



# A Component and Association Based Model For Source Data

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and others VO members



# Why Doing a Source Model?

- **For the Science**

- Make sure that data, scientifically relevant for a particular use case, are well described.

- **To make sure that data sent by a service will be properly understood by the clients.**

- With a system of unambiguous annotations
- By enabling clients to understand these annotations
- By making sure that clients could take advantage of these annotations

The model design is not a goal in itself,  
it is just a (powerfull) tool



# Motivation for a Source Model

[J/A+A/532/A103/IC4665](#) [Photometry and proper motions in IC4665 \(Lodieu+, 2011\)](#)

2011A&A

*Post annotation*

Coordinates, photometry, proper motions, and physical parameters for IC4665 stars (*tables A1, B1 and C1 of paper*) (1533 rows)

[start AladinLite](#)

[plot the output](#)

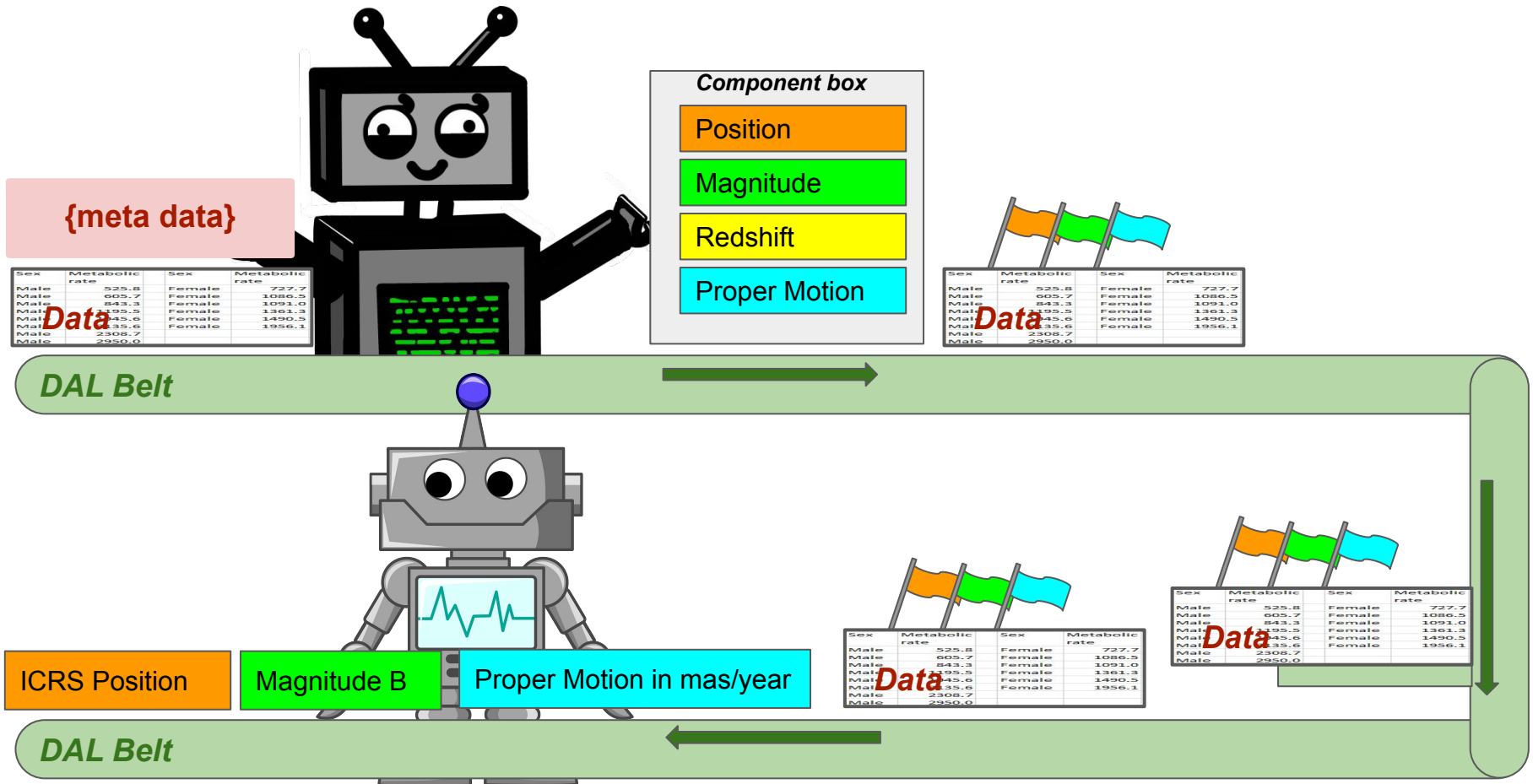
[query using TAP/SQL](#)

Full	<a href="#">RAJ2000</a> "h:m:s"	<a href="#">DEJ2000</a> "d:m:s"	Mm	Name	Zmag mag	Ymag mag	Jmag mag	Hmag mag	Kmag mag	pmRA mas/yr	pmDE mas/yr	logL [Lsun]	Mass Msun	GCS	Simbad	<a href="#">RAJ2000</a> "h:m:s"	<a href="#">DEJ2000</a> "d:m:s"
<a href="#">1</a>	<a href="#">17 42 05.9300</a>	<a href="#">+05 24 13.900</a>	C	<a href="#">174205.93+052413.9</a>	15.113	14.535	13.849	13.200	12.831	-1.80	-19.56	-1.29	0.448	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 05.93</a>	<a href="#">+05 24 13.9</a>
<a href="#">2</a>	<a href="#">17 42 06.0200</a>	<a href="#">+05 14 17.900</a>	C	<a href="#">174206.02+051417.9</a>	15.720	15.304	14.737	14.173	13.850	-56.48	24.63	-1.67	0.241	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 06.02</a>	<a href="#">+05 14 17.9</a>
<a href="#">3</a>	<a href="#">17 42 09.5800</a>	<a href="#">+05 21 12.600</a>	C	<a href="#">174209.58+052112.6</a>	15.693	15.200	14.587	13.944	13.615	-36.93	-34.57	-1.61	0.267	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 09.58</a>	<a href="#">+05 21 12.6</a>
<a href="#">4</a>	<a href="#">17 42 16.9500</a>	<a href="#">+05 26 51.300</a>	C	<a href="#">174216.95+052651.3</a>	15.670	15.269	14.676	14.082	13.761	-3.44	3.13	-1.65	0.251	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 16.95</a>	<a href="#">+05 26 51.3</a>
<a href="#">5</a>	<a href="#">17 42 17.7800</a>	<a href="#">+05 56 26.200</a>	C	<a href="#">174217.78+055626.2</a>	16.616	16.024	15.344	14.767	14.377	-25.95	-12.29	-1.93	0.160	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 17.78</a>	<a href="#">+05 56 26.2</a>
<a href="#">6</a>	<a href="#">17 42 18.0000</a>	<a href="#">+05 49 25.500</a>	C	<a href="#">174218.00+054925.5</a>	14.923	14.523	13.970	13.353	13.095	-8.36	4.92	-1.34	0.412	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 18.00</a>	<a href="#">+05 49 25.5</a>
<a href="#">7</a>	<a href="#">17 42 18.1900</a>	<a href="#">+05 53 53.300</a>	C	<a href="#">174218.19+055353.3</a>	17.047	16.495	15.845	15.246	14.900	17.51	-8.99	-2.14	0.115	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 18.19</a>	<a href="#">+05 53 53.3</a>
<a href="#">8</a>	<a href="#">17 42 20.2900</a>	<a href="#">+05 55 56.500</a>	C	<a href="#">174220.29+055556.5</a>	14.734	14.267	13.654	13.059	12.740	8.68	2.01	-1.21	0.508	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 20.29</a>	<a href="#">+05 55 56.5</a>
<a href="#">9</a>	<a href="#">17 42 20.7900</a>	<a href="#">+05 46 35.600</a>	C	<a href="#">174220.79+054635.6</a>	15.508	15.061	14.449	13.906	13.586	-27.37	-2.79	-1.55	0.293	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 20.79</a>	<a href="#">+05 46 35.6</a>
<a href="#">10</a>	<a href="#">17 42 21.0800</a>	<a href="#">+05 43 13.900</a>	C	<a href="#">174221.08+054313.9</a>	17.377	16.697	15.988	15.443	15.087	6.06	33.92	-2.20	0.104	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 21.08</a>	<a href="#">+05 43 13.9</a>
<a href="#">11</a>	<a href="#">17 42 23.5500</a>	<a href="#">+05 38 23.500</a>	C	<a href="#">174223.55+053823.5</a>	15.344	14.881	14.291	13.705	13.403	1.01	-31.80	-1.48	0.328	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 23.55</a>	<a href="#">+05 38 23.5</a>
<a href="#">12</a>	<a href="#">17 42 24.8900</a>	<a href="#">+05 06 06.100</a>	C	<a href="#">174224.89+050606.1</a>	16.389	15.827	15.163	14.587	14.272	0.98	-0.62	-1.85	0.181	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 24.89</a>	<a href="#">+05 06 06.1</a>
<a href="#">13</a>	<a href="#">17 42 25.4100</a>	<a href="#">+06 21 05.300</a>	C	<a href="#">174225.41+062105.3</a>	14.731	14.381	13.831	13.177	12.885	-4.17	4.60	-1.29	0.453	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 25.41</a>	<a href="#">+06 21 05.3</a>
<a href="#">14</a>	<a href="#">17 42 25.6900</a>	<a href="#">+05 29 47.200</a>	C	<a href="#">174225.69+052947.2</a>	16.944	16.476	15.847	15.208	14.889	10.33	10.36	-2.14	0.114	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 25.69</a>	<a href="#">+05 29 47.2</a>
<a href="#">15</a>	<a href="#">17 42 26.6000</a>	<a href="#">+06 22 19.800</a>	C	<a href="#">174226.60+062219.8</a>	14.758	14.378	13.873	13.210	12.946	0.05	-6.42	-1.30	0.440	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 26.60</a>	<a href="#">+06 22 19.8</a>
<a href="#">16</a>	<a href="#">17 42 26.9300</a>	<a href="#">+06 20 14.600</a>	C	<a href="#">174226.93+062014.6</a>	16.782	16.238	15.635	15.019	14.640	-4.73	11.58	-2.05	0.132	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 26.93</a>	<a href="#">+06 20 14.6</a>
<a href="#">17</a>	<a href="#">17 42 28.0300</a>	<a href="#">+05 26 40.700</a>	C	<a href="#">174228.03+052640.7</a>	14.683	14.311	13.740	13.129	12.833	4.01	21.98	-1.25	0.481	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 28.03</a>	<a href="#">+05 26 40.7</a>
<a href="#">18</a>	<a href="#">17 42 28.9300</a>	<a href="#">+05 54 53.800</a>	C	<a href="#">174228.93+055453.8</a>	17.691	17.048	16.427	15.888	15.495	28.31	79.04	-2.39	0.078	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 28.93</a>	<a href="#">+05 54 53.8</a>
<a href="#">19</a>	<a href="#">17 42 28.9400</a>	<a href="#">+06 20 28.000</a>	C	<a href="#">174228.94+062028.0</a>	15.234	14.810	14.260	13.592	13.286	2.95	7.72	-1.47	0.336	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 28.94</a>	<a href="#">+06 20 28.0</a>
<a href="#">20</a>	<a href="#">17 42 31.9100</a>	<a href="#">+06 18 49.500</a>	C	<a href="#">174231.91+061849.5</a>	14.560	14.139	13.606	12.988	12.679	-41.07	0.18	-1.19	0.524	<a href="#">GCS</a>	<a href="#">Simbad</a>	<a href="#">17 42 31.91</a>	<a href="#">+06 18 49.5</a>

