

Internship

Stochastic Task Scheduling handling uncertainty

Computer Science - Internship Proposition

IRIT (Toulouse) or FEMTO-ST (Besançon)

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General Context

Studies estimate that by 2030 Information Technologies (IT) will be responsible for about 20% of global electricity consumption and can produce up to the quarter of the CO₂ emissions worldwide¹. To limit this impact, the IT energy efficiency has been the focus of many research projects over the last years, most of them focusing on reducing the consumption. However, even if the consumption is reduced, a system still has a carbon footprint as long as it relies on brown energy. A “greener” approach consists of reducing the carbon footprint by using renewable (CO₂-free) sources, such as solar panels, wind turbines or fuel cells, in the system’s power supply. Over the last decade, several companies and universities have investigated the use of renewable energies in datacenters. Some research initiatives as FP7 GreenDataNet² and ANR DATAZERO³ have paved the way to study how a datacenter mainly operated by renewable energies works. Starting in 2020, the DATAZERO2 project aims at improving the operation and the design of datacenters only operated with renewable energies, in particular using disruptive approaches for uncertainty management. This internship proposition will tackle the offline scheduling problems that need to be solved in the DATAZERO2 project to efficiently use the varying available power when processing the incoming workload while considering uncertainty.

Subject

The internship work will start on the problem of uncertainty in the DATAZERO Datacenter. In this context uncertainty is on the incoming workload. The aim of the internship work is to propose models for uncertainty, in the context of the DATAZERO2 project. These models will then be used to design new robust scheduling algorithms for offline scheduling, working on time windows, that take the predicted workload in parameter.

Organization

Expected start: As soon as possible. The internship work will take place at Besançon (Femto-ST) or Toulouse (IRIT).

The internship will address the following steps:

- Bibliography study on offline scheduling for distributed platforms and renewable-energy powered datacenters, on models (stochastic, fuzzy, possibility, . . .) to represent uncertainty
- Definition of the uncertainty models for workload.

¹<https://theshiftproject.org>

²<http://www.greendatanet-project.eu/>

³<http://datazero.org>

- First proposition of adapted scheduling algorithms.
- Design of simulations to validate the propositions. Algorithm efficiency assessment.

Student profile

The following qualities will be appreciated:

- Advanced Skills in Programming
- Optimization
- Team work
- Scientific curiosity
- Environmentally concerned
- Written and oral English