The Upper Ontology Alignment Tool

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In a nutshell

We provide a case in point that the two ontology modeling approaches

- **based on TLOs/MLOs**
- **based on Modular Ontology Modeling**

are compatible.

Modular Ontology Modeling (MOMo)

DaSe Lab

Would need a full tutorial.
(but see http://www.semantic-web-journal.net/content/modular-ontology-modeling)

Some key aspects that distinguish MOMo from conventional approaches:

- **Tailored towards modularity from the outset.**
- **Reuse components, not ontologies.**

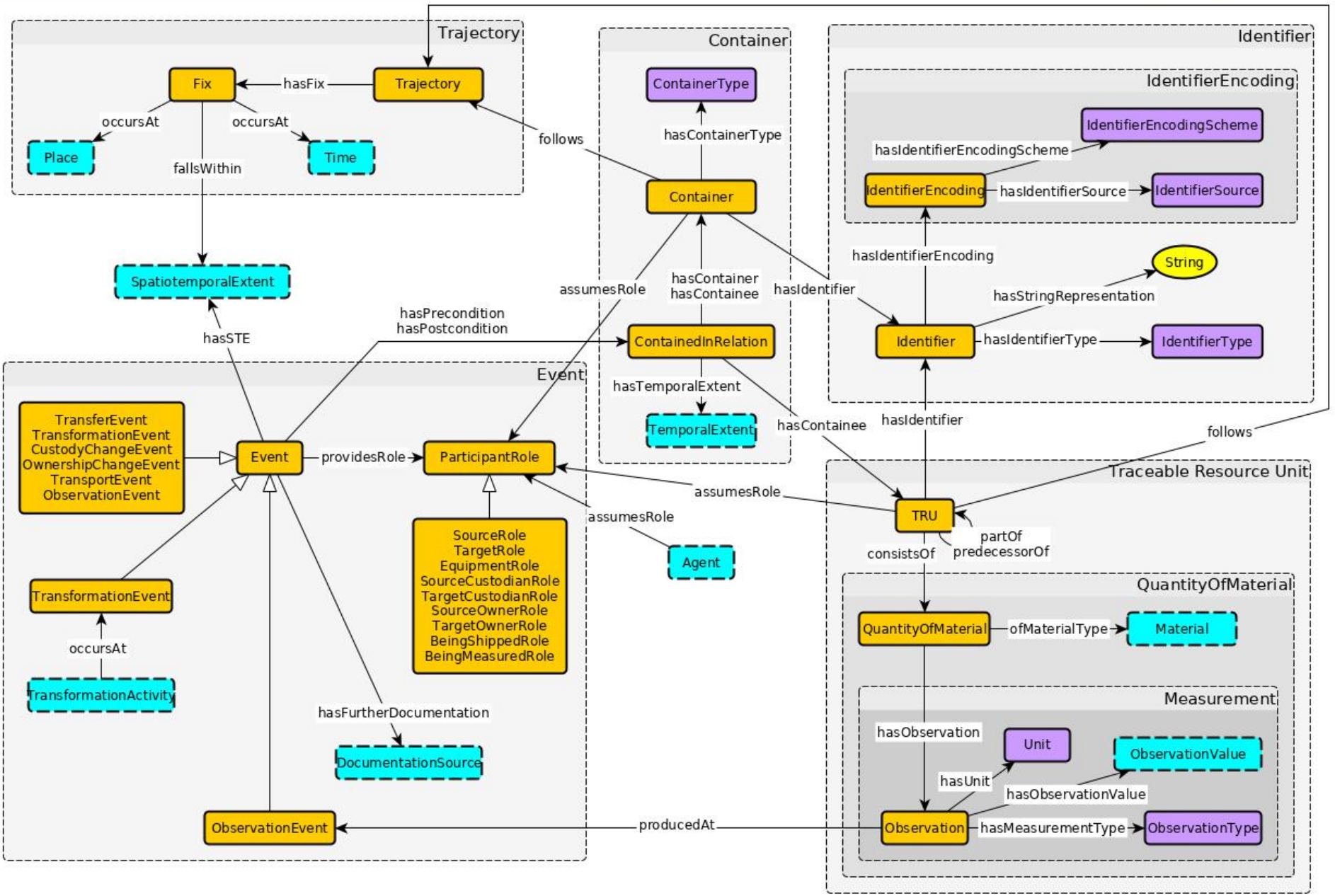
Key goal:

- **easier and more efficient development of quality ontologies**

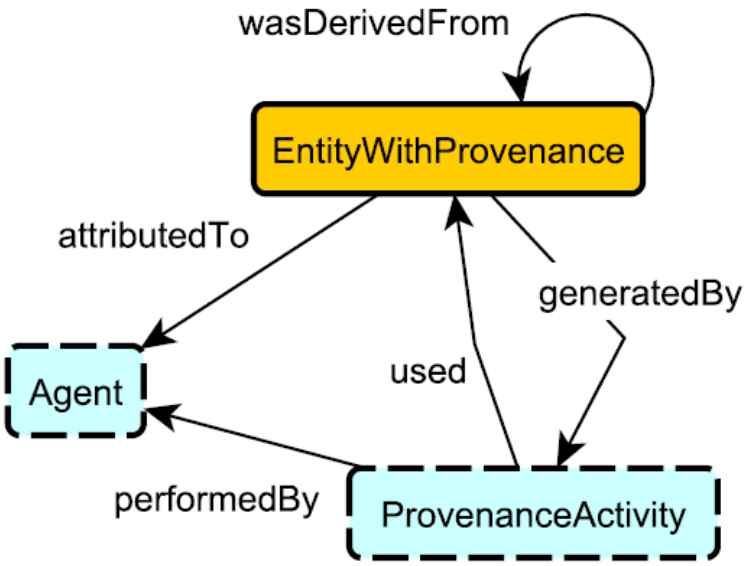
Modularity from the outset

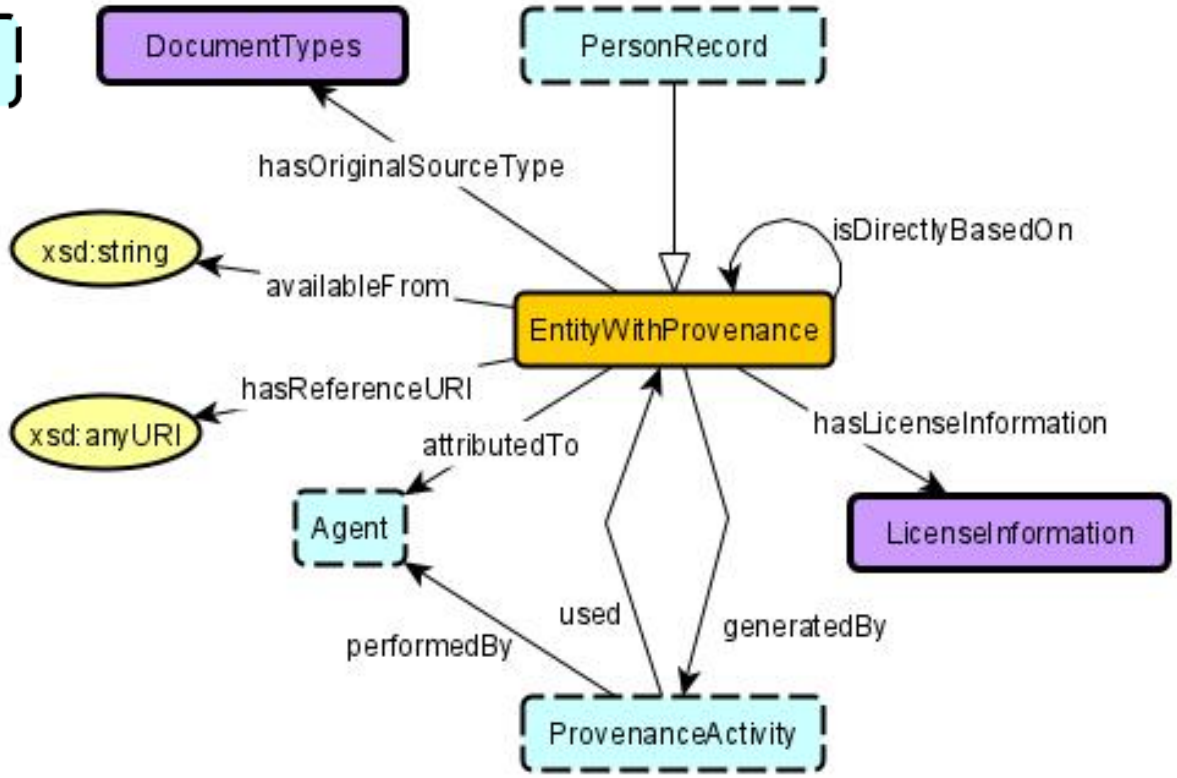
- **Design interconnected modules, rather than ontologies with a central class hierarchy.**
- **A module resonates with an expert's conceptualization of a key notion of the domain of interest.**
- **Focus on relating key terms, rather than on definitions.**
- **Leverage Ontology Design Pattern libraries. Use patterns as modifiable templates.**
- **Leverage schema diagrams prominently when modeling.**

