Annotating TAP responses on the fly with IVOA data models

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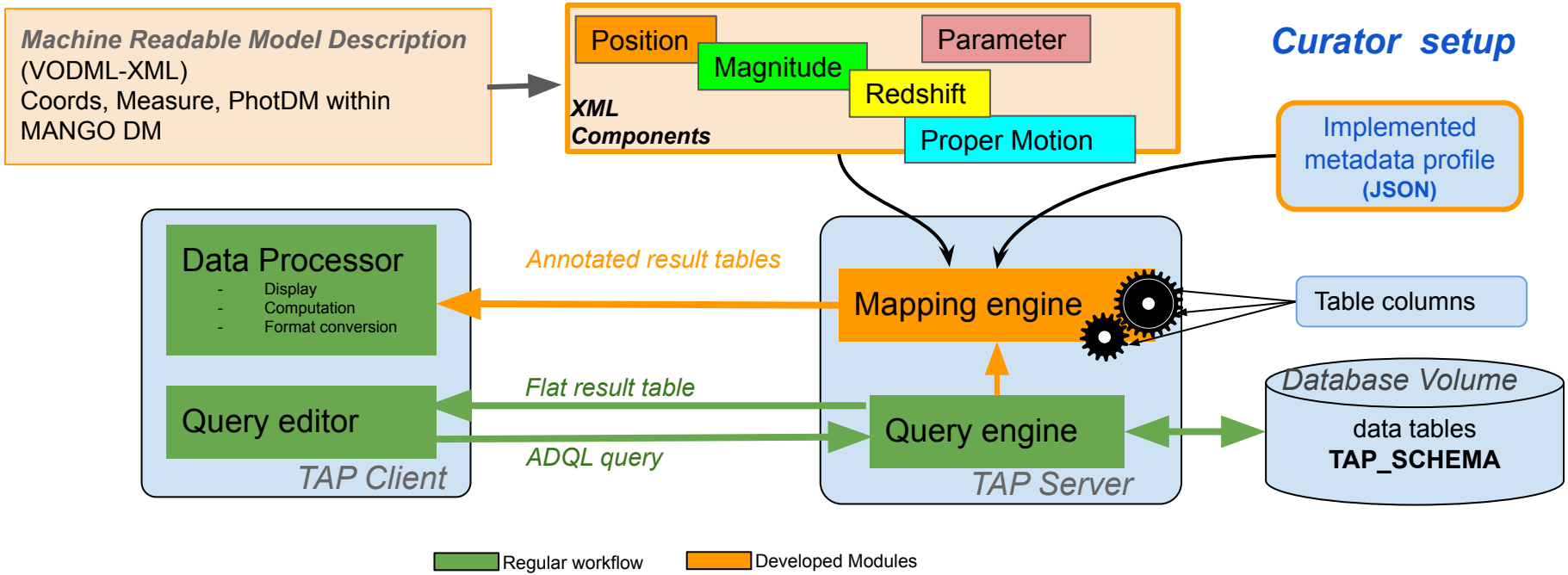
Goal & Test Case

Define a way to annotate a VOTABLE TAP response with IVOA data model information

- Our test case deals with catalogs of astronomical sources
- We have models to structure what is measured in terms of coordinates , flux, redshift , etc. **Coords, Measure, Photometry data models** propose classes to bind the various fields from the tables into attributes (leaves of the model)
- The **MANGO data model** (work in progress) aggregates these features within an object, with one source identifier and some associated data when necessary.
- We represent and embed the description of model elements in XML within the VOTable TAP response → be compliant with TAP output

presented at ADASS 2021, BoF TAP and data models

Annotation scenario



Prototype building blocks

The prototype is based on programs and components dictionaries developed by Laurent Michel for exercising two main specifications currently in progress :

- a data model for catalog sources with attached data and associated datasets: MANGO DM https://github.com/ivoa-std/MANGO
- a mapping syntax MIVOT former ModelInstanceInVOTable https://github.com/ivoa-std/ModelInstanceInVot

The prototype is written in JAVA. It builds the XML annotation block by browsing the dictionary of XML components. It appends to the annotation block the corresponding components mentioned within the JSON config file provided by the service.

Inserting the annotation block on top of the VOTable response is performed by extending the *WriteHeader* of the Vollt TAP Library developed by G. Mantelet. https://github.com/gmantele/vollt

The prototype : very short demo

- In TapHandle, consider one example table, excerpt from Chandra CS2 catalog.
- Querying the TAP service prototype : http://vo-proto.cds.unistra.fr:8080/TAP-annoter
- How we have mapped these columns in the service: https://github.com/loumir/TAP-annoter/blob/main/PAdass-chandra-table-profile.json
- Results of the decorated table with MANGO annotation: https://github.com/loumir/TAP-annoter/blob/main/PAdass-Annotated-Votable-Chandra.xml
- Model components directory: https://github.com/loumir/TAP-annoter/tree/main/tap_annoter/config/mapping_components

Further development

- Explore and define a way to store model related configuration resources (XML components & JSON Config). They are currently not supported by the TAP_SCHEMA.

  1- in the TAP_SCHEMA by adding specific tables

  2- in a file storage local to the server

- Define a strategy to handle default values for XML attributes non represented in the JSON config.
- Adjust the wrapping of the annotation block to the currently developed IVOA mapping syntax

TAP_SCHEMA add-on suggestion

Store the mapping configuration information in the TAP_SCHEMA by adding two specific tables named (for instance):

model_component_dictionary for the XML model components dictionary

component name	XML component snippet	datamodel ID
HardnessRatio	<HardnessRatio> ….. </HardnessRatio>	MANGO1.0
Flux	<Flux> ……</Flux>	MANGO1.0

...

model_annotation_config for the JSON mapping profile

resource name	JSON implementation profile
Chandra catalog table	list of supported elements for this table + ref to columns

...

