Characterisation package in DatasetDM : Why it is needed. How to build it

F.Bonnarel, M.Louys

CENTRE DE DONNÉES ASTRONOMIQUES DE STRASBOURG

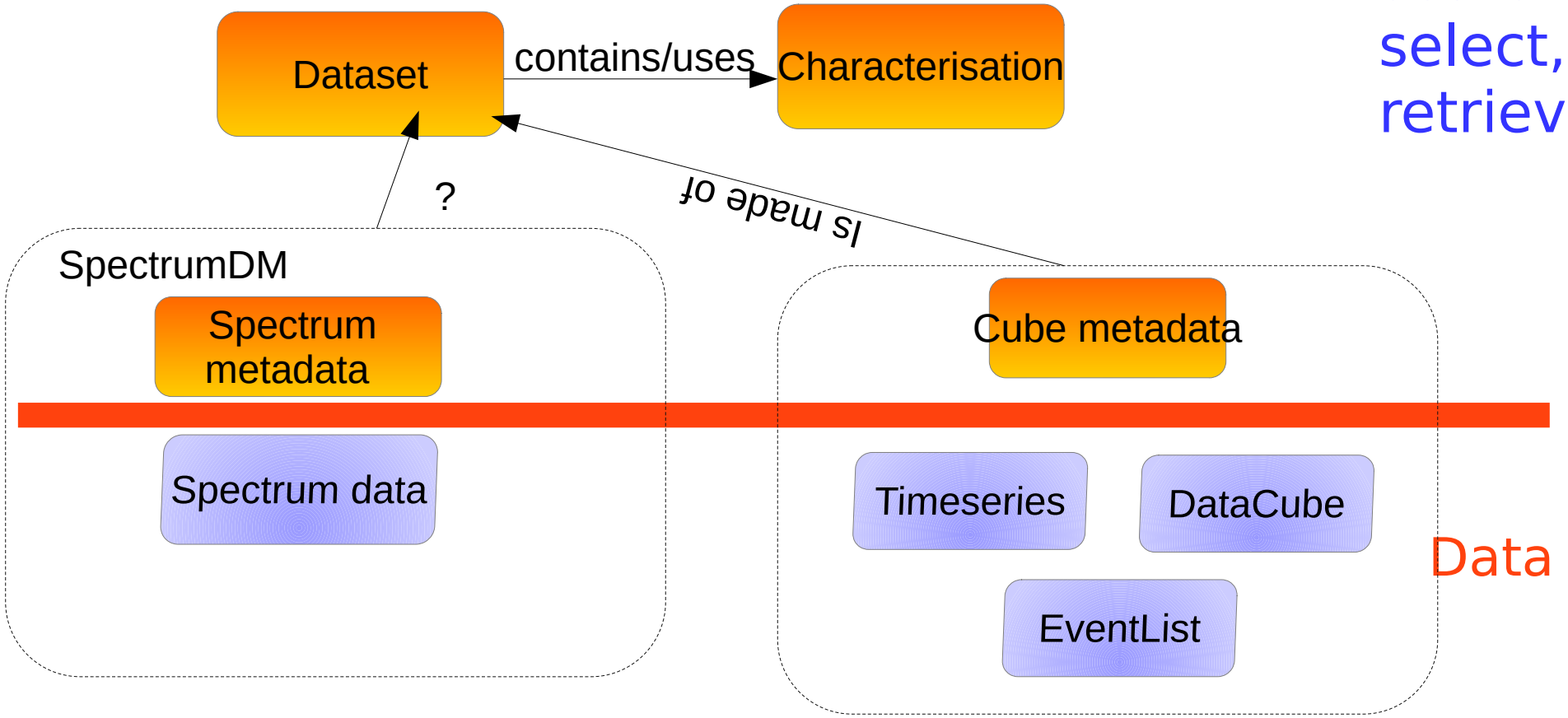
IVOA

Curation

Location on Physical axes

Metadata

search, select, retrieve



Data

explore, compare, analyse

DataSetDM motivation and characterisation

- Overall DM for generic dataset metadata
- Useful not only for discovery but also for analysis
- ObsCore seen as a partial view of DataSetDM
  - model for dataset discovery and selection
- Currently Characterisation of physical axes is missing in DataSet DM
  - but is in ObsCore !!!
- → This is an issue !

