DeepTelos Demonstration

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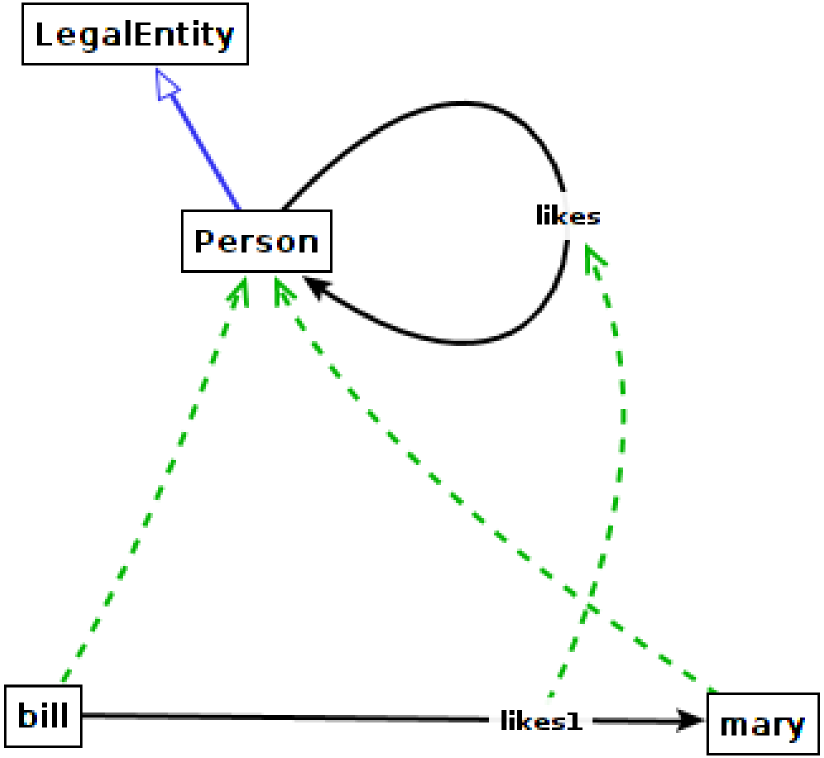
Outline

1) Telos

2) DeepTelos definition

3) Demonstration

Telos



http://conceptbase.sourceforge.net/deeptelos2/01-person.gel

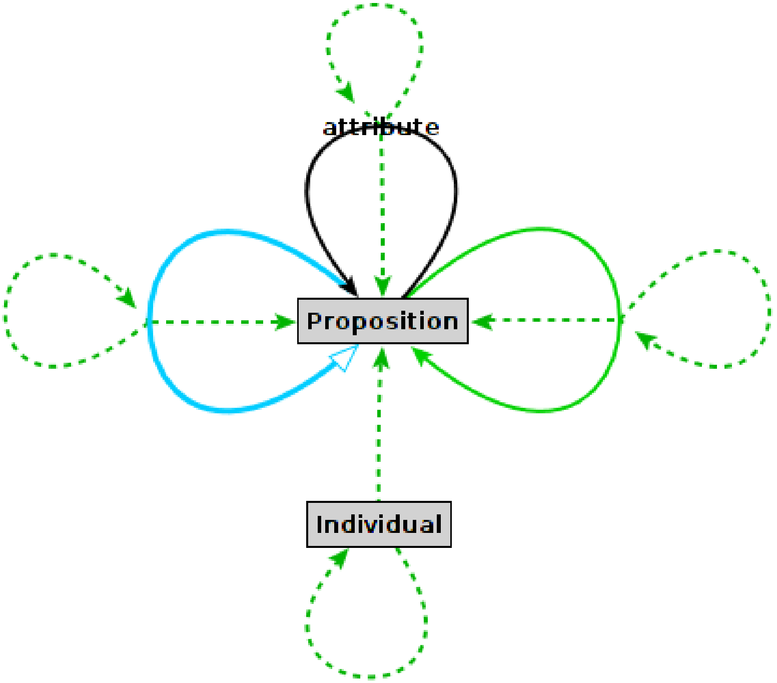
Specialization (c isA d)
(Person isA LegalEntity)

