Theme Issue "Trends in Formal Description Techniques"

Editorial

In the 80s, we witnessed the development and international standardization of the Formal Description Techniques (FDTs) Estelle, LOTOS, and SDL (in alphabetical order). These FDTs make it possible to capture the functional behaviour of distributed information processing systems and, in particular, communication protocols. Since then, SDL underwent substantial extensions, while the Estelle and LOTOS standards remained relatively stable. It is probably no exaggeration to say that now these three FDTs have reached their maintenance phase as far as functional aspects are concerned.

In the 90s, emphasis shifted towards high-speed networks and new applications such as multimedia systems. These required enhanced specification techniques to express additional requirements, for instance timing guarantees. FDTs suddenly lacked expressiveness due to the non-functional nature of some of these requirements. As an immediate response, the FDT community started to develop language support for real-time, probabilistic and stochastic aspects. Now initial ideas have matured, and some of these ideas should soon be seen as suggestions for language extensions in the standardization process.

This theme issue includes three papers representing different approaches to incorporating language support for non-functional aspects of distributed systems. All contributions are based on tutorials and advanced-technology seminars presented during the IFIP Joint International Conference FORTE/PSTV'96, which was held from October 9 to 11, 1996 in Kaiserslautern, Germany. The FORTE/PSTV series continues the tradition of the hitherto separate FORTE and PSTV conferences, both well-established conference series in their right, organized under the auspices of the IFIP Working Group on Architecture and Protocols for Computer Networks (WG6.1), which is chaired by Dr. Harry Rudin (CH). While the scope of FORTE is formal description techniques (FDTs) for distributed systems in general, PSTV is more concerned with communication protocols. The FORTE/PSTV conference series continues to be a forum for presentation of the state of the art and trends in theory, application, tools and industrialization of FDTs.

The paper by S. Fischer and S. Leue, "Formal Methods for Broadband and Multimedia Systems", points out significant problems in specifying Quality of Service requirements with SDL and Estelle. To improve the current situation, two alternative solutions are offered. The first solution starts with an operational specification, which is complemented by the property-oriented specification of real-time requirements. Semantic integration is achieved by a common real-time execution model. This approach is illustrated by SDL and Metric Temporal Logic. As an alternative solution, a language extension is proposed and illustrated for Estelle. The specification style of this extension is also property-oriented. However, instead of plain formulae, intuitive keywords replace temporal operators. Both solutions are illustrated by the specification of Quality of Service requirements for a simple protocol.

The paper by H. Hermanns, U. Herzog, and V. Mertsiotakis, "Stochastic Process Algebras - Between LOTOS and Markov Chains", observes that during the design of distributed systems, functional, probabilistic, stochastic, and real-time aspects have to be considered together. To provide adequate language support, Stochastic Process Algebras are offered. The main goal here is the integration of stochastic behaviour into a process algebraic framework that forms an expressive basis for performance and reliability modeling. The approach is illustrated by adding so-called Markovian timed prefixing to Basic LOTOS. Furthermore, equivalences between stochastic behaviours are defined, and the impact on compositional performance analysis is examined.

Finally, the paper by E. Brinksma, J.-P. Katoen, R. Langerak, and D. Latella, "Partial Order Models for Quantitative Extensions of LOTOS", studies the use of event structures, a candidate to model non-interleaving concurrency, in order to provide a formal semantics for LOTOS without data. More specifically, quantitative extensions of event structures are introduced, which can serve as a semantic basis for timed, probabilistic, and stochastic extensions of LOTOS. The choices are justified by a discussion of the suitability of true concurrency models as compared to interleaving models for these kinds of extensions. Furthermore, the consistency of the event structure semantics and an operational semantics is investigated.

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(Biography Reinhard Gotzhein + picture)

Reinhard Gotzhein received his Diploma (M.Sc.) and Dr.-Ing. (Ph.D.) degrees in computer science from the University of Erlangen, Germany, in 1982 and 1985, respectively. From 1985 until 1986, he was a post-doctoral fellow at the University of Montreal, Canada. From 1987 until 1993, he worked as Assistant Professor at the University of Hamburg, Germany, where he also completed his Habilitation in 1992. From 1991 until 1992, he was a visiting professor at the University of Montreal. Since 1993, he has been an Associate Professor at the University of Kaiserslautern, heading the Computer Networks Group. His research interests include communication systems and formal description techniques. Dr. Gotzhein is a member of the ACM, and of the Gesellschaft für Informatik (GI). He chaired the FORTE/PSTV'96 International Conference and has served on program committees for diverse international symposia.

(Biography Jan Bredereke + picture)

Jan Bredereke received his Dr. rer. nat. (Ph.D.) degree in computer science from the University of Kaiserslautern, Germany, in 1997, and the Diploma (M.Sc.) in computer science from the University of Hamburg, Germany, in 1992. He worked as a research assistant there from 1992-93, and at the University of Kaiserslautern from 1994-97. Since 1997, he has been a post-doctoral fellow at McMaster University, Hamilton, Canada. He is interested in the design of communication systems with formal methods. Dr. Bredereke is a member of the GI. He served as the organization chair and on the program committee of FORTE/PSTV'96.