

## 3<sup>rd</sup> Stuttgart ROS Meet-Up

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# Agenda



- Introduction
- Welcome by [ROS-Industrial Consortium Europe](#)
- First Presentation by Wolf Vollprecht talking about [Jupyter + ROS](#)
- Second Presentation or Lightning Talks
- Networking [Coffee & Code]
  
- Time 13:30 – 15:00

# Fraunhofer IPA

Technology consultant and innovation driver since 1959



- One of the largest institutes of the Fraunhofer-Gesellschaft
- 70.8 mil EUR budget, 25.8 from industry
- More than 1,000 employees



New technical center "Gebäude D" in Stuttgart

Note: key figures for 2016; IPA Stuttgart including locations in Rostock, Mannheim, Bayreuth and Vienna



Application Center  
Industrie 4.0



Motion laboratory



BioPoLis



Biomufacturing  
laboratory



Factory planning cockpit



Electroplating laboratory



Intervention room



Coating technology  
center



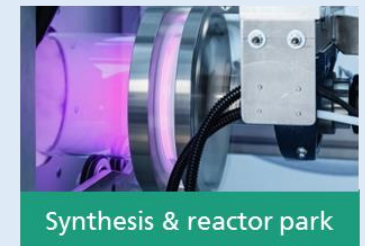
Production laboratory



Cleanrooms & cleanliness  
rooms



Robotics experimentation  
area



Synthesis & reactor park

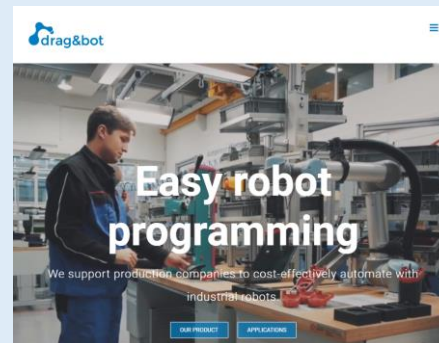
# Fraunhofer IPA

## Robot and Assistive Systems



- Department (320 - Dr. Werner Kraus) 7 groups, with focus on:
  - Handling and Intralogistics (321 – Richard Bormann)
  - Mobile Robotics (323 – Dr. Kai Pfeiffer)
  - Service Robotics (324 – Dr. Birgit Graf)
  - Robot Control (325 – Frank Nägele)
  - Software Eng. and System Int. (326 – Christoph Hellmann)
  - Assembly Automation (327 – Ramez Awad)
- And a number of spin-offs, established and in the making, incl.

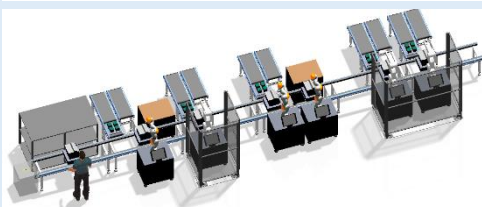
Mojin Robotics  
and drag&bot



[www.mojin-robotics.de](http://www.mojin-robotics.de)

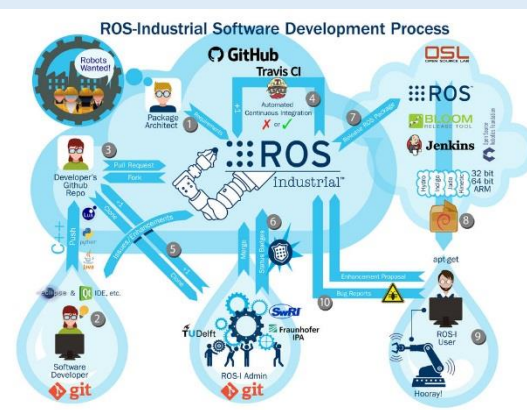
[www.dragandbot.com](http://www.dragandbot.com)

### Robot control architectures



Focus on system building  
"programming"

### System & app. lifecycle



Focus on system testing,  
maintenance, improvement  
"DevOps / tech stacks"

### Info. & runtime modeling



Focus on system composition  
"ecosystems"

### Open Source Robotics

Platform efforts merging community-based (*bottom-up*) and industrial (*top-down*) approaches  
**ROS-Industrial: porting to the industrial realm ROS, Open-Source effort *with critical mass***

# Tech transfer in industrial robotics: ex. robot end-effector developments since 1973 (>150)



→ "Milestones of robotics"  
exhibition at IPA



# Current focus: robots as the “tool of tomorrow” for personalized production



Are “points of sales” in robotics shifting?