Instantiation (x in c)
(bill in Person), (mary in Person),
(bill in LegalEntity), (mary in Legal Entity)
(bill!likes1 in Person!likes)

Attribution/relations (x m/n y)
(bill likes/likes1 mary)
(bill likes mary)

We utilize the free ConceptBase system in the demonstration, see www.conceptbase.cc

Step 1: Proposition as omega-level



Attribute: subsumes all eplicit attributes and relations

Individual: all node-like objects

InstanceOf: all explicit instantiations

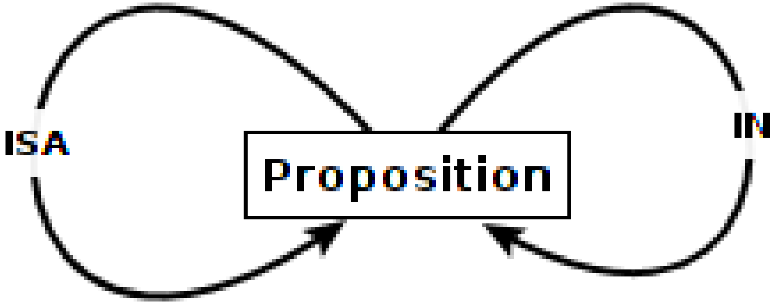
IsA: all explicit specializations

Proposition: all explicit objects

stored as P(id,x,n,y)

http://conceptbase.sourceforge.net/deeptelos2/telos.gel

Step 2: DeepTelos definition



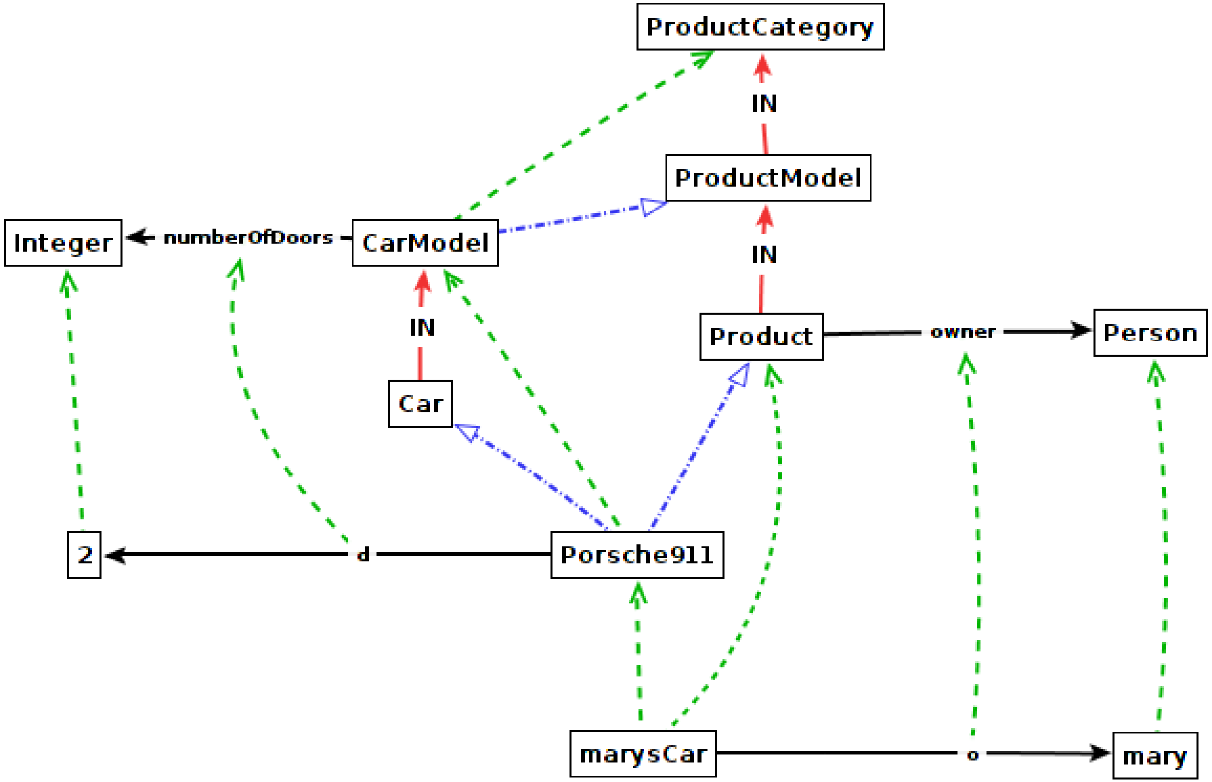
http://conceptbase.sourceforge.net/deeptelos2/deeptelos.gel

