.obspm.fr/planetary/data/epn/query/resource/

Machine interfaces: EPN-TAP
- *implementation*

→Mandatory & optional parameters defined in the **EPNCore data model**

→Parameters exposed through TAP service by an ***epn_core*** view

→Several ESDC astronomy archives already use TAP

→PSA uses the same common infrastructure

→***epn_core*** view populated from the PSA data model

EPNCore Data Model
- implementation

→Granularity of PSA EPN-TAP is per PDS observational product

→Current searchable parameters are based on existing PDAP:

Mission/Instrument_Host
Instrument
Target
Start/Stop Time
Processing Level

→Also **access URLs** provided to allow **data retrieval**

→Values for the geometry parameters are not yet included, but data is being analysed by the team

PSA EPN-TAP – beta testing

Results in service npsa

Show 10 entries

Column visibility | Show all | Hide all

Select All in current page | Reset Selection

access_url	dataproduct_type	granule_uid	target_name	time_max (d)
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T165033	67P/C-G	2016-09-29T16:50:33.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T225346	67P/C-G	2016-09-29T22:53:48.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T155033	67P/C-G	2016-09-29T15:50:33.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T075034	67P/C-G	2016-09-29T07:50:34.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T125033	67P/C-G	2016-09-29T00:50:33.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T001034	67P/C-G	2016-09-29T00:10:35.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T095033	67P/C-G	2016-09-29T09:50:33.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T065034	67P/C-G	2016-09-29T06:50:34.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T045034	67P/C-G	2016-09-29T04:50:34.
http://psa.esa.int/p...	catalogue	RO-C-NAVCAM-2-EXT3-MTP035-V1.0:DATA:ROS_CAM1_20160929T135033	67P/C-G	2016-09-29T13:50:33.

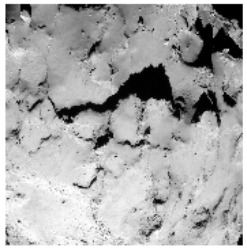
Showing 1 to 10 of 13 entries

Plotting tools

- TOPCAT
- Aladin
- SPLAT
- CASSIS
- 3DView

Example queries

Saturn in March 2012



Challenges
- metadata queries

- **Data Consistency**
  - On-going efforts to accommodate PSA data model to match EPN-TAP metadata
    - e.g spectra & geometry parameters
  - Mapping PDS labels to the EPN-TAP standard
    - e.g. IAU target names
  - Mapping PDS labels to more commonly used forms
    - e.g. *International Rosetta Mission* vs *Rosetta*
  - How to determine product type automatically

Challenges
- metadata queries (2)

→**Performance**

→Approx. 12 million products (and rising)

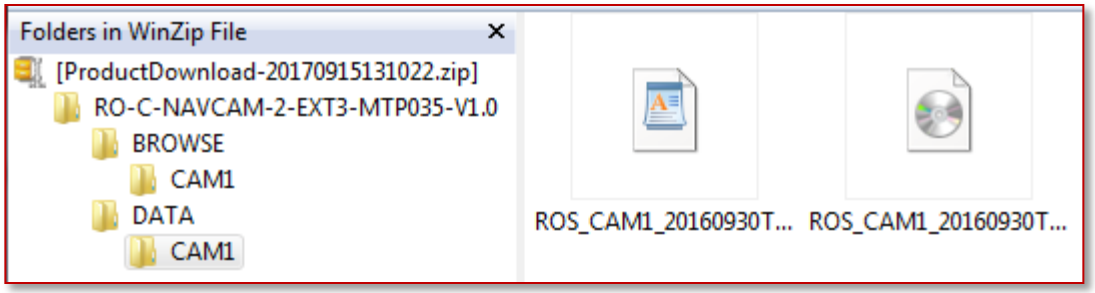
→Cross mission/instrument queries

→Some parameters need conversions to match EPNCore specification

→Need to pre-process values

Challenges
- data retrieval

- **Data access**
  - Retrieved data are **PDS products**
  - Downloaded data in PDS format and directory structure:



  - Clients may not be able to benefit from this download format
    - e.g. to visualise spectral products

The PSA is providing access to various types of data from many missions

Several interfaces to the archive

- **to facilitate data discovery**
- **to improve interoperability of the archive with existing tools and clients**

A functional PSA EPN-TAP service is expected by end of 2017

Efforts will continue through 2018 to provide more scientific parameters for more data sets