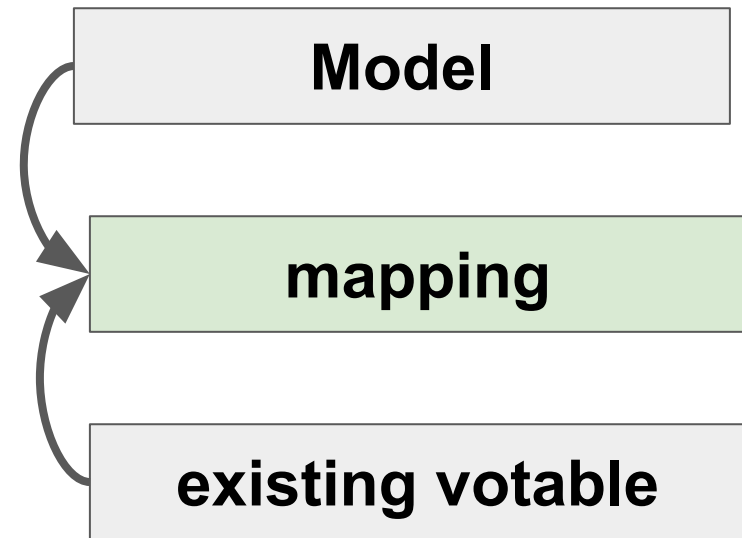
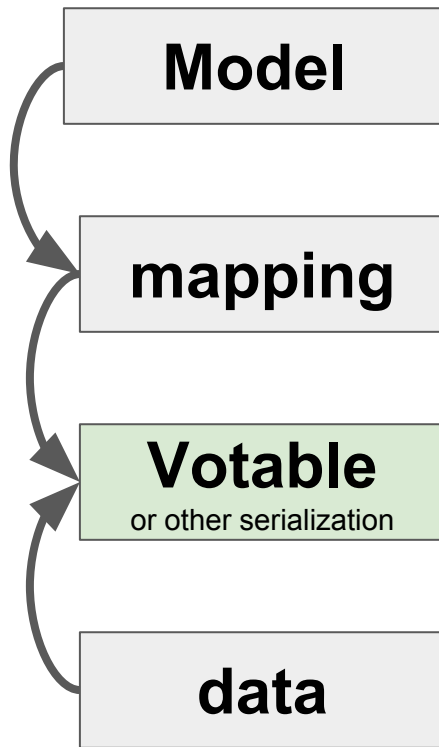


*Annotating*  
**GAIA**  
*Time Series*  
*with*  
**VO-DML**

<https://github.com/lmichel/vodml-lite-mapping>

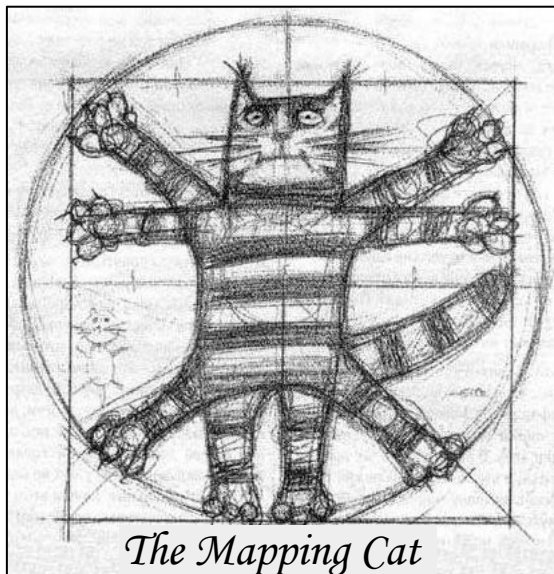
# 2 Ways of Seeing Things



- Data can be put in a VOTable in a way they can be mapped onto the model.
- Might put limitations on the VOTable structure
- The mapping must be applicable to any existing dataset.
- This impacts the mapping syntax
- The mapping has also to drive the parser