(m IN c) declares the object m to be the most-general instance of class c. Hence,
it shall be the superclass of all instances of c

forall m,x,c/Proposition
    (x in c) and (m IN c) and not (x isA m)
    ==> (x ISA m)

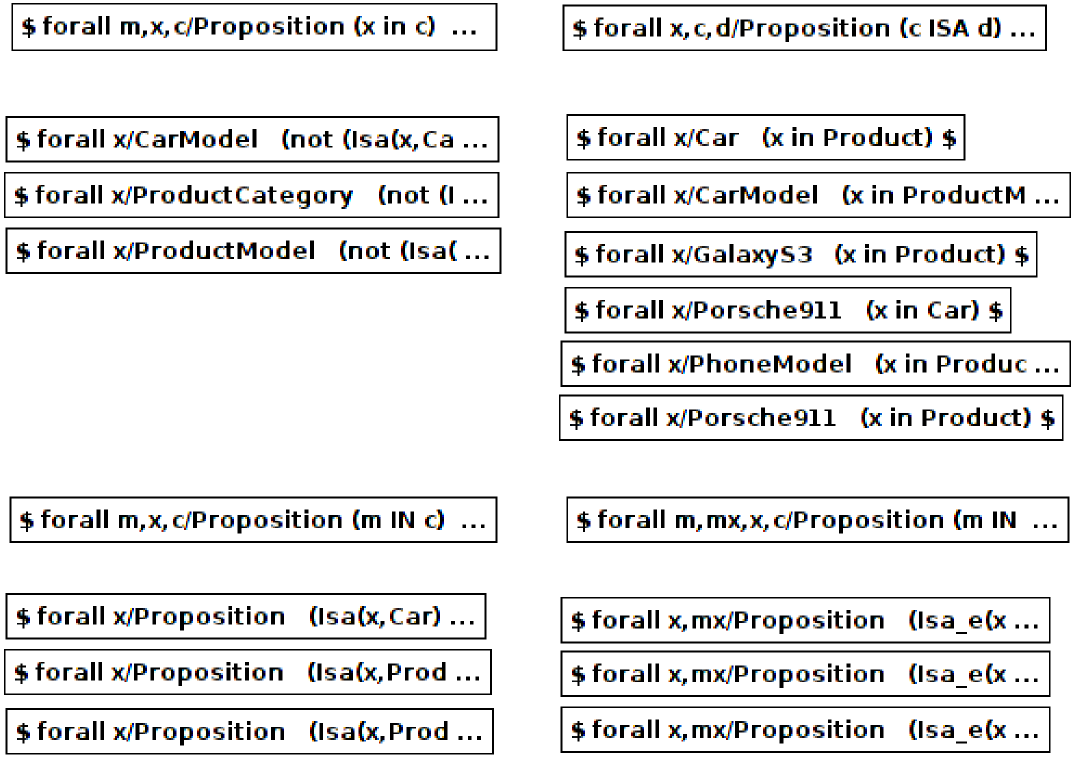
There are 5 more axioms of DeepTelos that are listed in the paper and are part of the example databases that we demonstrate.

Step 3: product hierarchy example



http://conceptbase.sourceforge.net/deeptelos2/products.gel

From multi-level to two-level



$ forall m,x,c/Proposition (x in c) ...

$ forall x/CarModel (not (Isa(x,Ca ...

$ forall x/ProductCategory (not (I ...

$ forall x/ProductModel (not (Isa(...

$ forall m,x,c/Proposition (m IN c) ...

$ forall x/Proposition (Isa(x,Car) ...