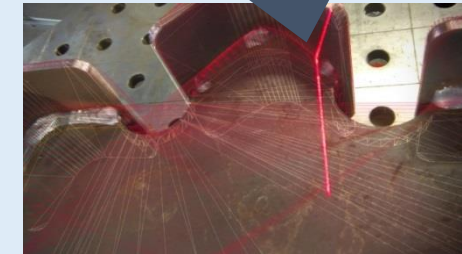
Megatrend Industrie4.0



Why does HRC catch on so slowly?



Sensors as part of the robot offering?



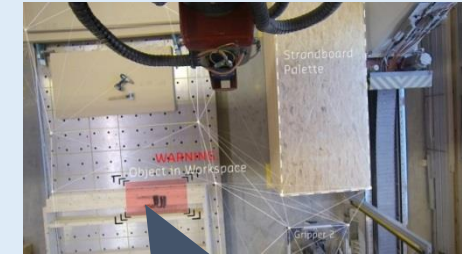
Do gripper/tools become part of the portfolio?



Intuitive programming, exception handling



What about Open Source?



Cognition and Machine Learning

Source: [video.smerobotics.org](http://video.smerobotics.org), “SMERobotics in 100 seconds”

# THE PRIVATE ACTION: ROS-INDUSTRIAL



# “Chicken and egg” dilemma in ROS-I



**Problem:** to bootstrap initial acceptance, we need initial buy-in from actors in each stakeholders' category

## End users

- Freed from vendor lock-in

BUT:

- Need hardware with ROS support, ideally from OEM
- Need eng. staff/integrators with ROS skills

## Industrial OEMs

- Reduce SW dev costs, make offering standards-compliant

BUT:

- Need ROS market pull
- Needs reassurance about ROS software quality

## Integrators, tech providers

- Reduce SW dev costs, make dev robot-agnostic

BUT:

- Need hardware with ROS support, ideally from OEM
- Need ROS skills

**ROS-I tackles general sw dev, OEM engagement and customer pull / outreach**

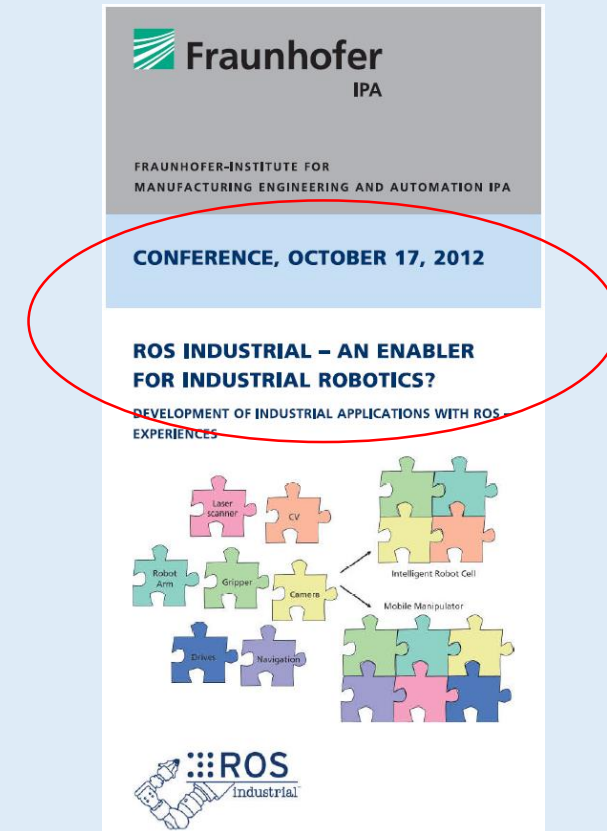
**ROSIN tackles SW quality, ROS skills education, and user-driven sw dev**

# ROS-Industrial from 2012 - 2019



## Relevant audience

- Piloting with SwRI the ROS-Industrial concept (2012)
- Managing ROS-I EU (~80 organizations worldwide)



rosindustrial.org

T-Systems

[https://www.youtube.com/watch?time\\_continue=1&v=Vd38e6Ly5cY](https://www.youtube.com/watch?time_continue=1&v=Vd38e6Ly5cY)

What is  ?