Design interconnected modules



From Patterns to Modules





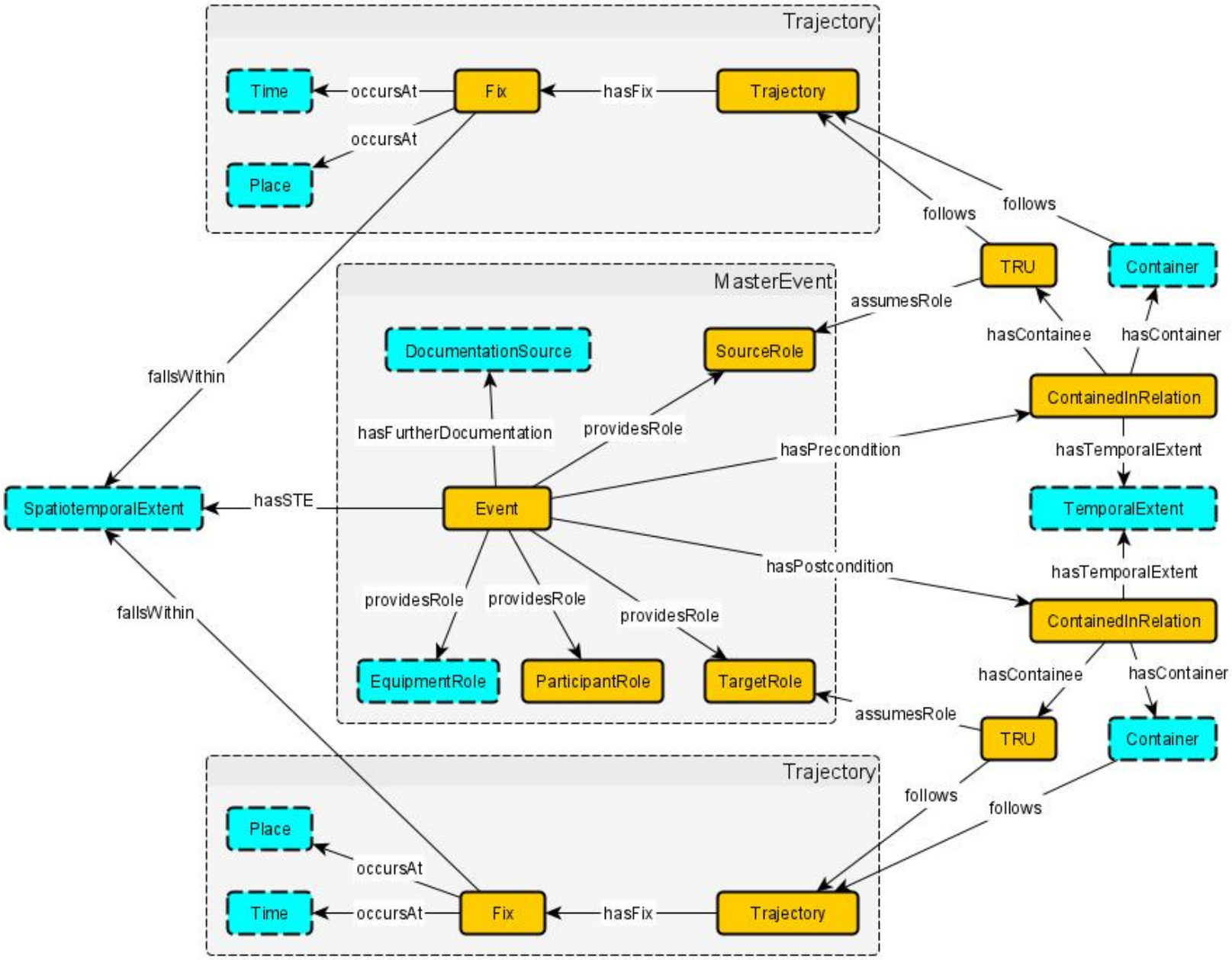
Focus on relating key terms, not on definitions

- **Early on define list of key terms.**
- **Most of these terms become modules**

Recipe	RecipeName	RecipeInstructions
TimeInterval	QuantityOfFood	Quantity
Equipment	FoodType	Difficultylevel
RecipeClassification	NutritionalInfo	Source

Example: Design of a Recipe Ontology: Initial Key Terms

Modules resonate with expert conceptualizations



The UOA tool

CoModIDE is a Protege plug-in for MOMo.

