

GAPS

time series and exoplanets discovery and modelling

Marco Molinaro¹

Andrea Bignamini¹, Serena Benatti², Riccardo Claudi²,
Eleonora Alei^{2,5}, François Bonnarel⁴, Mario Damasso³,
Mireille Louys⁴, Michele Maris¹, Valerio Nascimbeni^{2,5}

1,2,3



Trieste

Padova

Torino

4



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Outline

- GAPS Time Series
 - Datasets
 - Service (skeleton)
- Exoplanetary Systems
 - Data Model

GAPS Time Series

[RML Time Series](#)

[M Time Series](#)

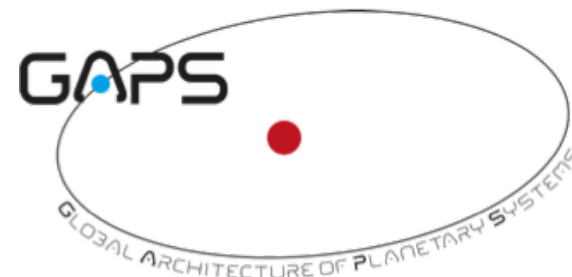
[KP Time Series](#)

[MP Time Series](#)

[OC Time Series](#)

[AST-IP-STD-GATO Time Series](#)

- Product of the GAPS project
- Internally stored and built
- RV temporal series



GAPS KP Targets

GAPS Name	α	δ	$\mu\alpha$	$\mu\delta$	Mv	(B-V)	Spectral Type	Radial Velocity	Number of Data	Discarded Data	Time Series	Pdf Report	Status	Update On
KP1	03:48:00.370	+40:31:50.30	0.054000	0.021100	7.24	0.634	G2	-10.100	93	0	KP1.dat	KP1.pdf	active	2017-10-05 at 03:50
KP2	05:23:21.570	-02:16:39.40	0.034400	-0.096900	8.94	0.761	G5	29.590	51	0	KP2.dat	KP2.pdf	active	2017-10-05 at 04:50
KP3	08:53:50.810	+33:03:24.50	-0.095400	-0.028400	8.03	0.626	G0	21.300	96	0	KP3.dat	KP3.pdf	active	2019-01-23 at 01:25
KP4	10:18:21.290	+12:37:16.00	-0.272300	-0.039900	7.03	0.594	G0	22.600	63	0	KP4.dat	KP4.pdf	active	2017-05-21 at 21:18
KP5	12:15:06.570	-07:15:26.40	-0.249700	-0.052300	7.96	0.815	G5	20.660	47	0	KP5.dat	KP5.pdf	active	2017-06-23 at 21:14
KP6	02:34:11.046	-12:23:03.47	0.057300	-0.187700	9.85	0.000	F2	24.250	27	0	KP6.dat	KP6.pdf	rejected	2013-01-30 at 20:38
KP7	12:30:26.900	+22:52:47.30	0.127100	-0.089400	8.76	0.738	G9	-29.600	97	0	KP7.dat	KP7.pdf	active	2017-02-06 at 06:06
KP8	00:15:50.850	+01:12:00.75	0.002600	0.012500	11.30	0.476	F8	18.280	12	0	KP8.dat	KP8.pdf	active	2016-10-07 at 02:53
KP9	00:18:24.700	-15:16:02.30	0.025500	-0.026500	11.30	0.576	G0	8.460	12	0	KP9.dat	KP9.pdf	active	2016-10-07 at 00:36
KP10	00:20:40.080	+31:59:23.79	-0.004800	-0.005600	11.79	0.538	F7	-13.500	13	0	KP10.dat	KP10.pdf	active	2016-07-25 at 03:03
											KP10_F.dat	KP10_F.pdf		

GAPS Time Series

```
# GAPS_NAME: KP7
# ALPHA: 12:30:26.900
# DELTA: +22:52:47.30
# PROPER MOTION (ALPHA): 0.127100
# PROPER MOTION (DELTA): -0.089400
# MAGNITUDE: 8.76
# (B-V): 0.738
# SPECTRAL TYPE: G9
# SPECTRAL TYPE OF THE MASK: G2
# SYSTEMIC RV: -29.600 [km/s]
# TIME SERIES UPDATED ON: 2017-02-06 at 06:06
```

- Custom ASCII format
- Used in internally developed libraries
- Datasets links and metadata in RDB

```
# -----
#ID          H_BJD          C_BJD          RVC[km/s]          dRVC[m/s]          BIS_SPAN
1            2456266.7756144    2456266.7768700    -30.000592793654    0.438641811740    -0.033687885349
2            2456288.7600700    2456288.7592600    -30.002592926899    0.652667304176    -0.035340040928
3            2456297.7797343    2456297.7778000    -30.017483243655    1.021413642952    -0.038451460912
4            2456298.7464164    2456298.7447100    -30.013971322659    0.401420395594    -0.033602684455
5            2456299.6857577    2456299.6840800    -30.017148485730    0.342304763703    -0.036787794336
6            2456305.7751079    2456305.7729100    -30.019509192761    0.414129371691    -0.034515653547
7            2456324.7450514    2456324.7415500    -30.025061639205    0.904676089902    -0.038409472716
8            2456324.8134471    2456324.8099100    -30.024866267906    0.610715811992    -0.031641312430
9            2456344.6559588    2456344.6513500    -30.041959907801    0.344306618194    -0.035302283354
10           2456345.5576606    2456345.5529300    -30.045054078932    0.483426241143    -0.032098020289
11           2456362.6409069    2456362.6358500    -30.045100931374    0.363052628555    -0.037400048651
12           2456363.6494948    2456363.6445000    -30.044223978297    0.421959466464    -0.036265889749
13           2456364.6765535    2456364.6715900    -30.045960349050    0.431904482152    -0.038855300832
14           2456365.6796057    2456365.6743900    -30.047683570576    0.404503349773    -0.035468293995
15           2456366.5462550    2456366.5393300    -30.050098153026    0.809221945047    -0.032358314979
16           2456375.5578538    2456375.5522500    -30.053986167976    0.656030366888    -0.038302196119
17           2456376.5564906    2456376.5511800    -30.052118020609    0.381495874323    -0.034762268290
18           2456379.6199837    2456379.6147900    -30.055001407306    0.463575651085    -0.034606213278
19           2456380.6110450    2456380.6058800    -30.055845494098    0.663712314063    -0.036645746079
20           2456382.6569003    2456382.6517400    -30.054586051565    0.365017000690    -0.036948848003
21           2456398.5531917          NaN          -30.053622043262    0.569969166224    -0.034282347747
22           2456399.5046787    2456399.5000600    -30.049408795551    1.275193650360    -0.036938724265
23           2456404.5386094    2456404.5339500    -30.050609779089    0.567713324318    -0.033962760561
```

