

Preface to the 9th International Workshop on Multi-Level Modelling (MULTI 2022)

Multi-level modeling (MLM) represents a significant extension to the traditional two-level object-oriented paradigm with the potential to dramatically improve upon the utility, reliability and complexity of models. Different from conventional approaches, they allow for an arbitrary number of classification levels and introduce other concepts that foster expressiveness, reuse and adaptability.

A key aspect of the MLM paradigm is the use of entities that are simultaneously types and instances, a feature which has consequences for conceptual modeling, language engineering and for the development of model-based software systems. Research into MLM has increased significantly over the last few years, manifesting itself in lively debates in the literature, eight previously held international workshops (MULTI 2014 - 2021), a published journal theme issue (SoSyM), a special issue for the EMISA journal, a Dagstuhl Seminar (in 2017) and an increasing number of tools and languages, including DMLA, DPF workbench, GModel, Melanee, MetaDepth, MultEcore, Nivel, OMME, ML2 and XModeller. Successful applications of MLM have been reported in domains such as software engineering, process modeling, enterprise modeling and industrial engineering.

The objectives of the MULTI series is to provide a forum for the MLM community to address the foundations of MLM approaches and support future modelers through better modeling languages, tools, methods and guidelines. The workshop encouraged the presentation of case studies and tool demonstrations in addition to submissions on new concepts, implementation approaches, formalisms, controversial positions, and requirements for evaluation criteria. Contributions in the area of tool building, multi-level modeling applications, canonical examples and educational material were equally welcome. Furthermore, we have organized a challenge to encourage communication and collaboration between research groups.

The workshop received 11 submissions, out of which 7 were accepted after careful evaluation from the program committee. Two of the papers were a response to the previously mentioned challenge – the Collaborative Comparison Challenge. Research groups were asked to employ their multi-level modeling technique to represent a domain that was described in natural language. Once they completed the modeling task, two research groups had to explain their solutions to each other and come to a shared understanding of the commonalities and differences of their solutions. The main goal of the challenge was to create a deeper understanding of the underlying mechanisms used by different schools of MLM. The contributions to the workshop were organized into the following main sessions:

MLM processes and methodologies

- *Towards Flexible Creation of Multi-Level Models: Bottom-Up Change Support in the Modeling and Programming Environment XModeler by Daniel Töpel and Monika Kaczmarek-Heß.*
- *Peculiarities of Language Engineering in Multi-Level Environments or: Design by Elimination by Ulrich Frank and Tony Clark.*

MLM tools and applications

- *Practical Application of the Multi-Level Modeling Playground by Ferenc Attila Somogyi and Gergely Mezei.*
- *Mediation-Based MLM in FOModeLer by Mira Balaban, Igal Khitron, Azzam Maraee and Michael Kifer*
- *Towards Integration-Preserving Customization of Just-in-Time Adaptive Interventions with Composite Clabjects in RDF and SHACL: Demo Paper by Sebastian Gruber, Bernd Neumayr and Jan David Smeddinck.*

Collaborative Comparison Challenge

- *DeepTelos and DMLA – A Contribution to the MULTI 2022 Collaborative Comparison Challenge by Gergely Mezei, Manfred Jeusfeld and Sándor Bácsi.*
- *Melanee and DLM – A Contribution to the MULTI Collaborative Comparison Challenge by Thomas Kühne and Arne Lange.*

We would like to thank the MODELS 2022 organization for giving us the opportunity to organize this workshop. Many thanks to all those who submitted papers, and particularly to the presenters of the accepted papers. We also warmly thank the many participants who contributed to the workshop discussions with their comments and experience. Last but not least, our thanks go to the reviewers and the members of the Program Committee and Steering Committee, for their timely and accurate reviews and for their help in choosing and suggestions for improving the selected papers. More details about the MULTI 2022 workshop are available on the workshop site at <https://jku-win-dke.github.io/MULTI2022/>.

Steering Committee

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We look forward to meet you at MULTI 2022!

Manfred Jeusfeld, Juan de Lara, Gergely Mezei