How could a client process or even plot Position/Mags/PM/Mass entries of this catalog **without taking into consideration it comes from Vizier?**



# 2 Stakeholders: Data Provider/Consumer:



The model is so discreet in this diagram that one may wonder if it exists

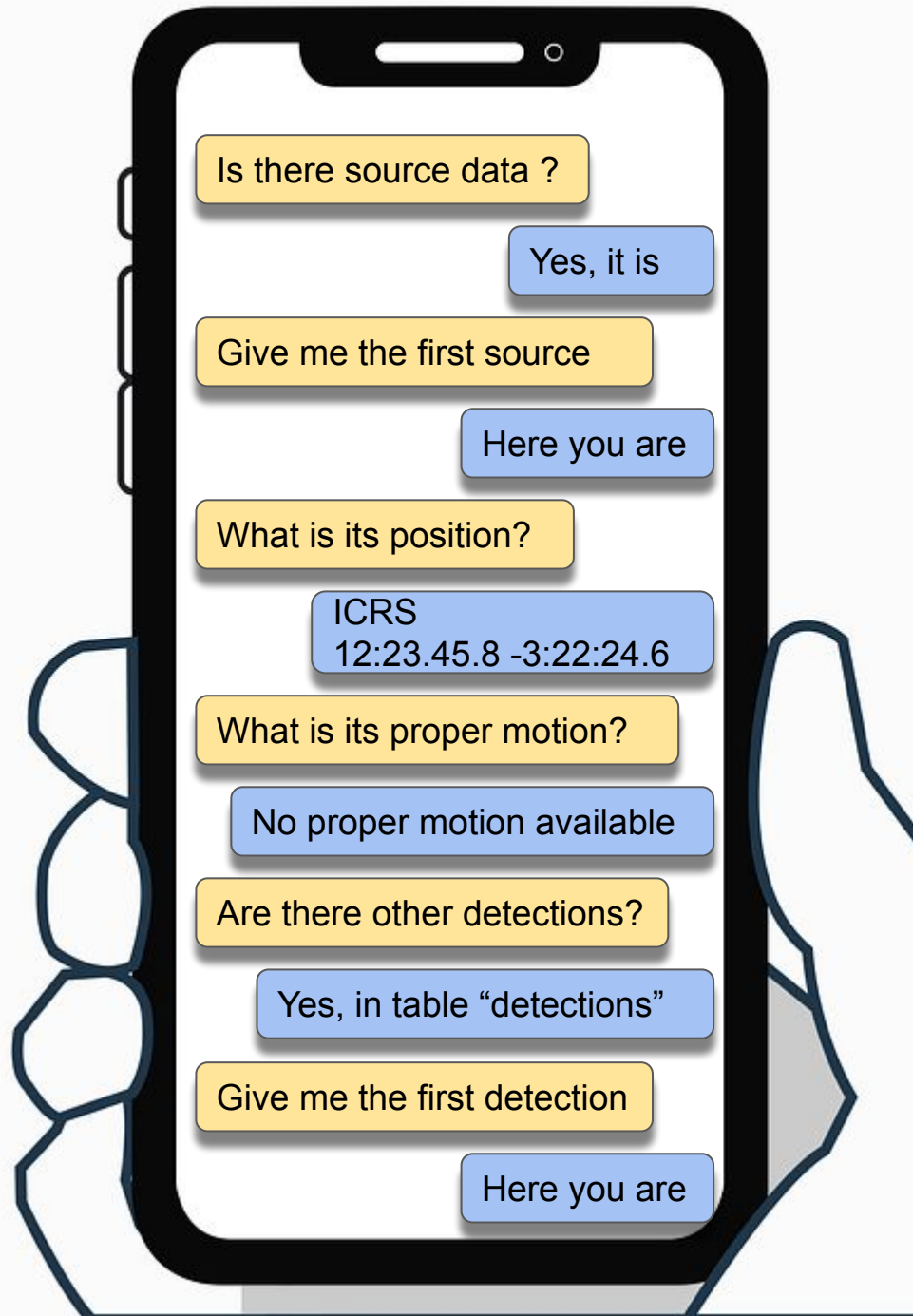
# Client Perspective

```
SourceDM — -bash — 80x24
MacBook-Pro-de-Laurent-MICHEL:SourceDM laurentmichel$

parser = Parser("My VoTable")
sources = parser.getInstanceSet("CABMSD");

while( sources.hasNext()
  source = sources.next()
  print(source.get("position"))
  print(source.get("mag.G"))

MacBook-Pro-de-Laurent-MICHEL:SourceDM laurentmichel$
```





# CAB-MSD Guideline

## We have to consider:

### 1. The annotation content

- a. Data modeling
  - i. Including the import of VO standards (Meas/Coord NDCube, semantic...)
- b. Serialization

### 2. The data annotation process

- a. Data provider point of view
- b. No hope to use the model as long as no data provider implements it

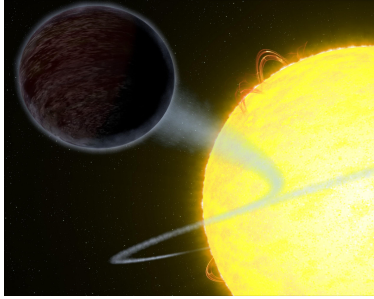
### 3. The annotated data processing

- a. Client developer point of view

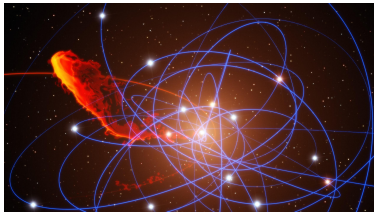
**All of these are parts of the CAB-MSD project**



