Internship offer for Master 2 students or final year computer engineering students - 2021

Generating a DSL from OpenAPI descriptors for non-developers testers

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Location: Inria Rennes - Bretagne Atlantique or remotely due to the COVID-19 situation

Salary: legal amount of 3.90€ / hour, full time (Gratification de stage)

Duration: up to 6 months

Keywords.

Domain-Specific Language (DSL), Application Programming Interface (API), test, Behavioral-Driven Development (BDD)

Context and Problem.

Developing an Application Programming Interface (API) requires a precise communication between business teams and developing teams in order to define the requirements of this API. However, the latter are often complex and business specific, which makes the communication between the two parties confusing. Consequently, Behavioral-Driven Development (BDD) has been recently promoted in industry to fill the gap between these two groups. The idea is for non-developers to write the needs of the API in a specific way that is executable and understandable by the developers. These needs can be expressed as tests to verify that the API implementation meets its requirements. Currently, Cucumber is one of the most famous frameworks of BDD. However, such a framework requires the developers to fulfill some tedious tasks, mainly related to the link between the API needs and implementation, which make them lose interest in it [1].

Objectives.

In this internship, we propose to explore the possibility of generating a Domain-Specific Language (DSL) from the existing API implementation, in order to allow non-developers to perform, with high level of abstraction, system testing on this API. Therefore, the consistency between the API requirements and the existing implementation will be guaranteed.
First of all, the candidate is expected to review the literature of existing BDD techniques, in particular Cucumber.
Then, the candidate will study ways to generate a DSL from existing APIs [2, 3, 4]. This DSL must have the following properties:

- usable by non developers, i.e. must not have complex features related to information technologies,
- expressive enough to describe test case scenarios,
- and last but not least, executable to verify the conformity of the implementation to the tests written using the DSL [5].

Finally, the contribution can be splitted into two parts:
As Cucumber is widely spread in industry and reliable, we propose to first tackle the automatic generation of Cucumber Steps [6] from the existing API implementation. This first contribution will advise on how to generate a DSL from an existing API implementation.
Then, the candidate will tackle the generation of a standalone DSL, *i.e.* without Cucumber, but by exploiting in-depth technical knowledge acquired thanks to the first contribution.

We have funding for a PhD position after this internship, in case the candidate is interested and has achieved encouraging results during his/her internship.

Required skills.

- Ability to work autonomously
- Strong skills in object-oriented programming
- Writing and speaking in English since the DiverSE team host foreign researchers
- Knowledge in model-driven engineering approach

To apply to this position, please send us an email with the following documents:

- A CV detailing your educational path and experience
- A motivation letter
- A transcript of your grades during the last five years (Bachelor + Master or Software Engineering diploma)

Environment.

The candidate will work at Inria in the DiverSE team. Inria is the French national institute for research in computer science. There are 8 Inria research centres located throughout France, hosting more than 200 research teams. The DiverSE team is located in Rennes. DiverSE's research is in the area of software engineering. The team is actively involved in European, French and industrial projects and is composed of 9 faculty members, 20 PhD students, 2 post-docs and 4 engineers. The candidate will work in the context of one of the main topics currently explored in the team, involving various professors and students.

References.

[1] Benefits and Drawbacks of Cucumber, b.ignited.

[2] Ed-douibi H., Cánovas Izquierdo J.L., Cabot J. (2017) Example-Driven Web API Specification Discovery. In: Anjorin A., Espinoza H. (eds) Modelling Foundations and Applications. ECMFA 2017. Lecture Notes in Computer Science, vol 10376. Springer, Cham. https://doi.org/10.1007/978-3-319-61482-3_16

[3] Daniel Perelman, Sumit Gulwani, Dan Grossman, and Peter Provost. 2014. Test-driven synthesis. *SIGPLAN Not.* 49, 6 (June 2014), 408–418. DOI:https://doi.org/10.1145/2666356.2594297

[4] S. Schwichtenberg, C. Gerth and G. Engels, "From Open API to Semantic Specifications and Code Adapters," *2017 IEEE International Conference on Web Services (ICWS)*, Honolulu, HI, 2017, pp. 484-491, doi: 10.1109/ICWS.2017.56.

[5] Lennart C.L. Kats, Rob Vermaas, and Eelco Visser. 2011. Testing domain-specific languages. In *Proceedings of the ACM international conference companion on Object oriented programming systems languages and applications companion* (*OOPSLA '11*). Association for Computing Machinery, New York, NY, USA, 25–26. DOI:https://doi.org/10.1145/2048147.2048160

[6] Cucumber Steps definitions.

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