Preface

MULTI 2016 is the third installment of the MULTI workshop series on multi-level modeling. The goal of the workshop, held on 4th October 2016 as a satellite event of the ACM/IEEE MODELS 2016 conference, in Saint-Malo, France, was to continue the community building initiated in the previous two editions of the workshop and further clarify the differences between the many multi-level modeling tools and approaches that have emerged over recent years. This year it reverted back to a one day format with a keynote talk and two papers sessions followed by a plenary session.

The workshop started with an invited keynote presentation by Ulrich Frank, from the University of Duisburg-Essen, Germany, on the topic of designing models and systems to support IT management. After outlining the importance of intuitive and easy-to-understand enterprise models for aligning IT infrastructure and business processes in modern companies, the talk identified various weaknesses in existing IT management approaches and enumerated the requirements they should ideally fulfill. The talk then explained why multi-level modeling technology provides the ideal foundation for overcoming these weakness and explained how it could be used to provide integrated support for modeling, analysis and decision making in IT management using carefully designed domain-specific modeling languages. A strategy for realizing this vision was then described in the context of the MEMO approach developed by the presenter's group at University of Duisburg-Essen.

The workshop was followed by a session of three papers presenting comparisons between well-known multi-level modeling tools. The first paper, by Ralph Gerbig, Colin Atkinson, Juan de Lara and Esther Guerra presented a feature-based comparison of the the Melanee and MetaDepth Modeling tools. In particular, it showed that while the two approaches appear to be quite similar on the surface, there are some significant differences in the way they handle such things as potency and the representation of connections. The second paper, by Kosaku Kimura and Kazunori Sakamoto presented an evaluation of multi-level modeling frameworks for extensible graphical editing tools. More specifically, three modeling frameworks (Melanee, Metadepth and EMF) were compared with regard to their graphical modeling capabilities in the context of a dataflow example. The third paper, by Muzaffar Igamberdiev, Georg Grossmann and Markus Stumptner presented a more comprehensive feature-based categorization of multi-level modeling approaches and tools. In total, 21 different tools/approaches were compared from three basic perspectives: language engineering, domain modeling and tool support.

The second paper session, after lunch, featured two papers that presented approaches for clarifying and enhancing multi-level modeling. The first paper by Andreas Prinz presented an approach for illuminating multi-level language descriptions based on the instantiation semantics of two practical language workbenches, MPS and LanguageLab, and a general, object-oriented virtual machine called MOF-VM. The basic premise of the paper is that ontological classification in multi-level modeling can be understood as a combination of four more primitive mappings, a defined mapping, an applied mapping, a runtime instantiation and a presentation. The second paper, by Fernando Macías, Adrian Rutle and Volker Stolz, presented an approach for combining the best of fixed-level and multi-level meta modeling. More specifically, it introduced a framework, called MultEcore, for supporting multi-level modeling within the Eclipse-EMF environment using a level "cascading" approach. Essentially the framework formalizes the "two-level", bidirectional cascading pattern, in which soft instance content at one level is transformed into hard type content for instantiation at the next level, and applies this pattern systematically across

as many levels as needed.

The final session of the workshop was a plenary discussion about the state of multi-level modeling technology and the associated community. In particular, potential measures for consolidating the progress made so far into commonly accepted principles and for making multi-level modeling more visible were discussed. It was agreed that for the next MULTI workshop, MULTI 2017, a set of "cannonical challenges" should be published to enable multi-level modeling research groups to demonstrate and compare their technologies on a "level playing field".

We are grateful to all authors of submitted papers, to the reviewers for their constructive criticism, to all participants of the workshop for the interesting and lively discussions, and to the organizers of MODELS 2016 for their support. Further information about the MULTI workshop series is available at the multi-level modeling wiki which can be found at: http://homepages.ecs.vuw.ac.nz/Groups/MultiLevelModeling/. The website for the MULTI 2016 workshop is hosted at: http://swt4.informatik.uni-mannheim.de/multi-2016.

October 2015 Colin Atkinson, Georg Grossmann, Tony Clark