UNIVERSITY of York

Domain-specific modeling languages for Citizen Science data provenance

MDENet seedcorn fund project

MDENet | The home of model-driven engineering

Aston University
BIRMINGHAM UK

Research Metadata

- FAIR Principles
  - **F**indability, **A**ccessibility, **I**nteroperability and **R**euse
- Reusable datasets
  - Documenting the creation encouragers use/reuse of datasets
  - User of a dataset is given an explanation of the creation process
- Citizen Science
  - Can be at a disadvantage lacking metadata expertise
  - Data produced is often mistrusted

  Example Citizen Science project: https://naturehood.uk/survey-your-space

Approaches to lineage documentation

NONE - Do nothing!

- “My data explains itself!”
- Lack of metadata knowledge or training

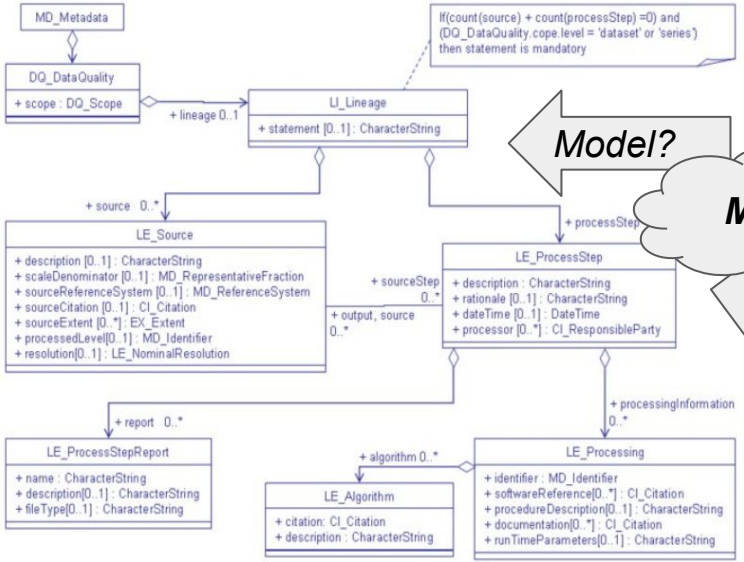
Unstructured

- Just write a document
- Not machine parsable
- May not follow a “standard”

Structured

- Lineage specifications
  - ISO19115-3
- Minimum level of detail
- Interchange formats (XML)
- Complex and difficult
  - Non-experts will struggle

ISO9115-3: UML, XML, Tools

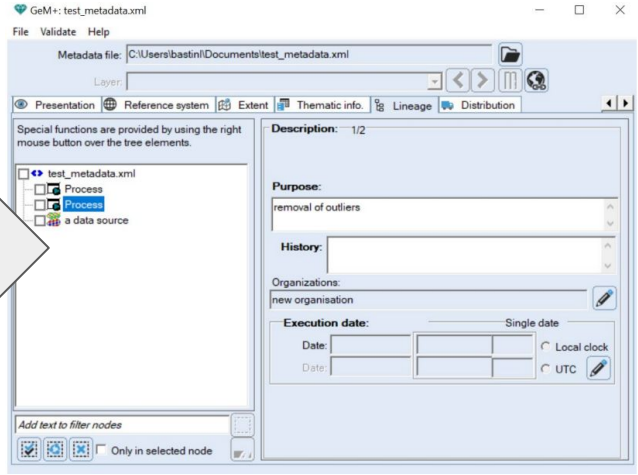


Model?

MDE?

Model editor?

Model-to-Text?