# Mapping *Any* Existing VOTable

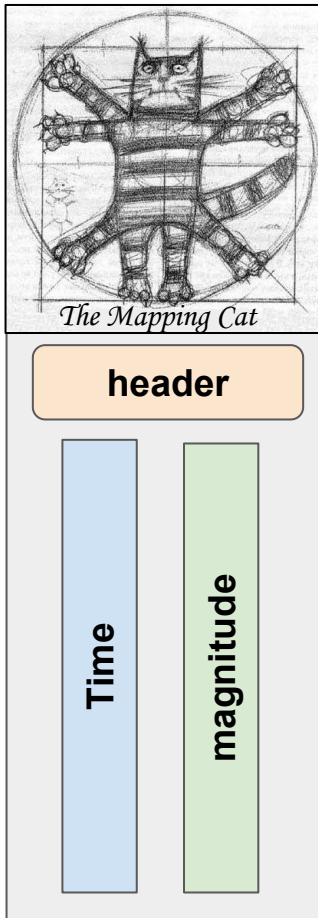
**Model**



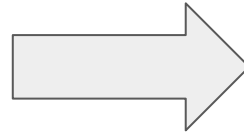
**existing votable**

- Mapping any model on any VOTable is like squaring the circle.
- **But time domain gives us some reasonable examples yet**
- Should mix model elements with directives for the parser

# The Basic Case

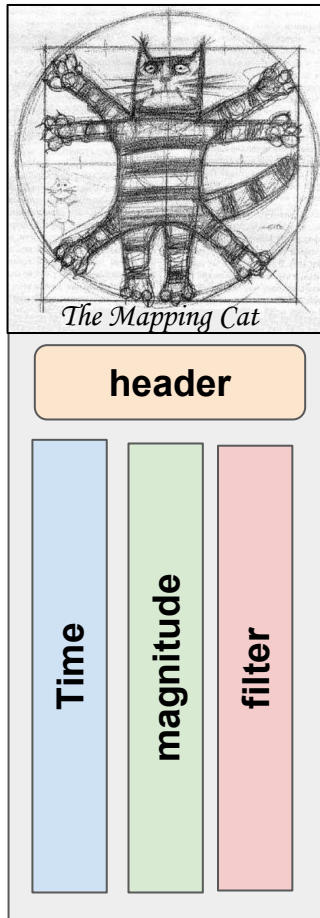


**Parser**

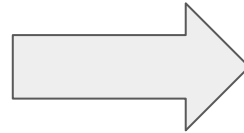


**TimeSeries**  
One instance  
One Light Curve

# The Case of the Day: GAIA



Parser

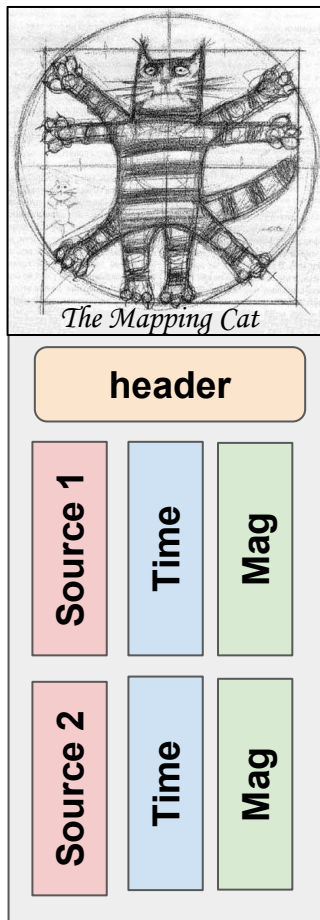


**TimeSeries**  
One instance  
Several Light Curves

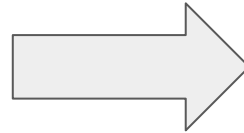
VOTable content:

- One source
- 3 filters (G, BR, RP)
- Photometric points mixed in one <DATATABLE>
- One column "BAND" identifying the filter for each measurement