# *The Model:* Object Types and Params



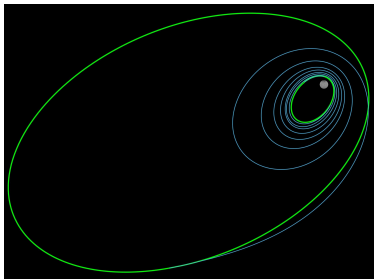
**Exoplanets**



**Orbiting stars**



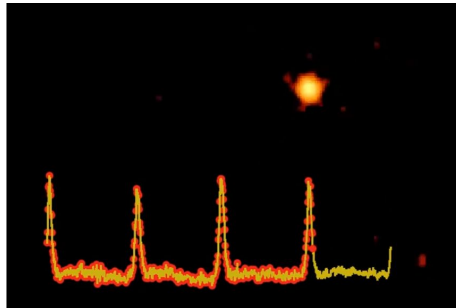
**Complex shaped objects**



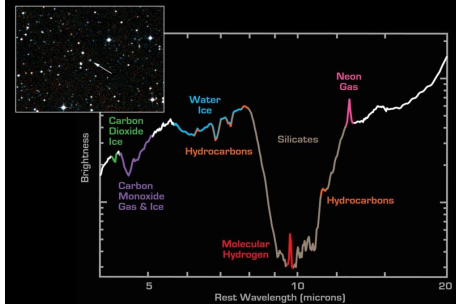
**Complex errors**



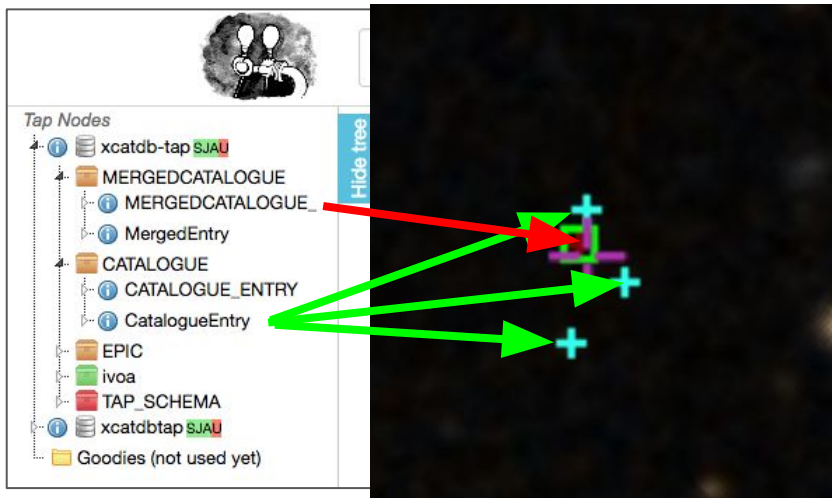
# The Model: Associated Data



Time Series



Spectrum



Multiple detections  
Correlations



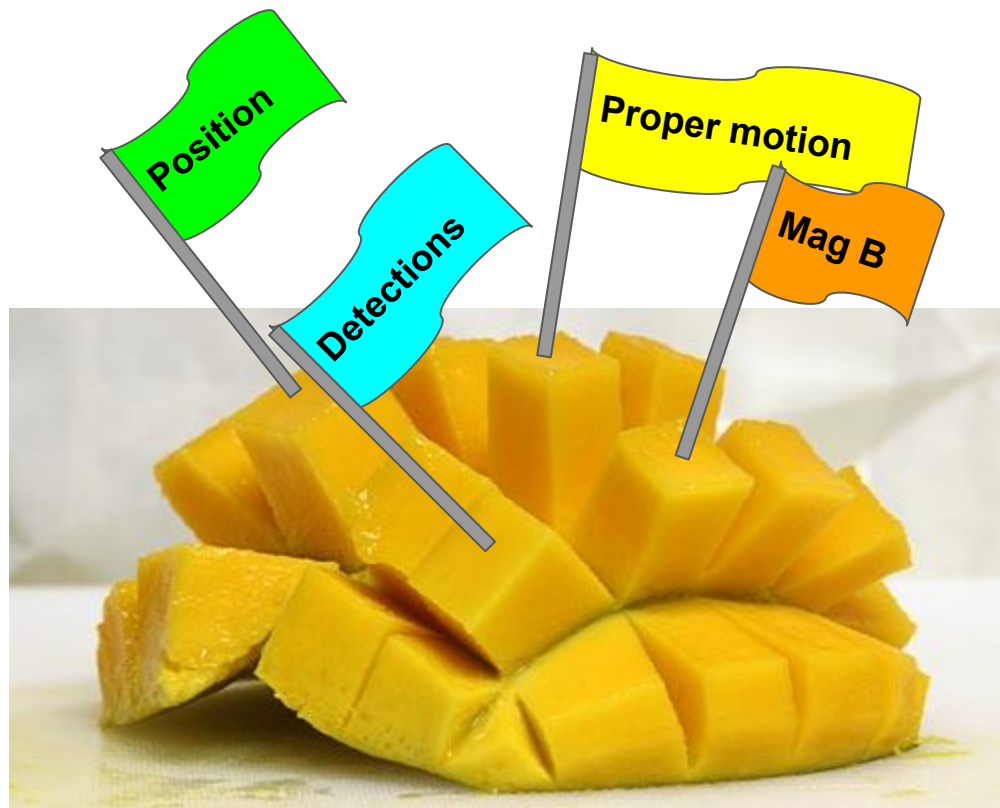


# The Model: The Fruity Version



## Source Data Model

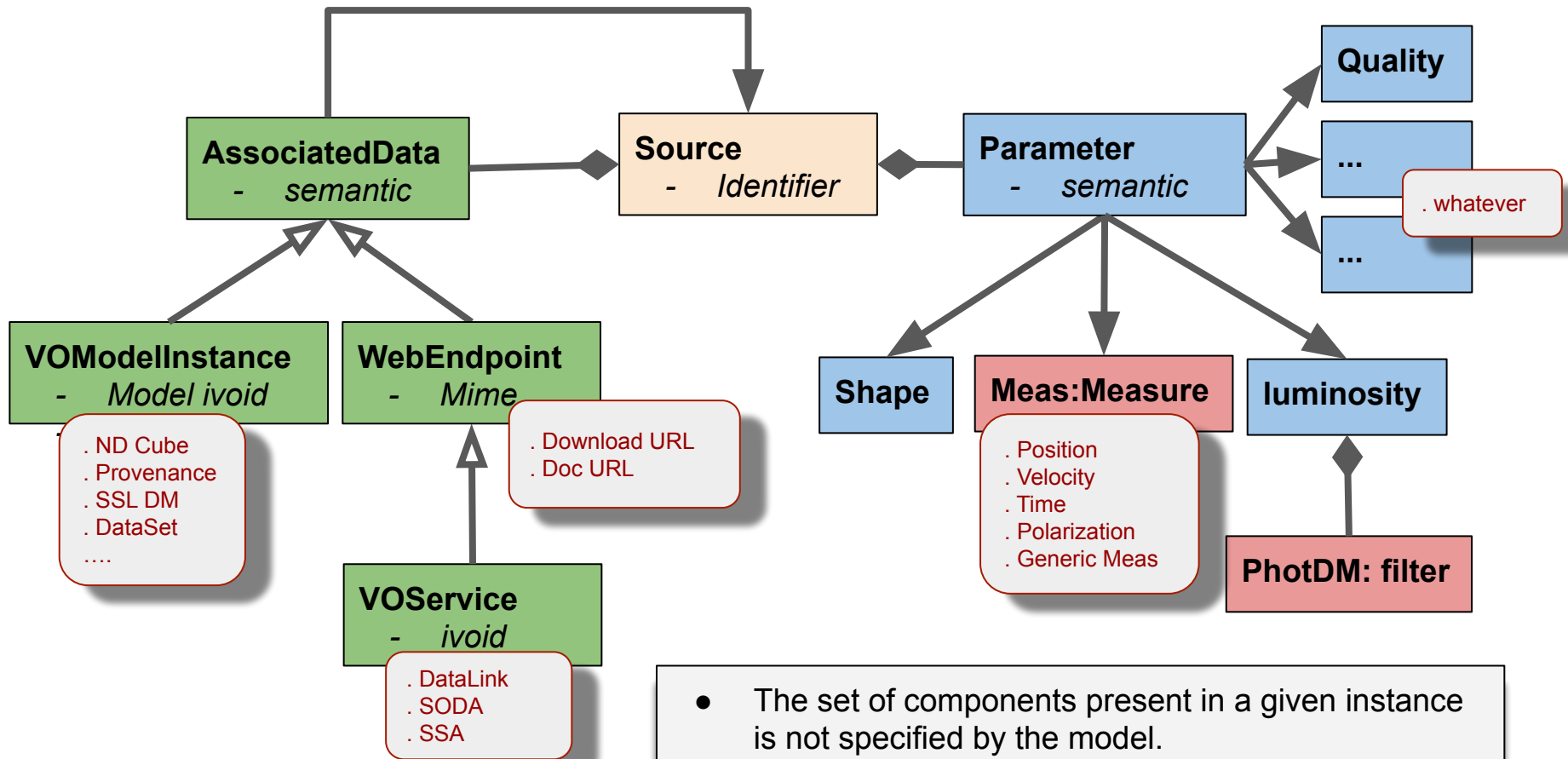
- Everything is well packed in a model instance



## Model for Source Data

- All available data can be discovered and retrieved in the model instance

# The Model: The UML Version

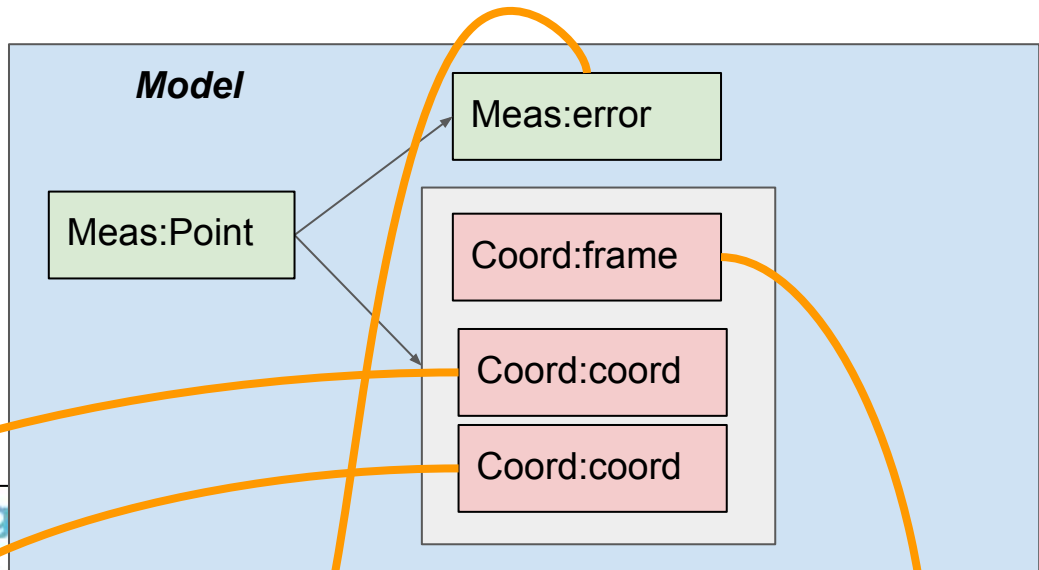


- The set of components present in a given instance is not specified by the model.
  - Components can be duplicated
    - E.g. multiple positions
  - They have to be discovered by the client
- The structure of individual component is given by the model