Characterisation definition and use cases

- How the data are spanned
  - on spatial, spectral time and polarization axes
- Discovery/selection use case 0 :
  - obvious
- Analysis/processing use case 1 (simple) :
  - physical axes values ranges : extract data

    -> spatial cutout / spectral cutout / polarization selection
- Analysis/processing use case 2 (advanced) :
  - detection limit at some physical coordinate

Characterisation DM material

- Characterisation 1.13 full data model
  - UML + utypes (class attributes)

    → no vodml description
- Characterisation attributes in ObsCore :
  - subset of 1.13 attributes, consistent utypes

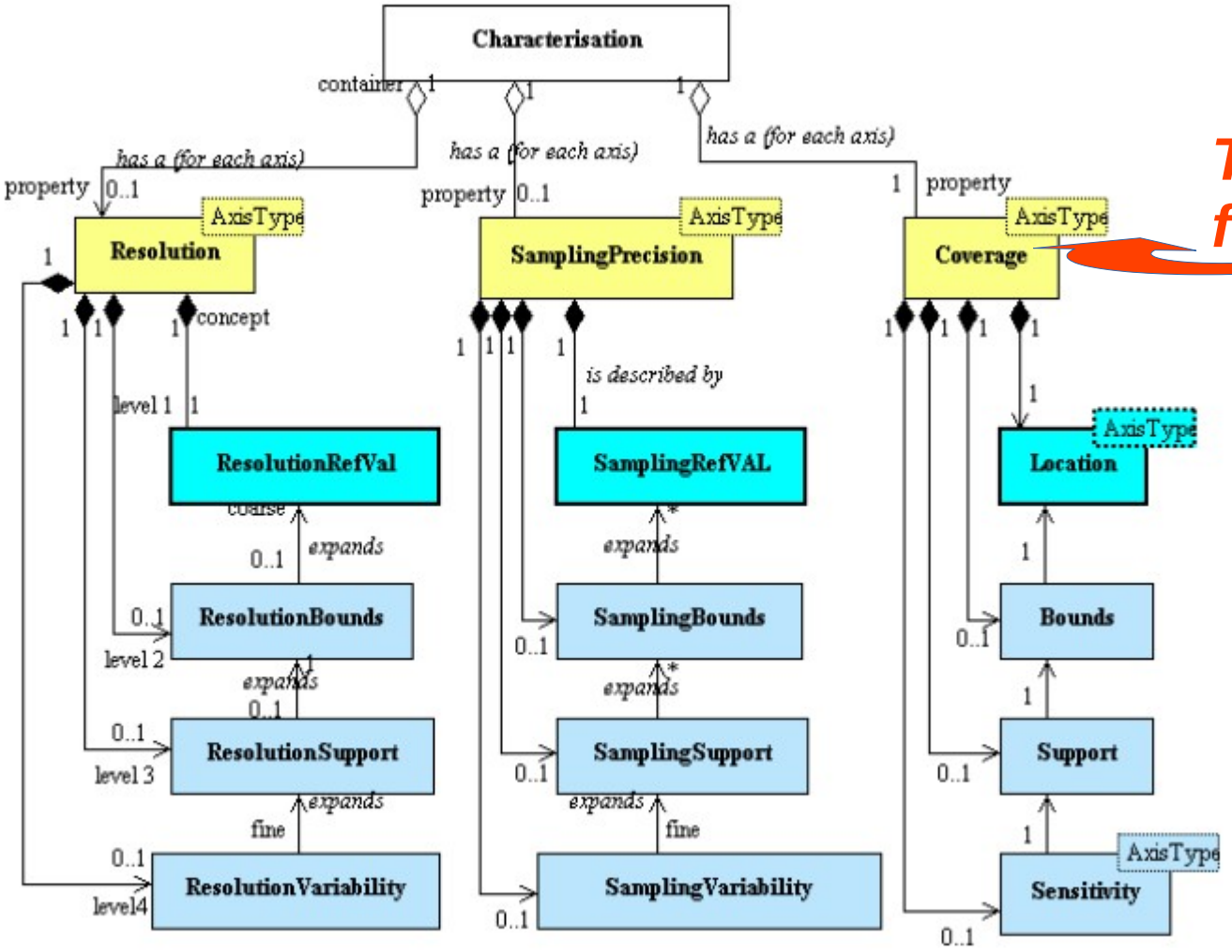
    → only partial, no vodml description
- Char attributes in ObsCore extensions :
  - Radio
  - Time
- UV plane, polarization, level 4 in the IVOA note (previously WD) :
  - « Characterisation DM: Complements and new features.

