THE *MISO* GROUP

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UNIVERSIDAD AUTONOMA DE MADRID

Computer Science Department
Universidad Autónoma de Madrid (Spain)

miso

THE AUTONOMOUS UNIVERSITY OF MADRID

Universidad Autónoma de Madrid

- Established in 1968
- North part of Madrid (*campus Cantoblanco*)
- One of the top universities in Spain
- >30000 students
- "*Excellence*" campus with CSIC (Spanish Research Council)

Computer Science and Telecommunication Engineering

- Created in 1992
- 96 full time professors
- Joint diploma Comp.Sci.-Maths

THE MISO GROUP

Modelling and Software Engineering Research Group

Professors:

- Juan de Lara, PhD (Catedrático)
- Elena Gómez, PhD (Ayudante doctor)
- Esther Guerra, PhD (Profesora titular)

PhD students & Researchers:

- Antonio Garmendia, PhD (FPI)
- Pablo Gómez (Ayudante, PhD student)
- Sara Pérez (research associate, PhD student)
- Ángel Mora (PhD student)
- Lissette Almonte (PhD student, ITN Lowcomote)
- Lea Brunschwig (PhD student, ITN Lowcomote)
- Sergio Bravo (research associate)
- Alberto Sebastián (research associate)

External and collaborators:

- Fatima Rani (PhD student, UGROUND, ITN Lowcomote)
- Jesús Sánchez, PhD (U. Murcia)
- Santiago Jácome, PhD (U. Fuerzas Armadas, Ecuador)

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OUR RESEARCH: MODEL DRIVEN ENGINEERING

Areas

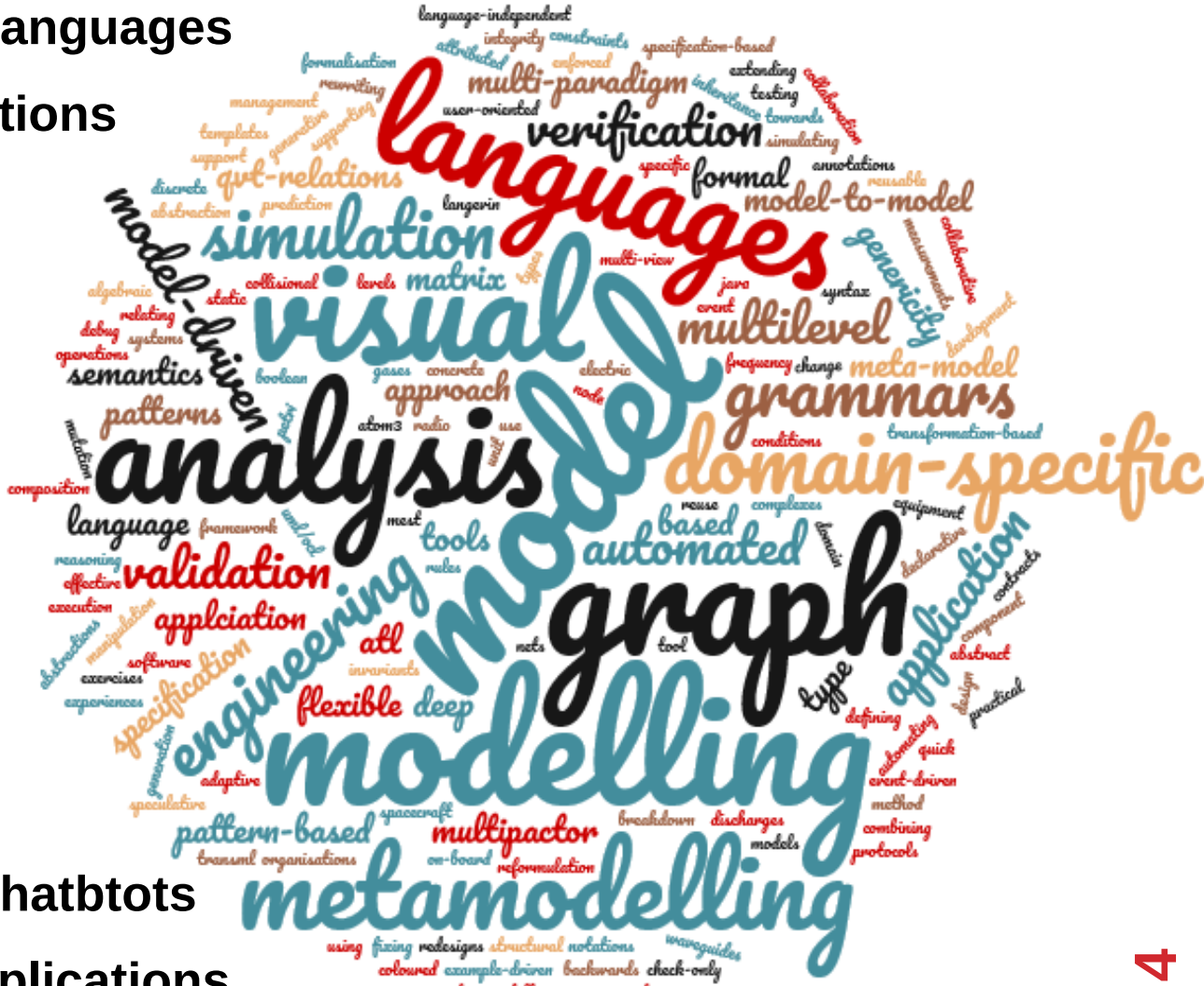
- Domain-Specific Languages
- Model-Transformations
- (Meta-)Modelling