GAPS Target: KP7

Last update: 2017-02-06 at UT 06:06:11

Star	Value
α	12:30:26.900
δ	+22:52:47.30
μ_α	0.1271 arcsec/yr
μ_δ	-0.089 arcsec/yr
M_v	8.8
$(B - V)$	0.7
Spectral Type	G9
Radial Velocity	-29.60 km/s
Known planets	2

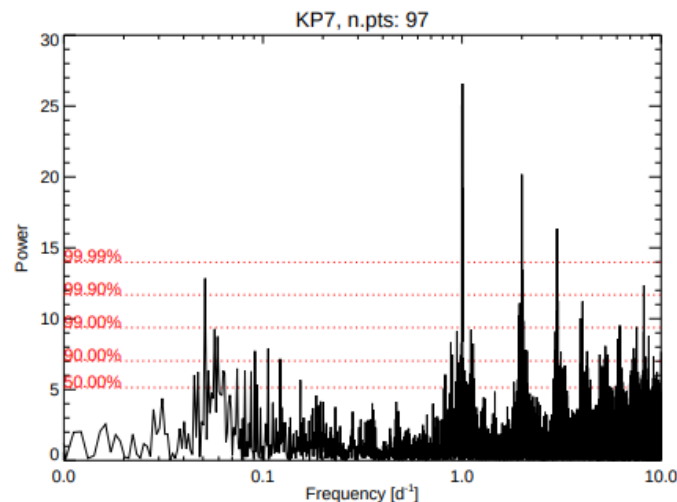
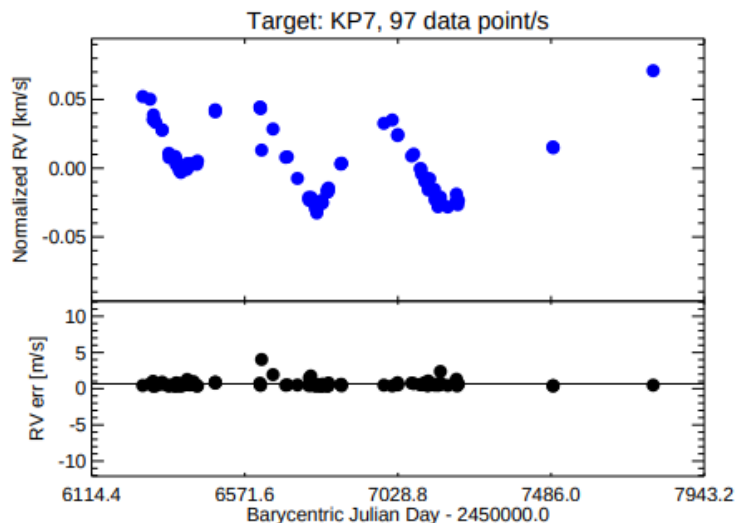
Table 1: Stellar parameters from GAPS Master Catalog.

Time series	Value
Data points	97
Acquisition	HARPNech_acq_wavesimult
Mean RV	-30.053 km/s
Median RV	-30.054 km/s
σ_{RV}	0.155 km/s
Mean Err_{RV}	0.66 m/s
Median Err_{RV}	0.53 m/s
$\sigma_{Err_{RV}}$	0.15 m/s
Independent frequencies ¹	118
Total SNR	10703

Table 2: Time series information. ¹From Horne & Baliunas, 1986, ApJ, 302, 757.

GAPS Time Series

- Report in PDF format
 - Includes global metadata and data
 - Provides data overview
 - Linked in the RDB

