



Embedded Systems: Analysis and Modeling with SysML, UML and AADL

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Since the construction of the first embedded system in the 1960s, embedded systems have continued to spread. They provide a continually increasing number of services and are part of our daily life. The development of these systems is a difficult problem which does not yet have a global solution. Another difficulty is that systems are plunged into the real world, which is not discrete (as is generally understood in computing), but has a richness of behaviors which sometimes hinders the formulation of simplifying assumptions due to their generally autonomous nature and they must face possibly unforeseen situations (incidents, for example), or even situations that lie outside the initial design assumptions.

Embedded Systems presents the state of the art of the development of embedded systems and, in particular, concentrates on the modeling and analysis of these systems by looking at “model-driven engineering”, (MDE2): SysML, UML/MARTE and AADL. A case study (based on a pacemaker) is presented which enables the reader to observe how the different aspects of a system are addressed using the different approaches. All three systems are important in that they provide the reader with a global view of their possibilities and demonstrate the contributions of each approach in the different stages of the software lifecycle. Chapters dedicated to analyzing the specification and code generation are also presented.

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About the Authors

Fabrice Kordon is Professor at University Pierre and Marie Curie in Paris, France, where he is in charge of the team “Modélisation et vérification” of the LIP6. His research field is at the crossroads of distributed systems, software engineering and formal methods.

Jérôme Hugues is lecturer-researcher at the Institut Supérieur de l’Aéronautique et de l’Espace (ISAE) in Toulouse, France and has been a member of the language standardization committee (AADL) since 2006. His research fields cover the engineering of embedded systems and the generation of automatic code of these systems from modeling languages, integrating verification and analysis tools on the model and code level.

Agusti Canals is a software engineer and has worked at CS “Communication et Systèmes” in Paris, France since 1981. He is deputy director of the “Direction de la Qualité et des Audits Techniques” (DQAT) of CS and an expert in software engineering (certified “UML Professional” and “SysML Builder” by OMG).

Alain Dohet is a general armament engineer at the “Direction Générale pour l’Armement” (organization of the French Defense Minister ensuring the conduct of system programs), where he is in charge of guiding activities, skills, methods and tools in the fields of systems of systems (SoS), systems engineering, analysis for certification purposes, operational safety of embedded computing systems and critical software.

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