

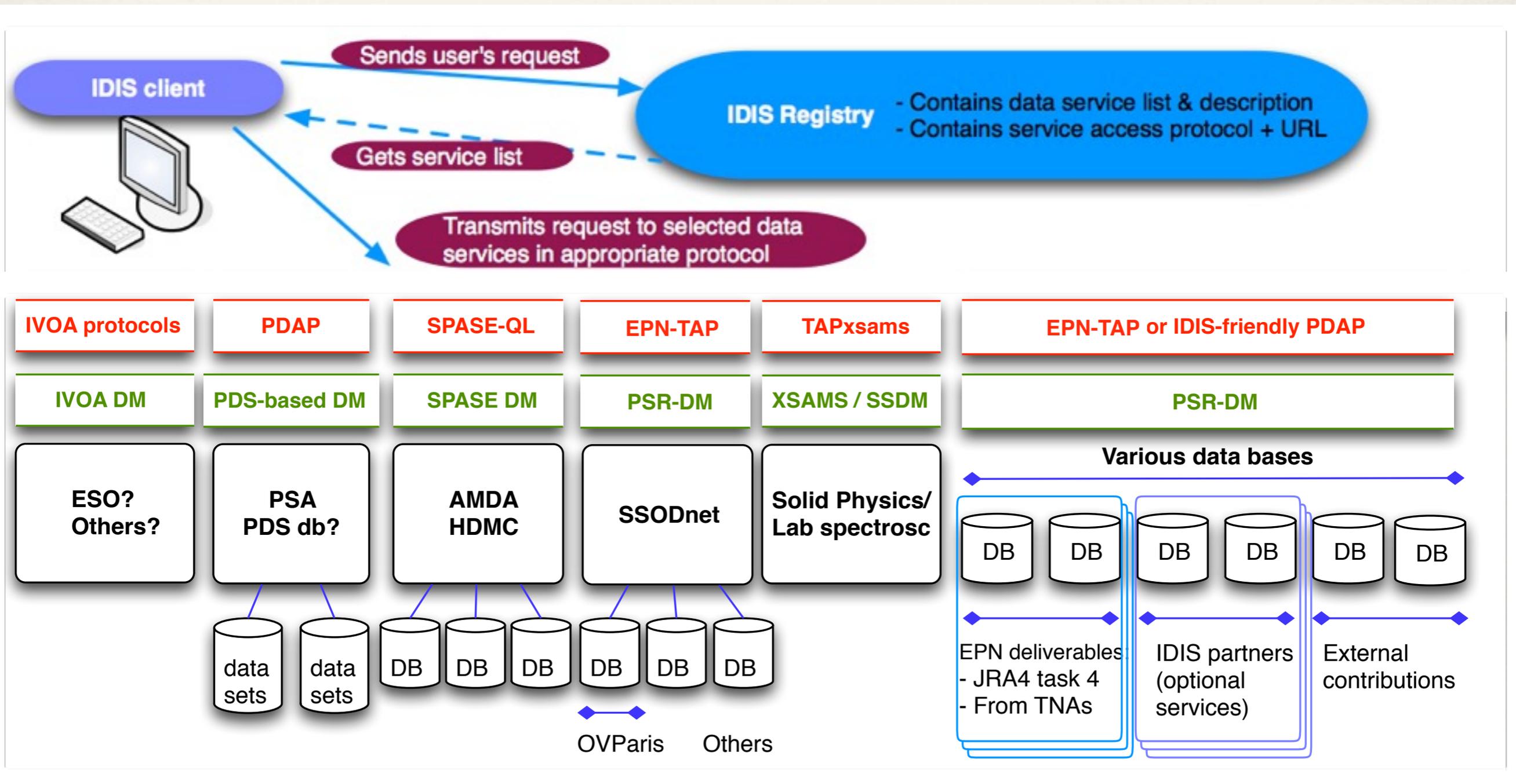
Planetary Science Resources Data Model

B. Cecconi & IDIS Data Model SWG

Context

- ❖ Europlanet/IDIS: prototyping a Planetary Sciences VO
- ❖ Several of science thematics: *atmospheres, surfaces, interiors, small bodies, orbital parameters, in situ exploration, plasma (waves, particle and fields), radio astronomy...*
- ❖ Large variety of data types: *images, spectra, times series, movies, dynamic spectra, profiles, maps...*
- ❖ Even larger variety of physical parameters
- ❖ Including: *remote data, in-situ data, models, lab experiments, field analogs*