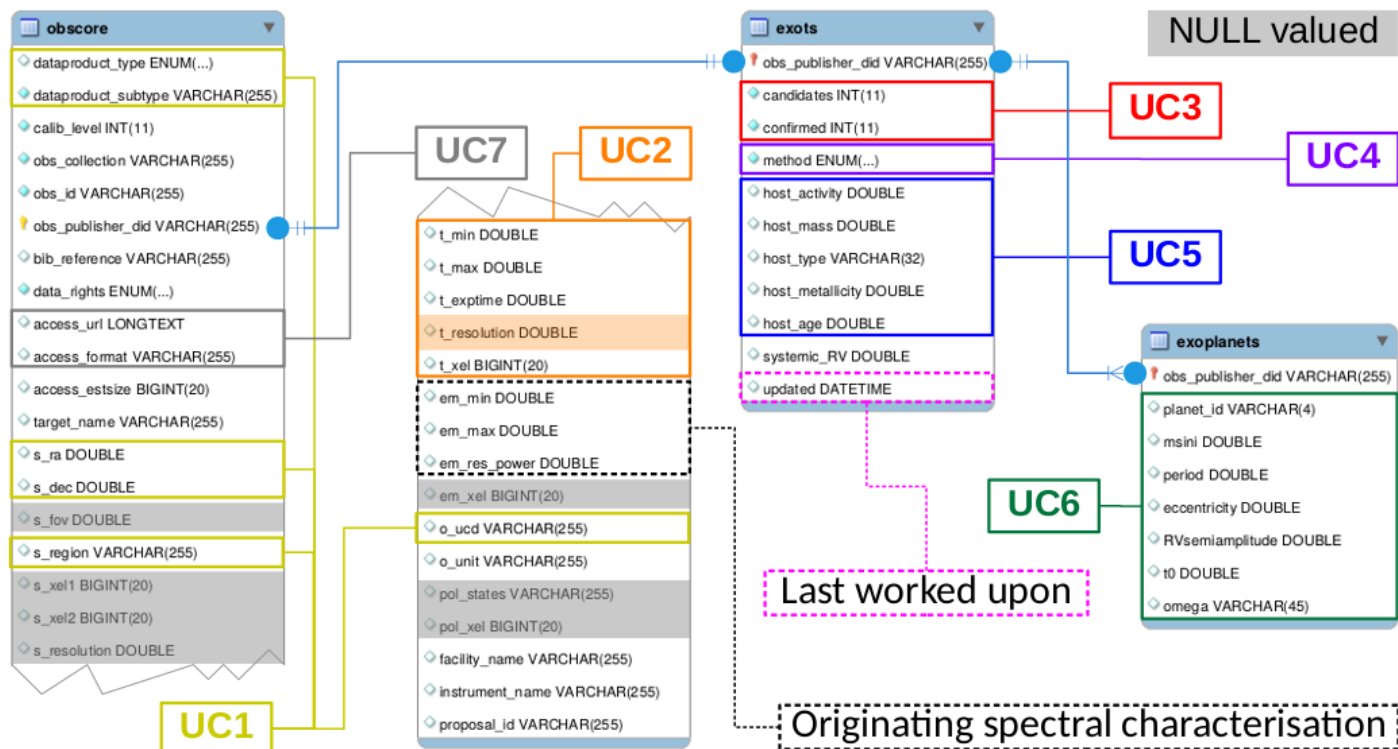




ADASS & IVOA Report

October 2017

Global view



Use Case driven
ObsCore based

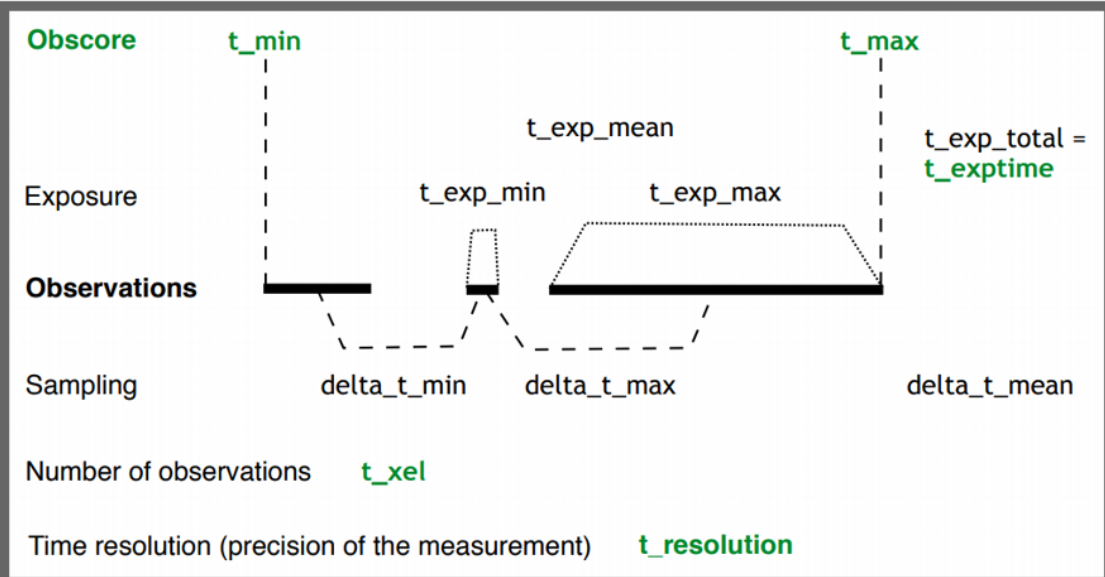
DataSet
Discovery
approach



Time Axis Characterisation

Oct. 2017 – May 2018

Time Axis evolution



ObsCore

Time Axis description

Taken into account:

- $t_{exp}_{\{min|max\}}$
- $\delta t_{\{min|max\}}$

Not yet finalised. Details may fall into modelling.



Skeleton ObsTAP

TOPCAT(9): Table Browser

Window Subsets Help



Table Browser for 9: TAP_9_obscore

	obs_collection	dataproduc...	obs_id	target_name	obs_publisher_id	access_url	access_format
9	GAPS/TimeSeries	timeseries	AST01	Tau Boo	ivo://ia2.inaf.it/gaps/dsetdesc?859943eb	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/AST01/AST01.dat	text/plain
10	GAPS/TimeSeries	timeseries	KP22	XO-2 N	ivo://ia2.inaf.it/gaps/dsetdesc?60692363	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP22/KP22.dat	text/plain
11	GAPS/TimeSeries	timeseries	KP44	Tres-4	ivo://ia2.inaf.it/gaps/dsetdesc?e7478dbb	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP44/KP44.dat	text/plain
14	GAPS/TimeSeries	timeseries	KP6	HIP11952	ivo://ia2.inaf.it/gaps/dsetdesc?4846bd2e	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP6/KP6.dat	text/plain
12	GAPS/TimeSeries	timeseries	KP7	HD108874	ivo://ia2.inaf.it/gaps/dsetdesc?474b8c9b	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.dat	text/plain
1	GAPS/TimeSeries	timeseries	KP7	HD108874	ivo://ia2.inaf.it/gaps/dsetdesc?474b8c9b_v	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.v1.xml	application/x-votable+xml
2	GAPS/TimeSeries	timeseries	KP76	XO-2 S	ivo://ia2.inaf.it/gaps/dsetdesc?19692bec	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP76/KP76.dat	text/plain
15	GAPS/TimeSeries	timeseries	KP79	KELT-6	ivo://ia2.inaf.it/gaps/dsetdesc?be65b67c	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP79/KP79.dat	text/plain
16	GAPS/TimeSeries	timeseries	M87	GJ3998	ivo://ia2.inaf.it/gaps/dsetdesc?a6ecfa77	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/M87/M87.dat	text/plain
3	GAPS/TimeSeries	timeseries	OC102	Pr0211	ivo://ia2.inaf.it/gaps/dsetdesc?306dfb06	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/OC102/OC102.dat	text/plain
4	GAPS/TimeSeries	timeseries	RML11	HAT-P-18	ivo://ia2.inaf.it/gaps/dsetdesc?1045c74d	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML11/RML11.dat	text/plain
17	GAPS/TimeSeries	timeseries	RML17	HAT-P-20	ivo://ia2.inaf.it/gaps/dsetdesc?96a2da13	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML17/RML17.dat	text/plain
7	GAPS/TimeSeries	timeseries	RML2	Qatar-1	ivo://ia2.inaf.it/gaps/dsetdesc?9a781977	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML2/RML2.dat	text/plain
5	GAPS/TimeSeries	timeseries	RML21	Qatar-2	ivo://ia2.inaf.it/gaps/dsetdesc?2de8a219	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML21/RML21.dat	text/plain
6	GAPS/TimeSeries	timeseries	RML24	WASP-11/HAT-P-10	ivo://ia2.inaf.it/gaps/dsetdesc?756ca646	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML24/RML24.dat	text/plain
8	GAPS/TimeSeries	timeseries	RML6	WASP-43	ivo://ia2.inaf.it/gaps/dsetdesc?880635ae	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML6/RML6.dat	text/plain
13	GAPS/TimeSeries	timeseries	RML8	HAT-P-36	ivo://ia2.inaf.it/gaps/dsetdesc?18b34120	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML8/RML8.dat	text/plain