$ forall x/Proposition (Isa(x,Prod ...

$ forall x/Proposition (Isa(x,Prod ...

$ forall x,c,d/Proposition (c ISA d) ...

$ forall x/Car (x in Product) $

$ forall x/CarModel (x in ProductM ...

$ forall x/GalaxyS3 (x in Product) $

$ forall x/Porsche911 (x in Car) $

$ forall x/PhoneModel (x in Produc ...

$ forall x/Porsche911 (x in Product) $

$ forall m,mx,x,c/Proposition (m IN ...

$ forall x,mx/Proposition (Isa_e(x ...

$ forall x,mx/Proposition (Isa_e(x ...

$ forall x,mx/Proposition (Isa_e(x ...

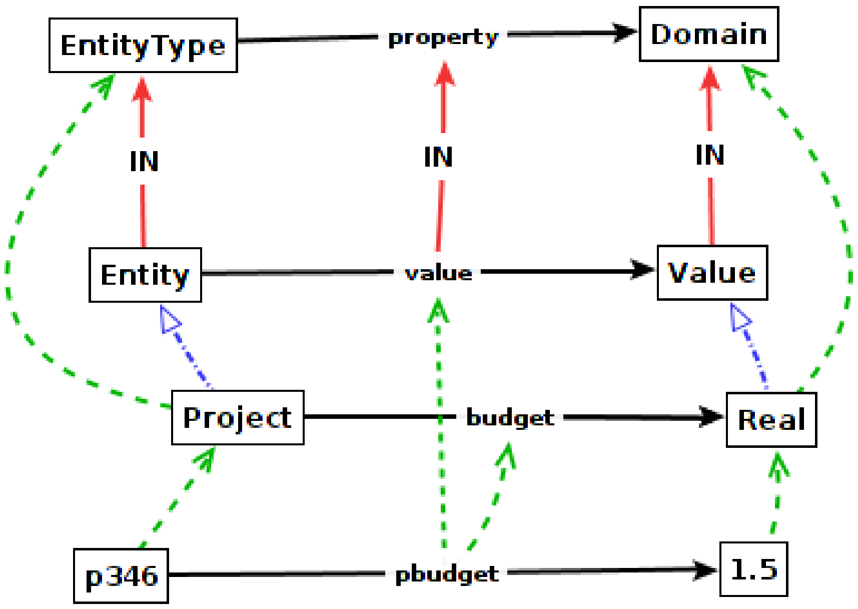
http://conceptbase.sourceforge.net/deeptelos2/twolevelrules.gel

Query generated rules

```
GeneratedRules in QueryClass isA Class with
   computed_attribute genrule : MSFOLrule
   constraint c1 : $ (this rule genrule) and
            exists mlrule/MSFOLrule
           (DeepTelosRules rule mlrule)
           and :(genrule isA mlrule): $
end
```

DeepTelos is entirely specifyed by the six axioms (5 deductive rules, 1 constraint).
We can query how ConceptBase partially evaluates these axioms.