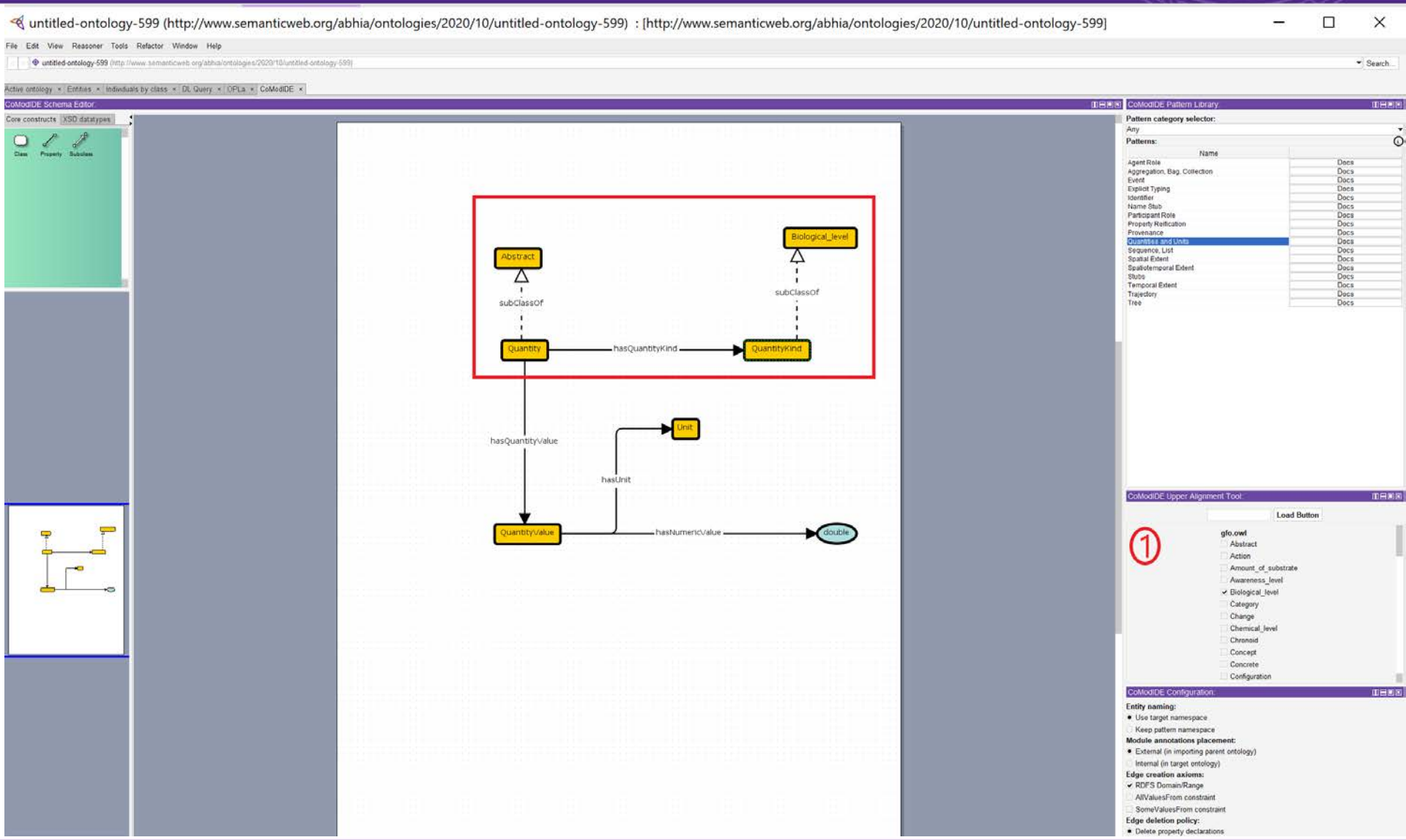
UOA has been developed within CoModIDE.