obscure w/ t_ext*

Table Access Protocol (TAP) Query

Window TAP Registry Edit Interop Help

Select Service Use Service Resume Job Running Jobs

Metadata

Find:

Name Descrip Or

Service	Schema	Table	Columns	FKeys	Hints
Name	Δ	DataType	Indexed	Unit	
TAP Service (8)					
TAP_SCHEMA (5)					
TAP_SCHEMA.colu					
TAP_SCHEMA.key					
TAP_SCHEMA.sch					
TAP_SCHEMA.tabl					
ivoa (3)					
ivoa.exoplanets					
ivoa.exots					
ivoa.obscure					
s_region		CHAR	<input type="checkbox"/>		Sky region covered by t
target_name		CHAR	<input type="checkbox"/>		Astronomical object obs
delta_t_max		DOUBLE	<input type="checkbox"/>		
em_max		DOUBLE	<input type="checkbox"/>	m	Stop in spectral coordin
em_min		DOUBLE	<input type="checkbox"/>	m	Start in spectral coordin
em_res_power		DOUBLE	<input type="checkbox"/>		Value of the resolving po
s_dec		DOUBLE	<input type="checkbox"/>	deg	Central Spatial Position i
s_fov		DOUBLE	<input type="checkbox"/>	deg	Estimated size of the co
s_ra		DOUBLE	<input type="checkbox"/>	deg	Central Spatial Position i
s_resolution		DOUBLE	<input type="checkbox"/>	arcsec	Spatial resolution of dat
t_exp_max		DOUBLE	<input type="checkbox"/>		
t_exp_min		DOUBLE	<input type="checkbox"/>		
t_exptime		DOUBLE	<input type="checkbox"/>	s	Total exposure time
t_max		DOUBLE	<input type="checkbox"/>	d	Stop time in MJD
t_min		DOUBLE	<input type="checkbox"/>	d	Start time in MJD
t_resolution		DOUBLE	<input type="checkbox"/>	s	Temporal resolution FW
access_estsize		UNKNOWN	<input type="checkbox"/>	kbyte	Estimated size of datase
calib_level		UNKNOWN	<input type="checkbox"/>		Calibration level / 0. 1. 2

Service Capabilities

Query Language: ADQL-2.0 Max Rows: Uploads: unavailable

ADQL Text

Mode: Synchronous

1

Examples Info

Run Query

access_url	access_format
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/AST01/AST01.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP22/KP22.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP44/KP44.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP6/KP6.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.v1.xml	application/x-votable+xml
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP76/KP76.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP79/KP79.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/M87/M87.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/OC102/OC102.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML11/RML11.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML17/RML17.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML2/RML2.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML21/RML21.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML24/RML24.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML6/RML6.dat	text/plain
twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/RML8/RML8.dat	text/plain