Concerns

- Flexibility
- Scalability
- Reuse

Applications

- Mobile apps
- Open data
- Social networks, chatbtots
- Streaming data applications



MAIN RESEARCH TOPICS

(Meta-)Modelling

- Flexible modelling (multi-level modelling, a-posteriori typing, facets)

Domain-Specific Languages

- Scalability (model fragmentation policies)
- Active DSLs (modelling through mobile devices)
- Modelling through Natural Language (via chatbots)
- Automated synthesis of chatbots (given domain models)
- Recommendation (for any DSL, or GPL)

Transformations

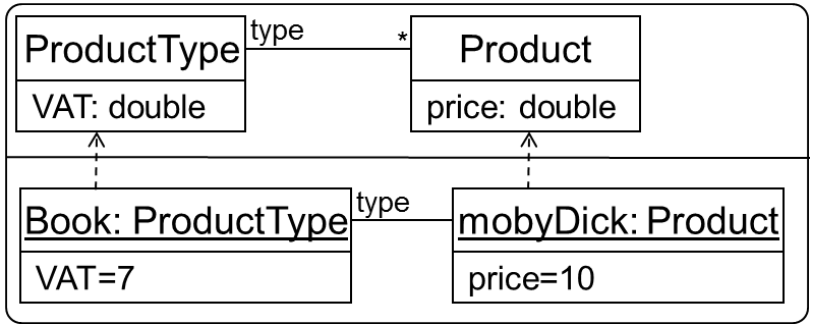
- Verification, reuse

Variability

- Language product lines
- Petri net product lines

MULTI-LEVEL MODELLING

Support multiple levels of instantiation



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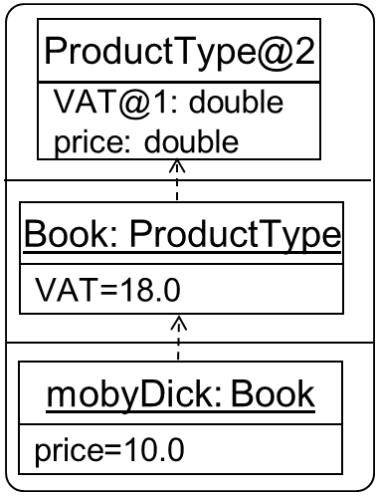


