Openmodels Workshop September 8, 2011

A Habilitation Project:

Semantic-based Modeling Framework for Information Systems (SeMFIS)

Report from a Research Project
Conducted with the Protégé Group at Stanford University

Dr. Hans-Georg Fill

Funded by the Austrian Science Fund: Grant Number: J3028-N23
Erwin-Schrödinger Fellowship

STANFORD
UNIVERSITY

OPEN | MODEL
Initiative

universität
wien

Agenda

- Knowledge Elicitation for Clinical Guidelines
- SeMFIS Approach
- Implementation on ADOxx®
- Usage Scenario

Knowledge Elicitation for Clinical Guideline Representation and Analysis

Clinical guidelines:

"Systematically developed statements to assist practitioner and patient decision making about appropriate healthcare for specific clinical circumstances"

Aims:

- Improve quality of patient care
- Minimize unjustified variance in patient care
- Cut down costs

Computerizing narrative guidelines for:

- Decision support
- Patient-specific advice at point of care
- Better impact on clinicians' behavior

Challenges when Computerizing Narrative Guidelines

- High amount of work and effort due to:
  - Ambiguity
  - Inconsistencies
  - Incompleteness

- Processing requires be re-conceptualization based on computable guideline formalisms:
  - Operationalizing in terms of available data
  - Explication of hidden assumptions
  - Clarification of undefined terms and inconsistent recommendations

- How to ease this process and handle the required information?

SeMFIS Approach

- Integrated view of conceptual models and ontology models
- Use of conceptual visual models for a first, intuitive representation
- Stepwise enrichment of the information contained in conceptual models by using
  - annotations and
  - subsequent transformations to ontology models
- Configurable for arbitrary conceptual modeling languages
- Generation of different output formats and transformation scripts based on generic XML format
- Further refinement and processing of formal information in ontology tools, e.g. to add PAL and OWL constraints in Protégé

Extensions provided by SeMFIS

Ontology model types:	**Annotation model types:**
• OWL Ontology Model Type • Frames Ontology Model Type • Term Model Type	• Annotation Model Type for OWL and Frames Ontologies based on the SeMAL language • Social Network Model Type • Version and Change Model Type
Algorithms Frames Models:	**Algorithms OWL Models:**
• Model2Frames Transformation • (Protégé Frames Import/Export)	• Protégé OWL Export • Semantic Obfuscation • (Model2OWL Transformation via Mapping Master)
Algorithms Term Models:	**Support model types:**
• User-centric semantic visualization	• Formal Meta Model Model type • Formal Model Model type

SeMFIS Implementation on ADOxx®

- Model types on ADOxx® including elements, relations, attributes and their graphical representation
- Algorithms in ADOScript and Java™via XML Import/Export
- Extension of a Protégé Export Plugin for offline and online export of OWL ontologies in ADOXML
- Configuration of the LBRS-WS for enabling web-based modeling
- Additional implementation of:
  - REST-Services for lightweight access of model information
  - Smart GWT client for a Web2.0 user interface for accessing models
  - Facebook Login Service for the Smart GWT client

Some SeMFIS Application Areas

- Processing of semantic model information, e.g. for applying reasoning and rule-based techniques
- Adding and querying of information without modification of the original modeling language
- As a reference to shared semantic schemata for ensuring a common understanding
- Semantic obfuscation of model information for sharing parts of models with untrusted third parties
- …

Scenario for Computerizing Clinical Guidelines

Outline of the Scenario:

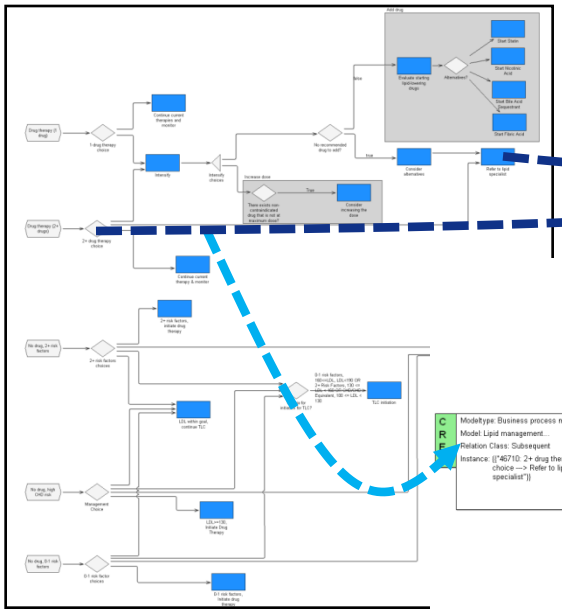
- Specification of clinical guideline relationships using a conceptual process modeling language
- Manual definition of the annotations using an existing ontology
- Transformation of the annotated conceptual model information to the ontology for further refinement

