



Real-World Evaluation of Batsim Probes

Context

Computing platforms are used to meet various kinds of computing needs, from scientific simulations in High Performance Computing context to load-adaptative virtual infrastructures on IaaS platforms. Managing such platforms at best is a challenging topic. This led us to develop the **Batsim** simulator [P17C4] in a continuous effort since 2015. Our main goal was to create a common framework to study resource management policies while taking interference phenomena (on networks and storages) into consideration and enabling the optimization of complex objectives such as the energy consumption.

We have recently introduced the concept of probes into Batsim. The idea is to enable users to decide which infrastructure information they want to observe and how, so that they can take decisions using this information. Our current implementation enables various use cases. For example, one can query instantaneous information about the platform, such as the current bandwidth of a network link (in bytes per second) or the current electrical consumption of a computing machine (in watts). One can also directly set up a periodic query of information, for example get every minute the total electrical energy consumed by the switches of the platform (in joules, for the minute elapsed).

Objective of the internship

The overall goal of this internship is to evaluate the probe system introduced in Batsim. We want to set up a real-world prototype to test whether simulation results are compliant with real-world data. We plan to build this prototype on the **Grid'5000** experimental testbed, with the **OAR** resource manager [CCG+05] and existing resource monitoring tools.

A first objective is to determine what information can be retrieved on a real platform and the various limitations that exist on such data, such as its precision and noise, its sampling frequency or the impact of the monitoring system on the overall system performance. Our goal here is to gain insight on these limitations so we can write a practical handbook to avoid the misuse of Batsim probes if one wants to remain in a realistic context.

A second objective is to reproduce, on the real-world prototype that will be developed during the internship, experiments that we have already conducted in simulation. Our goal is to make sure that conclusions we have taken in simulation remain relevant on the prototype, notably about scheduling algorithms that avoid the saturation of a Parallel File System or reduce the overall platform energy consumption.

Expected skills and profile

- Programming skills (Python, C++ is a plus)
- A taste for experimental methods (a taste for chocolate is a plus)
- Experience with Nix would be greatly appreciated but is not required
- Fluent French or English

Practical details

The internship will be supervised by Millian Poquet and Olivier Richard in a convivial atmosphere :). A computer and an office will be provided, as well as a monthly internship stipend of 591 €. Internship duration is 5-6 months.

The intership can take either take place at the **IRIT** laboratory in the **SEPIA** team on Univ Toulouse III campus, or at the **LIG** laboratory in the **DATAMOVE** team on Univ Grenoble Alpes campus. Both teams are interested in resource management on distributed systems (HPC centers, cloud datacenters, edge architectures, IoT...) and in the ecological transition.

You can send us your application (cover letter + resume / short curriculum vitae) by email to millian.poquet@irit.fr or olivier.richard@inria.fr.

Bibliography

- [CCG+05] Nicolas Capit, Georges da Costa, Yiannis Georgiou, Guillaume Huard, Cyrille Martin, Grégory Mounié Pierre Neyron and Olivier Richard. *A batch scheduler with high level components*. Cluster computing and Grid 2005 (CCGrid05), 2005, Cardiff, United Kingdom.
- [P17C4] Millian Poquet. *Simulation approach for resource management*. PhD manuscript, Chapter 4. Univ Grenoble Alpes, December 2017, Grenoble, France.