    Observation quality and variability - complex datasets »

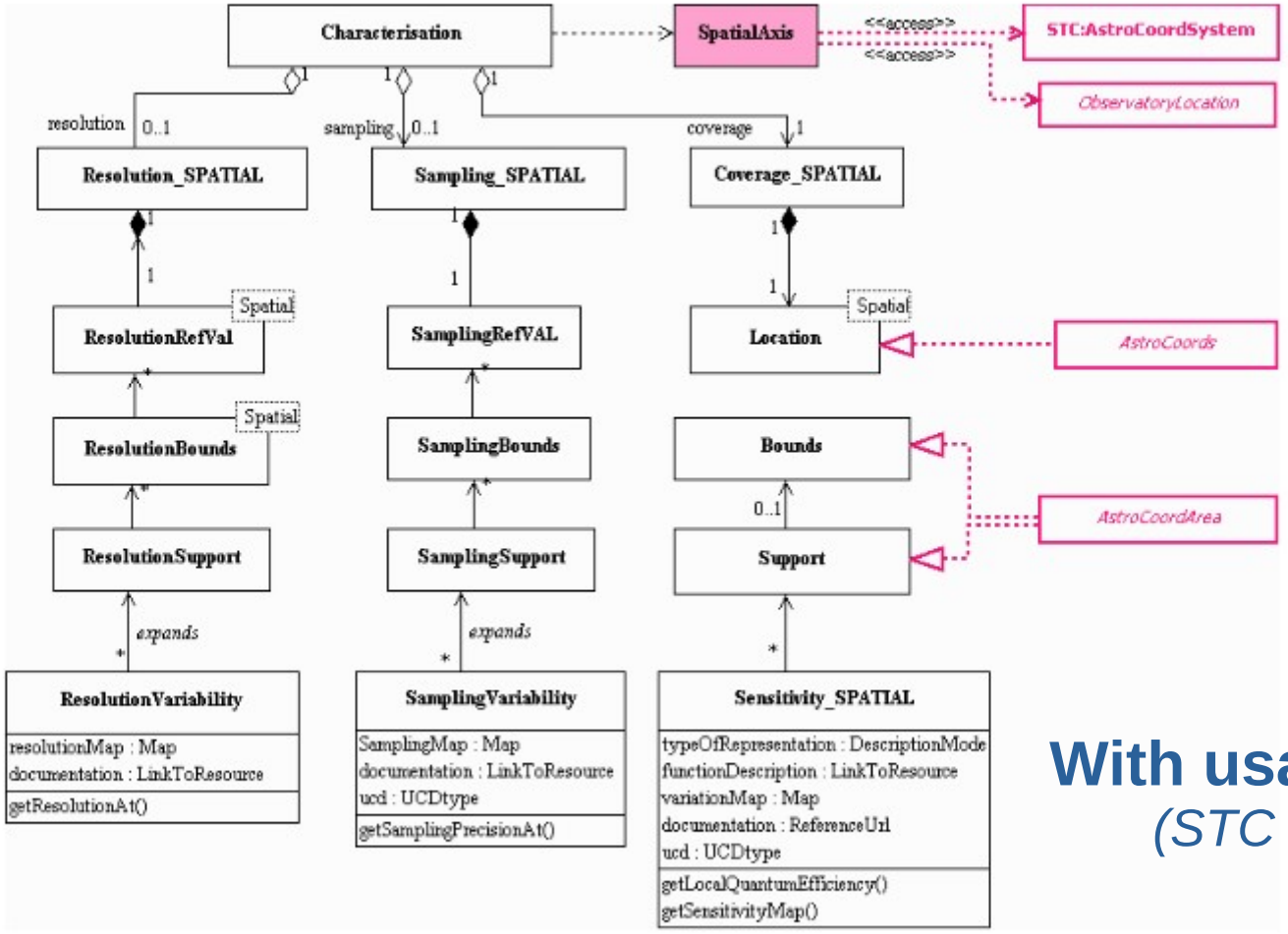
Char 1.13 : UML diagram

Properties

Levels



Char 1.13 : UML diagram – spatial axis



With usage of Coords

(STC 1 at the time)

Characterisation in ObsCore (excerpt) :

Spatial

and some Time

Characterisation

attributes

access_estsize	Access.size	kbyte	int	Estimated size of dataset: in kilobytes	YES
SPATIAL CHARACTERISATION (section B6.1)					
s_ra	Char.SpatialAxis.Coverage.Location.Coord.Position2D.Value2.C1	deg	double	Central Spatial Position in ICRS Right ascension	YES
s_dec	Char.SpatialAxis.Coverage.Location.Coord.Position2D.Value2.C2	deg	double	Central Spatial Position in ICRS Declination	YES
s_fov	Char.SpatialAxis.Coverage.Bounds.Extent.diameter	deg	double	Estimated size of the covered region as the diameter of a containing circle	YES
s_region	Char.SpatialAxis.Coverage.Support.Area		string	Sky region covered by the data product (expressed in ICRS frame)	YES
s_resolution	Char.SpatialAxis.Resolution.refval.value	arcsec	double	Spatial resolution of data as FWHM of PSF	YES
s_xel1	Char.SpatialAxis.numBins1	unitless	integer	Number of elements along the first coordinate of the spatial axis	YES
s_xel2	Char.SpatialAxis.numBins2	unitless	integer	Number of elements along the second coordinate of the spatial axis	YES