Step 4: entities and values

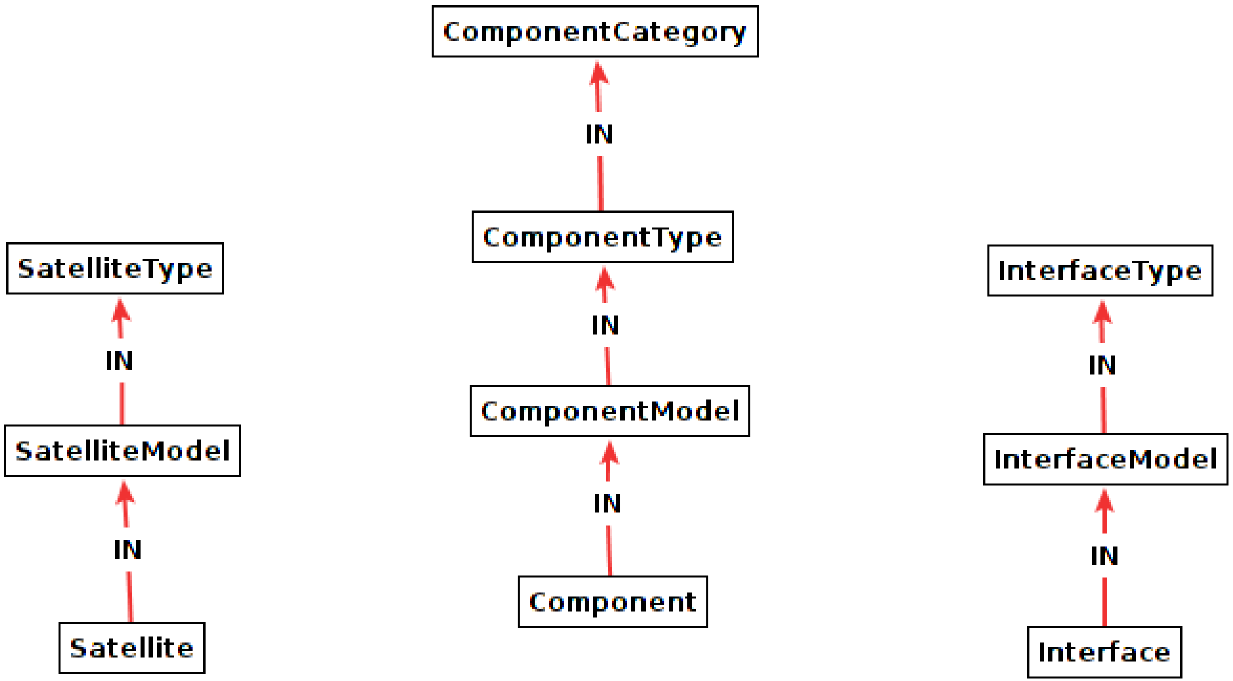


- Attributes and relations can also have most-general instances

- Allows to ”query” the M0 level with generic concepts such which entities have attributes with value 1.5?

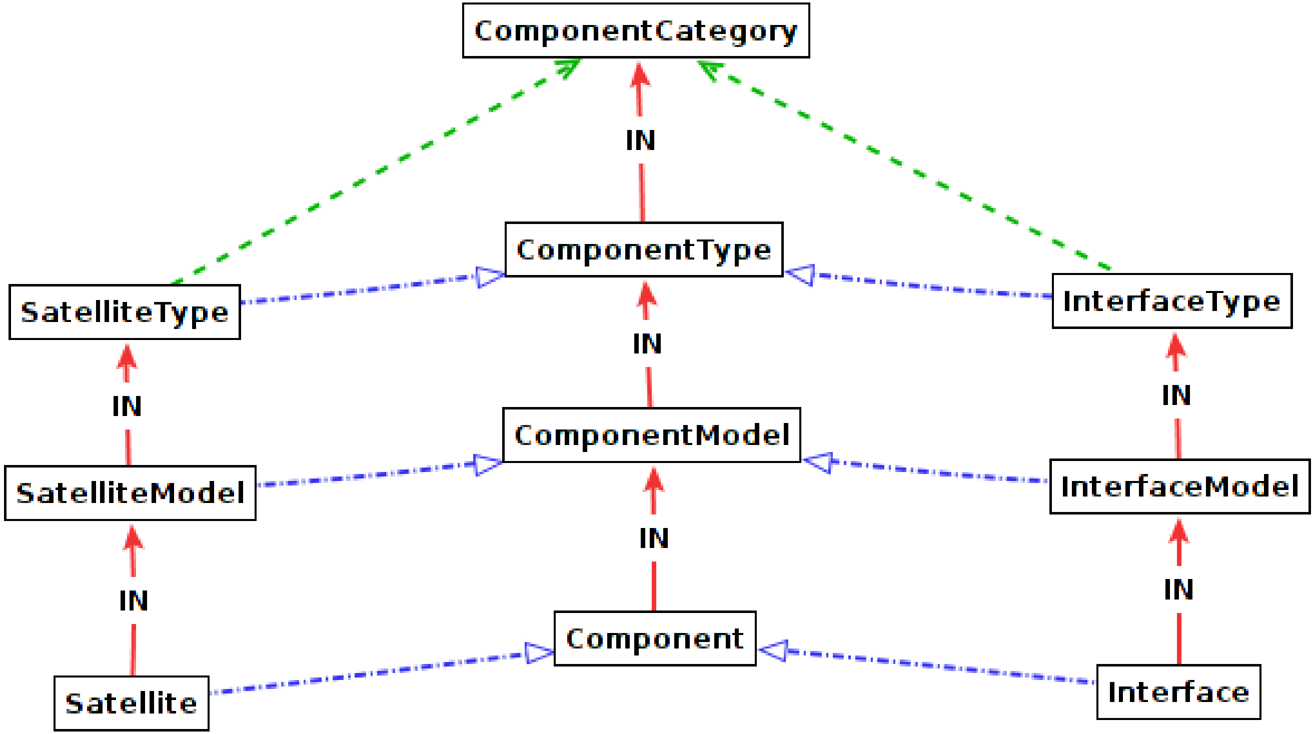
http://conceptbase.sourceforge.net/deeptelos2/entitiesvalues.gel

