Letter From the Guest Editors

Dependable Computing

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The dependability of systems is known as the reliance that can justifiably be placed on the service the system delivers. Dependability has become an important aspect of computer systems since everyday life increasingly depends on them, which has left us vulnerable to their potential malfunction. The causes to these malfunctions can potentially be introduced in every step of their development, deployment and operation. Hence the basic concerns associated with dependable systems: how to build them? What design principles are involved? How should these systems be evaluated?

The basic concepts and taxonomy associated with dependability were recently presented in a paper by Avizienis, Laprie, Randell and Landwehr on the first issue of the IEEE Transactions of Dependable and Secure Computing. It is clear from this key publication that dependability is in fact an integrating concept that encompasses several main attributes: availability, reliability, safety, integrity, and maintainability. When addressing security, confidentiality is an additional attribute, which allows to define security as a composite attribute of confidentiality, integrity and availability. There are several means for attaining these attributes, which can be grouped into four major categories. *Rigorous design*, which aims at preventing the occurrence or the introduction of faults. *Verification and validation*, which aims at reducing the number or severity of faults. *Fault tolerance*, which aims at delivering correct service despite the presence of faults. *System evaluation*, which aims at estimating the present number, the future incidence, and the likely consequences of faults. Dependability can be attained by the combined use of rigorous design, verification and validation, and fault tolerance, while system evaluation should demonstrate that dependability was indeed attained.

For this special issue, we have received 24 submissions dealing with a wide range of issues related to dependability. The papers sent for reviewing were carefully evaluated by at least 4 referees. This thorough reviewing process has led to the acceptance of 5 high-quality papers. Below, we provide a brief overview of these papers, which fall mainly in the areas of fault tolerance and system evaluation.

In the paper “A Systematic Approach for Structuring Exception Handling in Robust Component-Based Software”, F. Castor Filho, P. A. de C. Guerra, V. A. Pagano, and C. M. F. Rubira describe an

approach for systematically incorporate exception handling in the development of dependable component-based software. The proposed approach integrates two complementary strategies: a local exception handling strategy for dealing with errors in reusable components, and a global exception handling strategy for inter-component composition.

P. Prata, M. Rela, H. Madeira, and J. G. Silva in "Robust Assertions and Fail-Bounded Behavior" present the robust assertions technique that is an improvement of assertion-based error detection techniques. The new technique has motivated the proposal of a new failure model "fail-bounded", somewhere between the fail-silent and the fail-Byzantine models. In this failure model all results produced are with high probability either correct or, if wrong, they are within a certain bound of the correct value, whose exact distance depends on the output assertions used.

In the paper "Efficient and Robust Adaptive consensus Services based on Oracles", L. Sampaio, R. C. Nunes, F. Brasileiro, and I. Jansch-Pôrto have investigated the use of slowness oracles to design efficient consensus services. These oracles allow consensus protocols to adapt themselves to the changing conditions of the environment, enhancing their performance when there are substantial changes on the load to which the system is exposed. The authors provide efficient and robust implementations of slowness oracles based on techniques that have been previously used to implement adaptive failure detection oracles.

In the paper "A Generalized Model for Distributed Comparison-Based System-Level Diagnosis", L. C. P. Albini, E. P. Duarte Jr., and R. P. Ziwich have introduced a new system-level diagnosis model and an algorithm, which is hierarchical, distributed and comparison-based. This algorithm allows the diagnosis of systems that can be represented by a complete graph. The diagnosability is (N–1), the latency is $\log_2 N$ testing rounds, and the maximum number of tests required per testing round is $O(N^3)$.

P. Lollini, F. Di Giandomenico, and A. Bondavalli in "A Modeling Methodology for Hierarchical Control Systems and its Application" have proposed an approach for efficiently evaluate dependability of hierarchical control and resource management systems by a model-based approach. The authors have exploited the characteristics of this specific, but important, class of systems and derived a modeling methodology that is not only directed to build models in a compositional way, but it also includes some capabilities to reduce their solution complexity.

As guest editors of this special issue, we are genuinely grateful to the many people who made it possible, and we hope its contents will prove valuable for researchers in the area. Our special thanks to Paulo Cesar Masiero, the editor-in-chief of JBCS, for giving us the opportunity to organise this special issue, to the authors of the contributions for their excellent work, and last but not least, we appreciate the time and effort our reviewers devoted to guaranteeing the high quality of the contributions. They are Marinho Barcellos, Luiz Eduardo Buzato, Dong Chen, Stefano Chessa, Silvano Chiaradonna, Mario Dal Cin, Jose Contreras, Mario Dantas, Paulo de Geus, Jorge Moreira de Souza, Xavier Defago, Susanna Donatelli, Lúcia Drummond, Klaus Echtle, Jean-Marie Farines, Pascal Felber, Christof Fetzer, Holger Giese, Fabíola Greve, Michel Hurfin, Ricardo Jimenez-Peris, Zbigniew Kalbarczyk, Karama Kanoun, Johan Karlsson, Kane Kim, Maria Lucia Lisbôa, Carlos Maziero, Graham Morgan, Arnaldo Moura, Ivan Mura, Priya Narasimhan, Rui Oliveira, Fernando Pedone, David Powell, Matteo Sonza Reorda, Luis Rodrigues, Luigi Romano, Bradley Schmerl, Andy Schürr, Adenilso Simão, Ferda Tartanoglu, Peter Urban, Alfonso Valdes, Daniel Varro, Mladen Vouk, Feiyi Wang, Taisy Weber, Murray Woodside, Jie Xu, and Avelino Zorzo.

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