



ROS and Zephyr OS (and Hypervisor) for Collaborative Robots

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Type:

Master/Bachelor

Description:

The Robot Operating System (ROS) is one of the most widely used set of tools to develop robotic applications. While normally running on Linux, smaller ROS variants exist (e.g, Micro-ROS) that are capable of executing on POSIX-oriented RTOSes (e.g., FreeRTOS or Zephyr OS). While Micro-ROS focuses on microcontrollers, there is a trend in the industrial automation world towards the safe use of larger SoC, such as the Xilinx Ultrascale+ or the NXP i.MX8M.

- The thesis analyzes the architecture of Micro-ROS and ROS and builds a toolchain for ROS on top of Zephyr OS on a Xilinx Ultrascale+ and/or a NXP i.MX8M. The trade-offs and different choices of packages (e.g., libraries etc.) should be discussed and evaluated.
- The performance of the frameworks and of the different layers (ROS-benchmarks, jitters, latency etc.) should be evaluated.
- The support of ROS + Zephyr OS for FANUC collaborative robots (available in our Lab) should be investigated and a ROS-based library should be developed to predictably control the robot in closed loop at high frequency.
- (If Master) The obtained toolchain should be integrated to run as a guest operating system on the Jailhouse Hypervisor.

- (If Master) SMP support in Zephyr OS (both natively and on Jailhouse) should be implemented, and the effectiveness of isolation capabilities in Jailhouse (cache-coloring etc.) for ROS-based workloads should be assessed.

Requirements:

C, Linux Kernel, Makefile, Bash

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