ROSIN: ADVANCING ROS IN EUROPE

Carlos Hernandez, TU Delft

ROS-I Conference, Dec 10 2019 Stuttgart

rosin-project.eu
The Robotics Institute at TU Delft consists of:

- 6 faculties
- 13 departments
- 140 staff and PhD

- Fundamental research
- BSc and MSc education
- Industrial collaboration

**Cognitive Robotics Department**

- Robot Dynamics unit
- Robot control software
- Knowledge Representation and Reasoning for self-adaptive robot control architectures

Team Delft winning Amazon Robotics Challenge 2016

© ROSIN – ROS-Industrial Quality-Assured Robot Software Components
TOC

- ROSIN introduction
- Quality Assurance
- Education
- Focused Technical Projects
- Results
ROSIN Introduction
ROS-INDUSTRIAL QUALITY-ASSURED ROBOT SOFTWARE COMPONENTS

- ROSIN: 4 years, ~8 million EUR IA H2020-ICT-2016-1
  - Speed-up the *industrial* uptake of advanced *robotics* applications.
  - Builds upon the **ROS-Industrial Europe** community, to make it sustainable and leading worldwide.

**H2020 EU Digital Industrial Platform for Robotics**

- ROSin
- RobMoSys
- FERA
- ROBOTUNION
- HORSE
- ... and more
**Objective 1:** Assuring the availability of high-quality robot software tools and components,

**Objective 2:** Creating a sufficiently large European user- and developer base.

**Self-sustainability** of ROS-Industrial Europe community
ROSIN Pillars

Software Quality Assurance
- Community involvement
- Continuous Integration
- Code scanning
- Model-in-the-loop

ROS Education
- Academy for professionals
- School for students

3+ Million EUR funding
- For ROS-I software development and education.
- 9 calls

Package Summary
- Details available on GitHub.
- Contributions welcome.
- Code quality checks.
- Code reviews performed.

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Quality Assurance
Quality Assurance
Working with the community to have better tools:

- continuous integration
- MDD and model-in-the-loop
- automated test generation
- code scanning
MORE ROSIN QA @ROS-INDUSTRIAL CONFERENCE

Today

- **14:10** Andrzej Wasowski (ITU Copenhagen)
  [Reactive] Programming with [Rx]ROS

- **16:10** Carlos Hernandez (TU Delft)
  Metacontrol for ROS2 systems

Wednesday

- **11:10** Nadia Hammoudeh (Fraunhofer IPA)
  Ros Model
Education
EDUCATION IN ROS-INDUSTRIAL

Education

Professionals trained in ROS
• curriculum
• ROS-I Academy professional trainings
• ROS-I Schools for students
• 3rd party ROS education

12:20 Kallweit, Stephan
FH Aachen University Applied Sciences
kallweit@fh-aachen.de
Hello (Real) World with ROS – Robot Operating System

Learn the fundamentals of ROS, Robot Operating System, to create advanced robotic systems.

10,856 already enrolled!

Enroll
Starts Jan 15, 2020

Learn the fundamentals of ROS to create advanced real-world robotic systems

https://www.edx.org/course/hello-real-world-with-ros-robot-operating-system
@ TU DELFT CAMPUS
- 800 M² FOR ROBOTICS
- CONNECTS END-USERS <> ROBOT DEVELOPERS
- ROS-INDUSTRIAL TRAININGS, TESTING FACILITIES, WORKSHOPS
- https://tudelftroboticsinstitute.nl/study/ros-academy

2020 TRAININGS:
- 27 and 28 February
- 28 and 29 May
- 20 and 21 August
- 19 and 20 November
Focused Technical Projects
ROSIN FOCUSED TECHNICAL PROJECTS

What service?

- Finance ROS open source development
  - Concrete industry need:
    - driver, algorithm, application template, license or code audits…
  - We fund 1/3 of the development efforts
  - Up to EUR 100K ~ 1 year duration
  - Also ROS education actions

Who can benefit?