Useful to:

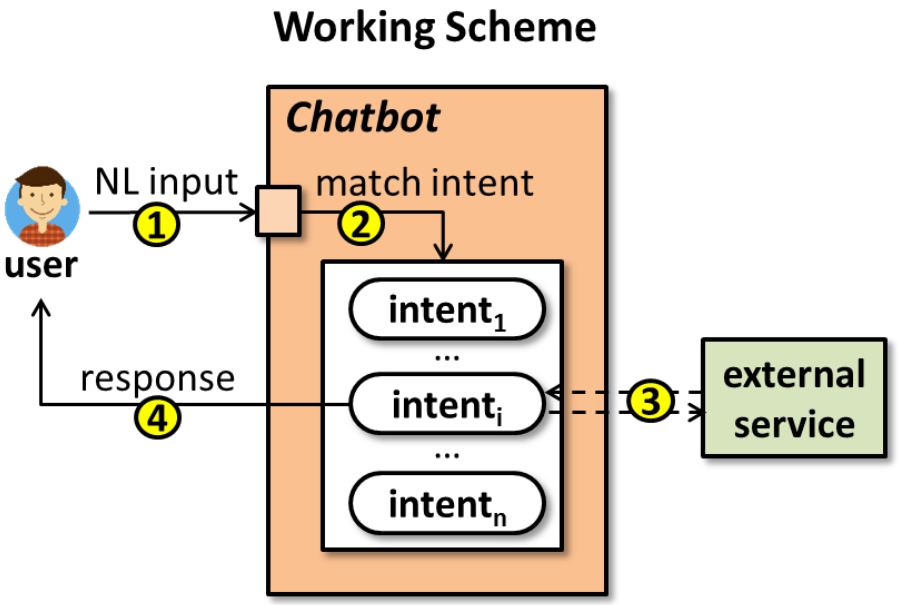
- Reduce accidental complexity in domain models
- Define families of DSLs (e.g., for process modelling)

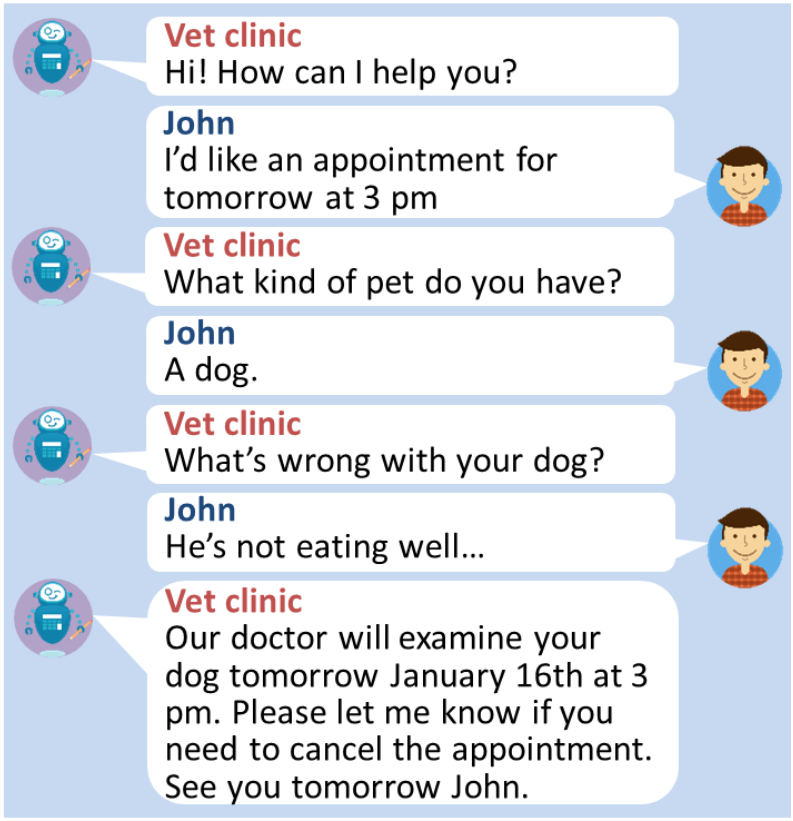
Some challenges:

