

# Scenario for ObsCore DM Extension for time series and radio data

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recap on discussions with Time domain IG and Radio IG

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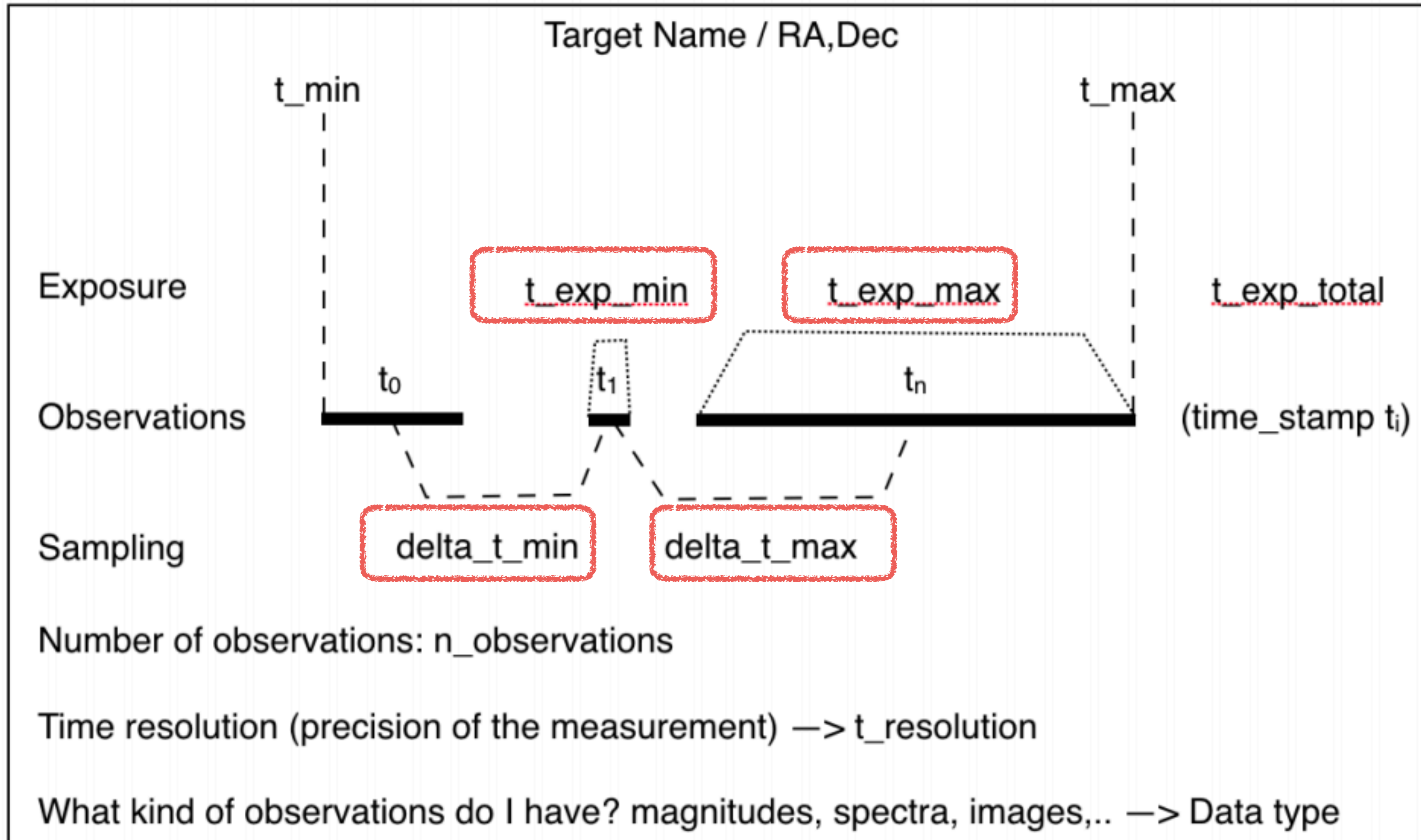


# □ Context

- ObsCore DM has been designed to allow data discovery and data selection for the largest fraction of distributed astronomical data sets.
- —> it covers general properties
- Some specific metadata are required for time within the Time Domain IG charter
- Some specific metadata are required for radio data by the Radio IG
- How can I add extra metadata to an ObsTAP service to cope with these requirements ?
- How can I discover the services supporting these extensions ?