Step 5.1: multilevel hierarchies for the satellite case



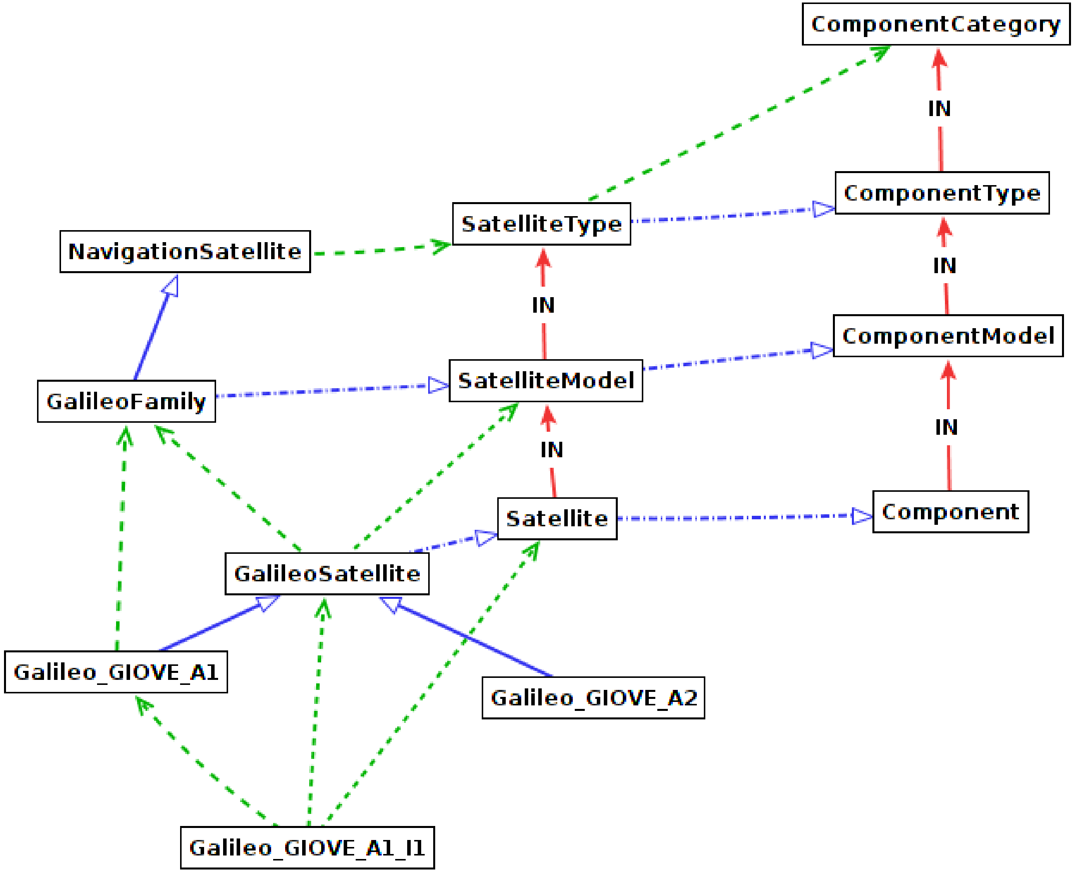
http://conceptbase.sourceforge.net/deeptelos2/multisat1.gel

