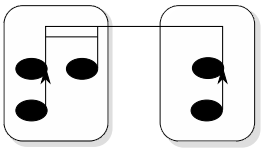
VeRDi - Verified Reconfiguration Driven by execution



Postdoc position - 18 months

keywords : Deployment, reconfiguration, verification, distributed systems

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VeRDi project

The VeRDi project is funded by the French region *Pays De La Loire* where Nantes is located. VeRDi is an acronym for *Verified Reconfiguration Driven by execution*. It aims at addressing distributed software reconfiguration in an efficient and verified way.

Configuring complex distributed software for heterogeneous distributed infrastructures is a non-trivial and technical task, often called *deployment*. A deployment, because of its error-prone and complex nature, needs to be automated in an efficient and verified manner to guarantee its behavior. This is the work under research by a few members of the STACK research group, a joint team of Inria and LS2N located in Nantes. However, both distributed infrastructures and software are nowadays evolving towards more dynamic behaviors. For instance, in *Edge Computing* infrastructures, small computational devices frequently enter or leave the network because of their own mobility or failures, thus creating a need for system re-configuration over time. Other examples are IoT, Smart-* or services-oriented applications composed of many different modules that evolve through time according to dynamic information (*e.g.* coming from sensors or dynamic policies linked to energy or security for instance).

If ad-hoc specific solutions have already emerged, both in production and research, to address a subpart of possible reconfigurations, there is an active research trend to address reconfiguration expressivity and execution in a generic fashion applicable to most software reconfiguration cases [1, 2, 3, 5]. Moreover, given the high frequency of reconfigurations and the high availability required by service-oriented applications, reconfigurations have to be as efficient as possible which is difficult to address for large-scale infrastructures, applications and systems. The problem becomes even more complex when embedding verification mechanisms both statically and at run-time. Yet verification is of major importance for large-scale dynamic problems such as this one. Actually, as E. W. Dijkstra said "when exhaustive testing is impossible, our trust can only be based on proof". Thus, because of the amount of possible behaviors, verification of distributed systems is of major importance [6, 7]. In this context verification on software reconfiguration is an interesting, rather new, research subject with large possibilities.

The aim of the VeRDi project is to build an argued disruptive view of the problem. To do so we want to validate the work already performed on the deployment in the team [4] and extend it to reconfiguration. A PhD student is already working on this subject and the VeRDi project will bring additional forces to the team by means of this posdoctoral position as well as an engineering position.

Position description

The postdoc position is part of the multi-disciplinary VeRDi project. As illustrated above VeRDi can be divided in two different parts (though strongly related): (1) the design of efficient distributed reconfiguration models and systems; (2) the formalization of these models and the formal verification of some properties on them. The STACK team and the other actors of the VeRDi project are researchers and engineers specialized in the first aspect of the project. The role of the postdoc candidate is thus to lead the second research aspect of the project with Helene Coullon. To help the candidate in this difficult task, two collaborations have already been initiated by Helene Coullon. The postdoc candidate will collaborate with the STR team of the LS2N specialized in Petri Nets and model checking, as well as with the Northern Arizona University (Frederic Loulergue) for aspects related to the proof assistant Coq. Moreover, the LS2N also holds the Inria research team *Gallinette*, specialized in proof assistants and involved the Coq development team. Finally, research is already ongoing regarding the formal and verification aspects of the Madeus deployment model designed by the team. This work will be the starting point of the postdoc candidate.

The missions of the postdoc candidate are to:

- formalize and prove few properties on reconfiguration models both statically and at runtime,
- enrich the team and participate to the team decisions from a formal perspective,
- collaborate with other teams specialized in model checking and proof assistants,
- publish in a top ranked conference.

The expected skills of the candidate are:

- a strong knowledge on formalization, model checking and proof assistants,
- an ability to collaborate with other domains and to apply their knowledge to other domains,
- a strong motivation for the project and its subject.

Details

The postdoc position is based in Nantes at the IMT Atlantique engineering school. The candidate will be a member of the STACK research group (`http://stack.inria.fr/`). This team is part of the LS2N laboratory of Nantes, and the DAPI department of IMT Atlantique. This position opens in **November 2018** for a period of **18 months**. The salary of the postdoc candidate will be 33500 with an additional annual bonus of 6.6%. By subtracting taxes and spreading the bonus on each month, the net salary is equivalent to 2380€. Please contact Helene Coullon to apply: **helene.coullon@inria.fr**

References

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