Annotated Serialisation

```
<VOTABLE version="1.3" xmlns="http://www.ivoa.net/xml/VOTable/v1.3">
```

```
<!--
! VOTable written by STIL version 3.2-1 (uk.ac.starlink.votable.VOTableWriter)
! at 2018-03-29T12:21:35
!-->
<RESOURCE>
<!-- Source parameters -->
<PARAM arraysize="3" datatype="char" name="GAPS name" value="KP7">
<DESCRIPTION>internal project target identifier</DESCRIPTION>
</PARAM>
<PARAM arraysize="12" datatype="char" name="alpha" ucd="pos.eq.ra;meta.main" value="12:30:26.900">
<DESCRIPTION>Right Ascension of target</DESCRIPTION>
</PARAM>
<PARAM arraysize="12" datatype="char" name="delta" ucd="pos.eq.dec;meta.main" value="+22:52:47.30">
<DESCRIPTION>Declination of target</DESCRIPTION>
</PARAM>
<PARAM datatype="float" name="PM alpha" ucd="pos.pm;pos.eq.ra" value="0.1271">
<DESCRIPTION>Proper motion, alpha component</DESCRIPTION>
</PARAM>
<PARAM datatype="float" name="PM delta" ucd="pos.pm;pos.eq.dec" value="-0.0894">
<DESCRIPTION>Proper motion, delta component</DESCRIPTION>
</PARAM>
<PARAM datatype="float" name="Magnitude" ucd="phot.mag;em.opt" unit="mag" value="8.76">
<DESCRIPTION>Photometric magnitude (optical)</DESCRIPTION>
</PARAM>
<PARAM datatype="float" name="B-V" ucd="phot.color;em.opt.b;em.opt.V" unit="mag" value="0.738">
<DESCRIPTION>B-V color</DESCRIPTION>
</PARAM>
<GROUP ID="char" name="characterisation" utype="ts:Char">
<!-- This is the characterisation of the whole TimeSeries. It replaces Jiri's quantity and gavers "statistics" -->
<PARAM array:
<DESCRIPTI
<PARAM name="SpatLocationRA" ucd="pos.eq.ra" unit="deg" utype="ts:Char.SpatialAxis.Coverage.Location.Coord.SpatialValue2D[0]" datatype="float" value="187.651"/>
<PARAM name="SpatLocationDEC" ucd="pos.eq.dec" unit="deg" utype="ts:Char.SpatialAxis.Coverage.Location.Coord.SpatialValue2D[1]" datatype="float" value="+22.88643"/>
<PARAM name="SpatBoundsSizeRA" ucd="pos.eq.ra;stat.length" unit="deg" utype="ts:Char.Coverage.SpatialAxis.Bounds.CharBox.Size2[0]" datatype="float" value="0.0001"/>
<PARAM name="SpatBoundsSizeDEC" ucd="pos.eq.dec;stat.length" unit="deg" utype="ts:Char.Coverage.SpatialAxis.Bounds.CharBox.Size2[1]" datatype="float" value="0.0001"/>
<PARAM name="t_min" ucd="time.start" unit="d" utype="ts:Char.TimeAxis.Coverage.bounds.StartTime" datatype="float" value="2456266.77166"/>
<PARAM name="t_max" ucd="time.stop" unit="d" utype="ts:Char.TimeAxis.Coverage.bounds.StopTime" datatype="float" value="2457790.764710648"/>
<PARAM name="t_mean" ucd="time" unit="d" utype="ts:Char.TimeAxis.Coverage.location.TimeInstant" datatype="float" value="2456270"/>
<PARAM name="t_exptime" ucd="time.duration" unit="d" utype="ts:Char.TimeAxis.Coverage.support.Extent" datatype="float" value="84008.801"/>
<PARAM name="t_resolution" ucd="time.resolution" unit="d" utype="ts:Char.TimeAxis.resolution.RefVal" datatype="float" value="NaN"/>
<PARAM name="delta_t_min" ucd="time" unit="d" utype="ts:Char.TimeAxis.sampling.bounds.SamplingPrecision.TimeStart" datatype="float" value="0.0002893517"/>
<PARAM name="delta_t_max" ucd="time" unit="d" utype="ts:Char.TimeAxis.sampling.bounds.SamplingPrecision.TimeStop" datatype="float" value="298.2966319453"/>
<PARAM name="em_min" ucd="em.wl;sta.min" unit="m" utype="ts:Char.SpectralAxis.Coverage.Bounds.Limits.LoLimit" datatype="float" value="0.000000383"/>
<PARAM name="em_max" ucd="em.wl;sta.max" unit="m" utype="ts:Char.SpectralAxis.Coverage.Bounds.Limits.HiLimit" datatype="float" value="0.000000690"/>
</PARAM>
</GROUP>
```

- Only 1 attempt so far
- Plan to provide at least a more complete VOTable serialization
- Try all 3 of them?
- Definitely needs a model behind

Use Case Fulfill

```

SELECT
obs_collection, dataproduc... , obs_id, target_name, access_url, access_format
FROM
obscore
WHERE
s_ra > 187.6 AND s_ra < 187.7 AND
s_dec > 22.8 AND s_dec < 22.9 AND
dataproduc... = 'timeseries' AND
o_ucd = 'spect.dopplerVeloc.opt'

```

Table Browser for 14: TAP_14_obscore

	obs_collection	dataproduc...	obs_id	target_name	access_url	access_format
1	GAPS/TimeSeries	timeseries	KP7	HD108874	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.v1.xml	application/x-votable+xml
2	GAPS/TimeSeries	timeseries	KP7	HD108874	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.dat	text/plain

```

SELECT
target_name, systemic_RV, access_url , planet_id, period, eccentricity
FROM
obscore AS o
JOIN
exots AS s
ON s.obs_publisher_id = o.obs_publisher_id
JOIN
exoplanets AS p
ON p.obs_publisher_id = s.obs_publisher_id
WHERE
confirmed IS NOT NULL

```

Table Browser for 12: TAP_12_obscore,exots,exoplanets

	target_name	systemic_RV	access_url	planet_id	period	eccentricity
1	HD108874	-29.6	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.dat	b	395.34	0.142
2	HD108874	-29.6	http://twiki.oats.inaf.it/twiki/pub/GAPS/TimeSeries/KP7/KP7.dat	c	1732.2	0.229

Data Model for Planetary Systems

February 2018

(exoplanets) Data Model



exots	
obs_publisher_id	VARCHAR(255)
candidates	INT(11)
confirmed	INT(11)
method	ENUM(...)
host_activity	DOUBLE
host_mass	DOUBLE
host_type	VARCHAR(32)
host_metallicity	DOUBLE
host_age	DOUBLE
systemic_RV	DOUBLE
updated	DATETIME

- Allow specific exoplanets domain use cases and solution
- Re-usable
 - developed joining efforts within the community?
- Requires

exoplanets	
obs_publisher_id	VARCHAR(255)
planet_id	VARCHAR(4)
msini	DOUBLE
period	DOUBLE
eccentricity	DOUBLE
RVsemiampitude	DOUBLE
t0	DOUBLE
omega	VARCHAR(45)

