Towards an Open-Source MDE Tooling Infrastructure for the Internet of Things

(Keynote)

Juergen Dingel

School of Computing, Queen's University

Kingston, Ontario, Canada

Email: dingel@cs.queensu.ca

I. ABSTRACT

Despite significant progress, the efficient construction of high-quality software is still challenging. As software continues to penetrate more parts of industry, business, and society, and is entrusted with increasingly complex tasks, these challenges will not diminish. With its emphasis on abstraction and automation, Model Driven Engineering (MDE) has the proven potential to deal with this complexity.

In this talk, we summarize our ongoing efforts to build comprehensive open source tool support for the use of MDE for the development of real-time embedded systems that are distributed, heterogeneous, and adaptive, and thus possess many of the features that Cyber-Physical Systems (CPS) and Internet of Things (IoT) applications are expected to have. Our starting point are short descriptions of UML-RT, a proven UML2 profile for real-time embedded systems, and Papyrus-RT, an open source MDE tool for UML-RT. Then, our work on extending the capabilities of UML-RT and Papyrus-RT is discussed.

In particular, we show how UML-RT models can be

1) connected with external tools and components for the purposes of quality assurance (e.g., monitoring, animation, simulation), adaptation (e.g., steering), and construction of loosely coupled, heterogeneous systems (e.g., via IoT's MQTT protocol),
2) debugged on the model-level in a platform-independent fashion, and
3) modified at runtime.

Next steps and open problems are sketched.

II. BIOGRAPHY

Juergen Dingel joined the Computing faculty of Queen's University in the winter of 2000. He received an M.Sc. in Computer Science from Berlin University of Technology in 1992, an M.Sc. in Pure and Applied Logic in 1994 and a Ph.D. in Computer Science in 1999 from Carnegie Mellon University. Juergen was PC Co-chair of the ACM/IEEE 17th International Conference on Model Driven Engineering Languages and Systems (MODELS'14) and of the IFIP International Conference on Formal Techniques for Distributed Systems (FMOODS-FORTE'11). He is on the editorial boards of the Springer journals Software and Systems Modeling (SoSyM), and Software Tools for Technology Transfer (STTT) and currently serves as chair of the MODELS Steering Committee and as Interim Co-chair of the Research and Academia Committee of the Eclipse Papyrus Industrial Consortium. His research has been supported by various sources including IBM, GM, Ericsson, the Natural Science and Engineering Council of Canada (NSERC), the Ontario Centres of Excellence (OCE), the Ontario Ministry of Research, Innovation, and Science, the Deutsche Forschungsgemeinschaft (DFG), and the German Academic Exchange Service. At Queen's, he has served as the Chair of Undergraduate Studies (2015-2017) in the School of Computing where he also leads the Modeling and Analysis in Software Engineering Group (MASE).