ObsCore and Extensions

Data Model Working Group discussion

IVOA Görlitz 2025

Status of Obscore and proposed extensions

- **ObsCore standard**
  - **Ambitious**: « data discovery for almost all archived astronomical observations »
  - **2 building blocks**: « Data Models » and « TAP »
  - **REC v1.0** 2011-10-28
  - **REC v1.1** 2017-05-09
  - Github and ivoatex version in 2025
- **ObsCore Extensions**
  - Radio Domain ObsCore Extension: 2025-09-15
  - High Energy ObsCore Extension: 2025-11-12
  - Time Domain ObsCore Extension: 2024-07-17

Observation Data Model Core Components and its Implementation in the Table Access Protocol

Version 1.1

IVOA Recommendation 2017-05-09

Working Group
DM
This version
https://www.ivoa.net/documents/ObsCore/20170509
Latest version
https://www.ivoa.net/documents/ObsCore
Previous versions
R-ObsCore-v1.1-20161004.pdf
REC-ObsCore-v1.0-20111028.pdf
Author(s)
Mireille Louys, Doug Tody, Patrick Dowler, Daniel Durand, Laurent Michel, François Bonnarel, Alberto Micol
Editor(s)
Mireille Louys, Doug Tody, Patrick Dowler, Daniel Durand
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Content of Obscore

OBSERVATION INFORMATION
dataproduct_type
dataproduct_subtype
calib_level
TARGET INFORMATION
target_name
target_class
DATA DESCRIPTION
obs_id
obs_title
obs_collection
obs_creation_date
obs_creator_name
obs_creator_did
CURATION INFORMATION
obs_release_date
obs_publisher_did
publisher_id
bib_reference
data_rights
ACCESS INFORMATION
access_url
access_format
access_estsize

SPATIAL CHARACTERISATION
s_ra
s_dec
s_fov
s_region
s_resolution
s_xel1
s_xel2
s_ucd
s_unit
s_resolution_min
s_resolution_max
s_calib_status
s_stat_error
s_pixel_scale
TIME CHARACTERISATION
t_xel
t_refpos
t_min
t_max
t_exptime
t_resolution
t_calib_status
t_stat_error
SPECTRAL CHARACTERISATION
em_xel
em_ucd
em_unit
em_calib_status
em_min
em_max
em_res_power
em_res_power_min
em_res_power_max
em_resolution
em_stat_error

OBSERVABLE AXIS
o_ucd
o_unit
o_calib_status
o_stat_error
POLARIZATION CHARACTERISATION
pol_xel
pol_states
PROVENANCE
facility_name
instrument_name
proposal_id

- Flat table
  - Mandatory and optional attributes
- Characterisation DM
- Observation DM –> Dataset DM
- ObsProvDM –> Provenance DM (?)

Time Domain ObsCore Extension

Table 6: Time extension Table Summary.

(a) Time reference frame for searching and comparing temporally sampled datasets.

t-obs attribute	Definition	VODML-ID in Coords DM	TIMESYS attribute	UCD	Units	Status
t_origin	Time frame origin	TimeOffset.time0	timeorigin	time.epoch		man
t_scale	Time frame scale	TimeFrame.timeScale	timescale	time.scale	?	man
t_refPosition	Time reference position	TimeFrame.refPosition	refposition			man
t_refDirection	Time reference direction	TimeFrame.refDirection	refdirection			man
t_format	Time representation			time;meta.code.class	null	man

(b) Sampling properties along Time axis.

Name	**Definition**	**Utype**	**UCD**	**Units**	**Status**
t_variant	sub product attached to a time stamp		meta.code.class		opt
t_exp_min	minimal length of time sample (min integration time)	Char.TimeAxis.Sampling.Extent.LoLim	time.duration; obs.sequence;stat.min	s	man
t_exp_max	maximal length of time sample (max integration time)	Char.TimeAxis.Sampling.Extent.HiLim	time.duration; bs.sequence;stat.max	s	man
t_delta_min	minimal length of time interval cadence (min)	Char.TimeAxis.Sampling.Period.LoLim	time.interval; obs.sequence;stat.min	s	man
t_delta_max	maximal length of time interval cadence (max)	Char.TimeAxis.Sampling.Period.HiLim	time.interval; obs.sequence;stat.max	s	man
t_fold_period	folding period length		time.period	d	man
t_fold_phaseReference	time stamp of folding start in time series		meta.ref; time.phase	d	opt