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          codeListValue="dataset"/>
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    <gmd:lineage>
      <gmd:LI_Lineage>
        <gmd:statement>
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          uniform. The overall quality of the map depends heavily on the individual quality of the
          data for the different countries.</gco:CharacterString>
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  </gmd:DQ_DataQuality>
</gmd:dataQualityInfo>
```

Model-driven solution

Aim: try and reduce the barrier of entry to creating lineage documentation that meets specifications like ISO19115-3.

- Modeling language (based on ISO19115-3)
  - Use generators for model editors and text file outputs
  - One example of file output: the standard XML files
- Assistive tools with a “text-like” editor (MPS, Abstract Syntax Tree)
  - Form-like structure, task automation, auto-complete, hints
- Model your project once, produce multiple deliverables

Project: MPS Prototype

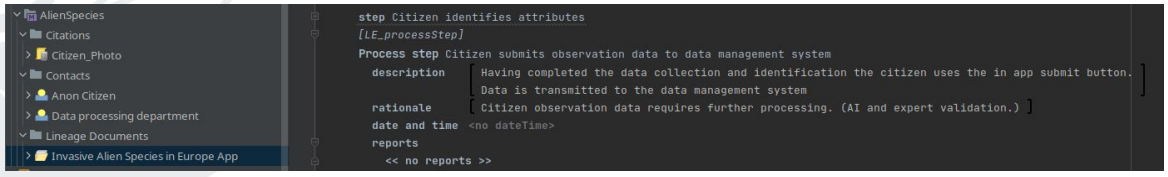
Project participants:

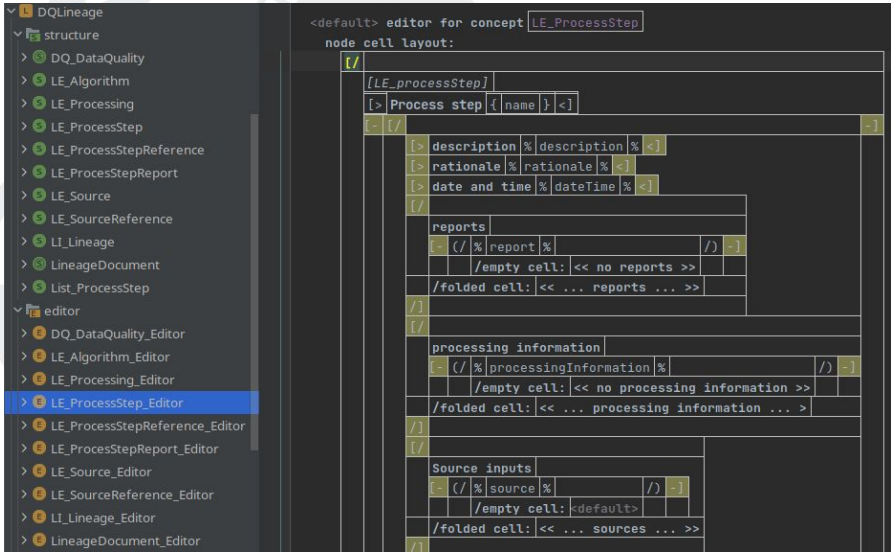
- Aston University
  - Owen Reynolds, *PhD student*
  - Lucy Bastin,
    Research metadata & Citizen Science expert
- University of York
  - Antonio Garcia-Dominguez, *MDE expert*
- Earthwatch
  - James Sprinks, *Citizen Science expert*

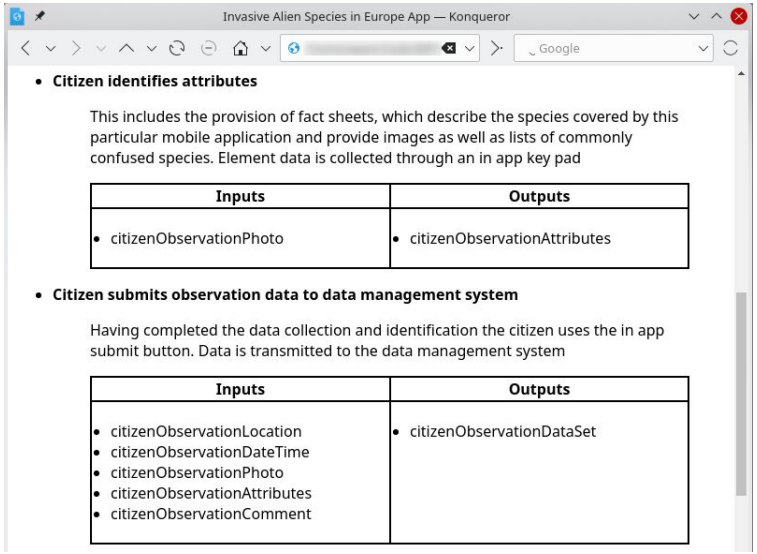
Why Jetbrains MPS?

- Open-source language workbench
  - Structure, Editor, Type system
  - Transformations, Constraints
- Projectional editor
  - Quickly implements complex
    “text-like editor with a guide
  - Looks like a document but has cells
  - Intentions & auto-complete
  - Automated validation of user inputs

MPS: ISO 19115-3







Next step: User testing

Earthwatch Citizen Science project managers

- What do Citizen Science project managers think of the modelling style approach to project documentation?
- Is the “text-like” editor interface helpful/intuitive?
- What other kinds of output formats would helpful?

Observations so far…

- Using ISO 19115-3 for documentation is hard
  - Overwhelming with the details
  - Unclear documentation, which is also overwhelmingly big!
- Model representations can be tuned to audiences
  - One language model and one project model
  - Multiple editors and outputs
- Modelling tools and lineage specifications share a problem
  - Both become complicated with the levels of detail involved
  - Higher levels of abstraction and assistive tools help

Future work

- User feedback will guide
  - Additional output types (graphical representations of process flows?)
  - Editor experience (different projectional editors)
- Tool delivery via the web
  - “Cloud based” project modelling tool
  - Remove the requirements for installing software
  - Enable collaborative modelling for project documentation
- Follow up research grant application
  - To build a set of standards-based notations for the Citizen Science community using MDE tools to support the development process

Thank you for attending!

Any questions?

Contact details:

Antonio Garcia-Dominguez
a.garcia-dominguez@york.ac.uk

Lucy Bastin
l.bastin@aston.ac.uk

Owen Reynolds
180200041@aston.ac.uk