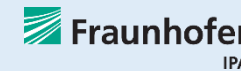
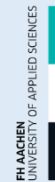
rosin-project.eu



- Horizon2020 EU-project ROSIN supports EU's strong role within ROS-Industrial
- Fostering Europe's expertise in advanced manufacturing
- **4 years, ~ 8 million EUR funding (01.01.2017 – 31.12.2020)**
  - Builds upon what exists; sustainable results after its completion
  - Key actions to make ROS **better**, business **friendlier**, more **accessible**
  - (Extra goal:) cluster other publicly funded activities using ROS like RobMoSys, OFERA, or SeRoNet



This project has been funded by the European Union's Horizon2020 research and innovation programme under grant agreement No 732287



# Key actions to make ROS:



## better

### Software Quality

**ROS-I best practices and tools:** continuous integration, unit testing, code reviews

**ROSIN further improves on them** with code scanning, automated test generation, model-in-the-loop testing

[rosin-project.eu/  
software-quality-assurance](https://rosin-project.eu/software-quality-assurance)

## business friendlier

### New components + path for exploitation

**3.5 Million € available to  
third parties for  
ROS-Industrial development**

Develop missing components  
or improve existing ones

Commercial release template  
(licensing, etc)

[rosin-project.eu/ftps](https://rosin-project.eu/ftps)

## more accessible

### Education

Educate students:  
**summer schools**

Train professionals:  
**ROS-I academy**

**Open Call** to fund your  
ROS education initiative

[rosin-project.eu/  
education](https://rosin-project.eu/education)

# Better via Software Quality Assurance



- Better structuring of development process
- Code scanning techniques
- Testing methodologies
- Model-driven development  
[rosin-project.eu/software-quality-assurance](http://rosin-project.eu/software-quality-assurance)
- E.g. Rosinstall Generator Time Machine  
<http://rosin-project.eu/consortium-results>
- ROS Software Quality Hub  
<http://wiki.ros.org/Quality>
- Discuss issues of quality policies in ROS  
<https://discourse.ros.org/c/quality>

A screenshot of the ROS.org website. The top navigation bar includes 'ROS.org', 'About | Support | Discussion Forum | Service Status | Q&amp;A answers.ros.org', and a search box. Below the navigation bar are links for 'Documentation', 'Browse Software', 'News', and 'Download'. The main content area is titled 'Quality' and 'ROS Software Quality Hub'. It contains an introductory paragraph, a central entry point for quality assurance material, and a table of contents with three items: '1. ROS Software Quality Hub', '1. Tutorials and articles', '2. Quality category on ROS Discourse', and '3. Who is behind ROS Quality Hub? (About Us)'. An orange arrow points from the second item in the table of contents to the corresponding text in the main content area. On the right side, there is a sidebar with a 'Wiki' section containing links for 'Distributions', 'ROS/Installation', 'ROS/Tutorials', 'RecentChanges', and 'Quality'. Below that is a 'Seite' section with links for 'Geschützte Seite', 'Kommentare', 'Info', and 'Dateianhänge'. At the bottom of the sidebar, there is a 'Benutzer' section with a login link.