Architecture



Data Model

Required Metadata

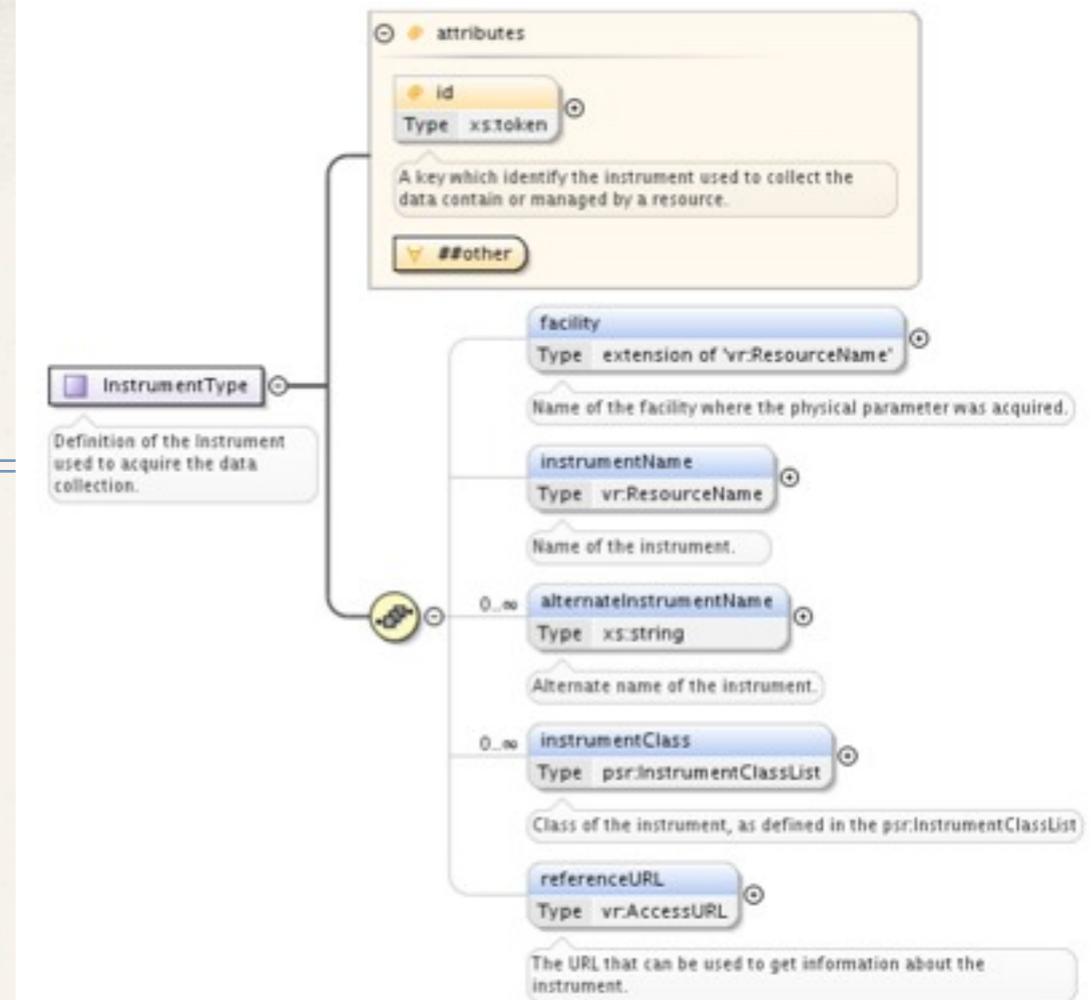
- ❖ We describe Datasets and Granules (i.e., product, file, or the smallest granularity distributed by the service) content, not the access the the data.
 - ❖ Resource identification
 - ❖ Target
 - ❖ Instrument (including hosting facility)
 - ❖ Axis (including bounds, resolution, sampling, unit)
 - ❖ Physical parameter (including UCD, unit)

Data Model Heritage

- ❖ IDIS-DM v1 was build almost from scratch. Simple but restricted and not compatible with IVOA (especially registries).
- ❖ IDIS-DM v2, now called Planetary Science Resources (PSR)-DM, is based on VODataService and VODataCollection. It makes use of several other IVOA data models, such as STC, Utypes, UCDs...
- ❖ Units: specific EPN-Unit data model (inspired by Osuna&Salgado 2008)
- ❖ We planned to use ObsCoreDM at some point, but not done in curent implementation (*I couldn't find an official XML schema for validation*).
- ❖ Latest version (not final) of documentation is available here:
<http://voparis-europlanet.obspm.fr/docs/PlanetaryScienceResource-DM-latest.pdf>

