SEMANTIC SUPPORT FOR DSL DEMONSTRATOR IN AN ADDITIVE MANUFACTURING ENVIRONMENT

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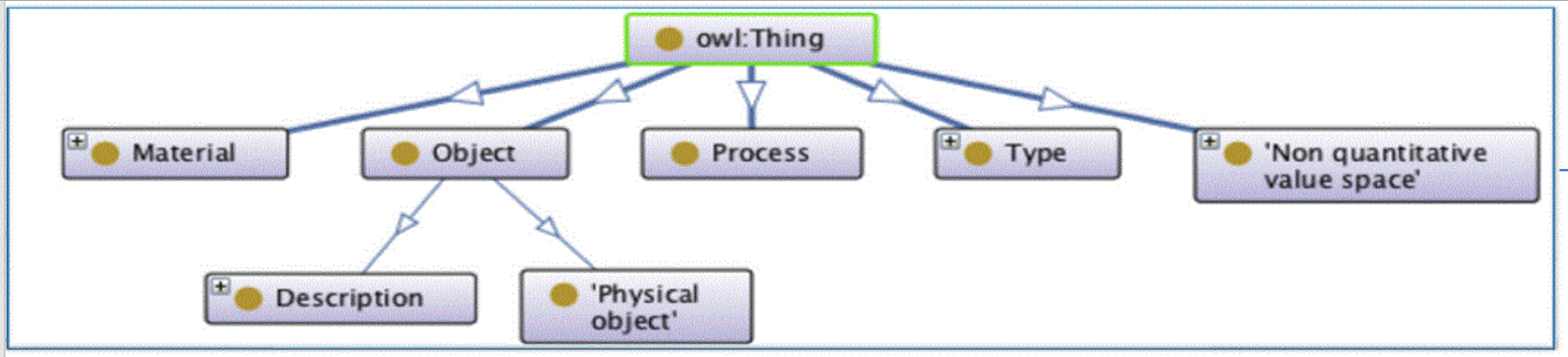
MOTIVATION

- A Domain-Specific Language (DSL) demonstrator based on ontology that controls the interaction with the user in an Additive Manufacturing Environment
- DSL lets users query the components of a complicated system without having to learn an unfamiliar query language

AGENDA

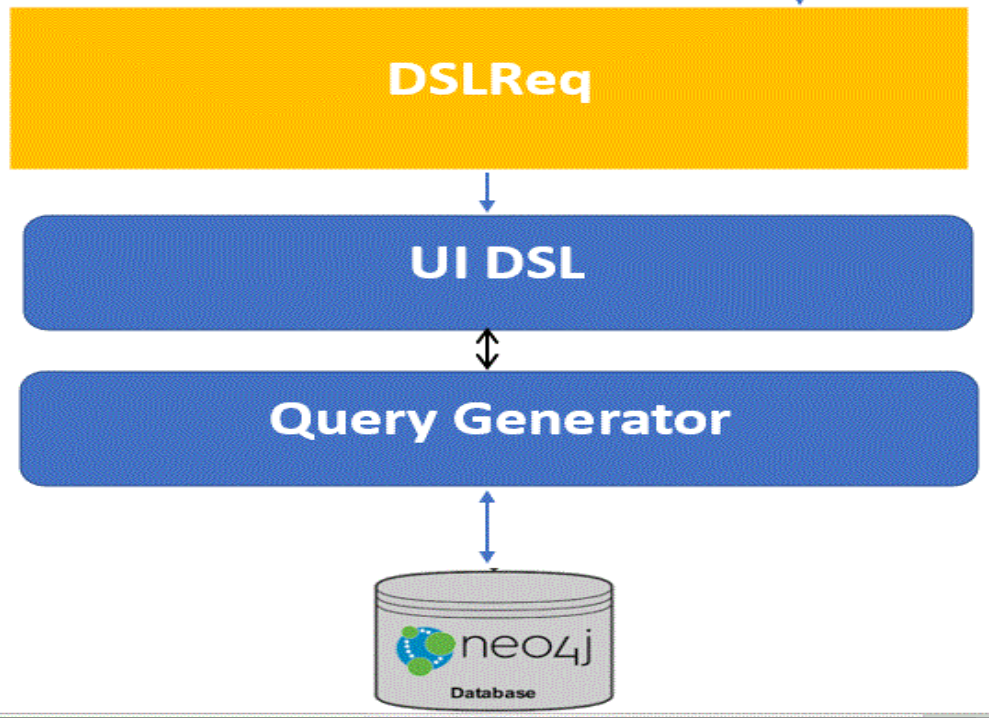
- DSL demonstrator: DSLReq
- Ontology AMO
- From ontology to DSL grammar
- Scenario Example
- Conclusions and future work

DSL DEMONSTRATOR: DSLReq



Our framework is structured around four interconnected models:

- **AM ontology** defines an additive manufacturing domain,
- **DSLReq grammar** is generated from our ontology,
- **User interface**, which generates a Cypher query from our DSLReq grammar ,
- **Semantic graph database** based on AM ontology.