Realization using SeMFIS:

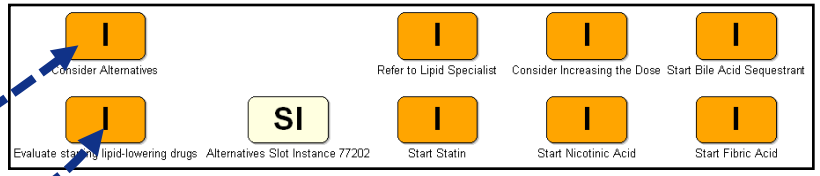
- Using the provided flowchart-like business process modeling language
- Definition of the SeMFIS annotation model using a Frames or an OWL ontology model
- Creation of instances / individuals in the knowledge base based on
  - Static export algorithm, e.g. for Frames ontologies
  - (Dynamic configuration of exports using XML Mapping Master expressions for OWL ontologies)

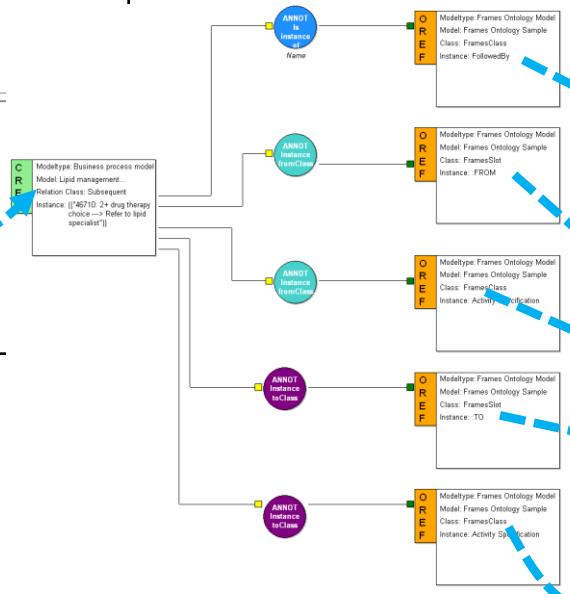
Example Scenario for Frames Ontologies

Conceptual Business Process Model Instance

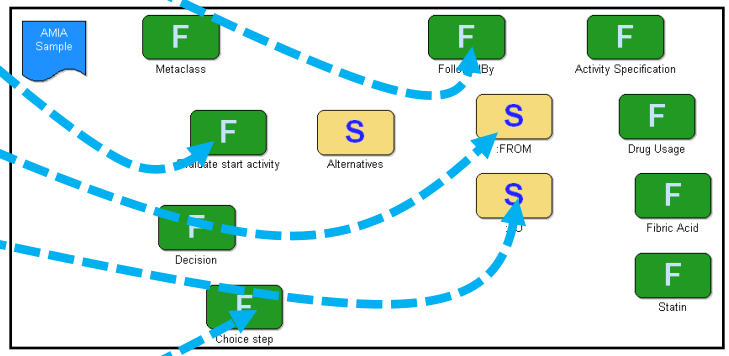


Frames Ontology Instances





Annotation Model Instance

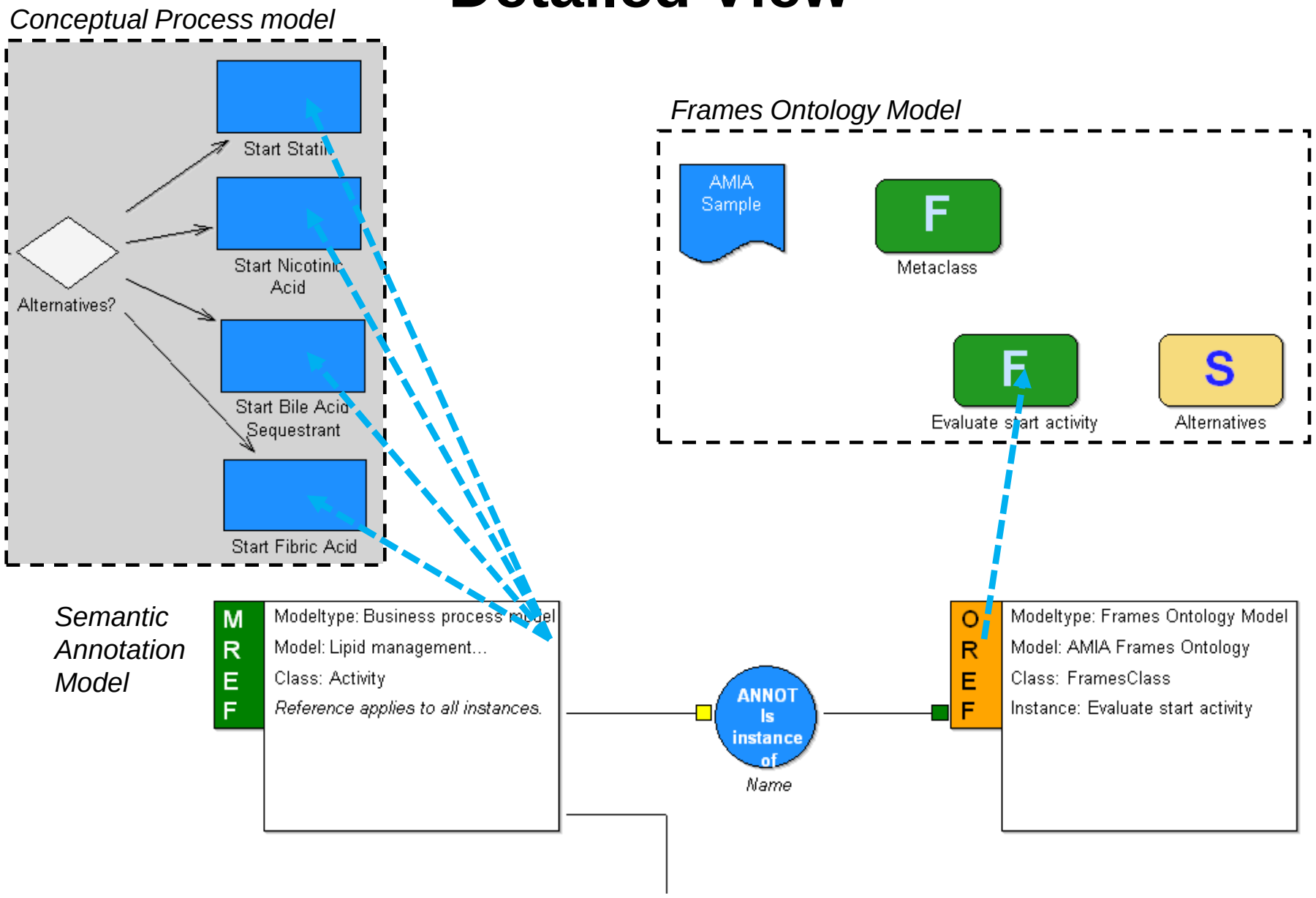


Frames Ontology Class and Slot Instances

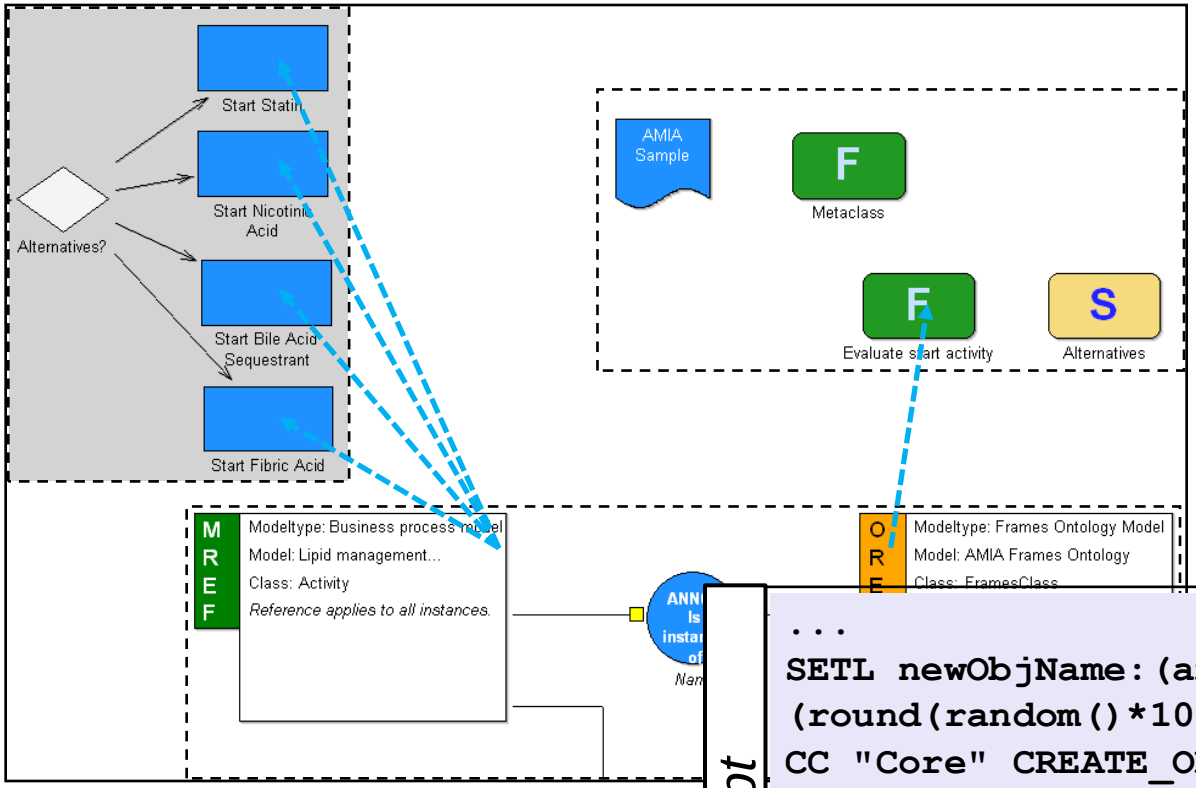
Reference

Transformation

Detailed View



Detailed View