Step 5.2: adding derived specializations



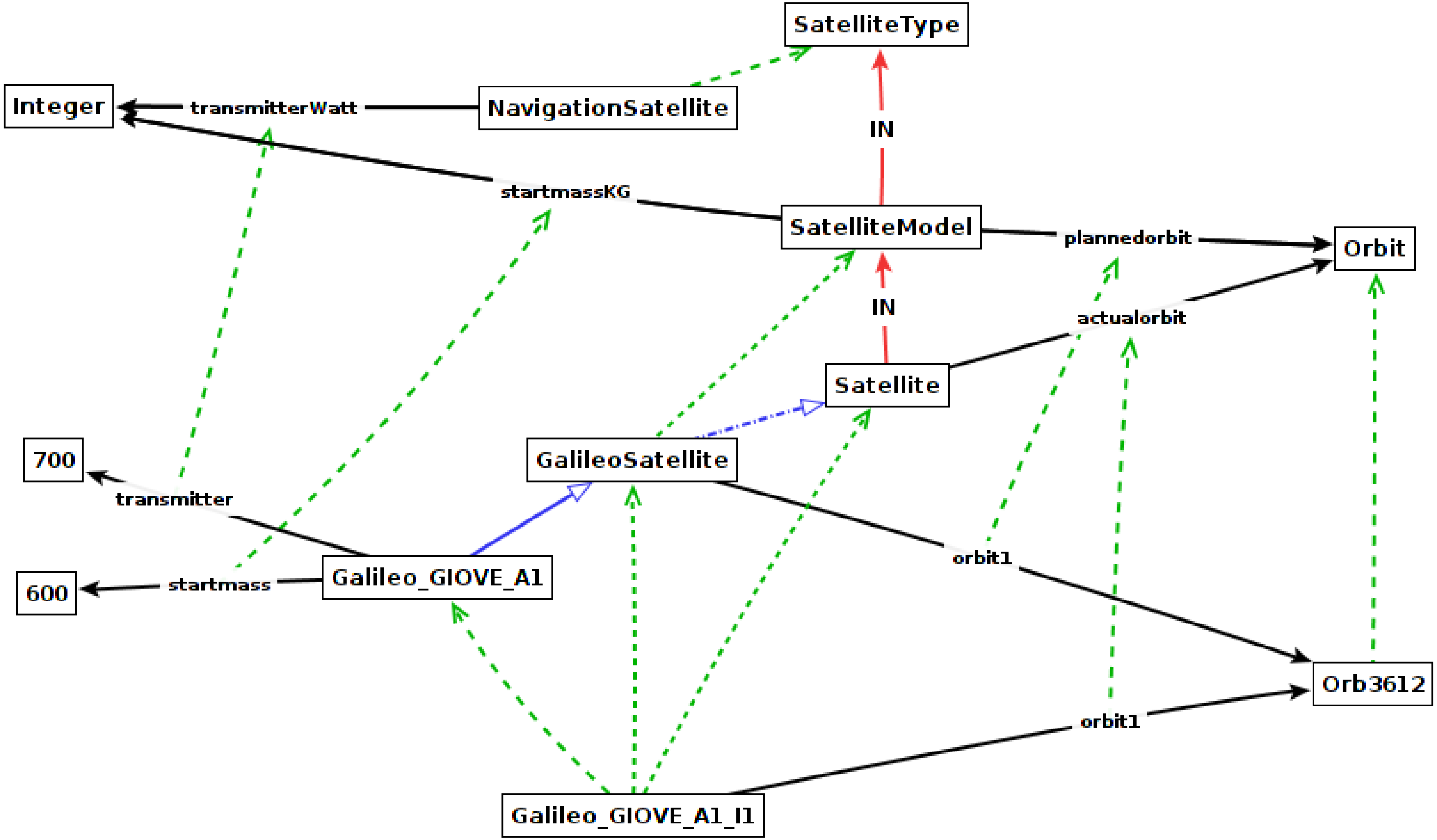
http://conceptbase.sourceforge.net/deeptelos2/multisat2.gel