- Some specific technical work
- ~complete science scenario



Describe stellar system components and their attributes in a common way

Data Model dedicated meeting

September 2018

ASTERICS Wiki pages



Trace: • authnauthzf2f • wp4 • wp4exodm

Exo-Planetary Systems Data Model Meeting

INAF-OAPd, Padova, 20-21/09/2018

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Goal

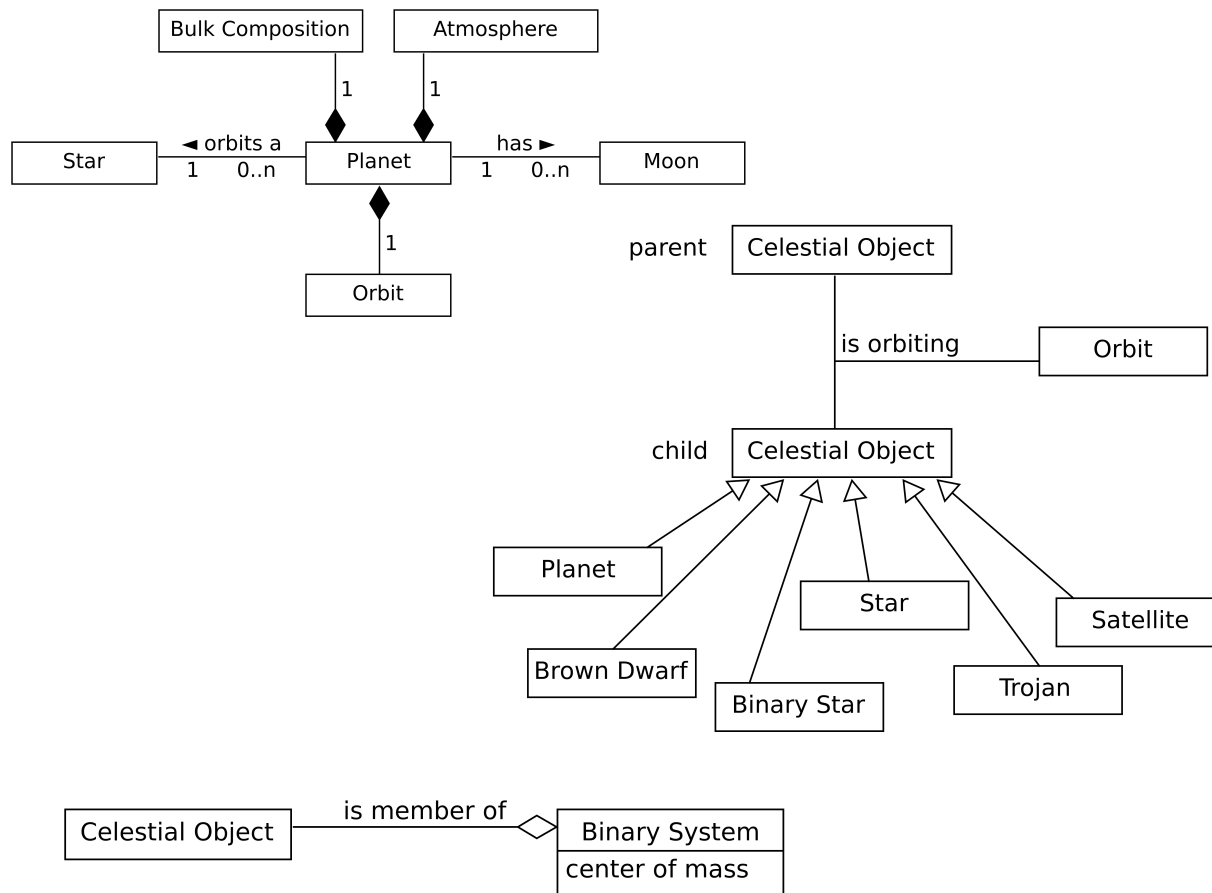
Starting from the experience aimed at deploying through the VO the Time Series for exoplanets (see, e.g., the [GAPS Time Series face-to-face](#)) first hints that a model to describe and annotate (exo-)planetary systems might be needed to allow for proper dataset discovery and metadata annotation. The solution of a common model for this specific area of interest was later enhanced by exoplanetary atmosphere numerical simulations and exoplanets catalogue and their visual client applications.

Thus the idea of this meeting was launched to start gathering the first block for the above model and to try to identify interests in the community to improve and adopt it.

First blocks identified
Overlap to other IVOA
models identified
More projects involved

ADASS XXVIII

November 2018



Reporting meeting
conclusions
Engaging larger
community

ExoDM meeting participation

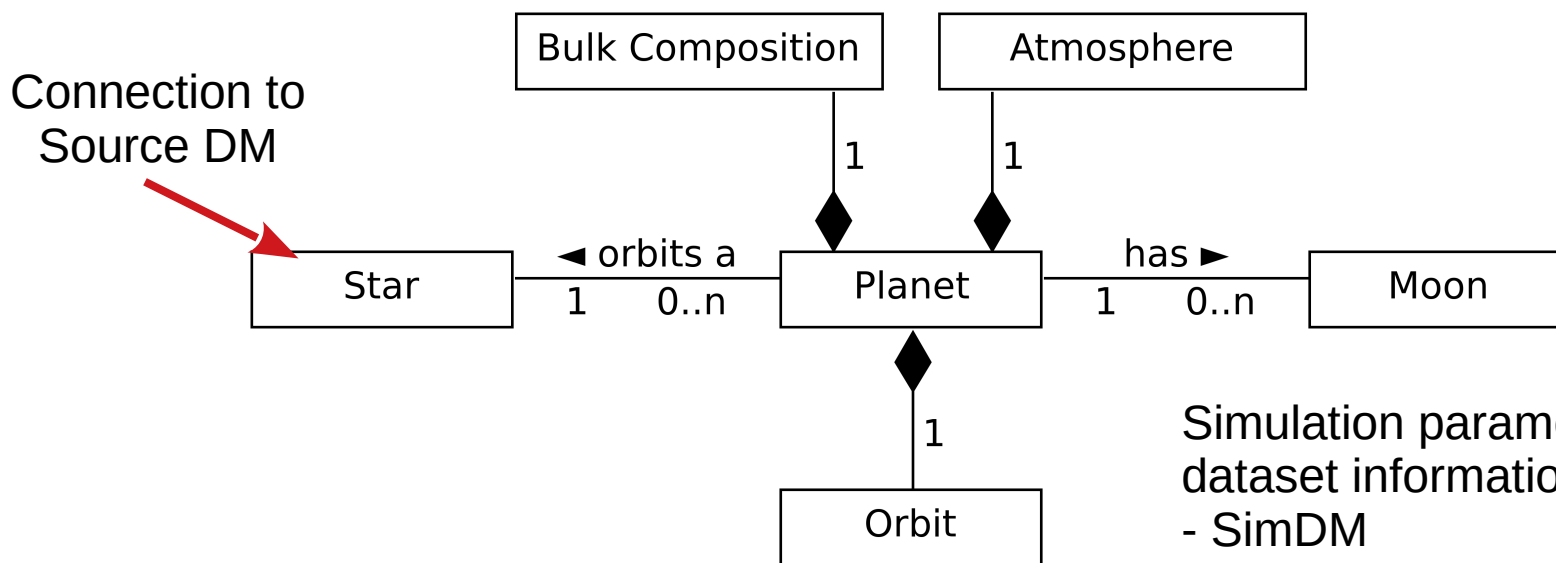
- Physical attendance
 - VO experts: Introducing VO modelling examples
 - GAPS members: requirements from observations, catalogues, ...
 - ARTECS representative: requirements from simulations
- Couldn't make it
 - ExoplAn3T developer
 - EuroPlaNet representative(s)