# □ Time series specific properties



Thanks to  
Ada Nebot

Figure 1: Simple representation of Time Series data.



# Time description in ObsCore

Obscore + TObs	Definition	Utype/datamodel path	UCD	Units	Mandatory/optional
t_min	Time start of the sequence (MJD)	Char.TimeAxis.Coverage.Bounds.Limits.LoLim	time.start;obs.sequence	d	man
t_max	Time end of the sequence	Char.TimeAxis.Coverage.Bounds.Limits.HiLim	time.end;obs.sequence	d	man
t_exptime	Exposure time (sum of multiple exposures)	Char.TimeAxis.Support.Extent	time.duration;obs.exposure	s	man
t_exp_min	minimal length of time sample (min integration time)	Char.TimeAxis.Sampling.Extent.loLim	time.duration;obs.sequence;stat.min.	s	opt
t_exp_max	maximal length of time sample (max integration time)	Char.TimeAxis.Sampling.Extent.hiLim	time.duration;obs.sequence;stat.max	s	opt
%time space between 2 time samples / cadence					
t_delta_min	minimal length of time interval between 2 observations / cadence (min)	Char.TimeAxis.Sampling.Period.loLim	time.interval;obs.sequence;stat.min.	s	opt
t_delta_max	maximal length of time interval between 2 observations / cadence (max)	Char.TimeAxis.Sampling.Period.hiLim	time.interval;obs.sequence;stat.max	s	opt
t_resolution	minimal interpretable time difference	Char.TimeAxis.Resolution.Refval	time.resolution	s	man
t_xel	nb of time stamps in the series	Char.TimeAxis.numBins	meta.number	null	man

grey cell = current Obscore keywords

add every parameter in blue cells to *ivoa.t\_obs* table

# Time Coordinate System



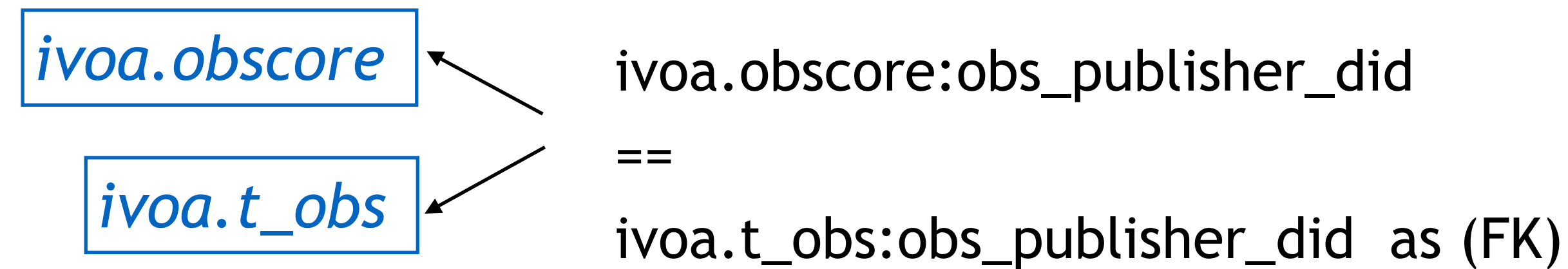
- The datasets description in Obscore1.1 are not constrained to one specific TIME coordinate system.
- The data representation in the time series data rely on a TIMESYS element.
- Is it useful to query on it ?
- At least it is useful to get in the query response and let a client API prepare some time coordinates conversion

add every blue parameters to **ivoa.t\_obs** table

Obscore + TObs	Definition	VODML-ID IN Coords DM and TIMESYS attribute	UCD	Units	Mandatory/optional	Query setup
% Time Coordinate system						
<b>t_origin</b>	Time( frame origin)	TimeOffset.time0 (TBC) timeorigin	time.epoch	?	opt	
<b>t_scale</b>	Time frame scale	TimeFrame.timeScale timescale	time.scale	?	opt	
<b>t_refPosition</b> (barycenter, heliocenter, ...)	Time reference position	TimeFrame.refPosition refposition	?	?	opt	
<b>t_refDirection</b> (e.g. for solar observations)	Time reference direction	TimeFrame.refDirection refdirection	?	?	opt	
%Time representation ISOtime , MJD, JD , ...						
<b>t_format</b>	Time format representation	?	time;meta.code.class	null	opt	MJD

