

ROS-INDUSTRIAL

OPEN SOURCE FOR INDUSTRIAL ROBOTICS

Background

Robotics and automation are shifting from fixed sets of scripted actions in highly structured environments to increasingly flexible means of operation. Industrial manipulators can handle product variety through perception-driven, on-line trajectory generation. Automated guided vehicles can navigate environments through simultaneous localization and mapping, rather than relying on fixed tracks or expensive positioning infrastructures. Such increasingly software-intensive innovations often leverage open-source software tools and practices. Vendor-neutral software infrastructures provide stock commodity components and allow for future-proof hardware investments. Open and accessible to different stakeholders, they also streamline the innovation pipeline from research to production, and ease the introduction of new talent into the workforce.

ROS-Industrial

The open-source “Robot Operating System” (ROS) offers software components providing common interfaces to robot hardware, developer tools for visualization, data logging and debugging, and utility components – particularly in the areas of image processing and collision-free motion planning. Such ROS components are well established in research and service robotics and are increasingly being transferred to the industrial domain. The purpose of the “ROS-Industrial” initiative, coordinated in Europe by Fraunhofer IPA, is to support this transfer process. This is performed by cooperating with the global ROS developer community; gathering needs from industrial partners; and providing them with training and technical assistance in the use of this technology. Furthermore, it serves as a forum to discuss and improve or clarify on non-functional aspects, such as software quality, licensing issues, and safety.

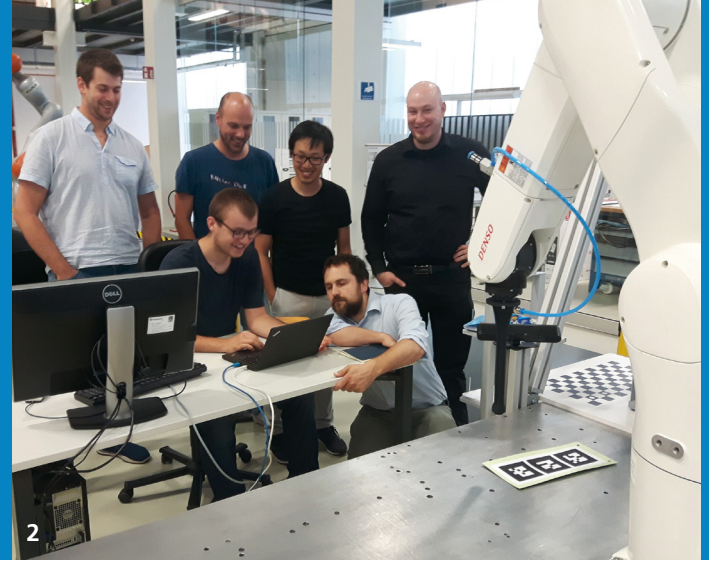
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Benefits of ROS-Industrial

For manufacturers of industrial hardware

- Availability of a feature-rich, open-source software stack to complement their hardware offer
- Increased customer traction through compatibility for the products in their portfolio with a wide software ecosystem

For end users and system integrators

- Open-source software for automation with a business-friendly license
- Reduced vendor lock-in and simplified exchangeability of hardware and software components through standardized interfaces
- Increased transparency of third-party integration work
- Availability of developer tools, including visualization, logging, debugging

ROS-Industrial Consortium

Fraunhofer IPA manages the ROS-Industrial consortium Europe with the following objectives:

- Gathering user experience and technical feedback to inform and influence further development of the platform
- Development of pilot examples of industrial applications
- Assessment of the technological potential of ROS components through testing
- ROS-Industrial support and training

A platform for research and production

As an open-source software stack, ROS-Industrial serves as the basis for both research and production work performed by Fraunhofer IPA within the context of public and private projects. Representative domains of expertise include:

Model-driven engineering tools

Model-based development environments complementing the stock ROS infrastructure with automatically generated ROS nodes and communication interfaces. Extensive experience in this field has been gathered during past and current projects (FP7 BRICS, BMWi ReApp and SeRoNet, H2020 ROSIN, agROBOfood and ScalABLE4.0).

Integration with other platforms

ROS covers many use cases in industrial robotics and automation, and its open-source nature makes it easy to integrate it with other frameworks and communication protocols, like e.g., the Industry 4.0-mandated OPC-UA. Within the project SeRoNet (Service Robotics Network), we achieve interoperability between multiple platforms (including ROS) through common, abstract interfaces, semantic system and component modeling and code generation.

“Manufacturing stacks”

Combining the hardware-independent functionalities of ROS with the convenience of container technology and intuitiveness of web frontends, we develop complete IT stacks from the cloud level down to manufacturing hardware within projects for private customers, allowing for manufacturing lines that are easy to configure, deploy and replicate.

What we offer

For manufacturers of industrial hardware

- Development of ROS-Industrial drivers for industrial hardware components
- Development of simulation models

For end users and system integrators

- Advice on selection of ROS-Industrial components and system design
- Prototypical implementation and proof-of-concepts with ROS-Industrial components
- Advice on use of open-source in relation to licensing, liability and support

Furthermore, we offer services to make this technology accessible to all stakeholders:

Training

The training program focusses on the new version of the middleware, ROS 2. The curriculum is addressing everything needed to understand and start developing or porting applications on ROS 2, from the fundamentals concepts (communication and system architecture) to the advanced ones (navigation, manipulation, best practices).

Market studies and business advice

As early adopters of ROS and key stakeholders in ROS-Industrial we routinely advise on:

- Market adoption of ROS, and projected industry trends
- How to approach open-source as end-users or to supplement in-house engineering activities.

1 *Pick and place application with ROS components.*

2 *Our ROS trainings cover basics and advanced concepts.*