s_ucd	Char.SpatialAxis.ucd	unitless	string	UCD for the nature of the spatial axis (pos or u,v data)	NO
s_unit	Char.SpatialAxis.unit	unitless	string	Unit used for spatial axis	NO
s_resolution_min	Char.SpatialAxis.Resolution.Bounds.Limits.LoLimit	arcsec	double	Resolution min value on spatial axis (FHWM of PSF)	NO
s_resolution_max	Char.SpatialAxis.Resolution.Bounds.Limits.HiLimit	arcsec	double	Resolution max value on spatial axis	NO
s_calib_status	Char.SpatialAxis.calibrationStatus	unitless	Enum string	Type of calibration along the spatial axis	NO
s_stat_error	Char.SpatialAxis.Accuracy.StatError.Refval.value	arcsec	double	Astrometric precision along the spatial axis	NO
s_pixel_scale	Char.SpatialAxis.Sampling.RefVal.SamplingPeriod	arcsec	double	Sampling period in world coordinate units along the spatial axis	NO
TIME CHARACTERISATION (section B6.3)					
t_xel	Char.TimeAxis.numBins	unitless	integer	Number of elements along the time axis	YES
t_refpos	Char.TimeAxis.ReferencePosition	unitless	Enum string	Time Axis Reference Position as defined in STC REC, Section 4.4.1.1.1	NO
t_min	Char.TimeAxis.Coverage.Bounds.Limits.StartTime	d	double	Start time in MJD	YES
t_max	Char.TimeAxis.Coverage.Bounds.Limits.StopTime	d	double	Stop time in MJD	YES