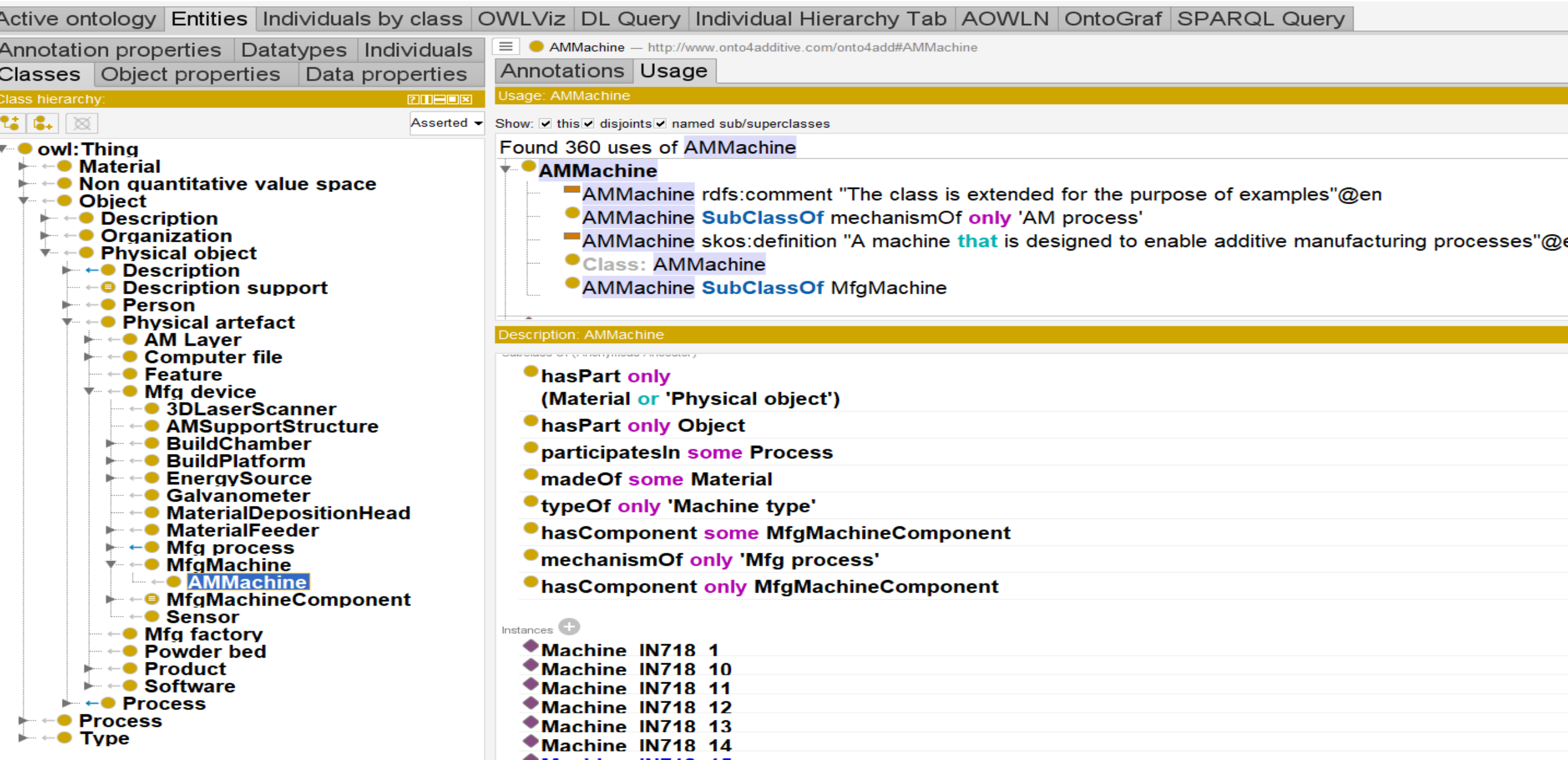


ADDITIVE MANUFACTURING ONTOLOGY (AMO)

The methodology of developing an ontology is composed of two steps:

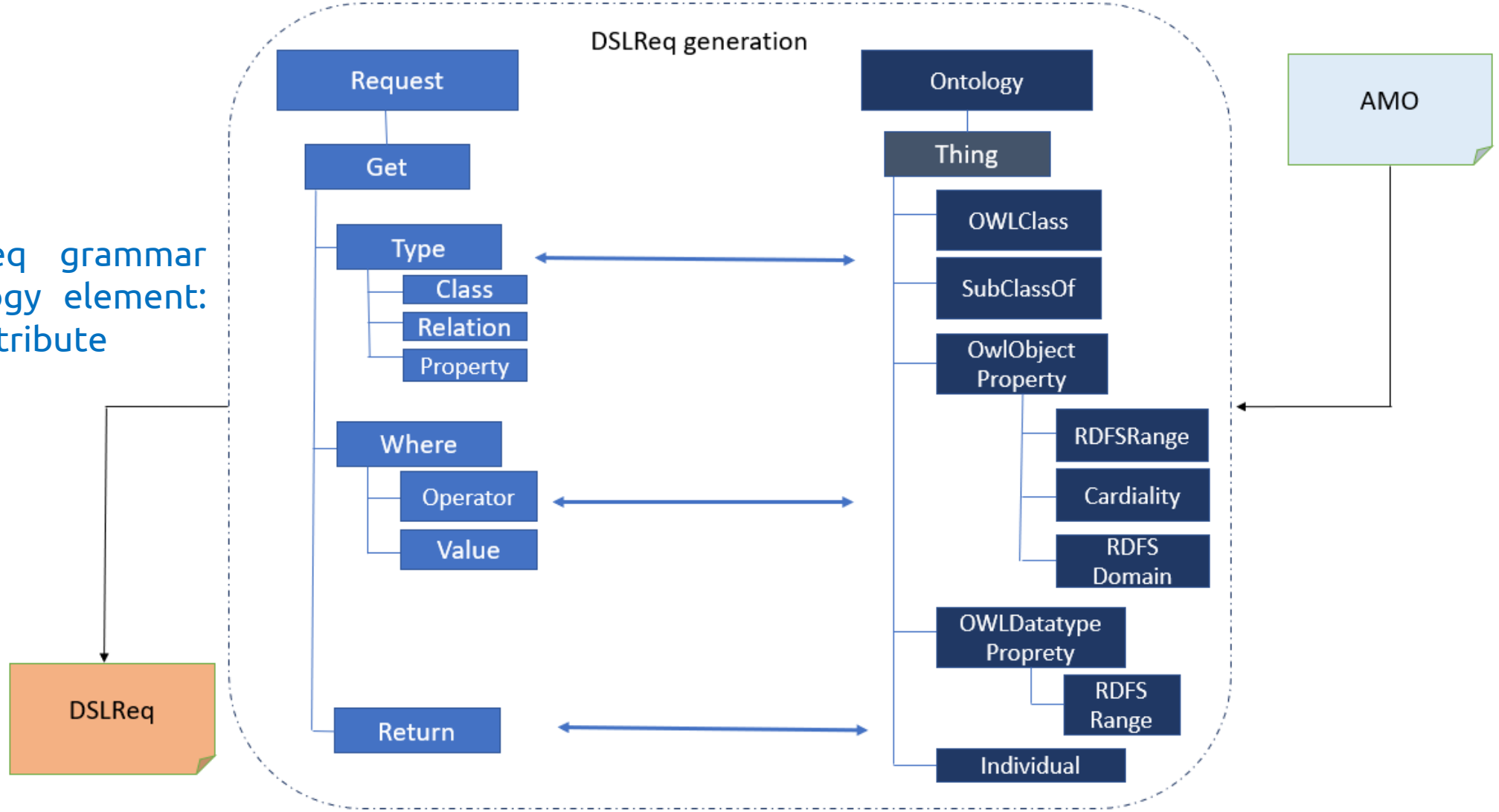
- The reuse of upper-level ontology DOLCE (Descriptive Ontology for Linguistic and Cognitive Engineering) to facilitate the grouping of classes sharing common high-level characteristics.
- The extension of the upper-level branch to additive manufacturing according to our use case

ADDITIVE MANUFACTURING ONTOLOGY: AMMACHINE CLASS



FROM ONTOLOGY TO DSL GRAMMAR

Each rule of DSLReq grammar consists of an ontology element: concept, relation, or attribute



FROM ONTOLOGY TO DSL GRAMMAR

The request takes as its input the elements in the ***Type*** rule, operates on them as specified in the ***Where*** and ***Return*** rules, and then produces the RDF triple researched by the user:

