Provenance Data Model Status

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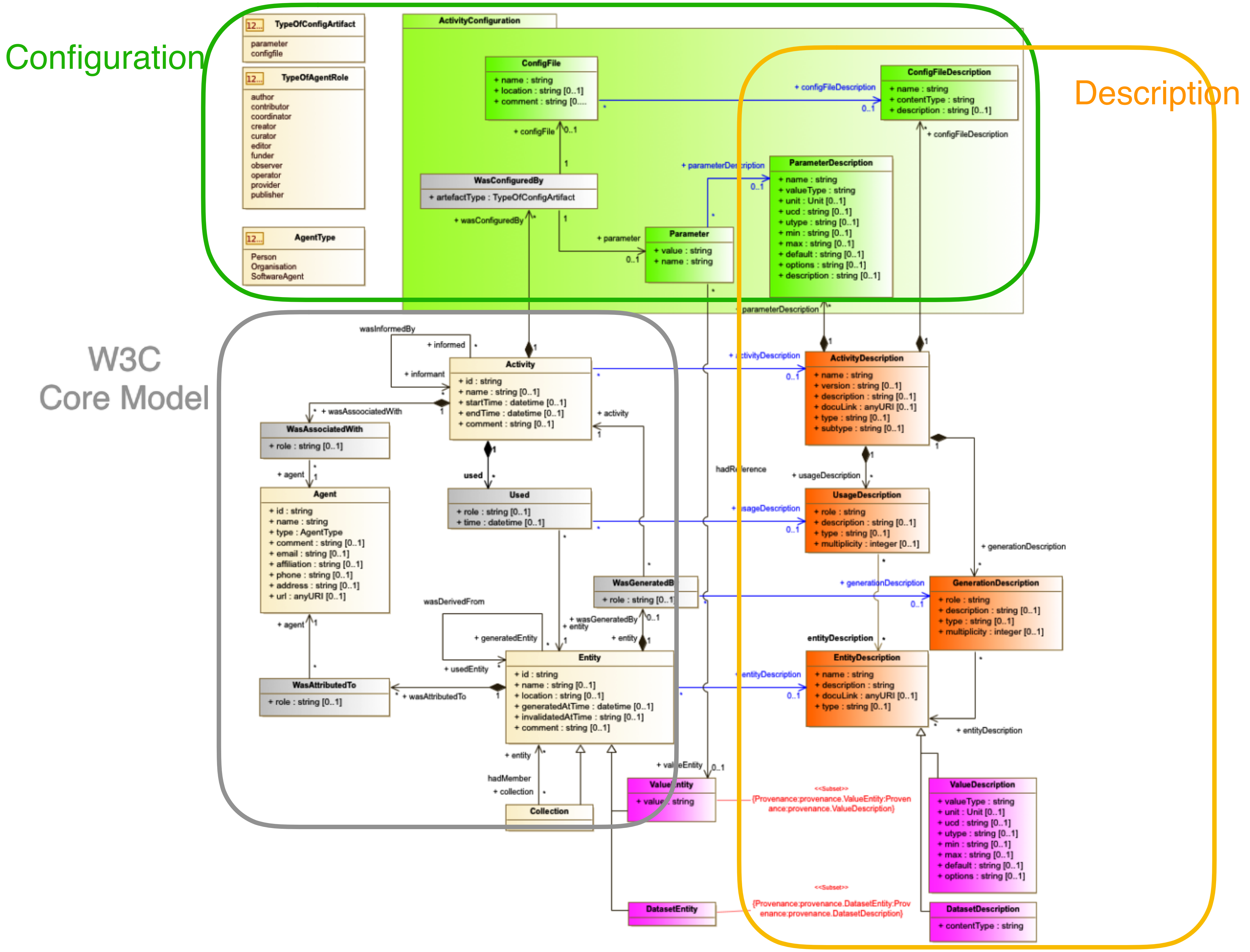
New Data Model Document

https://volute.g-vo.org/svn/trunk/projects/dm/provenance/ProvDM/doc/

- Text updated according to suggestions when appropriate
- RFC comments answered
- Vocabulary terms to be studied with the semantics group
    - during the current review of Vocabularies 2.0 WD
    - poll various projects for feedback
- To do :
- Minor changes to the Modelio project
- Reprocess VODML documents
- VODML XML reference doc—> Provenance.xml
- Data model description —> Provenance.html

Data Model Overview



What do we have now?