# Another Gaia Case ?

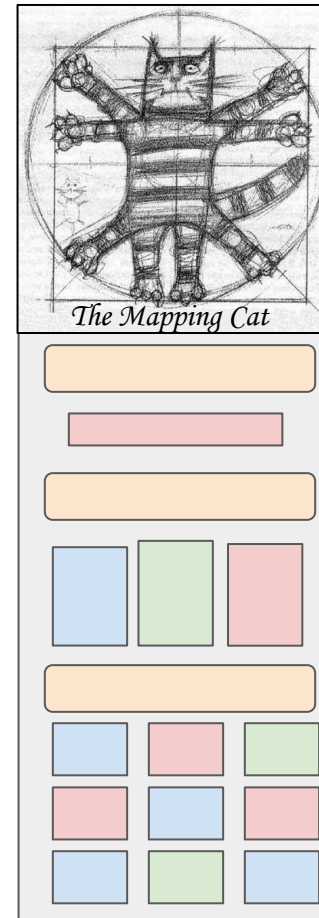
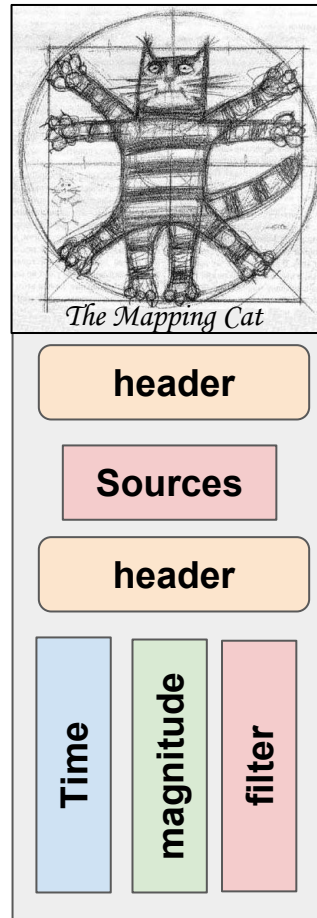
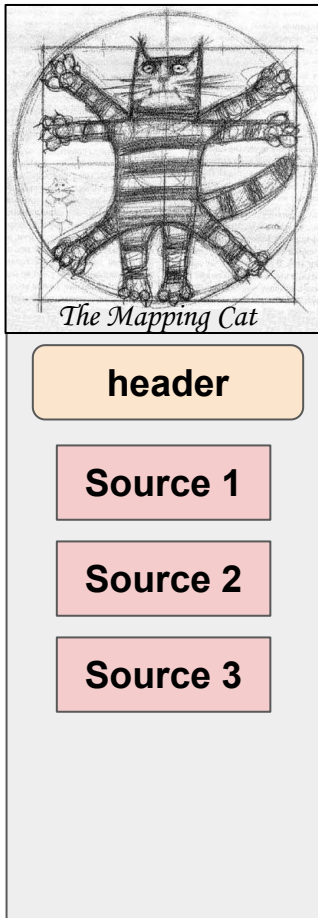


Parser



- [TimeSeries]
- . List of instances
  - . The number of instances results from the data grouping
  - . Each instance owns a subset of the data rows

# And So Forth ...



# Lite Syntax at a Glance

<COLLECTION>  
a set of objects

<INSTANCE>  
a set of key/object pairs

<VALUE>  
An atomic value (string or numerical)

<COMPOSITION>  
Finite list of objects  
E.g. contributors

<ARRAY>  
List of instances to be read in <DATATABLE>  
One instance per row  
This element must have one unique  
<INSTANCE> as a child

<SET>  
Set of root instances  
Comes with a GROUPBY operator  
Must be child of the root <TEMPLATES>

- *Each one of these elements has a **dmrole***
- ***dmtypes** are supported by not used yet*

<FILTER>  
Filter the values read in <DATATABLE>  
Must be after the <INSTANCE> contained in a <ARRAY>