- Behaviour specification (e.g., based on OOP, rewriting rules)
- Combination with product lines

de Lara, Guerra, Cuadrado (2014). "*When and How to Use Multilevel Modelling*". ACM TOSEM.
de Lara, Guerra, Cuadrado (2015) "*Model-driven engineering with domain-specific meta-modelling languages*". SoSyM
de Lara, Guerra (2018) "*Refactoring Multi-Level Models*". ACM TOSEM

CHATBOTS





All major software companies are offering platforms for developing chatbots:

- Google's DialogFlow, Amazon's Lex, IBM's Watson Assistant, Microsoft Bot Framework + LUIS.

Conversation-as-a-platform

CHATBOTS

Increasing use of social networks

- Telegram, Twitter

Use them for collaborative modelling

- Chatbot
- Interprets natural language
- Creates a (meta-)model automatically

https://saraperezsoler.github.io/ModellingBot/

Challenges

- Testing, quality assurance
- Automated connection with services

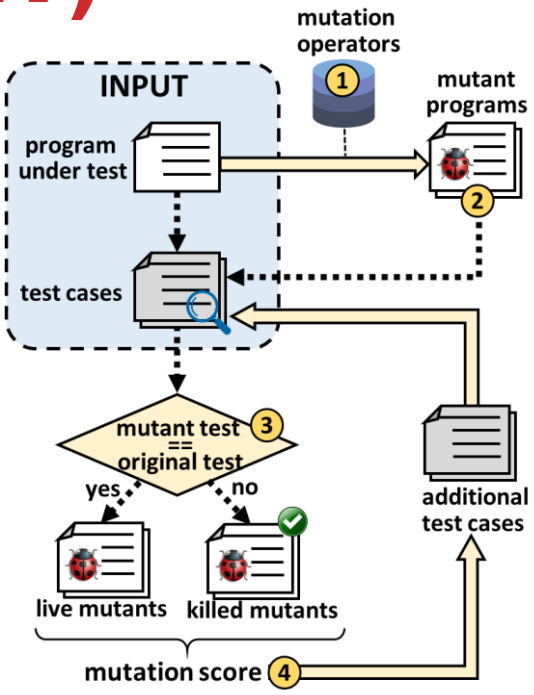
Pérez-Soler, Guerra, de Lara, Jurado. 2017. The Rise of the (Modelling) Bots: Towards Assisted Modelling via Social Networks. Proc. ASE.

Pérez-Soler, Guerra, de Lara. 2018. Collaborative Modeling and Group Decision Making Using Chatbots in Social Networks. IEEE Software.

Sara Pérez-Soler, González-Jiménez, Guerra, de Lara. 2019. Towards Conversational Syntax for Domain-Specific Languages using Chatbots. Journal of Object Technology

MUTATION TESTING (MT)