Idea:

- **When MOMo modeling, load a TLO/MLO.**
- **Provide easy interface to manually map your classes and relations to the TLO.**
  (using a few mouseclicks)

It's not doing anything spectacular or intelligent. It simply shows that the modeling paradigms can be combined.

The UOA tool


untitled-ontology-599 (http://www.semanticweb.org/abhia/ontologies/2020/10/untitled-ontology-599) : [http://www.semanticweb.org/abhia/ontologies/2020/10/untitled-ontology-599]
File Edit View Reasoner Tools Refactor Window Help
CoModIDE Schema Editor
Core constructs XSD datatypes
Class Property Subclass
Abstract
subClassOf
Biological_level
subClassOf
Quantity
hasQuantityKind
QuantityKind
hasQuantityValue
Unit
hasUnit
QuantityValue
hasNumericValue
double
CoModIDE Pattern Library
Pattern category selector:
Any
Patterns:
Name
Agent Role
Aggregation, Bag, Collection
Event
Explicit Typing
Identifier
Name Stub
Participant Role
Property Reification
Provenance
Quantities and Units
Sequence, List
Spatial Extent
Spatiotemporal Extent
Stubs
Temporal Extent
Trajectory
Tree
Docs
CoModIDE Upper Alignment Tool
Load Button
gfo.owl
Abstract
Action
Amount_of_substrate
Awareness_level
Biological_level
Category
Change
Chemical_level
Chronoid
Concept
Concrete
Configuration
CoModIDE Configuration
Entity naming:
Use target namespace
Keep pattern namespace
Module annotations placement:
External (in importing parent ontology)
Internal (in target ontology)
Edge creation axioms:
RDFS Domain/Range
AllValuesFrom constraint
SomeValuesFrom constraint
Edge deletion policy:
Delete property declarations

Evaluation

	mean	median	σ
Protégé	17.29	18	4.11
UOA	13.81	15	4.76

(a) Mean, median and standard deviation of *total time-taken* to complete both modeling task.

	mean	median	σ
Protégé (task A)	0.71	1	0.78
Protégé (task B)	0.52	0	0.74
UOA (task A)	1.38	2	0.86
UOA (task B)	1.05	1	0.86

(b) Mean, median and standard deviation of *output's correctness* for both modeling task.

	mean	median	σ
Protégé	44.05	42.5	21.04
UOA	71.79	72.5	13.06

(e) Mean, median and standard deviation for SUS score of each tool. The maximum score is 100.

Result	Significance (p)
Time-taken	$p \approx 0.010 < 0.05$
Corr. (Task-A)	$p \approx 0.004 < 0.05$
Corr. (Task-B)	$p \approx 0.012 < 0.05$
SUS Evaluation	$p \approx 0.0000015 < 0.001$

(f) Significance of results.

Conclusions

- ***Modular*** **and** ***Upper*** **approaches are compatible.**
- **The modeling process feels *very* different.**
- **What exactly is the “sweet spot” for combining the approaches?**

Thanks!

References

- Abhilekha Dalal, Cogan Shimizu and Pascal Hitzler, Modular Ontology Modeling Meets Upper Ontologies: The Upper Ontology Alignment Tool. In: Kerry L. Taylor, Rafael Goncalves, Freddy Lecue, Jun Yan (eds.), Proceedings of the ISWC 2020 Demos and Industry Tracks: From Novel Ideas to Industrial Practice co-located with 19th International Semantic Web Conference (ISWC 2020), Globally online, November 1-6, 2020 (UTC). CEUR Workshop Proceedings 2721, CEUR-WS.org 2020, pp. 119-124.
- Cogan Shimizu, Karl Hammar, Pascal Hitzler, Modular Graphical Ontology Engineering Evaluated. In: Andreas Harth, Sabrina Kirrane, Axel-Cyrille Ngonga Ngomo, Heiko Paulheim, Anisa Rula, Anna Lisa Gentile, Peter Haase, Michael Cochez (eds.), The Semantic Web - 17th International Conference, ESWC 2020, Heraklion, Crete, Greece, May 31 - June 4, 2020, Proceedings. Lecture Notes in Computer Science 12123, Springer, 2020, pp. 20-35.
- Cogan Shimizu, Karl Hammar, Pascal Hitzler, Modular Ontology Modeling. Under review. http://www.semantic-web-journal.net/content/modular-ontology-modeling