# Data Annotation: Bridge connecting model with Data



Bridge between data and model  
Must be able to set missing data



xcatdb-tap>MERGEDCATALOGUE>Merg

Show 5 entries

Showing 1 to 5 of 100 entries

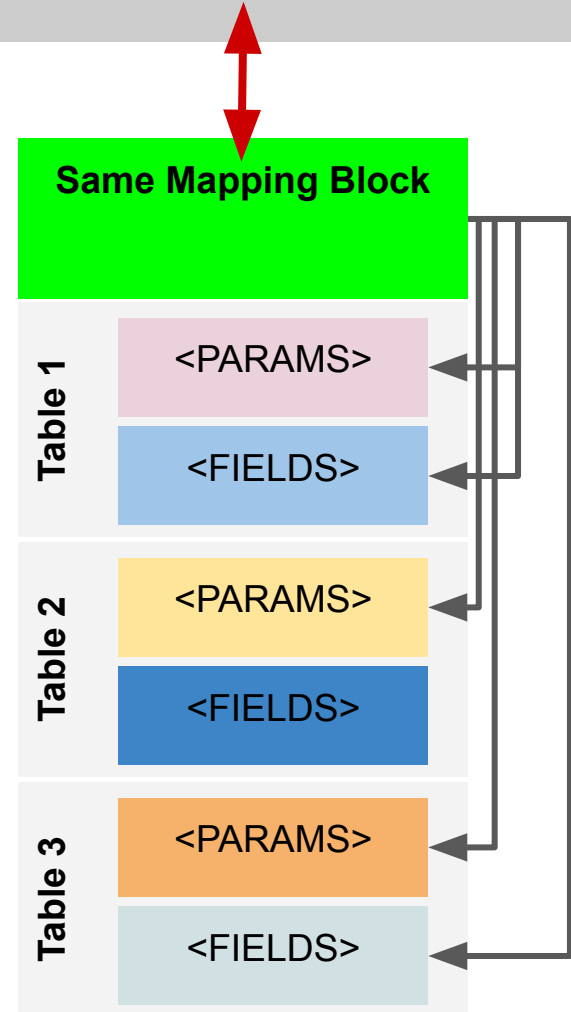
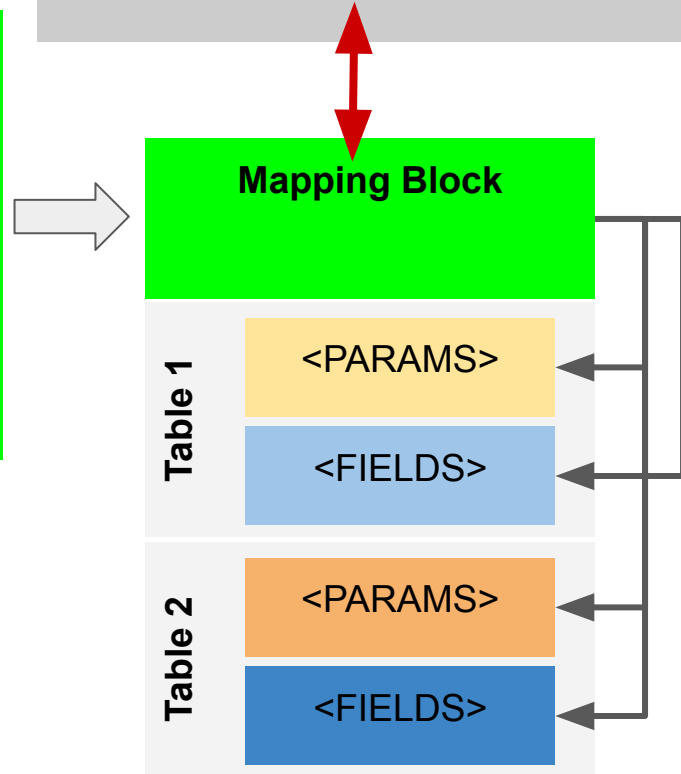
_iauname	_sc_ra	_sc_dec	_sc_poserr	_sc_ep_1_flux	_sc_ep_1_flux_err
3XMM J061628.5+223000	94.118827	22.500138	2	0	1
3XMM J061640.9+222438	94.170480	22.410767	5	6	6
3XMM J061704.2+090924	94.267916	9.1566678	1	0	1
3XMM J061706.7+224815	94.278027	22.804341	4	0	2
3XMM J061713.8+222914	94.307609	22.487336	1	0	6

?

## CAB-MSD Aware Client

- Only sees the mapping blocks
- Must be able to retrieve data just by querying the mapping block

VO-DML  
representation of the  
model(s)





# Mapping Process Overhead

- **Not Critical: Mission database**

- A few number of different products
- The source model mapping can be done once.

- **Critical: Archival Database (e.g. Vizier)**

- Huge number of different products
  - Daily updated
- Mapping a source model comes in addition to usual work
  - Must be done each time a new dataset is published
- Must be a lightweight task
  - By minimising the amount of meta-data to be mapped
  - By using small **reusable components**

- **Very Critical: TAP services**

- The possibility of automate the model mapping must be considered
  - This would be very useful for all VO stakeholders
- There is no concrete proposal yet but (some ideas anyway)
  - Avoid to use show stopper features: **modularity**

## ● Shy Annotations

- **#1:** Able to be ignored
  - Do not break working things
  - The parser implementation shouldn’t alter the existing code
  - The annotation implementation shouldn’t alter the original data
- **#2:** To provide what is still missing in VOTables
  - A clear indication of the nature of the VOTable content
- **#3:** Parser helper: Can be used at different levels
  - Just get the type of the VOTable content
  - Just the meta data
  - Just get column mapping
  - Get everything through the model

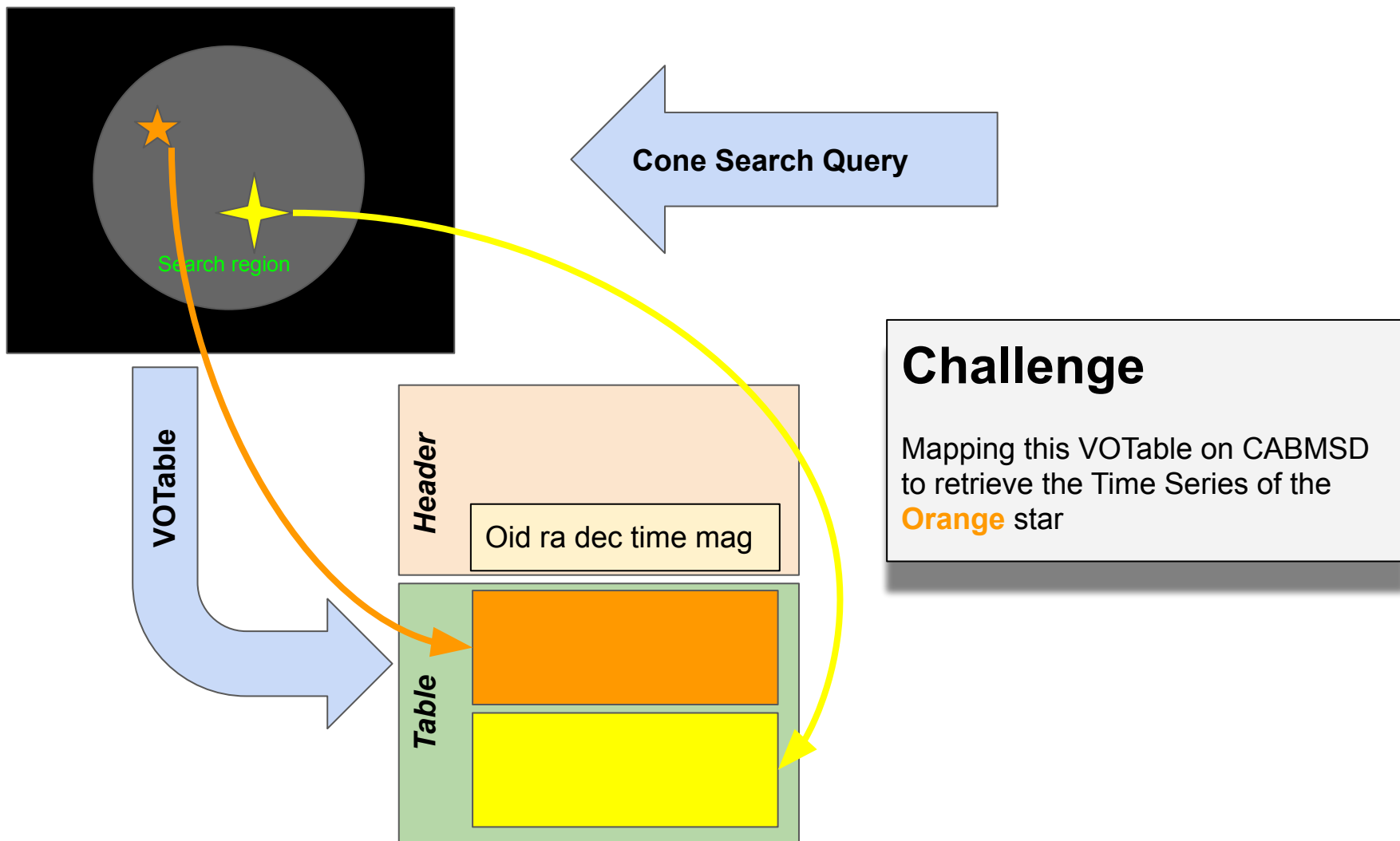
## 1. VO-DML mapping

- a. Mapping elements grouped outside of the data
- b. Model driven structure
- c. The mapping has its own schema
- d. Very chatty

