

Chapter 1 : Download Formal Methods In Standards: A Report From The Bcs Working Group

Formal Methods in Standards A Report from the BCS Working Group. Editors: Ruggles, Clive L.N. (Ed.).

Jonathan Bowen patterns of interaction among this small specifying and implementing the vari- number of elements. Proper use of the structural model assures that the system Research issues. Structural models will manifest the qualities that they have been used primarily on a class of model embodies. A structural model is real-time, man-in-the-loop simulators created by a systems engineering team early in the development process. The referred to as aircrew training systems. They have been used extensively on Formal methods team evaluates the structural model in acquisitions such as the B-2 Aircrew Jonathan Bowen, Oxford University, terms of both required system function- Training Device, the C Aircrew and Michael G. Hinchey, ality and desired system qualities. The Training System, the Special Opera- University of Cambridge structural model is then represented as tions Forces family of trainers, and a a set of specification forms and code number of other simulators acquired In recent years, the television news templates. The specification forms are by the Air Force and by other and the popular science journal seg- used to describe instances of the ele- branches of the US military. A number of specified instances. In addition to defining best acquisition systems or shutdown loops have Estimates of runtime resources required and development practices involving demonstrated inconsistency and air by the instances are used to generate structural models and patterned archi- crashes that could not be blamed on synthetic loads on the runtime resources. Developm knt proceeds in the context of nology, the Air Force intends to involve The introduction of computer sys- the synthetically loaded integration the simulator community in a number tems to replace more traditional me- harness. As development proceeds, of other activities: By making the deep structure of life-cycle costs. Many journalists have become self-explicit at the earliest possible stage in At the SEI, work on structural models styled authorities on techniques that the design process, structural models is part of a broad initiative focusing on increase confidence in the correctness allow systems engineers to evaluate the the role of software architectures and of such systems and reduce the number software structure with respect to quali- associated technologies. The general and frequency of computer errors. Acknowledgment ber of important existing and emerging Structural models also provide a This work is sponsored by the US Depart- standards, and attempt to identify discipline for coordinating development ment of Defense. The simu- lator is designed and implemented in William Pollak is a senior editor at the Formal methods. The level of indus- the context of the skeletal architecture. This architecture provides a workspace critical and security-critical areas con- for designers of individual subsystems. Michael Rissman is a member of the techni- tinues to grow rapidly; although their Thus, each subsystem is developed cal staff at the Software Engineering Insti- usage is still more the exception than within the system of which it is a part, tute, Carnegie Mellon University. Furthermore, the struc- Software Engineering Institute, Carnegie tural model makes the intent of the Mellon University, Pittsburgh, P A what they can actually do. Consider, for systems engineers clear to the engineers ; e-mail wp, mmr sei. This subsection introduces formal those involved in the development and methods and describes three levels of exploitation of formal methods, but the IEEE P The appendix of an rigor: However, it is likely significant amount of lobbying by the Governmental legislation is likely to to be an important standard in the aviation industry, system development further encourage the use of formal safety-critical area, and formal methods specialists, and the media for more methods and to prompt their inclusion may be applied in projects adhering to rigor in the development of aircraft in various emerging standards. For this standard in the future. Not surpris- posed standard for computer software in the supplier of machinery whose logic ingly, US Department of Defense Mil- nuclear power station safety systems. System The report, originally based on the IEC be in error. Suppliers must specific techniques. Indeed, unlike B, greater emphasison documentation. Until recently, few stan- ment and control, design and integra- standards and procedures submitted by dards have been concerned specifically tion, design evaluation, and compliance licensees, many of which such as those with software in safety-critical systems. The International Electrotech- nearest relevant guidelines. Software-related standards and guidelines. In , the European Space possibility of human error. The document is designed to tion and verification to

establish that it methods. We believe this trend will be read in conjunction with the IEC complies with its formal specification. Formal methods are This includes static and dynamic analy- methods can help to improve safety highly recommended for the highest of sis as well as formal and informal but standards and make them more unam- four safety integrity levels and recom- rigorous proof. The use of formal methods in mended for the middle two levels in the standards will provide motivation for areas of software requirements specifi- Discussion. Current trends in stan- further research, funding, teaching, and cation, design and development, and dardization and the number of stan- exploitation of formal methods in verification using formal proof. CCS, dards in the safety-critical domain that software development. Many are improvements in safety levels and help tioned. Thus, recommenda- Acknowledgments the technique may be combined to tions in international generic standards form part of a package of techniques. Appendix B gives a list of possible in the long term. Hansen, Bill Harvey, David Levan, and Tony Zawilski for their techniques, including specific formal Many of these standards are men- contributions. The UK be noted, however, that most standards References Ministry of Defence MOD provides a bodies are recommending formal meth- major impetus for the exploitation of ods rather than mandating them; the 1. S E S S 93, bodies. It is discon- Software Eng. This is often due to Vol. Like , it is divided are unfounded. Annex C of part 2 pro- themselves becoming standardized. Cambridge CB2 3QG, UK, phone 44 These must be analyzed for consistency The inclusion, or recommendation, general , fax 44 , and completeness with respect to all of formal methods in a number of e-mail michael.

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Standards, of which the author of this report is Chairman. Its primary objective is to promote the practical application of formal description methods and techniques in improving the quality of.

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start again from scratch. After all, ex- whose work we gratefully acknowledge as our language version and be published as an primary source. GKSRe- Avoid retroactive formalization.

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Finally, formal methods can aid standards development at the maintenance stage, for example, by allowing the adequacy of a proposed change to be proved. Guidelines for applying formal methods in the standardization process are provided.

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3. 1 What are formal methods *Formal Methods in Standards A Report from the BCS Working Group.*

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Abstract It is argued that applying formal methods to standards making would result in more accurate, more understandable, and more useful standards. The main benefit seen in using formal methods in a standard's development and expression is.

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Formal methods are This includes static and dynamic analy- methods can help to improve safety highly recommended for the highest of sis as well as formal and informal (but standards and make them more unam- four safety integrity levels and recom- rigorous) proof.

Chapter 9 : The case for formal methods in standards | Cornelia Boldyreff and Nik Tetteh-Lartey - calendri

The application of formal methods in the were made in the late s particularly by David Duce and his col- development of language standards is not widespread. Until recently, laborators to apply formal techniques in an attempt to clearly under-.