MT: Inject errors on program to assess the quality of a test suite

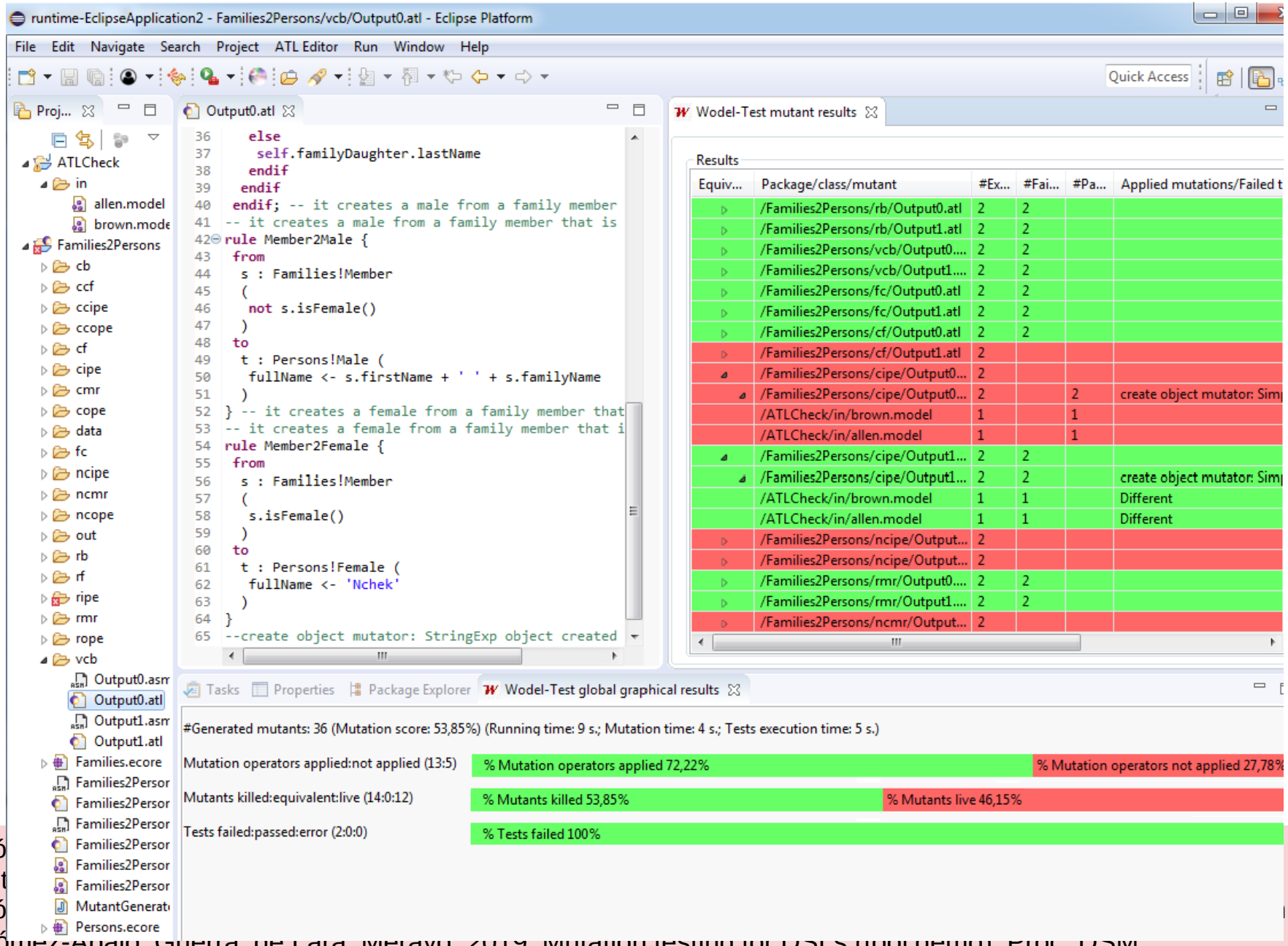


Challenge:

- Building MT tools is costly
- **Wodel**: a DSL and an MDE automation solution to create MT tools for arbitrary languages.

```
a = select one Assignment where {rhs is typed ObjectCreation}
create NullLiteral in a->rhs
```