**My Proposal:** Simplified syntax presented at College Park



# ZTF example







# ZTF Example: instantiated Components

[https://irsa.ipac.caltech.edu/docs/program\\_interface/ztf\\_lightcurve\\_api.html](https://irsa.ipac.caltech.edu/docs/program_interface/ztf_lightcurve_api.html)

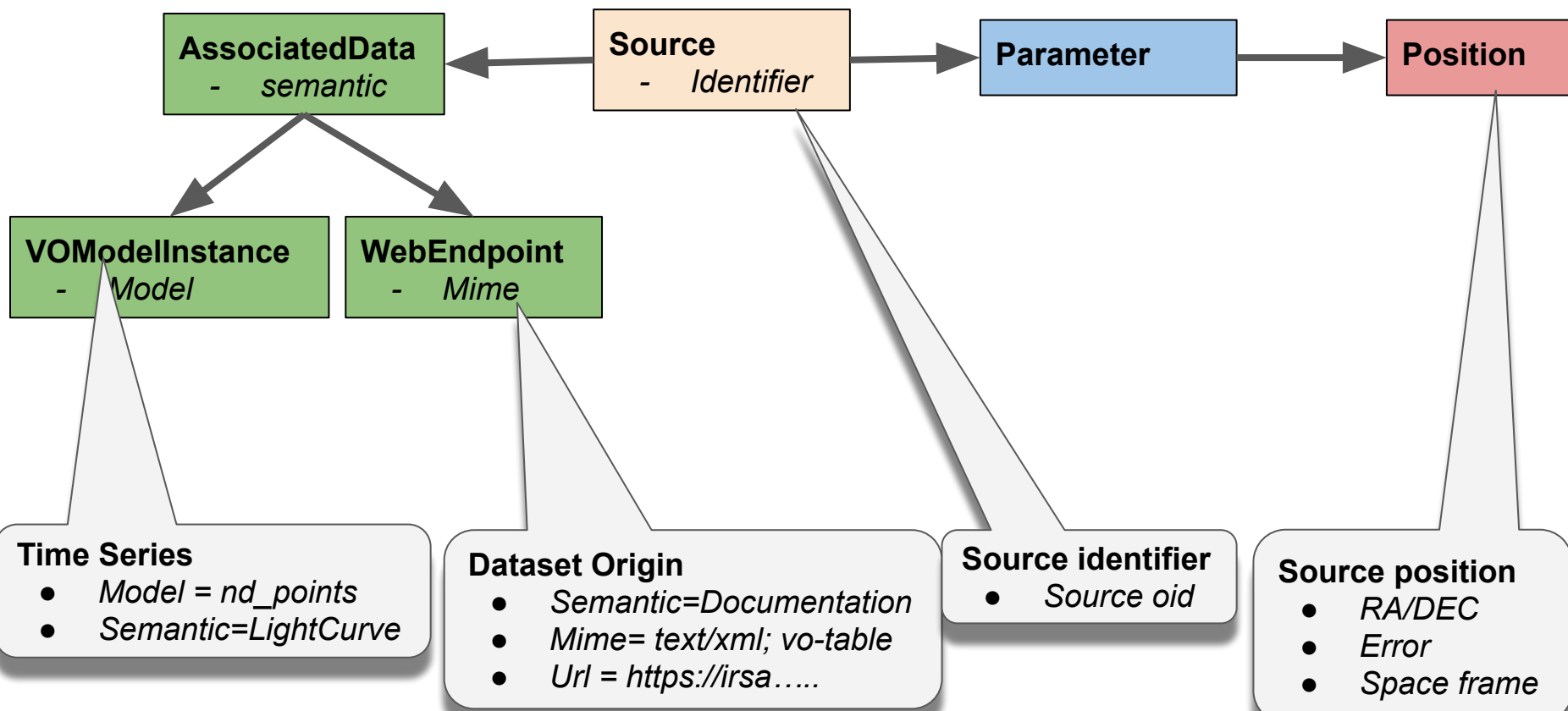
## Behind the scenes

Typically there are multiple lightcurves for a given source position. Lightcurves are tagged in the ZTF lightcurve files by object identifier. As mentioned above, lightcurves corresponding to specific identifiers may be retrieved using the ZTF-LC-API via the ID parameter. Alternatively, this API also supports the retrieval of all lightcurves meeting positional and other constraints. When such constraints are supplied, a preliminary TAP query extracts the identifiers of all objects meeting those constraints from the ZTF objects table. Lightcurves corresponding to these identifiers are then retrieved from the ZTF lightcurve collection.

## Sample queries

- Obtain the available g-band lightcurves within 5 arcsec of a source position:

[https://irsa.ipac.caltech.edu/cgi-bin/ZTF/nph\\_light\\_curves?POS=CIRCLE 298.0025 29.87147 0.0014&BANDNAME=g](https://irsa.ipac.caltech.edu/cgi-bin/ZTF/nph_light_curves?POS=CIRCLE 298.0025 29.87147 0.0014&BANDNAME=g)