# □ TAP schema extension

- An ObsTAP service can already provide metadata from *ivoa.obscore* table together from complementary tables. ( cf CADC ObsTAP)



- A table join allows to search on ObsCore keywords, but also on time specific keywords
- Suggestion:
  - define a 'time series' profile for ObsTAP when *ivoa.t\_obs* is served together with *ivoa.obscore*
    - ▶ *ivoa.obscore* + *ivoa.t\_obs* tables are included in the service TAP\_SCHEMA
  - define a 'radio' ObsTAP capability when *ivoa.r\_obs* is served together with *ivoa.obscore*
    - ▶ *ivoa.obscore* + *ivoa.r\_obs* tables are included in the service TAP\_SCHEMA



# Visibilities in ObsCore + ivoa.r\_obscore

Obscore and R	Definition	Utype	UCD	Units	Mandatory/ Optional	Default
dataprodct_type		ObsDataset.dataProductType	meta.code.class			visibility
% position on sky in ICRS						
s_ra	Position (within a certain area)	Char.SpatialAxis.Coverage.RefVal	pos.eq.ra	deg	man	ICRS
s_dec	Position (within a certain area)	Char.SpatialAxis.Coverage.RefVal	pos.eq.dec	deg	man	
s_resolution	Angular resolution	Char.SpatialAxis.Resolution.RefVal	pos.angResolution	arcsec	man	
% observable						
o_ucd	Physical nature attached to observable	Char.ObservableAxis.ucd	meta.ucd	null	man	stat.Fourier
stat.Fourier	Fourier coeff in visibilty as amplitude , phase depending on u,v					
% spectral coverage						
em_min	spectral interval (min)	Char.SpectralAxis.Coverage.Bounds.Limits.LoLim	em.wl;stat.min	nm	man	m
em_max	spectral interval	Char.SpectralAxis.Coverage.Bounds.Limits.HiLim	em.wl;stat.max	nm	man	m
em_ucd	Wavelength/ Frequency/ Energy	Char.SpectralAxis.ucd	meta.ucd	null	opt	em.freq
em_unit	Unit along spectral axis	Char.SpectralAxis.unit	meta.unit	null	opt	
f_min	spectral coverage (min) in frequency	Char.SpectralAxis.Coverage.Bounds.Limits.LoLim	em.freq;stat.min	<em_unit>	man	MHz
f_max	spectral coverage (max) in frequency	Char.SpectralAxis.Coverage.Bounds.Limits.HiLim	em.freq;stat.max	<em_unit>	man	MHz
% Polarisation states						
pol_states	Polarization state list	Char.Polarization.List	meta.class	null	opt	
%time features						
t_exp_mean	average length time interval integration time	Char.TimeAxis.Coverage.Support.Refval	time.interval;obs.sequence;stat.mean	s	opt	

grey cell = current Obscore keywords

add green parameters to an ivoa.r\_obs table

<— ?  
<—

# □ Extension mechanism

- radio data varying with time ( ex: pulsar data, FRB, ..)  
: both extensions are needed to expose such data sets in ObsTAP
- declare 3 tables in ./tables
  - ivoa.obscore
  - ivoa.t\_obs
  - ivoa.r\_obs
- declare capabilities : how can I do that ? which model ? which standard?
  - standard\_id = ivo://ivoa.net/std/obscore#sync-1.1
  - standard\_id = ivo://ivoa.net/std/obscore+time#sync-1.1.
  - standard\_id = ivo://ivoa.net/std/obscore+radio#sync-1.1Or
  - declare specialized obscore profiles for main data\_product\_subtype

data_product_subtype	obscore profile
light curve	obscore+t_obs
pulsar light curve	obscore+t_obs +r_obs
event	obscore+e_obs ?





# □ Specialize table extension