DM Details Instrument

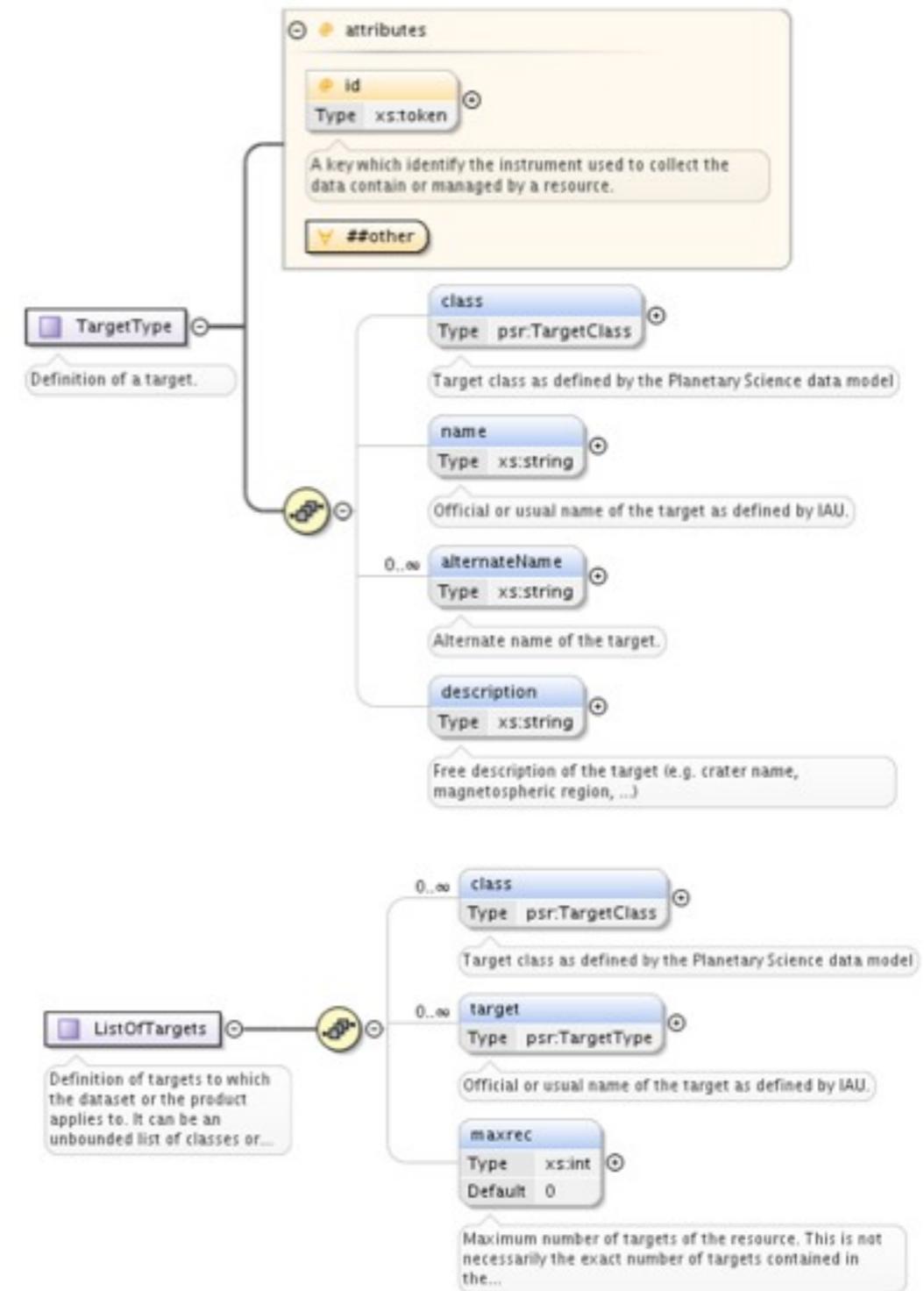
- ❖ We define here the measurement device by
 - its name; *name used in official archive is recommended*
 - its class; *from a (long) list of instrument classes*
- ❖ Optionally, alternate names can be provided.
- ❖ We can also describe the facility hosting the instrument by
 - its name; *the name used in official archive is recommended*
 - its class; *Spacecraft, Ground Based Telescope, Simulation, Laboratory, Field analog...*
- ❖ *Each instrument must have an **instrument-id** so that can be referred to internally.*