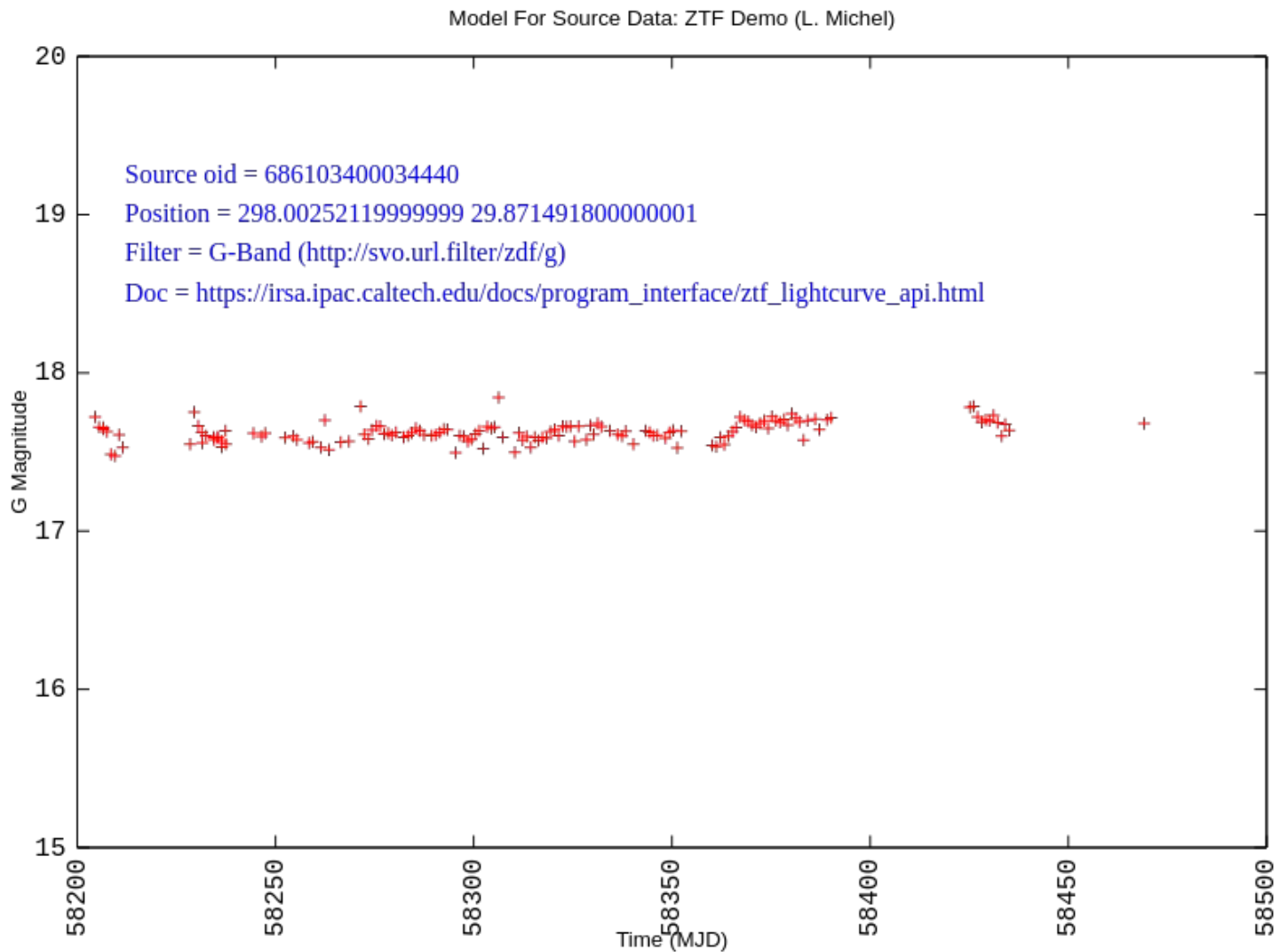


# TS MappingPYTHON API Snippet

```
<INSTANCE dmrole="nd_point:point" dmttype="nd_point:Point">
  <FILTER key="oid" value="686103400034440" />
  <!--
    Time Stamp : MJD supported CAB-MSD s
  -->
  <INSTANCE dmrole="nd_point:TimeStamp" dmttype="coords:MJD">
    <INSTANCE dmrole="nd_point:TimeStamp.date" dmttype="ivoa:RealQuantity">
      <VALUE dmrole="ivoa:Quantity.unit" dmttype="ivoa:Unit" value="d"/>
      <!-- fields have no ID: let's take their names as identifiers -->
      <VALUE dmrole="ivoa:RealQuantity.value" dmttype="ivoa:real" ref="mjd" />
      <INSTANCE dmrole="coords:Coordinate.frame" ref="TimeFrame_TT_BARY"/>
    </INSTANCE>
  </INSTANCE>
  <!--
    Mag : The band is given by the filter
  -->
  <INSTANCE dmrole="nd_point:Mag" dmttype="nd_point:Mag">
    <INSTANCE dmrole="nd_point:Mag.coord" dmttype="nd_point:Coord">
      <VALUE dmrole="nd_point:mag.value" dmttype="ivoa:real" ref="mag" />
      <INSTANCE dmrole="nd_point:Mag.frame" ref="Filter_G"/>
    </INSTANCE>
    <COMPOSITION dmrole="meas:Measure.error" size="1">
      <INSTANCE dmrole="meas:Measure.error" ref="magerr"/>
    </COMPOSITION>
  </INSTANCE>
</INSTANCE>
```



# ZTF Example: GNUPlot Output





# Moving Ahead: Roadmap

- **Assess the interest of the community for CAB-MSD**
- **Model**
  - Distribute use case requirements over imported model components and CABMSD classes
- **Data annotation**
  - Define the schema of the mapping syntax
  - Assess mapping methods with data providers (including TAP)
- **Client side**
  - Define a language-agnostic API (à la Xpath?)
  - Develop a AstroPy module
  - Develop a Java client
- **Start with a end to end implementation of selected cases**
- **Go in PR**



# Pointers

- **Note:**

- <https://github.com/lmichel/Model-For-Source-Data/>

- **ZTF Demo**

- <https://github.com/lmichel/vodml-lite-mapping>
- <https://github.com/lmichel/vodml-lite-mapping/tree/master/src/test/java/test/xml>

- **Wiki Page**

- <https://wiki.ivoa.net/twiki/bin/view/IVOA/SourceCatalogs>





**Do not read ahead....**



# Moving Ahead: One Big Open Question

- **Which protocol could carry CAB-MSD instances?**
  - The best (only) candidate is TAP
  - How annotate TAP responses now?
- **Is it possible to do more than a simple demonstrator?**
  - We could start with a few Vizier tables
  - And after?
  - Exercise with a specific TAP service?



# PYTHON API Snippet

```
* Extract the source measurements[]
public void exploreDataSet() throws Exception{
    MappingElement dataSet = this.liteMappingParser.getFirstNodeWithRole("cab-msd:Source.identifier");
    this.cabmsdReport.sourceId = dataSet.getStringValue();
    dataSet = this.liteMappingParser.getFirstNodeWithRole("meas:EquatorialPosition.ra");
    this.cabmsdReport.ra = dataSet.getSubelementsByRole(IVOA_REAL_QUANTITY_VALUE).get(0).getStringValue();
    dataSet = this.liteMappingParser.getFirstNodeWithRole("meas:EquatorialPosition.dec");
    this.cabmsdReport.dec = dataSet.getSubelementsByRole(IVOA_REAL_QUANTITY_VALUE).get(0).getStringValue();

    this.cabmsdReport.docURL = this.liteMappingParser.getFirstNodeWithRole("cab-msd:WebUrl.url").getStringValue();
}

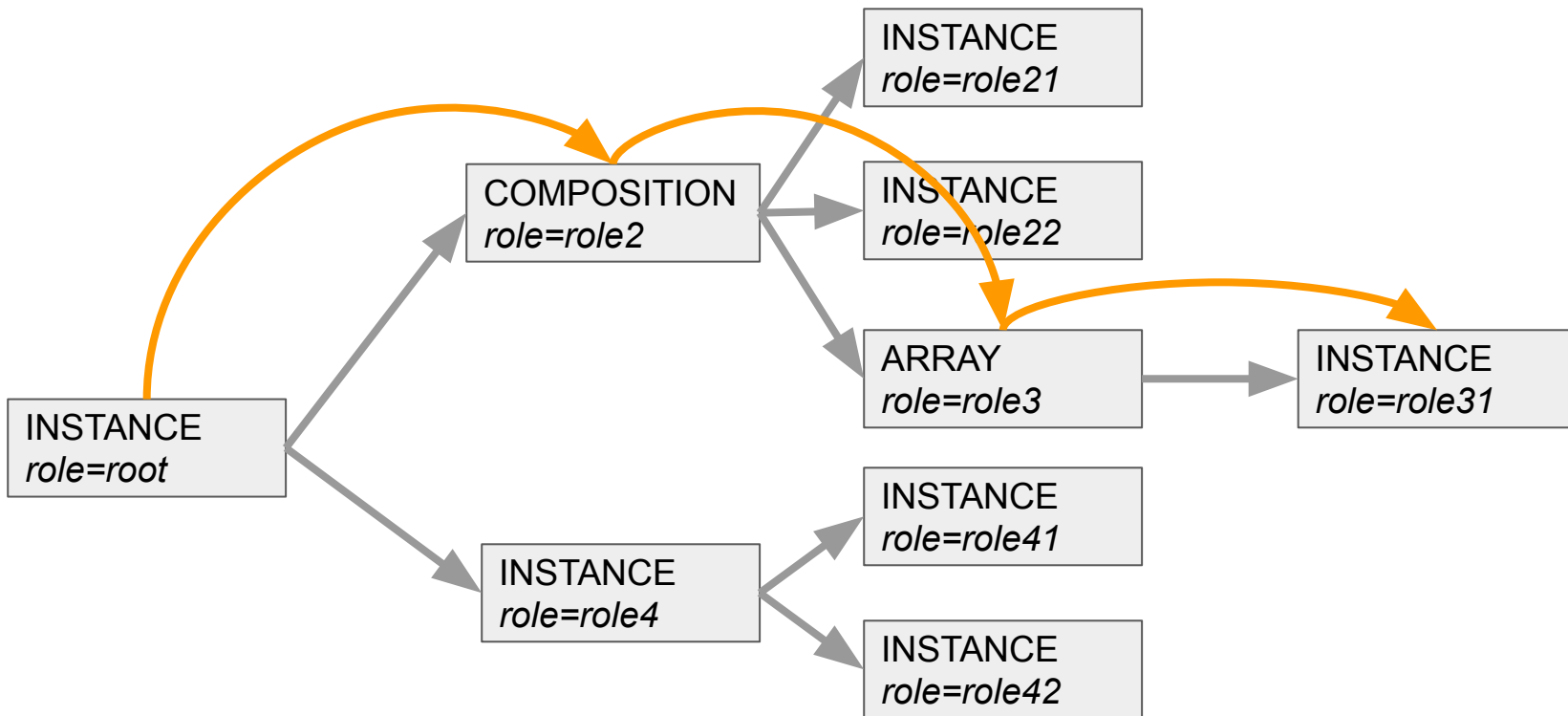
* Extract the magnitude filter[]
public void exploreFilters() throws Exception{
    MappingElement dataSet = this.liteMappingParser.getFirstNodeWithRole("cab-msd:FilterUrl");
    this.cabmsdReport.filterUrl = dataSet.getStringValue();
    dataSet = this.liteMappingParser.getFirstNodeWithRole("cab-msd:Filter.name");
    this.cabmsdReport.filterName = dataSet.getStringValue();
}

* Extract the time series[]
public void exploreData() throws Exception{
    MappingElement pointArray = this.liteMappingParser.getFirstNodeWithRole("nd_point:points");
    this.cabmsdReport.nbPoints = pointArray.getLength();
    this.cabmsdReport.columnMapping = pointArray.getColumnRoles();
    for( int i=0 ; i<this.cabmsdReport.nbPoints ; i++){
        MappingElement row = pointArray.getContentElement(i);
        this.cabmsdReport.points.add(
            new Point(
                row.getSubelementsByRole(IVOA_REAL_QUANTITY_VALUE).get(0).getStringValue(),
                row.getSubelementsByRole("nd_point:mag.value").get(0).getStringValue()
            )
        );
    }
}
```





