

Micro-ROS – puts ROS 2 onto microcontrollers

Ralph Lange
*Chief Expert for Robotic Systems and
Software Engineering
Bosch Research
Renningen, Germany
ralph.lange@de.bosch.com*

Juan Jose Hierro
*CTO
Fiware Foundation
Berlin, Germany
juanjose.hierro@fiware.org*

Tomasz Kolcon
*Electronic Engineer organization
Piap
Warsaw, Poland
tkolcon@piap.pl*

Jaime Martin Losa
*CEO and Founder
Proyectos y Sistemas de Mantenimiento
(eProsima)
Tres Cantos, Spain
jaimemartin@eprosima.com*

Abstract—Micro-ROS is a robotic framework bridging the gap between resource-constrained and larger processing units in ROS 2 (Robotic Operating System) applications.

I. MOTIVATION

Robots today are networks of microcontroller-based sensors and actuators, coupled to a larger computing device such as an onboard or external general-purpose computer (GPC) with large RAM and CPU resources. For the GPC side, the Robot Operating System (ROS) brings all the benefits of a common platform.

However, ROS does not encompass the microcontroller level.

II. PROBLEM STATEMENT

Although the ROS community has tried to support microcontrollers in the past and as part of the redesigned version ROS 2, these attempts unveiled various design choices in ROS and ROS 2 that render such porting impossible.

Thus, developers are forced to adopt custom solutions. Integrating systems at a low level requires so much effort

that each robot manufacturer works on its own platform. This results in robots that are still much too expensive to deploy and operate. Achieving the necessary cost savings and development efficiency highly depends on having the benefits of a common platform at the microcontroller level.

III. MAIN RESULT

In order to enable European companies to rapidly deliver robotic products integrating highly resource-constrained devices, Bosch, Fiware, Piap, and eProsima collaborated to contribute to the faster growth of a competitive industry of small robots and robot components manufacturers, with what is called micro-ROS today.

With micro-ROS, the project members developed the seamless and open-source extension of the well-established high-level framework ROS 2 for microcontrollers. Thanks to micro-ROS, MCU-based solutions can now use ROS 2 familiar concepts which significantly eases their adoption, portability, and interoperability with the ROS 2 ecosystem. Microcontrollers are no longer inflexible black boxes with very low-level abilities. The safety and efficiency of microcontroller-based solutions are now available to implement higher-level abilities like self-localization, obstacle avoidance, and object tracking.

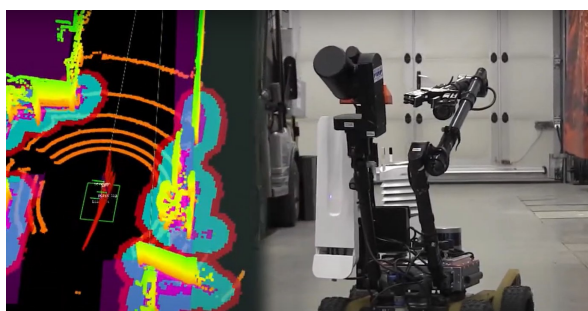


Image of the video “Enabling smart warehouses with micro-ROS” available on YouTube

SUPPORTED RTOS:

FreeRTOS, Zephyr, NuttX, Arduino, bare-metal

SUPPORTED HW:

ARM Cortex-M and similars, Renesas RA-Family, Espressif ESP32, Arduino, Raspberry Pi Pico, ROBOTIS OpenCR, Teensy, Crazyflie 2.1 Drone, and many other development platforms

MORE INFORMATION:

micro.ros.org



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