Research Internship:

Real-Time Control on Hyper-Converged Edge Infrastructure

This project will be conducted externally at *Software Defined Automation GmbH* and co-supervised by us and *Software Defined Automation GmbH*. This topic can be started as a Research Internship.

Context

Current Hardware PLCs are very costly for customers and cumbersome to implement. PLCs also need to be stopped and re-started for a change in program code. New “Edge Hardware” from Cloud and gateway players like AWS Outposts are cost effective and powerful, but not used for real-time control due to lack of experience. The goal of the student project is to implement real-time control in new edge hardware controlled from the cloud, thus reducing the cost and increasing flexibility for industrial end customers.

Tasks

1. Familiarize yourself with OpenPLC Project and Codesys Real Time Control
2. Implement a Hybrid Architecture
   - IDE on AWS compute instance
   - Runtime on Industrial Hyperconverged Edge
3. Instantiate Codesys Real Time controllers in HCI
4. Implement a „Hot Swap“ of PLC code via OpenPLC
   - Two exactly parallel running PLC runtimes
   - Common I/O plane
   - Real-time switch after code update
5. Evaluation of real-time behavior
6. Documentation of results

Requirements

- Python / Java / C#, C, C++ / Linux
- Ability to quickly master **Real Time Linux** (https://wiki.linuxfoundation.org/realtime/start) and **RTOS** (https://www.freertos.org/)
- Basic **PLC understanding** – Ideally Codesys and Open PLC
- **AWS / Cloud basics**

Contact

If you are interested in this project, please send your full application (CV, transcript of records, research interests, possible start dates) to Laurin Prenzel (**laurin.prenzel@tum.de**).

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