# The Mapping DOM



Parser dom

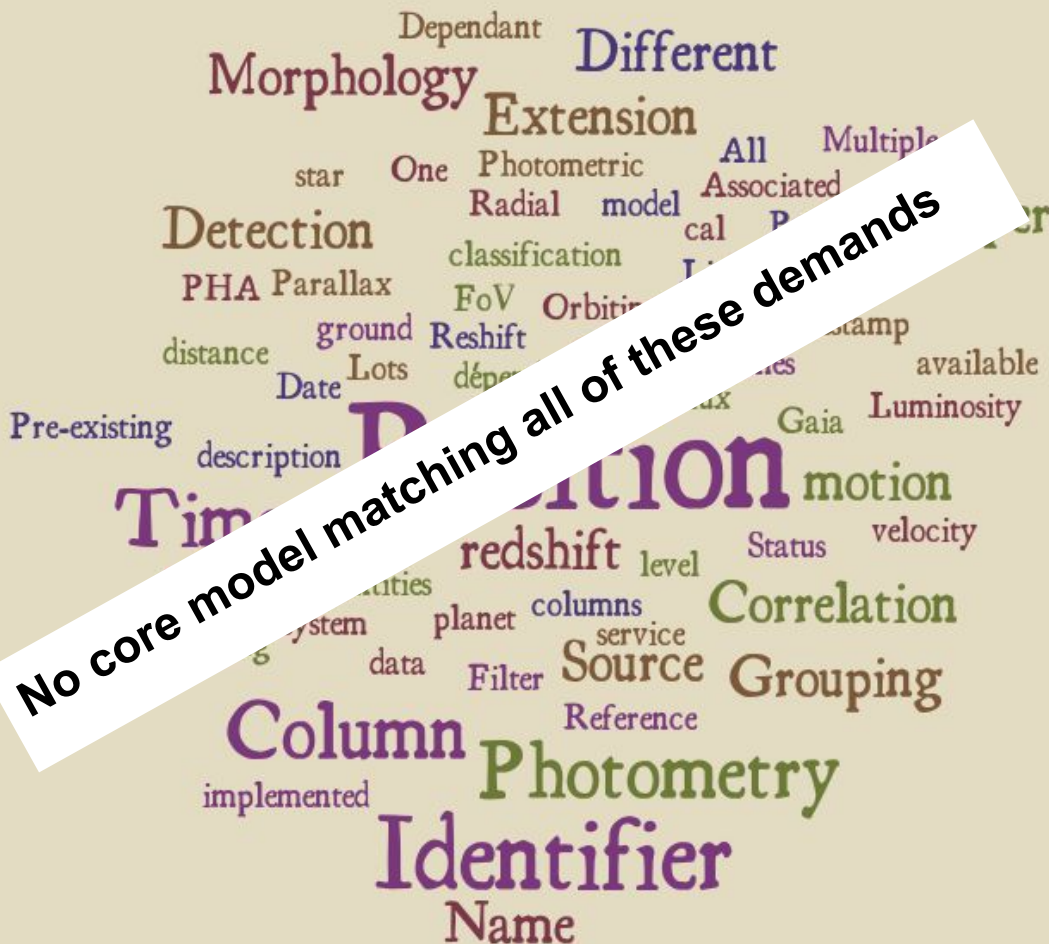
What the client does

```
Node (role=role31) = Node (role=root)  
->Node (role=role2)  
->Node (role=role3)  
->Node (role=role31)
```



# Paris Outcome

No core model matching all of these demands





# ZTF Example: Ass. data#2: T.S. origin

```
<INSTANCE dmrole="cab-msd:link" dmttype="cab-msd:VoInstance">
  <VALUE dmrole="cab-msd:link.semantic" value="LightCurve"/>
  <VALUE dmrole="cab-msd:VoInstance.model" value="nd_point"/>
  <INSTANCE dmrole="cab-msd:VoInstance.Instance"/>
  <!--
    ARRAY: One instance of cab-msd:VoInstance per DATATABLE row
  -->
  <ARRAY dmrole="nd_point:TimeSeries.points">
    <!--
      set of measurements defined by the LightCurve model (time-stamp + mag)
    -->
    <INSTANCE dmrole="nd_point:TimeSeries.point" dmttype="nd_point:Point">
      <FILTER key="oid" value="686103400034440" />
      <!--
        Time Stamp : HJD not defined in STC, let's suppose that CAB-MSD supports it
      -->
      <INSTANCE dmrole="nd_point:TimeStamp" dmttype="cab-msd:HJD">
        <INSTANCE dmrole="nd_point:TimeStamp.date" dmttype="ivoa:RealQuantity">
          <VALUE dmrole="ivoa:Quantity.unit" dmttype="ivoa:Unit" value="d"/>
          <!-- fields have no ID: let's take their names as identifiers -->
          <VALUE dmrole="ivoa:RealQuantity.value" dmttype="ivoa:real" ref="hjd" />
        </INSTANCE>
        <INSTANCE dmrole="meas:Time.coord" dmttype="coords:TimeStamp">
          <INSTANCE dmrole="coords:Coordinate.frame" ref="TimeFrame_TT"/>
        </INSTANCE>
        <COMPOSITION dmrole="meas:Measure.error" size="1">
          <INSTANCE dmrole="meas:Measure.error" dmttype="meas:Error" >
            <INSTANCE dmrole="meas:Error.ranError" dmttype="meas:Symmetrical">
              <INSTANCE dmrole="meas:Symmetrical.radius" dmttype="ivoa:RealQuantity">
                <VALUE dmrole="ivoa:Quantity.unit" dmttype="ivoa:Unit" value="sec"/>
                <VALUE dmrole="ivoa:RealQuantity.value" dmttype="ivoa:real" value="1"/>
              </INSTANCE>
            </INSTANCE>
          </INSTANCE>
        </COMPOSITION>
      </INSTANCE>
      <!--
        Mag : the band is given by the filter
      -->
      <INSTANCE dmrole="root" dmttype="nd_point:Mag">
        <INSTANCE dmrole="nd_point:Mag.coord" dmttype="nd_point:Mag">
          <VALUE dmrole="nd_point:mag.value" dmttype="ivoa:real" ref="mag" />
          <INSTANCE dmrole="nd_point:Mag.frame" ref="Filter_G"/>
        </INSTANCE>
        <COMPOSITION dmrole="meas:Measure.error" size="1">
          <INSTANCE dmrole="meas:Measure.error" ref="magerr"/>
        </COMPOSITION>
      </INSTANCE>
    </ARRAY>
  </INSTANCE>
```



# ZTF Example: Retrieving Data

```
/**
 * Parse the file and build the mapping maps
 * @throws Exception
 */
private void initParser() throws Exception {
    URL url = ZdfExplorer.class.getResource(VOTABLE_RESOURCE);
    String sampleName = url.getFile();
    liteMappingParser = new LiteMappingParser(sampleName);
}

/**
 * Extract the source measurements
 * @throws Exception
 */
public void exploreDataSet() throws Exception{
    MappingElement dataSet = this.liteMappingParser.getFirstNodeWithRole("cab-msd:Source.identifier");
    this.zdfTimeSeriesReport.sourceId = dataSet.getStringValue();
    dataSet = this.liteMappingParser.getFirstNodeWithRole("meas:EquatorialPosition.ra");
    this.zdfTimeSeriesReport.ra = dataSet.getSubelementsByRole(REAL_VALUE).get(0).getStringValue();
    dataSet = this.liteMappingParser.getFirstNodeWithRole("meas:EquatorialPosition.dec");
    this.zdfTimeSeriesReport.dec = dataSet.getSubelementsByRole(REAL_VALUE).get(0).getStringValue();
}

/**
 * Extract the magnitude filter
 * @throws Exception
 */
public void exploreFilters() throws Exception{
    MappingElement dataSet = this.liteMappingParser.getFirstNodeWithRole("cab-msd:FilterUrl");
    this.zdfTimeSeriesReport.filterUrl = dataSet.getStringValue();
    dataSet = this.liteMappingParser.getFirstNodeWithRole("cab-msd:Filter.name");
    this.zdfTimeSeriesReport.filterName = dataSet.getStringValue();
}

/**
 * Extract the time series
 * @throws Exception
 */
public void exploreData() throws Exception{
    MappingElement pointArray = this.liteMappingParser.getFirstNodeWithRole("nd_point:TimeSeries.points");
    this.zdfTimeSeriesReport.nbPoints = pointArray.getLength();
    this.zdfTimeSeriesReport.columnMapping = pointArray.getColumnRoles();
    for( int i=0 ; i<this.zdfTimeSeriesReport.nbPoints ; i++){
        MappingElement row = pointArray.getContentElement(i);
        this.zdfTimeSeriesReport.points.add(
            new Point(
                row.getSubelementsByRole(REAL_VALUE).get(0).getStringValue(),
                row.getSubelementsByRole("nd_point:mag.value").get(0).getStringValue()
            )
        );
    }
}
```



# *The Model: The guideline*

- **What we do not need**

- *“This is a VO compliant source instance, make your business with it.”*

- **What do we need**

- *“Here is a **set of data** attached to this **table row**, **help yourself**”*