Radio Domain ObsCore Extension

column name	definition
s_resolution_min	Angular resolution, longest baseline and max frequency dependent
s_resolution_max	Angular resolution, longest baseline and min frequency dependent
s_fov_min	field of view diameter, min value, max frequency dependent
s_fov_max	field of view diameter, max value, min frequency dependent
f_resolution	absolute spectral resolution in frequency

column name	definition
s_largest_angular_scale	maximum scale in dataset, shortest baseline and for typical frequency
s_largest_angular_scale_min	smallest maximum scale in dataset, shortest baseline and for highest frequency
s_largest_angular_scale_max	largest maximum scale in dataset, shortest baseline and for lowest frequency
uv_distance_min	minimal distance in uv plane
uv_distance_max	maximal distance in uv plane
uv_distribution_ecc	eccentricity of uv distribution
uv_distribution_fill	filling factor of uv distribution

column name	definition
instr_tel_number	number of antennas in array
instr_tel_min_dist	minimum distance between antennas in array
instr_tel_max_dist	maximum distance between antennas in array
instr_tel_diameter	diameter of telecope or antennas in array
instr_feed	number of feeds
scan_mode	sky and spectral axis scan mode
tracking_type	target tracking modes

- Product Type: visibilities (uv plane)
- min/max attributes
- instrument parameters and single-dish modes

High Energy ObsCore Extension

- Product types: event-list, response-function, advanced data products
- min/max not sufficient —> ref for energy, fov...
- instrument parameters and modes

Column Name	Description
ev_xel	Number of events in an event list
s_ref_energy	Energy at which the ObsCore spatial characterization attributes *s_fov*, *s_region*, *s_resolution* are defined
em_ref_energy	Energy at which the ObsCore spectral characterization attributes *em_res_power*, *em_resolution* are defined
s_ref_oaa	Off-axis angle (*i.e.*, the angular separation of the target or source from the telescope optical axis) at which the ObsCore spatial characterization attributes *s_fov*, *s_region*, *s_resolution* are defined
em_ref_oaa	Off-axis angle (*i.e.*, the angular separation of the target or source from the telescope optical axis) at which the ObsCore spectral characterization attributes *em_res_power*, *em_resolution* are defined
t_intervals	List of observation intervals or stable/good time intervals describing the exact observation time coverage as a TMOC
energy_min	Energy associated to the ObsCore attribute *em_max*, describing the minimum energy of the dataset
energy_max	Energy associated to the ObsCore attribute *em_min*, describing the maximum energy of the dataset
obs_mode	Observation mode of an observation
tracking_type	Tracking type of an observation
scan_mode	Scan mode of an observation
pointing_mode	Pointing mode of an observation
analysis_mode	Data reduction/analysis mode
event_type	Event subset indicator (*e.g.*, data quality flag for the events)

Main objectives and questions

- **About extensions documents**
  - Expecting Proposed Endorsed Notes (PEN) ?
    - Content extends beyond the DM working group
    - But listed as Working Draft and Proposed Recommendation in the IVOA D&S repo —> needs cleaning ?
  - Implementations ?
    - Proposed and planned for Radio and High Energy, are there others ?
    - Should prototype implementations be complete prior to recommending for EN ?
  - Term definitions and Vocabularies ?
    - Product types, UCDs, review of other terms...
    - Should this be part of the Obscore document ? or handled as external vocabularies ?

Main objectives and questions

- **Connection Obscore-Extensions in document ?**
  - **1.** ObsCore should reference the Notes ?
    (No content added to ObsCore, but pointers, also on landing page)
  - **2.** REC for domain specific details from each Note ?
    (portions of each note become Data Model RECs, require summary tables to cite ?)
  - **3.** ObsCore to hold sections with the details from each Note ?
- **How to handle multi-WG dependencies ?**
  - Focused ObsCore DM document on attribute definitions and table content ?
  - Separate ObsCore TAP document defining the TAP Schema and access layer ?
  - Registry aspects to be integrated somewhere...

Main objectives and questions

- **What attributes go where ?**
  - Main ObsCore table vs. Extension tables ?
    Idea to generalise some attributes (e.g. min/max)
  - Mandatory vs. Optional attributes ?
- **More detailed models ?**
  - Concepts that are (or should be) represented in more detailed models ?
    —> CAOM, DataSet, Provenance, Characterisation
- **Next steps ?**
  - Proposed Endorsed Notes for Extension, with proper tables of attributes
  - Define precise content of document(s)
  - Who does what ?