# Accessible via Training and education



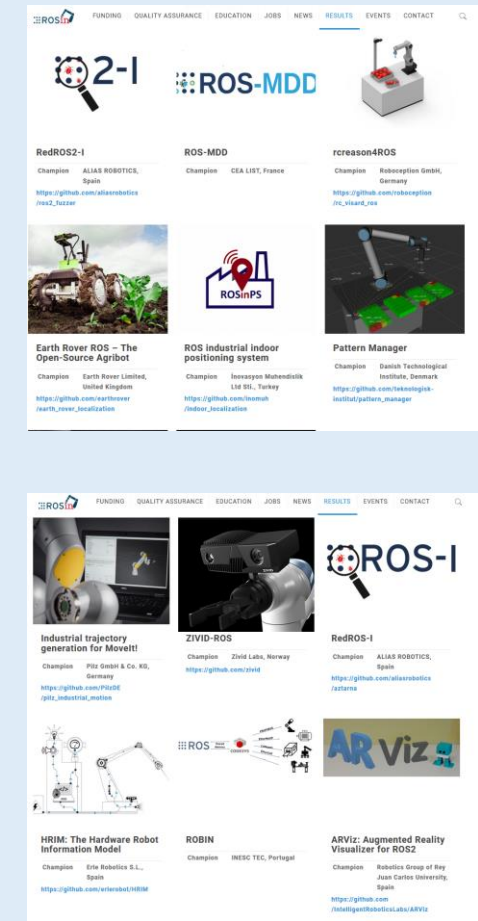
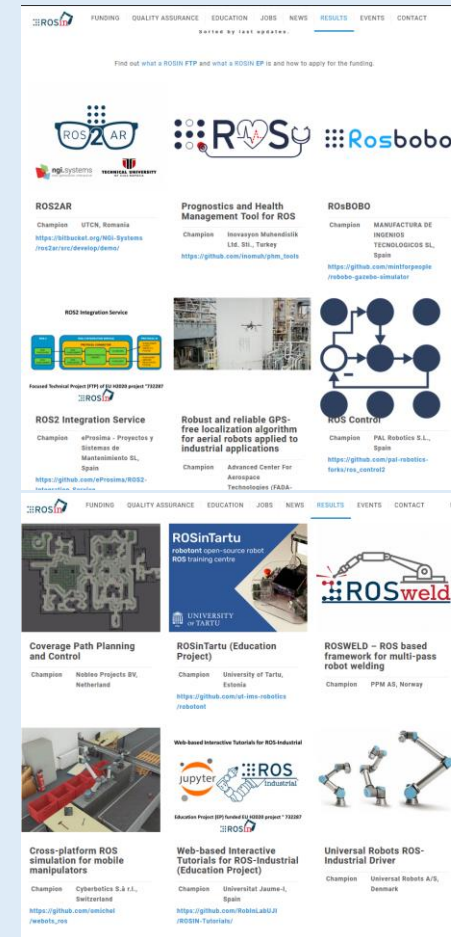
- **ROS-Industrial (Summer) School** for students at FH Aachen in Germany
- **ROS-I Academy in 2019** w/ SI & OEMs  
5x at Fraunhofer IPA, Germany (sold out)  
3x at RoboHouse, Netherlands  
1x at Tecnalia, San Sebastian (in Spanish) at external partners (trained trainers) in United Kingdom, Estonia, Turkey, France etc.
- **Technical Workshops (Fall)**  
October 9-10 on Movelt & Securcity
- **MOOC: Hello (Real) World with ROS**  
[online-learning.tudelft.nl/courses/hello-real-world-with-ros-robot-operating-systems/](https://online-learning.tudelft.nl/courses/hello-real-world-with-ros-robot-operating-systems/) starts again in January
- **Check** <http://rosin-project.eu/events>

The screenshot displays the 'Upcoming Events' section of the ROS Industrial website. It features a search bar at the top with fields for 'EVENTS FROM' (Date) and 'SEARCH' (Keyword), along with 'FIND EVENTS' and 'VIEW AS' (List) buttons. Below the search bar, there are navigation links for 'Previous Events' and 'Next Events'. The main content is organized by month, with 'September 2019' and 'October 2019' sections. Each event listing includes the event name, dates, location, and a price tag. For example, 'ROS-I Academy, Stuttgart' is listed for Sep 23 - Sep 27 at Fraunhofer IPA, Stuttgart, Germany, with a price of 1000€. Another event, 'ROS-Industrial EU Fall'19 Workshop', is listed for Oct 9 @ 11:00 am - Oct 10 @ 4:00 pm at Fraunhofer IPA, Stuttgart, Germany, with a price of 500EUR. The 'October 2019' section includes 'ROS-Industrial EU Fall'19 Workshop' (Oct 9 @ 11:00 am - Oct 10 @ 4:00 pm) and 'ROS-I Academy @ TECNALIA Research & Innovation' (Oct 16 @ 9:00 am - Oct 18 @ 12:00 pm) at Tecnalia, Donostia-San Sebastián, Spain, with a price of 500€. A 'Recent News' section on the right side of the page mentions 'ROSIN present at ROSCon 2019' and 'ROS-I Summer School at NMU Port Elizabeth, South Africa'.

# Business friendlier via FTPs



- **Focused Technical Projects (FTPs)** funding for 1/3 of SW dev cost
- In total 3.5 million EUR EU-funding aiming for 50+ FTP projects
- **Quarterly** cut-off dates (Final call: September 2019)
- Actually **60+ FTPs** granted (many are still running)
- (Intermediate) **results online** [rosin-project.eu/results](http://rosin-project.eu/results)
- Website sorted by last update → links to repos, wikis, videos, etc.