- A data model
- Experience with various use-cases
  - Working examples : ProvFocusAstericsExamples
- A list of implementations
  - CTA pipeline / OPUS jobs submission (end 2017)
  - Pollux theoretical spectra (2017)
  - RAVE prototype (07/2018)
  - PROV of Images prototype in Triplestore (2018)
  - MuseWise PROV prototype (02/2019)
  - Applause on line DB (05/2019)
  - CDS PROV-HiPS Image database (10/2019)
  - Prov-TAP prototype (10/2019)
  - CTA/HESS gammapy provenance tracking mechanism (10/2019)
- a library for translating serialization formats `voprov` (Michèle Sanguillon)
- Connexions to on going projects CWL Common Workflows Langage (M. Crusoe's talk @ADASS)

gammapy provenance tracking

from Mathieu Servillat

- Define the activity template.   YAML file
- Feed the template during execution for each step   Activitydescription tree(orange classes)
- Record provenance in a log file
- Extract provenance tags from the log —> Prov DB
- https://wiki.ivoa.net/internal/IVOA/InterOpOct2019DM/gammapy-prov.pdf

A best effort strategy

- This DM tries to cover all possible features of provenance in order to meet our use-cases. It is a rich model.
- The distribution of provenance metadata comes with a best effort strategy.
- On the data provider's side, the cost in implementing these features needs to be balanced with
  - an understandable content exportable outside the project
  - columns clearly mapped means better queries prepared by the user or by the wrapping API
  - enhance data search with provenance flavor selection
  - maintenance benefits to better monitor the archive collections
- On the client side, an application querying several data centers will have to deal with the various level of completeness chosen by the data centers.

Heterogeneous provenance coverage

- Some of our implementations services do not trace all classes.
- Some data products are fully traced, and some not within one project.

This is OK

- In order to stimulate the uptake of provenance metadata into collections:
- Encourage best effort

DM Class Feature coverage

DM Feature/ Project	Institute	Core DM	ValueEntity/ DatasetEntity	Parameter and configFile	DataFlow wasDerived From	Taskflow wasInformed By	ActivityDescrip tion
CTA Opus	LUTH paris	x	x	x	x	?	tree
ProvHiPS	CDS	x	x	x	x	x	tree
Image Triplestore	CDS	x	x	x	x	no	tree
Pollux	LUPM Montpellier	x	no	no	no	no	Activity/Entity
Dirac CTA reduction	LUPM Montpellier	x	x	x	no	no	tree
RAVE Prov	AIP Postdam	x	generic entity	no	no	no	Activity only
MuseWise prov	AIP Postdam	x	?	no	no	no	tree
Applause	AIP Postdam	x	no	no	no	no	tree

Accommodate differences and evolution

- Should we just downgrade existing prototypes and ignore implementation experience ? no
- Endorse a simplified W3C profile? then why IVOA PROV?
- Features are used by some of us
  - ex. configuration, wasDerivedFrom, wasInformedBy

Define a **Provenance Feature profile** and interpretation rules

- Explain the implementations choices and strategies
- Describe profile implementations as IVOA notes
- Check usage and implementation from other projects not us …

Compliance

- Provenance services should mention their Feature profile
- A TAP service which does not serve queries based on wasDerivedFrom should return a message like « wasDerivedFrom not implemented »
- Is my service compliant to the model ? Too vague a question :
  - We need to specify for which feature profile
    - P1: Core+ ActivityDesc level 1
    - P2: Core+ Dataflow
    - P3: Core+ taskflow+dataflow
    - etc…
    - P6: Full model (all features)

For one profile, classes with mandatory attributes should be filled.

Relations in the feature profile should be instantiated as in the model.