**The definition of what is a source is too much dependant from each use case to build a common model**

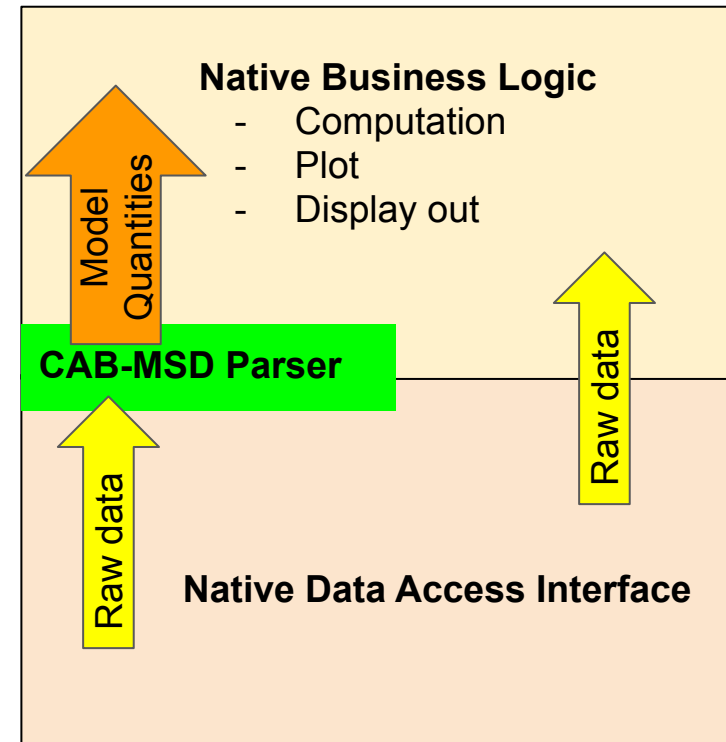


# Inserting mapping parser in existing code

**The parser code must be independent of any peculiar model**

**It must be able to retrieve individual quantities on demand**

**It must be designed in such a way it can be inserted in existing applications without breaking anything**



# Mapping Snippets Process

- mapping\_components
- EquatorialPosition.xml
- GenericCoordFrame.xml
- GenericMeasure.xml
- SpaceFrame\_ICRS.xml
- SymmetricalError.xml
- Time.xml
- TimeFrame\_TT.xml
- zdr\_annotated.xml

```
<INSTANCE dmrole="@@@@@@" dmtype="meas:EquatorialPosition">
  <COLLECTION size="-1">
    <INSTANCE dmrole="meas:Measure.error" dmtype="meas:Error" ref="SymmetricalError"/>
  </COLLECTION>
  <INSTANCE dmrole="meas:EquatorialPosition.dec" dmtype="coords:Latitude">
    <INSTANCE dmrole="coords:Coordinate.frame" ref="SpaceFrame_ICRS"/>
    <INSTANCE dmrole="coords:SpaceCoord.cval" dmtype="ivoa:RealQuantity">
      <VALUE dmrole="ivoa:Quantity.unit" dmtype="ivoa:Unit" ref="@@@@@@"/>
      <VALUE dmrole="ivoa:RealQuantity.value" dmtype="ivoa:real" ref="@@@@@@"/>
    </INSTANCE>
  </INSTANCE>
  <INSTANCE dmrole="meas:EquatorialPosition.ra" dmtype="coords:Longitude">
    <INSTANCE dmrole="coords:Coordinate.frame" ref="SpaceFrame_ICRS"/>
    <INSTANCE dmrole="coords:SpaceCoord.cval" dmtype="ivoa:RealQuantity">
```

```
<INSTANCE dmrole="root" dmtype="coords:TimeFrame" ID="TimeFrame_TT">
  <INSTANCE dmrole="coords:TimeFrame.refPosition" dmtype="coords:StdRefLocation">
    <VALUE value="HELIOCENTRIC" dmrole="coords:StdRefLocation.position" dmtype="ivoa:string" ref="@@@@@@"/>
  </INSTANCE>
  <VALUE value="TT" dmrole="coords:TimeFrame.timescale" dmtype="ivoa:string" ref="@@@@@@"/>
</INSTANCE>
```

```
<INSTANCE dmrole="root" dmtype="meas:Time">
  <INSTANCE abstr="true" dmrole="meas:Time.coord" dmtype="coords:TimeStamp">
    <INSTANCE dmrole="coords:Coordinate.frame" ref="TimeFrame_TT"/>
  </INSTANCE>
  <COLLECTION size="-1">
    <INSTANCE dmrole="meas:Measure.error" ref="SymmetricalError"/>
  </COLLECTION>
</INSTANCE>
```

```
<INSTANCE dmrole="root" dmtype="coords:SpaceFrame" ID="SpaceFrame_ICRS">
  <VALUE value="J2000" dmrole="coords:SpaceFrame.equinox" dmtype="coords:Epoch" ref="@@@@@@"/>
  <VALUE dmrole="coords:SpaceFrame.planetaryEphem" dmtype="ivoa:string" ref="@@@@@@"/>
  <VALUE value="ICRS" dmrole="coords:SpaceFrame.spaceRefFrame" dmtype="ivoa:string" ref="@@@@@@"/>
  <INSTANCE dmrole="coords:SpaceFrame.refPosition" dmtype="coords:StdRefLocation">
    <VALUE value="GEOCENTER" dmrole="coords:StdRefLocation.position" dmtype="ivoa:string" ref="@@@@@@"/>
  </INSTANCE>
</INSTANCE>
```

To be Checked and Completed



# *The model:* Appropriate description level

## 1. Just saying what data are

- a. This is a symmetrical error

## 2. Saying how to use these data

- a. This is a symmetrical error defined at  $3\sigma$

## 3. Giving information about the data provenance

- a. This symmetrical error defined at  $3\sigma$  is function of (position, pm, RV mag)





# Motivation for a Source Model

[J/A+A/532/A103/IC4665](#) [Photometry and proper motions in IC4665 \(Lodieu+, 2011\)](#)

2011A&A

*Post annotation*

Coordinates, photometry, proper motions, and physical parameters for IC4665 stars (*tables A1, B1 and C1 of paper*) (1533 rows)

[start AladinLite](#)

[plot the output](#)

[query using TAP/SQL](#)

Full	RAJ2000 "h:m:s"	DEJ2000 "d:m:s"	Mm	Name	Zmag mag	Ymag mag	Jmag mag	Hmag mag	Kmag mag	pmRA mas/yr	pmDE mas/yr	logL [Lsun]	Mass Msun	GCS	Simbad	RAJ2000 "h:m:s"	DEJ2000 "d:m:s"	
1	17 42 05.9300	+05 24 13.900	C	174205.93+052413.9	15.113	14.535	13.849	13.200	12.831	-1.80	-19.56	-1.29	0.448	GCS	Simbad	17 42 05.93	+05 24 13.9	
2	17 42 06.0200	+05 14 17.900	C	174206.02+051417.9	15.720	15.304	14.737	14.173	13.850	-56.48	24.63	-1.67	0.241	GCS	Simbad	17 42 06.02	+05 14 17.9	
3	17 42 09.5800	+05 21 12.600	C	174209.58+052112.6	15.693	15.200	14.587	13.944	13.615	-36.93	-34.57	-1.61	0.267	GCS	Simbad	17 42 09.58	+05 21 12.6	
4	17 42 16.9500	+05 26 51.300	C	174216.95+052651.3	15.670	15.269	14.676	14.082	13.761	-3.44	3.13	-1.65	0.251	GCS	Simbad	17 42 16.95	+05 26 51.3	
5	17 42 17.7800	+05 56 26.200	C	174217.78+055626.2	16.616	16.024	15.344	14.767	14.377	-25.95	-12.29	-1.93	0.160	GCS	Simbad	17 42 17.78	+05 56 26.2	
6	SOURCE : 174325.35+052128.5													0.412	GCS	Simbad	17 42 18.00	+05 49 25.5
7	POSITION: 17 43 25.35 +05 21 28.5													0.115	GCS	Simbad	17 42 18.19	+05 53 53.3
8	P.MOTION: -50.22 -46.39													0.508	GCS	Simbad	17 42 20.29	+05 55 56.5
9	MAGS : I=18.264 z=17.664 Z=17.763 Y=17.058 J=16.386 H=15.803 K=15.392													0.293	GCS	Simbad	17 42 20.79	+05 46 35.6
10	SOURCE : 174330.63+050217.5													0.104	GCS	Simbad	17 42 21.08	+05 43 13.9
11	POSITION: 17 43 30.63 +05 02 17.5													0.328	GCS	Simbad	17 42 23.55	+05 38 23.5
12	P.MOTION: -19.53 -10.09													0.181	GCS	Simbad	17 42 24.89	+05 06 06.1
13	MAGS : I=18.312 z=17.641 Z=17.760 Y=17.144 J=16.457 H=15.895 K=15.563													0.453	GCS	Simbad	17 42 25.41	+06 21 05.3
14	SOURCE : 174331.38+052723.3													0.114	GCS	Simbad	17 42 25.69	+05 29 47.2
15	POSITION: 17 43 31.38 +05 27 23.3													0.440	GCS	Simbad	17 42 26.60	+06 22 19.8
16	P.MOTION: -1.24 7.69													0.132	GCS	Simbad	17 42 26.93	+06 20 14.6
17	MAGS : I=17.350 z=16.854 Z=16.912 Y=16.395 J=15.779 H=15.218 K=14.865													0.481	GCS	Simbad	17 42 28.03	+05 26 40.7
18	SOURCE : 174331.39+053403.6													0.078	GCS	Simbad	17 42 28.93	+05 54 53.8
19	POSITION: 17 43 31.39 +05 34 03.6													0.336	GCS	Simbad	17 42 28.94	+06 20 28.0
20	P.MOTION: -904.33 -1413.85													0.524	GCS	Simbad	17 42 31.91	+06 18 49.5
	MAGS : I=18.705 z=18.013 Z=18.107 Y=17.431 J=16.745 H=16.184 K=15.753																	
	SOURCE : 174331.77+063945.3																	
	POSITION: 17 43 31.77 +06 39 45.3																	
	P.MOTION: -2.70 -9.07																	
	MAGS : I=16.149 z=15.739 Z=15.778 Y=15.317 J=14.662 H=13.971 K=13.697																	