Gómez-Abajo, Guerra, de Lara. 2017 A domain-specific language for model mutation and its application to the automated generation of exercises. Computer Languages, Systems & Structures.
Gómez-Abajo, Guerra, de Lara, Merayo. 2018. A tool for domain-independent model mutation. Sci. Comput. Program.
Gómez-Abajo, Guerra, de Lara, Merayo. 2019. Mutation testing for DSLs (tool demo). Proc. DSM




```
36     else
37      self.familyDaughter.lastName
38     endif
39    endif
40   endif; -- it creates a male from a family member
41  -- it creates a male from a family member that is
42  rule Member2Male {
43   from
44    s : Families!Member
45    (
46     not s.isFemale()
47    )
48   to
49    t : Persons!Male (
50     fullName <- s.firstName + ' ' + s.familyName
51    )
52  } -- it creates a female from a family member that
53  -- it creates a female from a family member that i
54  rule Member2Female {
55   from
56    s : Families!Member
57    (
58     s.isFemale()
59    )
60   to
61    t : Persons!Female (
62     fullName <- 'Nchek'
63    )
64  }
65  --create object mutator: StringExp object created
```

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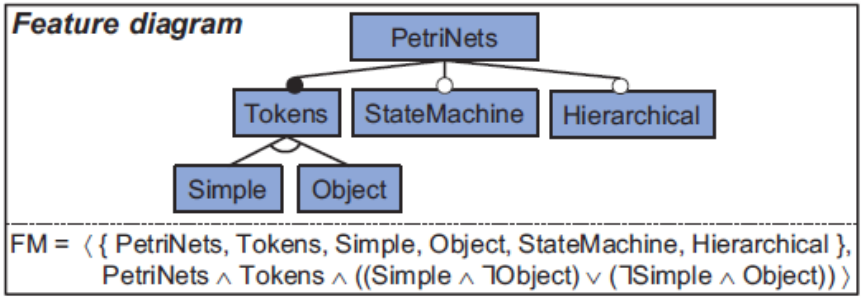
Gómez-Abajo, Guerra, de Lara, Merayo. 2019. Mutation testing for DSLs (tool demo). Proc. DSM

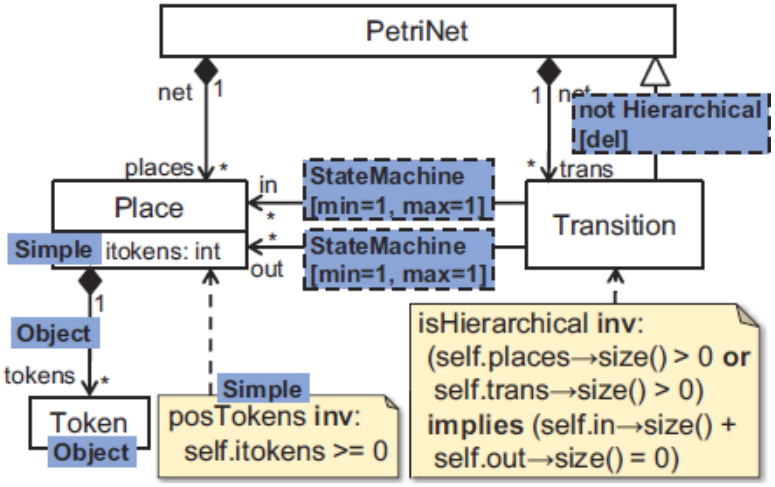
PRODUCT LINES + MDE

Product line (PL): "*SE methods for creating a collection of similar software systems from a shared set of software assets using a common means of production*"

Apply PLs to all sorts of MDE artefacts

- Meta-models and languages, transformations, code generators, etc





Challenges:

- Lifted analyses, testing

(avoid combinatorial explotion of checking each derivable product)

Guerra, de Lara, Chechik, Salay: Analysing meta-model product lines. SLE 2018.
de Lara, Guerra, Chechik, Salay. Model Transformation Product Lines. MoDELS 2018.
Gómez-Martínez, de Lara, Guerra. Towards Extensible Structural Analysis of Petri Net Product Lines. PNSE@Petri Nets/ACSD 2019: 37-46

THANKS!

Questions?

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