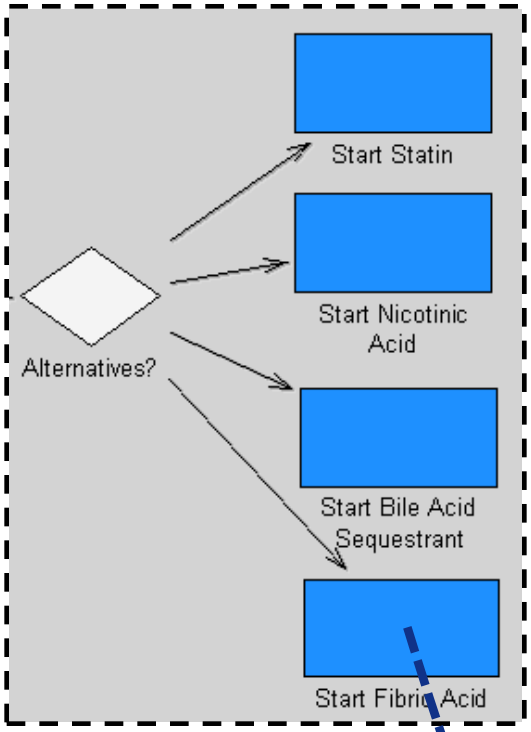
Transformation Algorithm

ADOscript

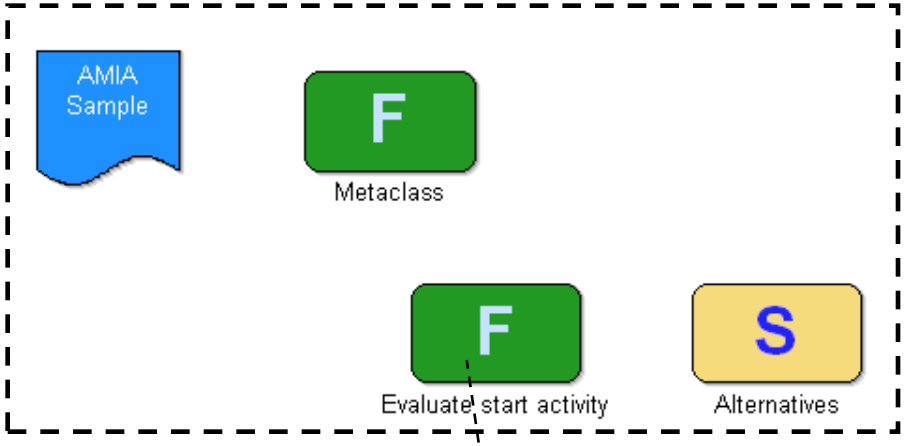
```
...
SETL newObjName:(annotValue + "-" + (STR
(round(random()*100000)) ))
CC "Core" CREATE_OBJ
modelid:(sameOntoRefID)
classid:(framesInstanceClassID)
objname:(newObjName)
CC "Core" ADD_INTERREF objid:(objid)
attrid:(instanceOfFramesInstanceAttrID)
tobjid:(framesClassID)
SETL newFramesClassID:(objid)
...
```