Characterisation in ObsCore extensions : time, radio - 1

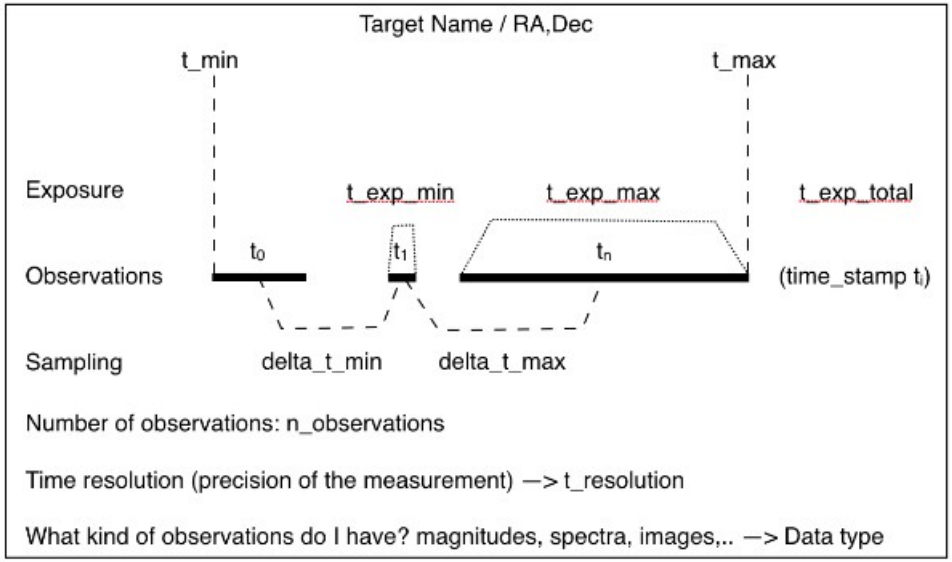


Figure 1: Simple representation of Time Series data.

Field	**Explanation**
(RA,Dec)	Coordinates[1]
target_name	Target name[1]
t_min	Date of the begining of the of observation
t_max	Date of the end of the observation
t_exp_min	Minimum exposure time
t_exp_max	Maximum exposure time
t_exp_total	Total exposure time
delta_t_min	Minimum time sampling / cadence
delta_t_max	Maximum time sampling / cadence
t_resolution	Time resolution/precision
n_observations	Number of observations
type_of_data	Type of data (fluxes, radial velocities, images,...)

Characterisation in ObsCore extensions : time, radio - 2

f_min	spectral coverage min in frequency	Char.SpectralAxis. Coverage.Bounds Limits.LoLim	em.freq;stat.min	Mhz	radio
f_max	spectral coverage max in frequency	Char.SpectralAxis. Coverage.Bounds Limits.HiLim	em.freq;stat.max	Mhz	radio
t_exp_min	minimum integration time per sample	Char.TimeAxis. Sampling.Extent LoLim	time.duration;obs.exposure; stat.min	s	radio
t_exp_max	maximum integration time per sample	Char.TimeAxis. Sampling.Extent HiLim	time.duration;obs.exposure; stat.max	s	radio
uv_distance_min	minimal distance in uv plane	Char.UVAxis. Coverage.Bounds. Limits.LoLim	stat.fourier;pos;stat.min	m	interferometry
uv_distance_max	maximal distance in uv plane	Char.UVAxis. Coverage.Bounds. Limits.LoLim	stat.fourier;pos;stat.max	m	interferometry
uv_distribution_exc	excentricity of uv distribution	Char.UVAxis. Coverage.Bounds. Excentricity	stat.fourier;pos		

Characterisation package / VODML

- Difficult points :
  - I) Design :
    - Generic coverage (location, bounds, support, variability) with derivation of specialized axes

      Versus
    - specialized axes (time, sepctral, spatial, ;.)
  - II) Relationship to Coords datamodel
  - III) Level 4 :
    - only integrating links to variability datasets ?
    - Or modeling these datasets ?