Master Internship — 5 to 6 months, starting between January and March 2026

RENEW: Requirements engineering for mastering the interplay between ENergy Efficiency and other qualities of softWare

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Keywords Energy awareness, Energy-efficiency, Requirement Analysis, Goal-oriented Modelling

Context and motivation In the last years, software systems' energy-efficiency has been investigated by the Software Engineering research community along different aspects. For instance, conceptual frameworks and guidelines have been proposed to help increase stakeholders' awareness about energy efficiency, and more generally about sustainability requirements of software systems. Moreover, specific design patterns or code refactoring have been proposed to guide software system architects when evaluating possible alternative solutions.

Problem Taking a requirements engineering perspective, we can observe that requirements for software energy-efficiency often interplay with other functional and quality requirements thus requesting an early analysis and characterisation of alternative design solutions, which may coexist in the resulting software product [5].

Principal idea We revisit requirements engineering methods such as goal-oriented model-driven approaches, and use them to generate usage scenarios from requirements in a systematic, semi-automated way, with the purpose to evaluate software energy-efficiency requirements (see our previous work [3]).

Internship objectives. To give continuity to our previous work [3], we aim at answer the following research question: How can we analyse the interplay between energy efficiency and other qualities of software?

Part of this research question was addressed in a previous internship. In that earlier proposal, the interplay of software qualities was studied; however, it did not specially focus on software energy efficiency. Therefore, to answer this question, concretely the tasks that will be carried by the selected candidate are:

1. Study goal-oriented modelling that proved to be effective in analysing conflicting requirements, e.g. [2].
2. Study the applicability of goal-oriented modelling for analysing sustainability requirements, *e.g.,* [1, 4].
3. Conduct an experimental study that validates the effectiveness of the earlier proposal.
4. Explore how to integrate energy consumption measurements into goal-oriented requirements models.
5. Design a method that analyses the interplay of **energy efficiency** and other qualities.

Terms and conditions

— Production of open source documentation and code (licenses: GFDL and LGPL).
— Preference for using open source software.
— Version control with the GitLab platform of Télécom SudParis.

References

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