Detailed View

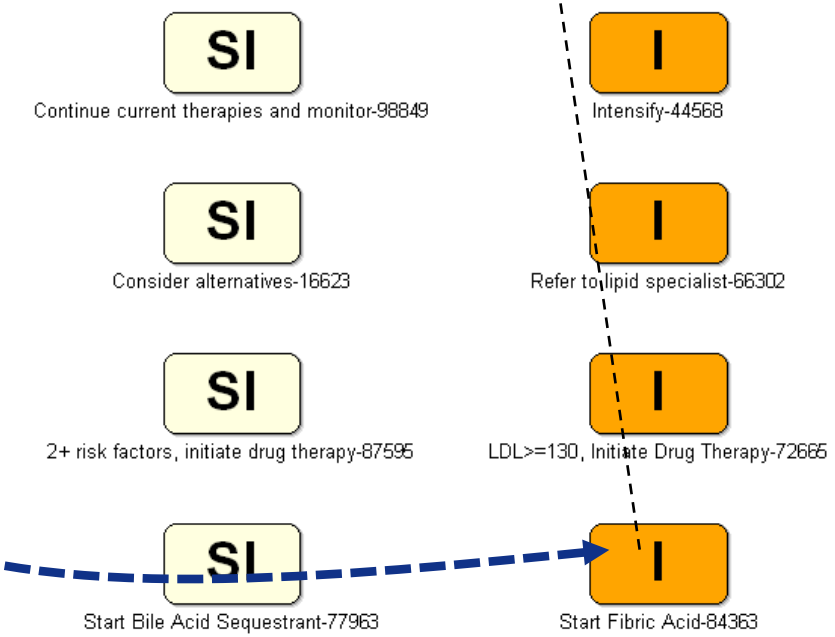
Conceptual Process model



Frames Ontology Model

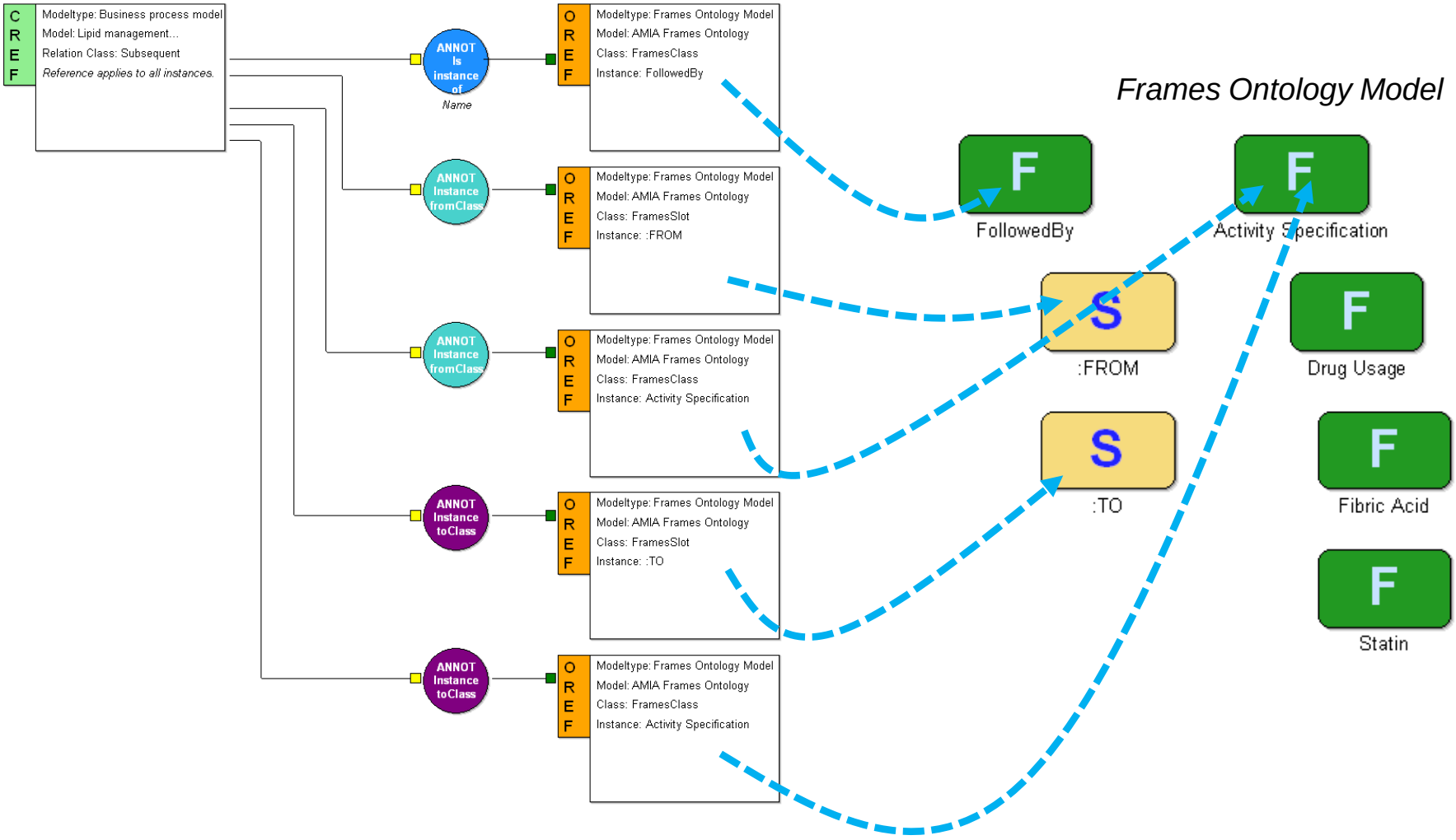


Created Instances in the Frames Ontology Model



Example for a Relation Annotation

Semantic Annotation Model



Thank you for your attention!

hans-georg.fill@univie.ac.at

References

[Fill and Redmond, 2011]: Fill Hans-Georg, Redmond, Timothy (2011): Representing Conceptual Models and Ontologies Using a Formal Visual Language, to be submitted.

[Fill, 2011d]: Fill, Hans-Georg (2011): Derivation of a Service Oriented Architecture for the Social Network based Semantic Annotation of Conceptual Models, to be submitted.

[Fill, 2011c]: Fill, Hans-Georg (2011): Using Semantically Annotated Models for Supporting Business Process Benchmarking, accepted for BIR 2011.

[Fill, 2011b]: Fill, Hans-Georg (2011): Using Obfuscating Transformations for Supporting the Sharing and Analysis of Conceptual Models, to be submitted.

[Fill, 2011a]: Fill, Hans-Georg (2011): On the Conceptualization of a Modeling Language for Semantic Model Annotations, accepted for CMM-Workshop 2011 in conjunction with CAiSE 2011.