Conclusion

This work was a proof of concept :

On the fly model annotation embedded in VOTable response is possible in TAP services.

VOLLT is useful to decorate the VOTable query response with the XML mapping block.

The DM annotation is then easy to use for organizing and accessing model instances in various lists, for instance in JSON or XML.

See also our poster @ ADASS 2021:

https://adass2021.ac.za/uploads/X3-010/upload/X3-010_latest.pdf

Further work going on for an internship this spring with Laurent Michel.

Links to documents examples

- Model components:

https://github.com/loumir/TAP-annoter/tree/main/tap_annoter/config/mapping_components

- JSON config for the Chandra table:

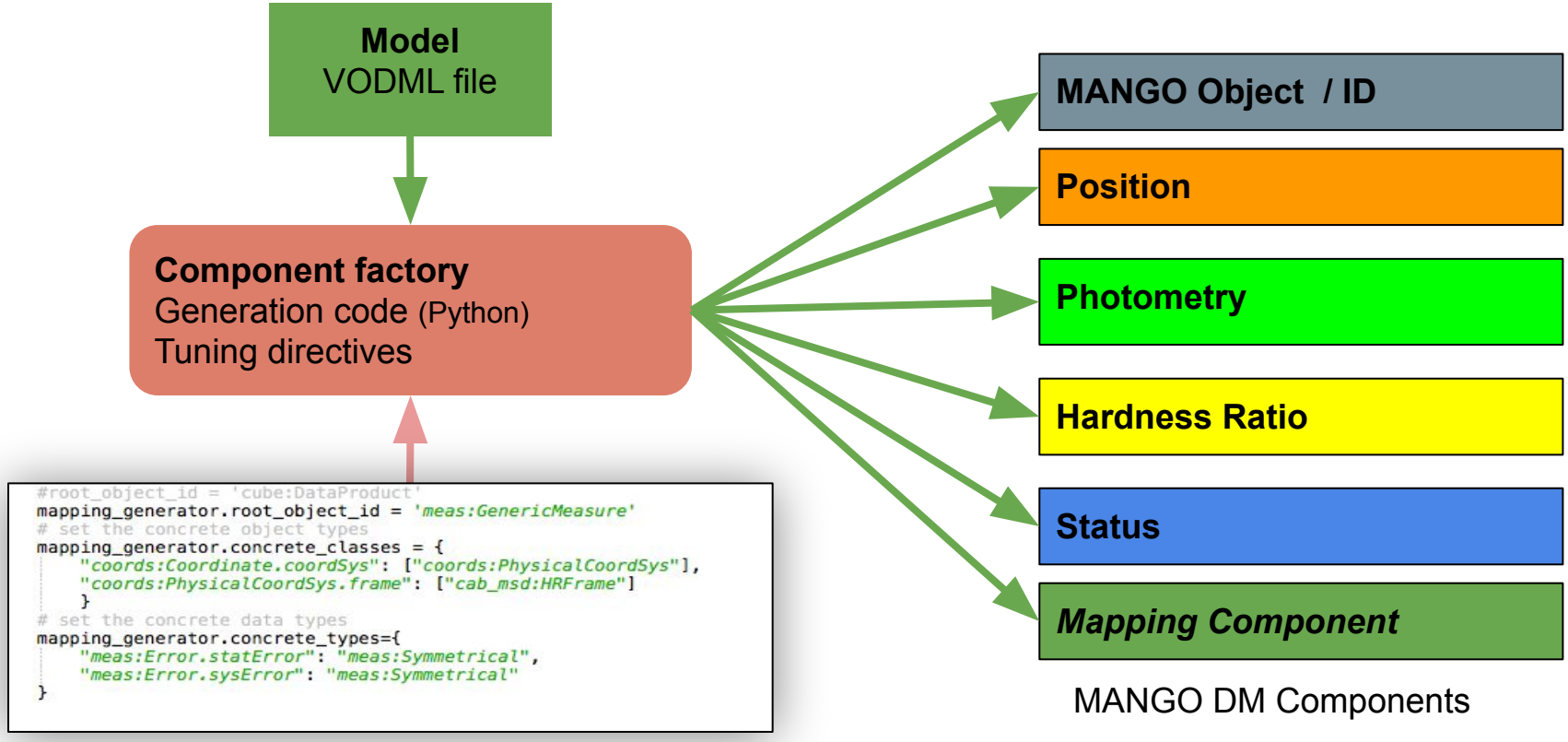
https://github.com/loumir/TAP-annoter/blob/main/PAdass-chandra-table-profile.json

- Final annotated table :

https://github.com/loumir/TAP-annoter/blob/main/PAdass-Annotated-Votable-Chandra.xml

Thank you for your attention

Building Mapping Components



MANGO DM Components

- Must be done once for each data collection served by the service
- The mapping components are templates that can be reused for all data sets
- They can (must) be refined by the curator

Dedicated roles to build annotation

Data provider side

- Define for each data collection the models it can mapped on, as well as the rules to bind columns with model components.
- Insert the model component and bind model leaves → produce one JSON profile

Annoter side

- **For each query**, analyse the selected columns
- interpret from selected columns which model components are involved from the server annotation pattern
  - grab the model components description from the model components library
  - append it to the annotation block

So each query in the TAP service provides the appropriate components annotation