

FOUNDATIONS FOR SPACE SYSTEMS MODELING

—PHD POSITION AT ONERA, TOULOUSE, FRANCE—

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Subject: The development of space systems (including on-board and ground systems) requires complex engineering and relies upon various disciplines. Until now, the success of such projects has relied upon the quality and experience of engineers as well as on partly-automated development processes. However, although some technical artifacts (e.g: mathematical model of a battery, satellite simulator) are used in such developments, there is still —and mainly— a huge amount of paper documentation expressed in natural language. This complexity and diversity of technical means mitigate the validation of a whole space system.

Systems model-based development, inspired by similar approaches in the software field, is gaining more and more importance both in the industrial and academic communities. However, the mainstream solutions currently proposed are still unsatisfactory, notably on two major points:

- on one hand, the requirement capture phase and its further refinement towards a formal specification are not well taken into account;
- on the other hand, there is still a lack of formal semantics for architectural models.

Both these points have obviously a strong impact on the verification and validation of such systems.

The objective of this PhD is to propose relevant concepts for a modeling language addressing these questions. The solution to the first problem may rely on goal-oriented requirement engineering, in the style of KAOS or Tropos methods... The second question will be addressed by devising formal architectural concepts with further (semi-)automated verification in mind. Categorical and/or algebraic approaches, process calculi, model-oriented techniques (such as the B method) will be favoured. Results from software engineering, such as component-based development will be taken into account. The results of the PhD will be backed up by a case study and may be implemented in a software prototype.

Candidate profile: MSc in computer science, having followed some “theory” courses (e.g logic, λ -calculus, process algebra, algebraic specification, B or Z method, etc.). Fluency in English.

Gross salary: ranging 1680-2140 € /month depending on the profile. 3-year position.

Localisation: Onera is the French Aerospace Research Center, affiliated to the French Ministry of Defence. The PhD will be carried out at Toulouse premises. Located in southwest France, Toulouse is a lively city, the 4th most important town in France, and the 2nd one as far as the student population is concerned (see <http://en.wikipedia.org/wiki/Toulouse>).