Master Thesis - “Going from monolithic proprietary software to a micro-service structure for industrial applications” (30 credits/20 weeks – 1 or 2 students)

About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With 55 manufacturing locations in 15 countries, we serve over 90% of the world’s aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world’s advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

This thesis work will be conducted at GKN Aerospace Engine Systems, Sweden, Trollhättan.

Project Background

Many of the industrial automation solutions today use hardware from well-known and proven providers like Siemens, Beckhoff, Rockwell and similar. The equipment can for example be a PLC, IPC or other fieldbus-related hardware. These providers also come with their own softwares used to program their equipment. The result is a monolithic software where it can be hard to switch to other providers or programming languages as well as integrate non-standard solutions. Emerging technologies like AI develop and change quickly. A lot of the latest avancements within these fields are available as open source software, using programming languages like Python or similar. Utilizing this software together with the vendor-specific software can be cumbersome, time-consuming and ineffiecient. With the change of using microservices instead of hard-to-develop and hard-to-maintain monolithic software, this problem can potentially be reduced. One example can be to use one micro-service to run the AI-related software (using Python), another micro-service handling vision-related tasks and a PLC can handle the safety-related features. So the question is, would it be more efficient to develop industrial automation software using a micro-service perspective instead? If so, what kind of communication protocols is suitable to use? And where to draw the line between going all vendor-software compared to going all micro-service and vendor-agnostic approach?

Questions:

- Where to draw the line between going all vendor-software monolithic compared to going all micro-service and vendor-agnostic approach?
- What communication protocols or services would be good to use between the micro-services?
- Should fieldbus-devices like sensors and actuators be controlled directly via a micro-service or via the conventional way via a PLC or IPC?
- Can a real-time linux distribution be used instead of a industrial PLC? If yes, what impact does it have on reliability?

Assignment Description

- Familiarize with forementioned topics and summarize the current best practices.
- Determine a suitable implementation level, not endangering the reliability of the solution.
- Implement a working micro-service proof-of-concept based on the researched best-practices and do suitable benchmarks and analysis.
- Documenting results in thesis and presenting thesis work at GKN.

Qualifications and Skills

- Be a final year master thesis student in automation, data science or similar fields.
- Have a strong interest for industrial automation and at least some knowledge of current software development solutions there are in the field.
- Strong interest and knowledge within containerization, Kubernetes, Docker, micro-services.
- Good knowledge of communication protocols and preferably micro-service communications.
- Programming experience.

Apply by

Send your resume and cover letter to samuel.jennerhav@gknaerospace.com .

Last date for application: 2024-11-30. Interviews will be held continuously and the position could be filled prior to the last application date