<FOREIGNKEY>  
Not implemented yet



# Compact Syntax

```
<INSTANCE dmrole="coords:Coordinate.frame" dmtype="coords:domain.time.TimeFrame"
  ID="timeframe">
  <INSTANCE dmrole="coords:domain.time.TimeFrame.refPosition"
    dmtype="coords:domain.space.StdRefLocation">
    <VALUE dmrole="coords:domain.space.StdRefLocation.position"
      value="BARYCENTER" />
  </INSTANCE>
  <INSTANCE dmrole="coords:domain.time.TimeFrame.time0"
    dmtype="coords:domain.time.JD">
    <VALUE dmrole="coords:domain.time.JD.date" value="2455197.5" />
  </INSTANCE>
  <VALUE dmrole="coords:domain.time.TimeFrame.timescale" value="TCB" />
</INSTANCE>
```

*Example: STC time frame*

# dmrole=root indicates the VOTable Content

```
<TEMPLATES tabref="results">
  <!--
    This TEMPLATES own the dmrole=root element. It must have one child (INSTANCE or SET)
    This child indicates that the client must return one instance of the ts:SimpleTimeSeries class
  -->
  <INSTANCE dmrole="root" dmtype="ts:SimpleTimeSeries">
```

*This VOTable contains **one instance** of class `ts:SimpleTimeSeries`*

```
<TEMPLATES tabref="results">
  <!--
    This TEMPLATES own the dmrole=root element. It must have one child (INSTANCE or SET)
    This child indicates that the client must return one instance of the ts:SimpleTimeSeries class
  -->
  <SET dmrol="root" groupby="sourceid">
    <INSTANCE dmrole="root" dmtype="ts:SimpleTimeSeries">
      <!--
        Reference to the DataSet of this Time Series
      -->
```

*This VOTable contains a **set of instances** of class `ts:SimpleTimeSeries`  
(work in progress)*

# <DATATABLE> Mapping

```
<ARRAY dmrole="observable">  
  <INSTANCE dmrole="cube:NDPoint.observable" dmtpe="cube:Observable">  
    <INSTANCE dmrole="cube:MeasurementAxis.measure" dmtpe="meas:StdTimeMeasure">  
      <INSTANCE dmrole="meas:CoordMeasure.coord" dmtpe="coords:domain.time.JD">..  
      <INSTANCE dmrole="cube:MeasurementAxis.measure" dmtpe="ts:PhotometricMeasure">..  
      <VALUE dmrole="cube:DataAxis.dependent" value="true" />  
    </INSTANCE>  
  </INSTANCE>  
</ARRAY>
```

Each <DATATABLE> row is mapped as an instance of the class `cube:Observable`

```
<ARRAY dmrole="observable">  
  <INSTANCE dmrole="cube:NDPoint.observable" dmtpe="cube:Observable">  
    <FILTER key="band" value="RP" />  
    <INSTANCE dmrole="cube:MeasurementAxis.measure" dmtpe="meas:StdTimeMeasure">  
      <INSTANCE dmrole="meas:CoordMeasure.coord" dmtpe="coords:domain.time.JD">..  
      <INSTANCE dmrole="cube:MeasurementAxis.measure"..  
      <VALUE dmrole="cube:DataAxis.dependent" value="true" />  
    </INSTANCE>  
  </INSTANCE>  
</ARRAY>
```

Each <DATATABLE> row with `band=RP` is mapped as an instance of the class `cube:Observable`

# One Tag for Both Values and Literals

*Value resolved by reference*

```
<VALUE dmrole="coords:domain.time.JD.date" ref="time" />  
<INSTANCE dmrole="coords:Coordinate.frame" ref="timeframe"/>  
<VALUE dmrole="cube:DataAxis.dependent" value="false" />
```

*Value resolved as a literal*

*If both `ref` and `value` attributes are present, `ref` is first resolved and then `value` is taken in case of failure*

# Validation

- **Mapping Validation**

- SimpleTimeSeries model
- Gaia 3 bands time series
- Ongoing tests on multi-source datasets
- Must be tested on the others Gaia data sets

- **Client Validation**

- See *app1* talk
- Everything is available on GitHub

<https://github.com/lmichel/vodml-lite-mapping>

**Contributors are Welcome**