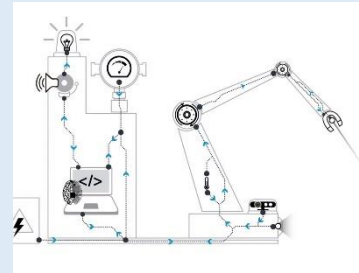




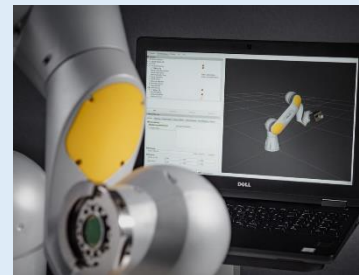
# Highlights from running FTPs



- **50% of FTPs** championed by **System Integrators**, **15 %** by **SMEs** & by **OEMs**
- **26% driver dev.**, **19%** improve. **existing comp.**, **15% ROS enhancement** (licences checks, prognostics, etc.), **15% algorithms** (planning & calibration)
- **HRIM: The Hardware Robot Information Model w/ Acutronic Robotics**
  - A set of rules each component has to meet in order to enable seamless interaction with other devices & database that can be used by all robotics HW manufacturers.  
HRIM facilitates integration effort when building robots and simplifies whole life cycle.
- **Robotics Language w/ Robot Care Systems**
  - The Robotics Language is a new modular and user-extendable domain-specific robotics language for ROS. It generates ROS components from abstracted languages.
- **Industrial trajectory generation for Movelt w/ Pilz**
  - Trajectory generator with a Movelt!-interface for easy planning and execution of Cartesian standard-paths (LIN, PTP, CIRC). In addition, the blending of multiple sequential motion commands is realized.



 **ROL**



# Upcoming FTP highlights



- **ROS2 Integration Service w/ ePROSIMA (by end 2019)**
  - Integration: Connect ROS2 to other protocols (MQTT, zeroMQ, a file/DB, etc): offer a common framework, standard interfaces, and useful services to create general bridges & transformations.
  - Routing: Enable ROS2 over Internet/WAN. Currently, ROS2 just allow LAN comms because of underlying protocol of ROS2: offer routing services for ROS2 traffic in several scenarios.
- **Universal Robots ROS-Industrial Driver w/ UR (released '19; distributed control 2020)**
  - high performing, stable and sustainable interface between UR robots and ROS  
enable all robot features that can be exploited within the current ROS Industrial driver paradigm
- **roScan w/ BOSCH Engineering (by early 2020)**
  - Clarification of license terms and conditions for ROS itself or functional ROS-packages. Bosch Engineering GmbH will perform the open source scanning (OSS) of the whole ROS core software and main mobile robotics functional packages, analyses the results and prepare a referable source of their license terms and conditions.

# Achievements in 2019 (reporting on RIC-EU activities)



- 5 ROS-I trainings (on ROS1) with 12-18 external participants
- 2 ROS-I Tech Workshops (on ROS2) with 20-40 participants
- 1 ROS-Industrial Conference with a total of 150 participants as flagship / lighthouse event
- A lot of media work, this a new press release, 39 news items on [rosin-project.eu/news](https://rosin-project.eu/news), Twitter 1220 followers (318 tweets), LinkedIn with 1240 followers
- More than 175 times the EU project was mentioned there (as of Dec.18, 2019). [discourse.ros.org/search?q=ROSIN](https://discourse.ros.org/search?q=ROSIN)
- more & more on [rosin-project.eu/results](https://rosin-project.eu/results) & [rosin-project.eu/consortium-results](https://rosin-project.eu/consortium-results)

# ROS-Industrial dates & events in 2020



- Presentations & videos of ROS-Industrial Conference 2019 online  
<https://rosindustrial.org/riceu2019>
- News on our ROS-Industrial blog  
<https://rosindustrial.org/news>
- Next events worldwide  
<https://rosindustrial.org/events-summary>
- Coming up in Europe
  - Five complete new ROS2 training in 2020 (pre-register for 3-4 day training in Feb. May July Sept. Nov.)  
[www.ipa.fraunhofer.de/de/veranstaltungen/messen/ros\\_industrial\\_trainings2020.html](http://www.ipa.fraunhofer.de/de/veranstaltungen/messen/ros_industrial_trainings2020.html)
  - Two ROS-I Tech Workshops with hands on latest developments
  - Hannover Messe in April & AUTOMATICA 2020 in June
  - ROS-Industrial Conference #RICEU2020 in Q4 /2020  
[rosin-project.eu/events](http://rosin-project.eu/events)

# Feedback & discussion



- Do you want this event to happen at ARENA2036?
- Do you want to meet at different locations?
- ?
- Do you want to present your own?
- Do you have a wish-list for presenters?

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