Requirements

- Time series of radial velocities to confirm and characterise exoplanetary systems
- Analysis of exoplanets catalogued data
- Simulations of planetary atmospheres to define habitability
- Radial velocity and photometric investigation of exoplanets
- Exoplanets atmospheres observations

- All of them have defined or hidden models for the produced or observed datasets

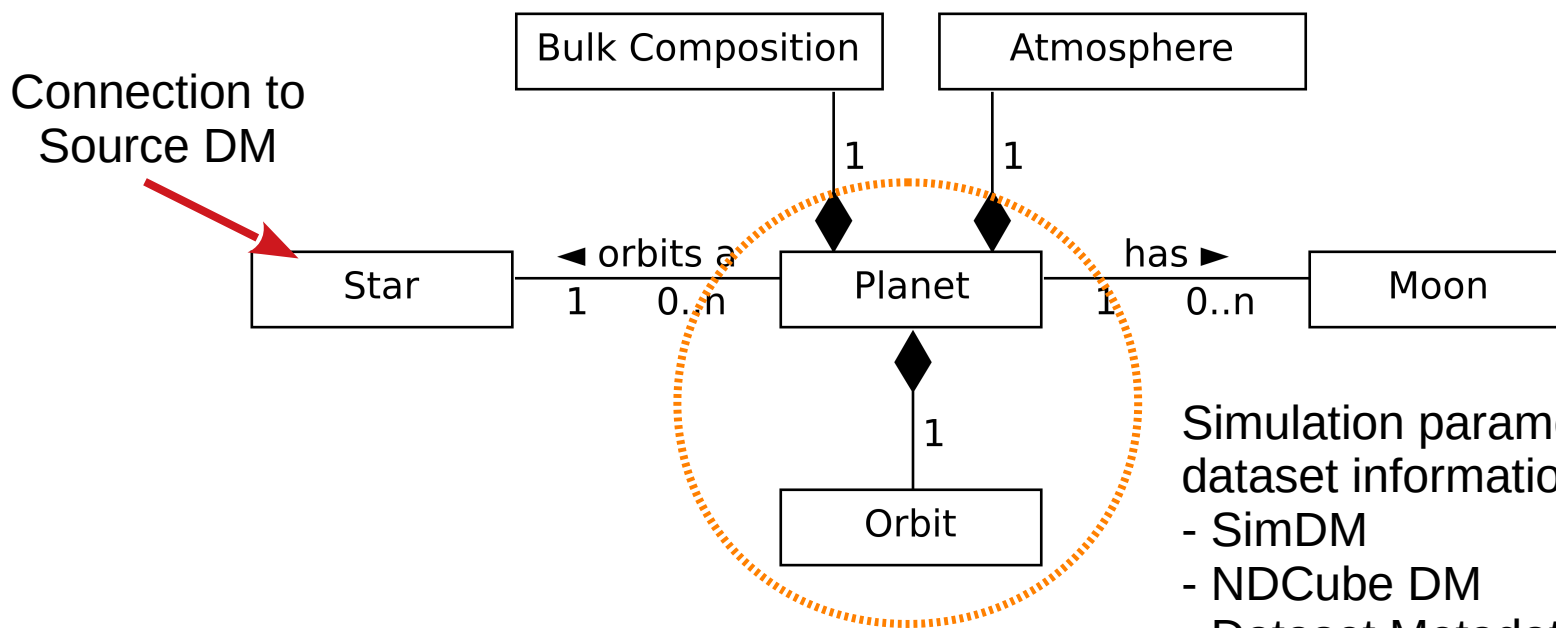
First attempt



Simulation parameters and dataset information part of

- SimDM
- NDCube DM
- Dataset Metadata DM

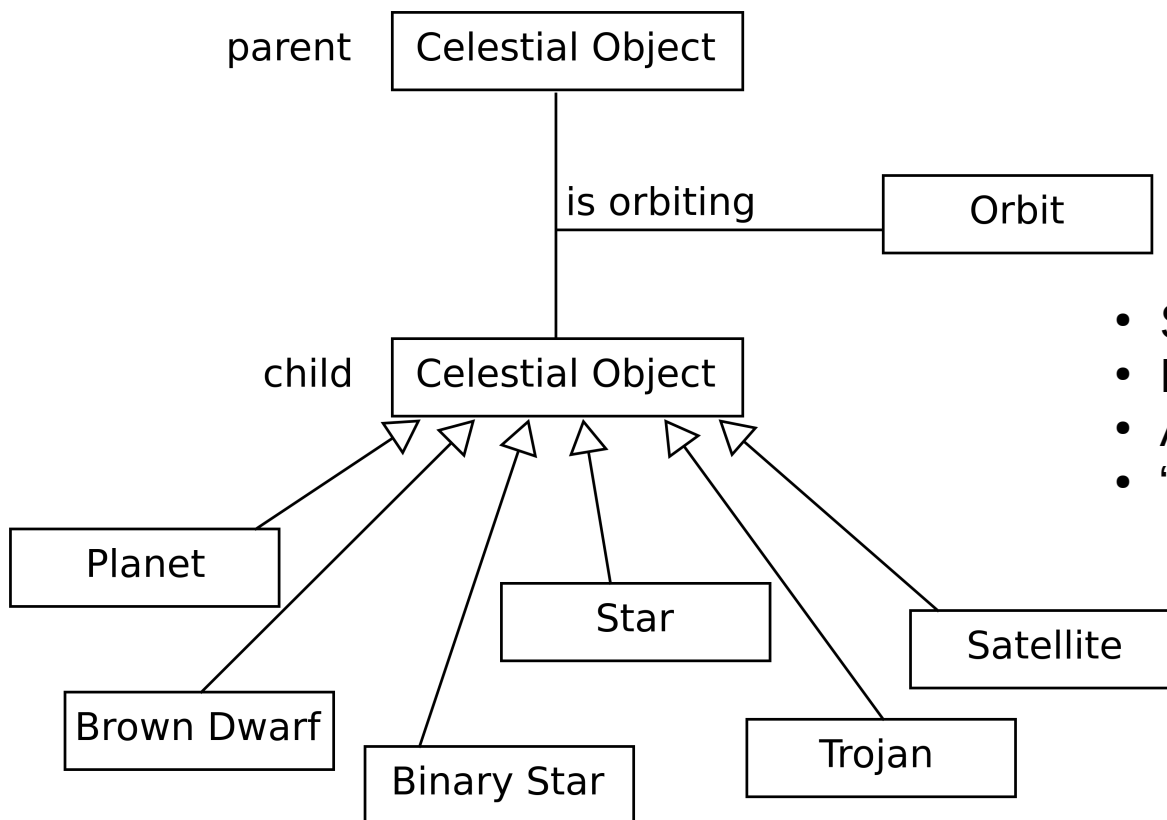
First attempt



Simulation parameters and dataset information part of

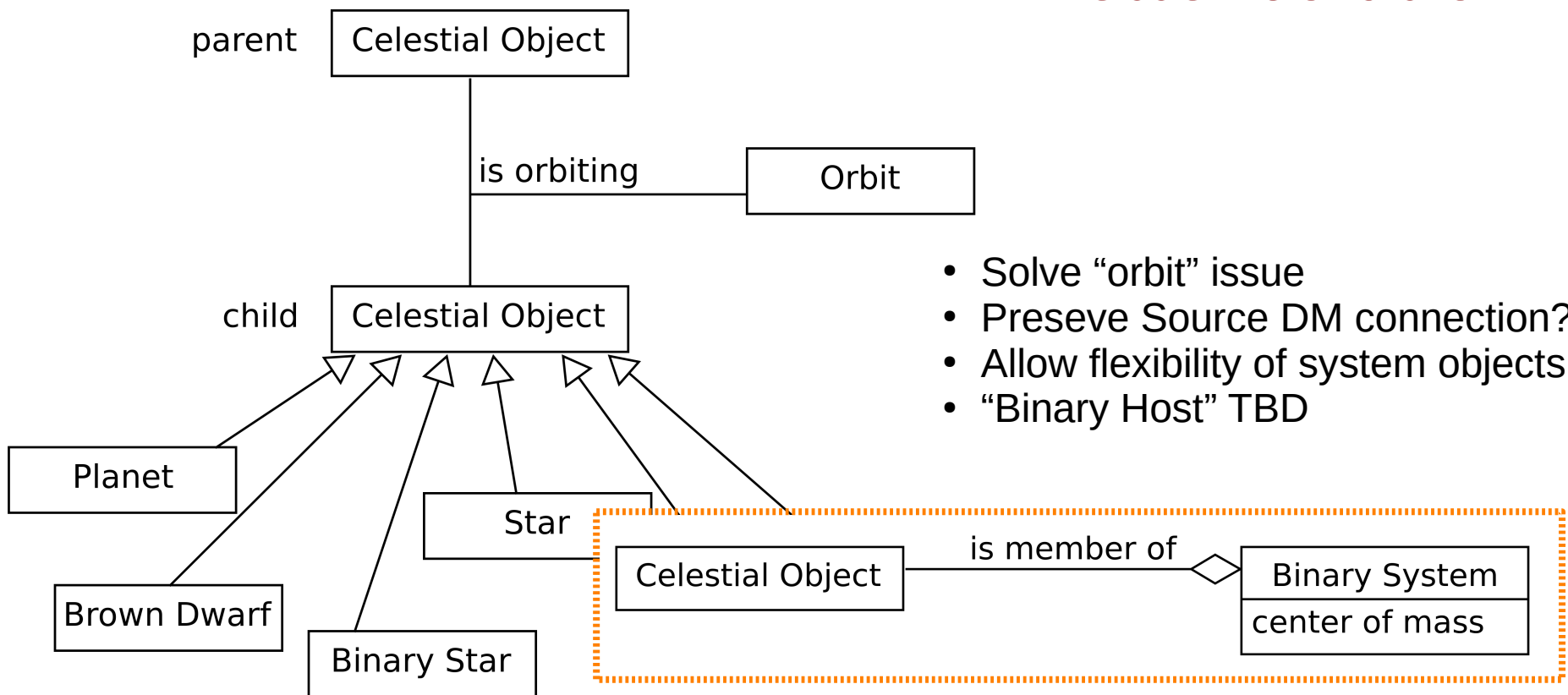
- SimDM
- NDCube DM
- Dataset Metadata DM

Better solution



- Solve “orbit” issue
- Preserve Source DM connection?
- Allow flexibility of system objects
- “Binary Host” TBD

Better solution



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Next steps ... (resources)

- Finalise serialization
 - Requires model annotations
- DataLink solution
 - Complete time series dataset description
 - Allow multi-format dataset access
- Register the resource and service(s)
 - May add a Cone Search
- Working on deploying a “merged catalogue” of exoplanets (more details in Paris)

Next steps ... (model)

- Grow community interested in the effort
 - Simbad managers, DM WG & SS IG at IVOA, others...
 - NASA Small Bodies Node
- Fill up the attributes of the various classes depicted
 - planet, star, satellite, a brown-dwarf, a group of trojans, ...
 - orbit, atmosphere of a planet
- Tighter connections with other models and modelling efforts
 - Source DM to have the stellar (planet? other?) components characterization
 - SimDM, TimeSeries, Data Cube, Dataset Metadata
- Work on further details in description and discovery
 - time resolution with respect to orbital completeness
 - resolution momentum
 - Multi-object attributes: e.g. orbit resonance
- Test implementation: discovery & access!

Thank you!

Eleonora Alei Serena Benatti Andrea Bignamini

François Bonnarel Riccardo Claudi

Mario Damasso Mireille Louys Michele Maris

Marco Molinaro Valerio Nascimbeni