Step 5.3: the Galileo satellite example



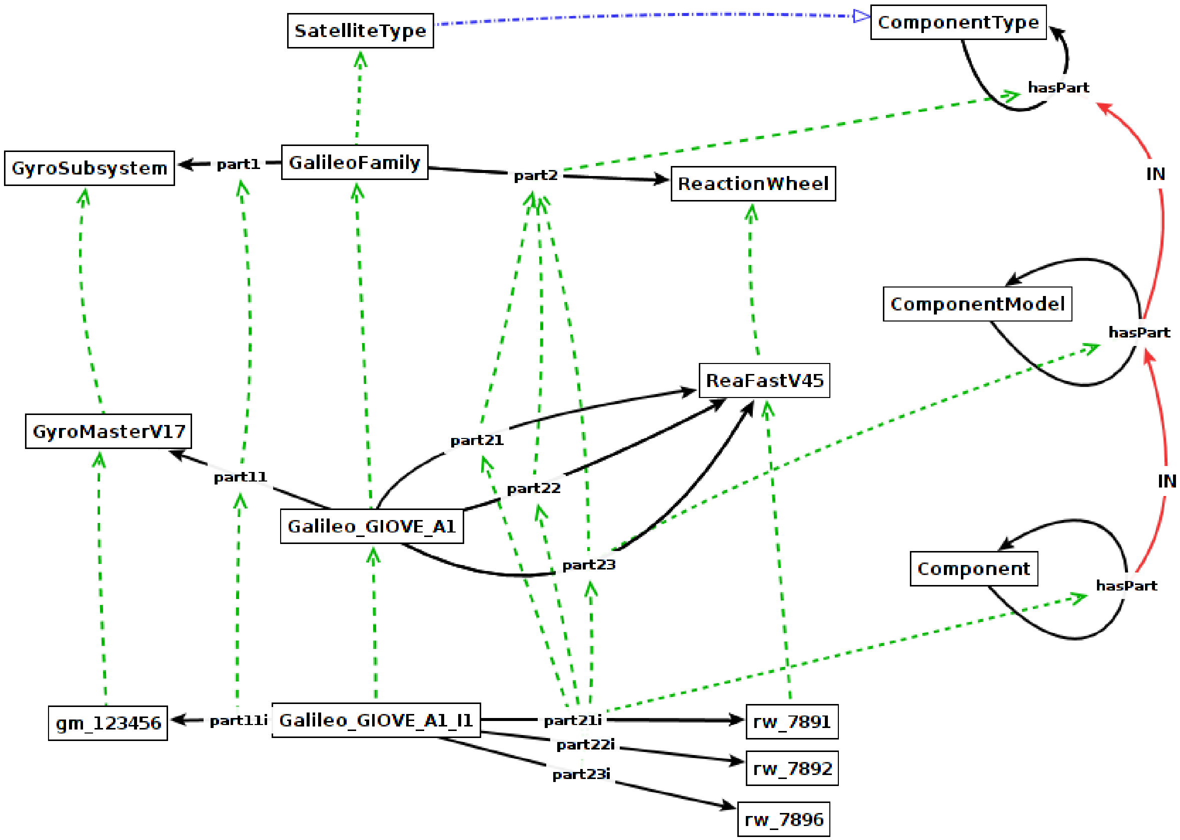
http://conceptbase.sourceforge.net/deeptelos2/multisat3.gel

Step 5.4: multi-level properties



http://conceptbase.sourceforge.net/deeptelos2/multisat4.gel

Step 5.5: satellite configurations



http://conceptbase.sourceforge.net/deeptelos2/multisat5.gel

Summary

- The demonstration showed how ConceptBase implements DeepTelos
- Semantics is based on Datalog with negation (ConceptBase is a deductive database system)
- No explicit level numbers and potencies. Instead, DeepTelos uses the most-general instances
- Not directly applicable to UML since UML has for example no multiple generalization
- The generated two-level rules could however be used to extract partial 2-level views
- Essential was the Telos extensibility via the omega level