PhD Position: Distributed computing applied in a satellite swarm system
ENAC Lab, National School of Civil Aviation, Toulouse, France

Job Title	PhD Position: Distributed computing applied in a satellite swarm system
Department	Telecommunication
	https://cnes.fr/fr
Institution	ENAC Lab, National School of Civil Aviation, Toulouse, France
	Toulouse, Occitanie, France
Date Posted	Dec. 1, 2023
Application Deadline	Mar. 5, 2024
Position Start Date	Oct. 1, 2024
Job Categories	Graduate Student
Academic Field(s)	Robotics
	Computer Engineering
	Computer Science
	Aerospace/Aeronautical/Astronautics
Job Website	http://perso.recherche.enac.fr/~silvestre/jobs.html#nanosats1
Apply Online Here	http://perso.recherche.enac.fr/~silvestre/jobs.html
Apply By Email	
Job Description	

Proposed research

The PHD thesis will aim at tackling the following scientific challenges:

- How to apply distributed computing to satellite swarm systems considering the specific constraints that do not apply for Earth counterparts ? This include a very limited data transmission speed (a few kb/s to 1Mb/s for instance), intermittent connexion between nodes, possible loss or corruption of data, limited CPU power (700MHz dual core Arm processor for instance), … Identify or design the technologies (framework, software components, protocols, etc) to perform such computing.
- At system level, how the different technologies for distributed computing in a satellite swarm may or may not apply to the different industrial use cases and their needs (high resiliency or not, reactivity, CPU load, etc.) ? Evaluate performances, limitations, advantages and drawbacks compared to standard non-distributed computing. This work will rely on demonstrations on a representative swarm testbed with nanosatellite-compliant hardware provided by CNES.
- How to operate, at system level, such technologies? Evaluate the degrees of autonomy and resiliency of such processes, how to monitor it and mitigation techniques to apply.

Currently, the availability and fault-tolerance of traditional, cloud-based distributed system are commonly guaranteed by a replication protocol based on replicated state machine (RSM). Such a protocol implements a consensus algorithm to enable strong consistency, like Fast Paxos [Lam06] and Raft [OO14]. Strongly consistent replication is key to efficient implementation of critical distributed systems' building blocks, like distributed lock manager, reliable configuration or transactional key-value store. To our knowledge though, such protocols have never been designed and extensively evaluated on nanosatellite constellations. Finally, it is important to highlight that this doctoral project is a joint work with our colleagues at the National Centre for Space Studies (CNES).

Requirements and application

In this research project, we intend to explore both a fundamental and an applied aspects. Candidates to this position should hold a Master's degree in Computer Science/Informatics, Mathematics or a related field by the starting date of the doctoral project. They must be excited by research in distributed systems/computing, distributed algorithms, orbital edge computing, and/or intermittent computing, and should have an excellent academic record in one of these areas. Familiarity with formal specification and verification, and graph theory/algorithms would be greatly appreciated. Teamwork and communication skills are key to this position, and industrial experience is a plus.
Excellent proficiency in English is required (CECR : C1; IELTS : 7.0; Cambridge English Scale : 185; or equivalent). Knowledge of French is not required for this position.
To apply, please send the following information to ds-resco-recruitment@lists.recherche.enac.fr

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(Subject=PhD position [ENAC-CNES-PhD24]: distributed computing in nanosats swarms):

- Curriculum Vitæ
- Letter of motivation that should describe the applicant's background in the areas of the project, reason for interest in the project, and future plans
- A list of courses and grades of the last three years of study (an informal transcript is OK).
- Names and contact details of at least two people who can write you references, whom we will contact directly.
- If relevant, a link to your publications and/or open-source developments.

Application deadline: 5 March 2024.
This fully-funded PhD starts in October 2024 and the duration of the contract/scholarship is 3 years.
This project is fully funded by CNES.

Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

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