[Fill and Reischl, 2011]: Fill, Hans-Georg, Reischl, Ilona (2011): Stepwise Semantic Enrichment in Health-related Public Management by Using Semantic Information Models, accepted for "Semantic Technologies for Business and Information Systems Engineering: Concepts and Applications" to be published by IGI.

[Fill and Tudorache, 2011]: Fill, Hans-Georg, Tudorache, Tania (2011): On the Collaborative Formalization of Agile Semantics Using Social Network Applications, AAAI Spring Symposium 2011 - AI for Business Agility.

[Fill et al., 2011a]: Fill, Hans-Georg, Schremser, Daniela, Karagiannis, Dimitris (2011): A Generic Approach for the Semantic Annotation of Conceptual Models using a Service-oriented Architecture, accepted for International Journal of Knowledge Management.

[Fill et al., 2011]: Fill, Hans-Georg, Eberhart, Andreas, Laslop, Andrea, Reischl, Ilona, Lang, Thomas, Karagiannis, Dimitris (2011): An Approach to Support the Performance Management of Public Health Authorities using an IT based Modeling Method, in: Bernstein, A., Schwabe, G. (2011): Proceedings of the 10th International Conference on Wirtschaftsinformatik WI 2.011, Volume 1, 38-47.

[Fill and Burzynski, 2009]: Fill, Hans-Georg, Burzynski, Patrik (2009): Integrating Ontology Models and Conceptual Models using a Meta Modeling Approach, Abstract of the talk at the 11th International Protégé Conference, Amsterdam