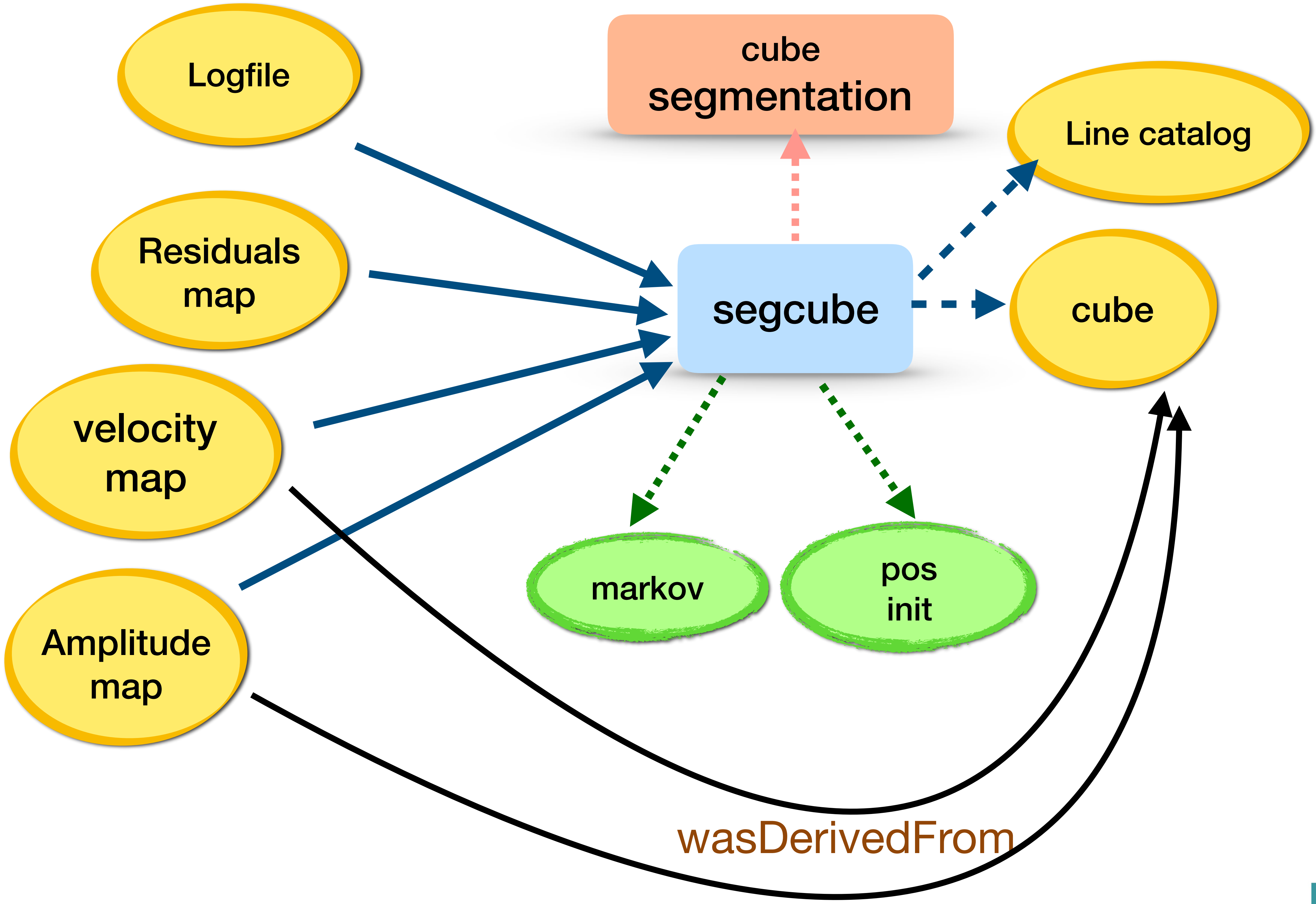
Feature profiles

- **Core Model** : the basic loop : an Activity with consumed and produced Entities and their links to Agents.
- **ActivityConfiguration** feature
  - to allow a focus on parameter/configuration search by specialised classes
  - the types and descriptions of Parameters and ConfigFiles are exposed as well
- **ActivityDescription feature**
  - level 1: an ActivityDescription instance is present and explains Activity instances bound to it
  - level 2: The full tree with root as an ActivityDescription instance and the Usage/generation description branches as well as the Configuration Description branch are present

Feature profiles (2)

- **Data flow** feature: To illustrate the processing dependencies between datasets
  - wasDerivedFrom encodes the progenitor link for one processing step.
  - it emphasizes data dependency through time
  - Not applicable to Parameter instances
- **Task chain** feature
  - to chain activities along the time line and show their execution dependencies
  - wasInformedBy encodes the progenitor
- Both relations can be added on top of the Core Feature. —> this is added semantics
  - These are emphasized relations between data or activities that the data provider think relevant to highlight
  - All results of an Activity instance are not necessarily exposed as derived products from all inputs
  - When parameter values are encoded as entities with Used.role=setup, they are part of the used Entity set, however not traced as progenitor data for the results of this particular activity

wasDerivedFrom semantics



Serialisation Formats

- Ready :
  - Gammapy Provenance embedded VOTable, PROV-N, PROV-XML
  - CTA Pipe/DIRAC text JSON
  - OPUS job submission and execution (LUTH) VOTable, JSON
  - Image database prototype in Triplestore (CDS) RDF/ttl
  - HiPS Image database (CDS) with PROV-TAP VOTable
  - Applause VOTable
  - RAVE implementation (AIP, Postdam)
    - Simple access (Prov-SAP) prototype Prov-N, PROV-JSON
  - Provenance for Pollux DB & *voprov* library (LUPM) VOTable, Prov-N, PROV-JSON
  - Under study :
  - SVOM pipeline execution tracking JSON FITS embedded

Access Protocols

- DAL protocols to serve provenance metadata
- Provenance TAP protocol PROV-TAP (WD in progress)
    - cf talk by François Bonnarel @Apps&DAL session
      https://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpOct2019DAL#DAL
    - PROV-TAP working draft issued in the Working Group
- Provenance simple access protocol Prov-SAP
    - Many Implementations in RAVE, CTA, Pollux
- Both waiting for the DM being approved

Review comments are welcome on the PROV-TAP page

Thanks

Questions ?
Comments ?