DM Details

Target

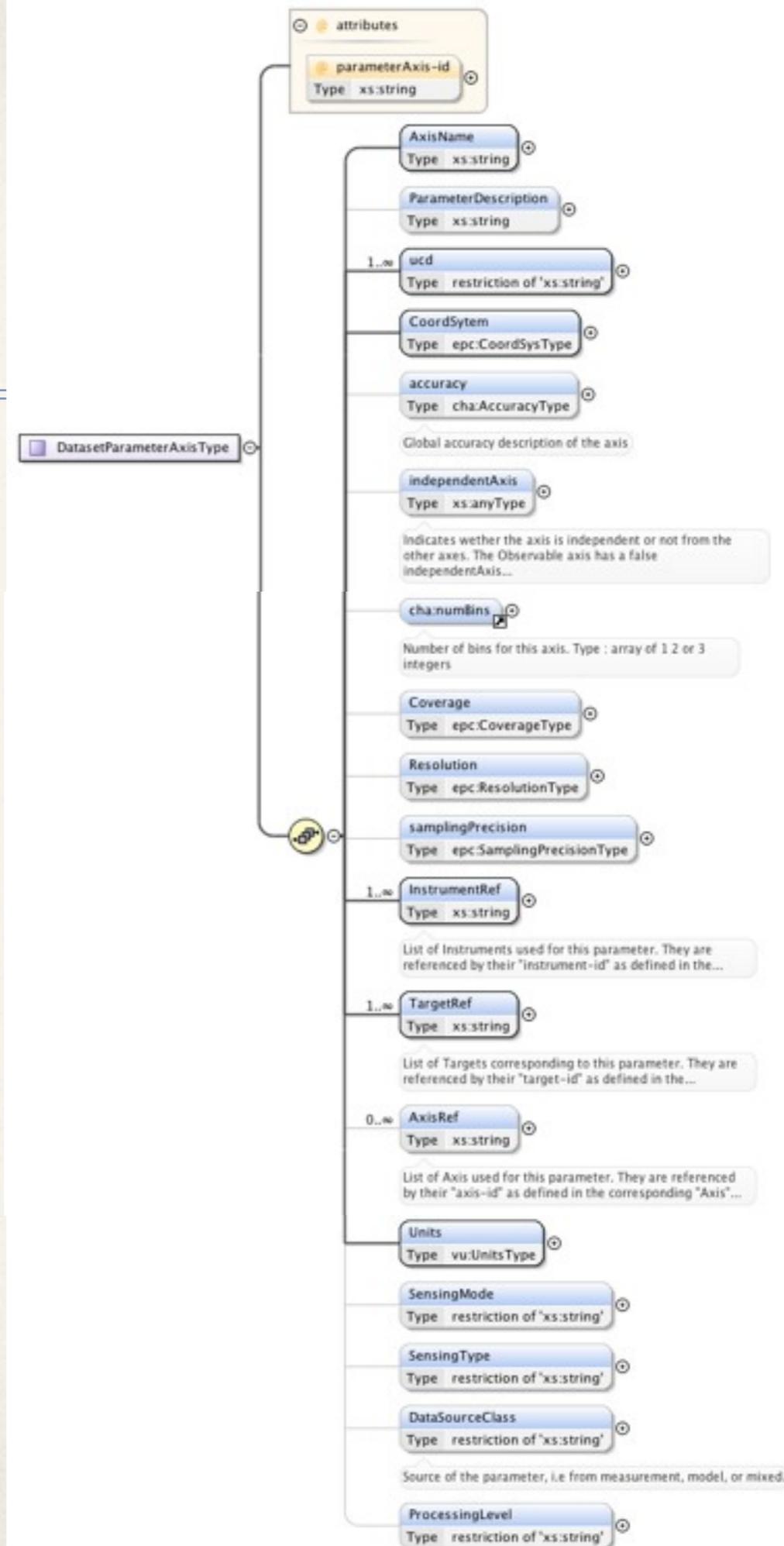
- ❖ We define here the observation target
 - its name; *IAU name is recommended*
 - its class; *from a list of target classes*
- ❖ Flexible:
 - *Target Class only is allowed*
 - *List of Targets*
- ❖ Alternate names.
- ❖ Description field: *free text to describe in more details what is observed.*
- ❖ *Each target must have a **target-id** so that can be referred to internally.*