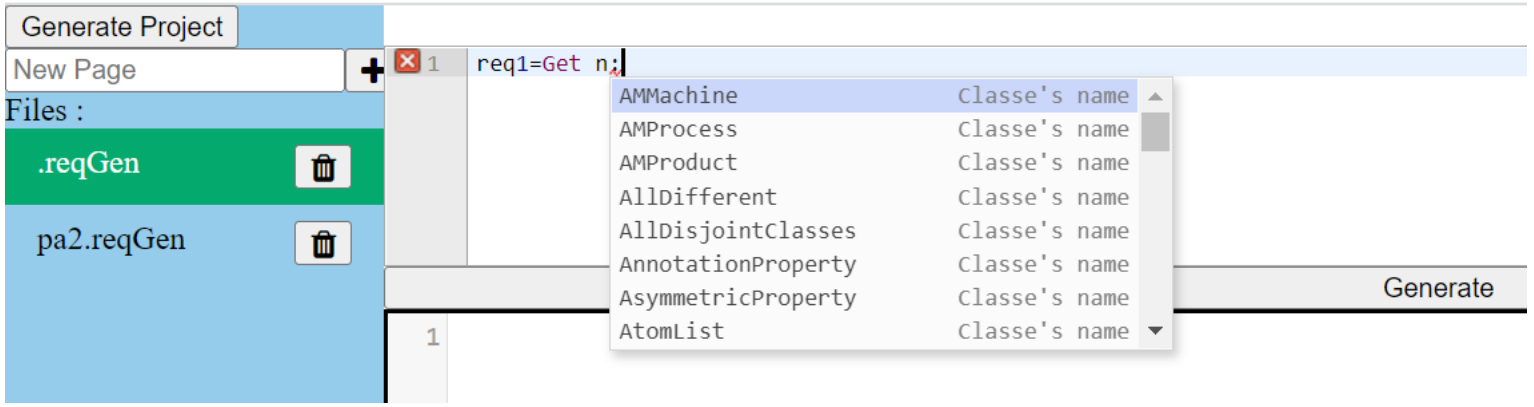
$$\{\mathrm{Get}\}'\mathrm{Get}'(\mathrm{type} = (\mathrm{Type}))('\mathrm{Where}'(\mathrm{clauses} += \mathrm{Clause})*)?$$

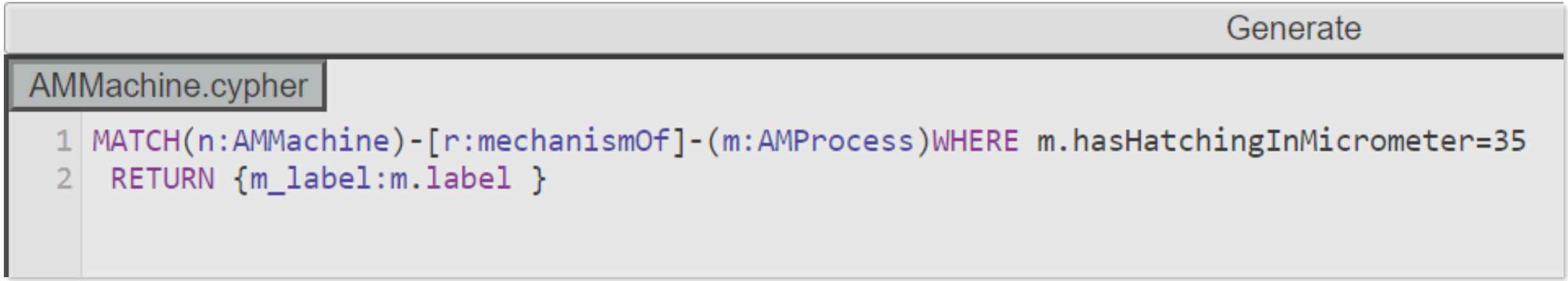
$$(\mathrm{retours} = (\mathrm{Return}))$$

SCENARIO EXAMPLE

User request:

$$\textbf{Get } n\text{: } AMMachine \; r\text{: } mechanismOf \; m\text{: } AMProcess$$
$$\textbf{Where } hasHatcingInMicromer \; of \; m = 35$$
$$\textbf{Return } label \; of \; m$$





RELATED WORK

OntoDSL

The use of ontologies during the design phase

Onto2Gra

The mapping of concepts and relation into grammar productions

DSLReq

We define a Domain Specific Language describing the user Request from Additive Manufacturing Ontology

CONCLUSIONS

- In this paper, we proposed a query demonstrator able to give appropriate results of user requests by using a DSL grammar. All modules of our system shared a central ontology describing the additive manufacturing domain.

- Ontology is used for building and validation of DSL request. It is also used to support queries for retrieving that knowledge.

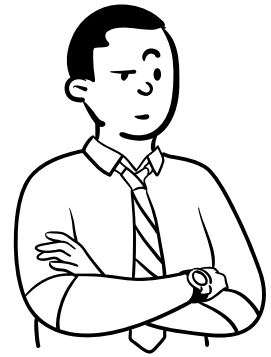
FUTUR WORK

Additive manufacturing environment require knowledge contributions from different stakeholders, so it's necessary that software engineering interact with other engineering disciplines.
For that reason, the presented approach needs to be complemented by a set of multiple Domain-Specific Languages.

- Each DSL will relate to an engineering discipline and will be in interaction with the other DSLs.
- Ontology will provide interoperability between DSLs in our system

DSL software

DSL manufacturing process



DSL client

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