Preface

Modularity has been and continues to be one of the central research topics in ontology engineering. The number of ontologies available, as well as their size, is steadily increasing. There is a large variation in subject matter, level of specification and detail, intended purpose and application. Ontologies covering different domains are often developed in a distributed manner; contributions from different sources cover different parts of a single domain. Not only is it difficult to determine and define interrelations between such distributed ontologies, it is also challenging to reconcile ontologies which might be consistent on their own but jointly inconsistent. Further challenges include extracting the relevant parts of an ontology, re-combining independently developed ontologies in order to form new ones, determining the modular structure of an ontology for comprehension, and the use of ontology modules to facilitate incremental reasoning and version control.

Modularity is envisaged to allow mechanisms for easy and flexible reuse, combination, generalization, structuring, maintenance, collaboration, design patterns, and comprehension. This is analogous to the role of modularity in software engineering, where there are well-understood notions of modularity that have led to generally accepted and widely supported mechanisms for the named tasks. In contrast, modularity for ontologies is still an active research field with open questions because existing approaches are heterogeneous and less universally applicable. For ontology engineering, modularity is central not only to reducing the complexity of understanding ontologies, but also to maintaining, querying and reasoning over modules. Distinctions between modules can be drawn on the basis of structural, semantic, or functional aspects, which can also be applied to compositions of ontologies or to indicate links between ontologies.

In particular, reuse and sharing of information and resources across ontologies depend on purpose-specific, logically versatile criteria. Such purposes include "tight" logical integration of different ontologies (wholly or in part), "loose" association and information exchange, the detection of overlapping parts, traversing through different ontologies, alignment of vocabularies, module extraction possibly respecting privacy concerns and hiding of information, etc. Another important aspect of modularity in ontologies is the problem of evaluating the *quality* of single modules or of the achieved overall modularization of an ontology. Again, such evaluations can be based on various (semantic or syntactic) criteria and employ a variety of statistical/heuristic or logical methods.

Recent research on ontology modularity has produced substantial results and approaches towards foundations of modularity, techniques of modularization and modular developments, distributed and incremental reasoning, as well as the use of modules in different application scenarios, providing a foundation for further research and development. Since the beginning of the WoMO workshop series, there has been growing interest in the modularization of ontologies, modular development of ontologies, and information exchange across different modular ontologies. In real life, however, integration problems are still mostly tackled

in an ad-hoc manner, with no clear notion of what to expect from the resulting ontological structure. Those methods are not always efficient, and they often lead to unintended consequences, even if the individual ontologies to be integrated are widely tested and understood.

Topics covered by WoMO include, but are not limited to:

What is Modularity?
- Kinds of modules and their properties
- Modules vs. contexts
- Design patterns
- Granularity of representation

Logical/Foundational Studies
- Conservativity and syntactic approximations for modules
- Modular ontology languages
- Reconciling inconsistencies across modules
- Formal structuring of modules
- Heterogeneity

Algorithmic Approaches
- Distributed and incremental reasoning
- Modularization and module extraction
- Sharing, linking, and reuse
- Hiding and privacy
- Evaluation of modularization approaches
- Complexity of reasoning
- Implemented systems

Application Areas
- Modularity in the Semantic Web
- Life Sciences
- Bio-Ontologies
- Natural Language Processing
- Ontologies of space and time
- Ambient intelligence
- Social intelligence
- Collaborative ontology development and ontology versioning

Previous events. The WoMO 2012 workshop follows a series of successful events that have been an excellent venue for practitioners and researchers to discuss latest work and current problems. It is intended to consolidate cutting-edge approaches that tackle the problem of ontological modularity and bring together researchers from different disciplines who study the problem of modularity in ontologies at a fundamental level, develop design tools for distributed ontology engineering, and apply modularity in different use cases and application scenarios. Previous editions of WoMO are listed below. The links refer to their homepages and proceedings.

WoMO 2006. The 1st workshop on modular ontologies, co-located with ISWC 2006, Athens, Georgia, USA. Invited speakers were Alex Borgida (Rutgers) and Frank Wolter (Liverpool).

http://www.cild.iastate.edu/events/womo.html
http://sunsite.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-232

WoMO 2007. The 2nd workshop, co-located with K-CAP 2007, Whistler BC, Canada. The invited speaker was Ken Barker (Texas at Austin).

http://sunsite.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-315

WoRM 2008. The 3rd workshop in the series, co-located with ESWC 2008, Tenerife, Spain, entitled "Ontologies: Reasoning and Modularity" had a special emphasis on reasoning methods.

http://dkm.fbk.eu/worm08
http://sunsite.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-348

WoMO 2010. The 4th workshop in the series, co-located with FOIS 2010, Toronto, Canada. Invited speakers were Simon Colton (London) and Marco Schorlemmer (Barcelona).

http://www.informatik.uni-bremen.de/%7Eokutz/womo4
http://www.booksonline.iospress.nl/Content/View.aspx?piid=16268

WoMO 2011. The 5th workshop in the series, co-located with ESSLLI 2011, Ljubljana, Slovenia. Invited speakers were Stefano Borgo (Trento), Stefan Schulz (Graz) and Michael Zakharyaschev (London).

http://www.informatik.uni-bremen.de/%7Eokutz/womo5
http://www.booksonline.iospress.nl/Content/View.aspx?piid=20369

Organizers of the previous editions and editors of the proceedings were Diego Calvanese (Bolzano) – 2008; Bernardo Cuenca Grau (Manchester, Oxford) – 2007, 2008, 2010; Peter Haase (Karlsruhe) – 2006; Jie Bao (Rensselaer) – 2010; Joana Hois (Bremen) – 2010; Vasant Honovar (Iowa State) – 2006, 2007; Oliver Kutz (Manchester, Bremen) – 2006, 2010, 2011; Ulrike Sattler (Manchester) – 2008; Anne Schlicht (Mannheim) – 2007; Thomas Schneider (Bremen) – 2011; Luciano Serafini (Trento) – 2008; Evren Sirin, (Clark & Parsia LLC, Washington DC) – 2008; York Sure (Karlsruhe) – 2006; Andrei Tamilin (Trento) – 2006, 2008; Michael Wessel (Hamburg) – 2008; Frank Wolter (Liverpool) – 2007, 2008

This volume contains the papers presented at the 6th International Workshop on Modular Ontologies (WoMO 2012) held on July 24, 2012 in Graz, as a satellite event of the joint ICBO/FOIS conferences. There were nine submissions. Each submission was reviewed by three program committee members. The committee decided to accept eight papers for long or short presentations. The program also included two invited talks:

– Thomas Eiter (Vienna University of Technology, Austria)
Distribution and Modularity in Nonmonotonic Logic Programming

– Luciano Serafini (Fondazione Bruno Kessler, Trento, Italy)
Multi Context Logics: a Formal Framework for Structuring Knowledge

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July 12, 2012 — Thomas Schneider
Bremen and Madrid — Dirk Walther

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