- Robot software developers and users: companies, research centers…
  - EU H2020 program eligible entities (small consortiums)
Scope of FTPs

- All industrial application areas:
  - Manufacturing, but also
  - Intralogistics
  - Agriculture
  - Drones
  - ...

- ROS(1) and ROS2.0
Scope of FTPs

Target a **concrete business need**, i.e.: software development, definition of technical standards, security and license audits, etc.

- **HW-related components**, e.g. drivers, configuration tools;
- **ROS Enhancement Proposals (REPs)**: REPs are akin to, e.g. IEEE standards with a reference implementation of a working system;
- **algorithms**: e.g., a SLAM algorithm which currently exists only as a MATLAB implementation;
- **“application templates” driven by concrete use cases**, e.g. a configurable software component for a palletizing work cell;
- **improvement of existing components**, e.g., Rviz, the ROS navigation stack;
- **process-related work**, e.g. code security audits.
- **improvement of documentation**: technical manuals, deployment guides, etc.
- **integration with other software frameworks**

… (this is a non-exhaustive list)
FTP grant program

- 9 selection rounds
- > 80 applications received
- > 50 funded projects
- EUR granted > 3M
MORE ON FTPS
@ROS-INDUSTRIAL CONFERENCE

■ 14:40 Commercial exploitation with ROS-Industrial and introduction into FTP session
   Jon Azpiazu Lozano (Tecnalia)

■ 14:50 Highlights of the FTPs / outcomes of ROS developments
Results
ROSIN EXAMPLE: INDUSTRIAL TRL


- **Integrates** results from:
  - FTP “Ensenso-ROSIf”
  - FTP “Industrial trajectory generation for MoveIt!”
  - Scan-and-plan ROS-Industrial Consortium

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TRL9  | actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies, or in space)
TRL8  | system complete and qualified
TRL7  | system prototype demonstration in operational environment
TRL6  | technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL5  | technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL4  | technology validated in lab
TRL3  | experimental proof of concept
TRL2  | technology concept formulated
TRL1  | basic principles observed

- Typical impact of ROSIN: accelerated creation of TRL9 industrial installations with intelligent robots
- Typical release level for ROS-Industrial components after completion of ROSIN
- Typical starting point for new ROS components

**Main image:** ROSIN Industrial demonstrator at IROS18
H2020 EU DIGITAL INDUSTRIAL PLATFORM FOR ROBOTICS

ROS-MDD

Champion: CEA LIST
Country: France
Project budget: 281,001 €
Duration: 12 Months

ROS2 Integration Service
Champion: eProsima - Proyectos y Sistemas de Mantenimiento SL, Spain

RoScan
Champion: Bosch

ROS2 Automated Benchmark
Champion: eProsima

ROS2 shared memory
Champion: eProsima

Champion: TU Delft
Budget: 300,000 € 12 months
NEED FOR SUPPORTING OPEN SOURCE SOFTWARE

Toolbox • 01 July 2019

How to support open-source software and stay sane

Releasing lab-built open-source software often involves a mountain of unforeseen work for the developers.

Anna Nowogrodzki

- Consolidate and **valorise** the scientific and technical **results** of research projects
- **Problem**: funding for supporting the **software engineering required**
- Maintenance, Code Reviews, Community Work, travel grant or budget for hackathons like WRID etc. as a (standard) work package in more projects?

- What can we do?
SUMMARY

- **ROSIN** EU project fostering *industrial use of ROS* through *open source* – 2020 final year

- New Quality Assurance tools available

- Education activities will continue after ROSIN

- New open source **ROS components** - FTP program
More information

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http://rosin-project.eu
http://rosindustrial.org
@ROSINproject

Supported by ROSIN – ROS-Industrial Quality-Assured Robot Software Components.  
More information: http://rosin-project.eu/  
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 732287.