DM Details

Parameter Axis

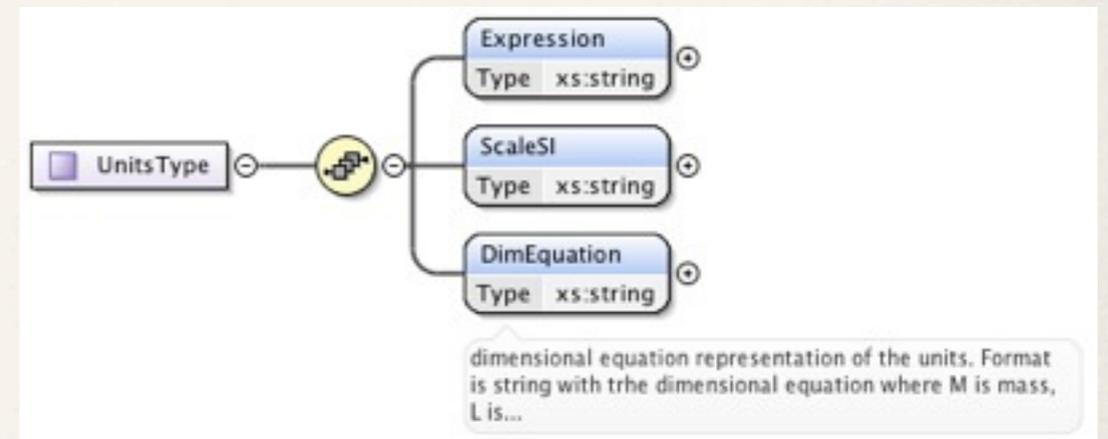
- ❖ Extension of CharacterizationDM
- ❖ Main Additions:
 - *InstrumentRef, TargetRef, AxisRef*
 - *Units (modified)*
 - *SensingMode (active/passive)*
 - *SensingType (remote/in-situ)*
 - *DataSourceClass (measurement/model/mixed)*
 - *ProcessingLevel (list: raw, calibrated...)*
 - *Description field*
- ❖ Axis type:
 - *Abcissa axis: independentAxis «true»*
 - *Ordinate axis: independentAxis «false»+AxisRef*
- ❖ *Each axis must have an axis-id so that can be referred to internally.*



DM Details

Coordinates

- ❖ Modified STC to include EPN-Units (following Osuna&Salgado 2008)
- ❖ Additional Frames for in-situ particle measurement (*charge, mass, mass per charge...*)
- ❖ Open questions:
 - provide list of well defined planetary reference frames ?
(centered on planetary bodies, on spacecraft; equatorial, ecliptic, magnetic frames...)
 - back to VOUnits ?



DM Details

Data product type

The data product type describes the high level scientific organization of the data product being considered. The list of product values is:

- ❖ **Image:** associated scalar fields with two spatial axes, e.g. image with multiple color planes, from multichannel cameras for example.
- ❖ **Spectrum:** data product for which the spectral coverage is the primary attribute, e.g. a set of spectra
- ❖ **DynamicSpectrum:** consecutive spectral measurements through time, organized as a time series. voir baptiste 1D temp, 1D Spectral
- ❖ **SpectralCube:** set of spectral measurements with 1D or 2D spatial coverage, e. g. imaging spectroscopy. The choice between Image and Spectral_cube is related to the characteristics of the instrument
- ❖ **Profile:** scalar or vectorized measurements along one spatial dimension, e.g. atmospheric profiles, atmospheric paths, sub-surface profiles, etc.
- ❖ **Volume:** any measurement with three spatial dimensions
- ❖ **Movie:** set of chronological 2D spatial measurements
- ❖ **Cube:** multidimensional data with three or more axes, e.g. all that is not described by other 3D data types such as spectral cubes
- ❖ **TimeSeries:** measurements organized primarily as a function of time (with exception of dynamical spectra). A light curve is a typical example of a time series dataset.
- ❖ **Catalogue:** it can be a list of events, a catalog of object parameters, a list of feature, ..., e.g. list of asteroid properties
- ❖ **SpatialVector:** list of summit coordinates defining a vector, e.g. vector information from GIS, spatial footprints, ...

Details

Other

- ❖ `<content>` :
from IAU Thesaurus
=> move to IVOAT ?
- ❖ `<coverage>` :
ok for time and space, but not for spectral domain (only list of bands)
- ❖ `<ucd>` :
new items to be proposed to cover planetary science data (especially for in-situ data)
=> ongoing, next Interop?

Discussion

- ❖ Under testing phase. Minor modifications (especially completion of predefined lists).
- ❖ No big changes in the next 6 months: Europlanet project ends at the end of 2012. Further changes will be done after that.
- ❖ Used for EPN-TAP (see *P. Le Sidaner* presentation) at VOParis and PDAP implementation at CDPP.
- ❖ Possible use for heliophysics.
- ❖ Future version use closer to ObsCoreDM ?