ROS-Industrial Consortium
Americas Community Meeting

Matt Robinson
ROS-Industrial Consortium Program Manager
September 21, 2023
Q3 2023

Agenda

• 10:00 – Welcome
• 10:05 – ROS-Industrial Consortium Activities
  • Status on Activities and Initiatives
  • Training Update
  • Workshop Planning at ROSCon (REACH)
  • FTP – Collaboration Project Updates
• 10:30 – SWORD Update
• 10:55 – ROS 2 Integration on Embedded Devices: overview and alternatives, Pablo Garrido, Project Manager, eProsima
• 11:20 – Open Forum
ROS-I Mission

• Mission
  • What do we work on?
  • How should our tools work?

• Where are we now?
• Where do we want to be?
Shaping a Roadmap - Feedback

• Workshops over last handful of years providing feedback

• OEM outreach and more resources for education and enable more contributions and leverage on hardware
Supporting ROS 2 and manipulators

• Inquiries regarding porting of industrial_core and use of legacy drivers

• There is NO Plan to port industrial_core

• The goal is to leverage OEM provided external motion interfaces and incentivize OEMs to create interfaces between their interfaces and ROS 2
  • UR – via ros2_control
  • Yaskawa – MotoROS2 + micro-ROS

• Highlight OEM provided solutions to encourage more OEMs to offer an interface solution they can support
Supporting ROS 2
Moving Forward

- Additional paths to offering interfaces
- More OEMs offer external motion interfaces
  - Minimal interface development
  - Able to leverage tools like ros2_control & micro-ROS
Actions

• Create an Industrial Robot Driver Specification for ROS 2
  • Planning phase
  • Provide pathway for OEMs to build out
• Continue to add roadmaps to ROS-I repositories
  • Noether -
Strategy for Development

**Environment Layer (MoveIt, Tesseract, Dart, etc.)**

**ROS 1 / ROS 2 / Middleware Layer**

**Messages, Topics**

**Build ROS1 or ROS2, these are independent**

**Independent of ROS**

- Collision Detection
- Motion Planners
- Kinematic Solvers
- Connectivity Structure

Continue to support deployed end-user ROS1 systems with new capabilities as they are developed even if for a ROS2 solution.
Teaching Application

https://github.com/ros-industrial-consortium/scan_n_plan_workshop
Developers’ Meeting Overview: https://youtu.be/GgTxvIaekjE
Training for 2023 & 24

• Planned three training events for ‘23
  • Feb 2023 – registration opening soon!, San Antonio
    • Advanced Topic: Motion Planning Pipeline
  • July 2023 – San Antonio, TX
  • October 2023 – San Antonio, TX – registration open!
    • Advanced Topic: Motion Planning Pipeline

• Seeking options for additional training topics/workshops
  • Will bring more lab exercises to Day 3 in ROS 2

• Bite Size Learning – recorded educational on a smaller topic – targeting 3-6 minutes in length – stay tuned
  • Submit topics to Matt Robinson, RIC Americas PM
Workshop(s)

• Seeking to set up a Scan-N-Plan workshop

• Current locations considered:
  • Columbus, OH
  • Pittsburgh, PA
  • Other? – interested in hosting? Ping the PM!

• ROSCon23 Workshop
  • REACH
  • https://roscon.ros.org/2023/
ROSCon 2023

• ROSCon 2023 will be in New Orleans in October!
• ROS-I will be exhibiting
• REACH Workshop still has space available
  • Register:
    https://roscon.regfox.com/roscon-2023
• Additional events co-located
  • MoveItCon -
    https://picknik.ai/moveitcon2023
Continue to foster collaboration

• In person conferences, training events, meetups

• Write ups and additional broader reach collaborative initiatives beyond the ROS community
  • American Welding Society
  • Steel Founders’ Society of Americas
  • Remanufacturing Industries Council
  • Manufacturing Innovation Institutes
Updated to the website!

- Hoping to launch in time for ROSCon in October
- Easier ties to the repos and resources – both open source and for Consortium members
Project Updates

- Robotic Blending M5
- SWORD
Job Shop Automation for the Foundry

• Introductions
  • SwRI
  • SFSA
  • Iowa State
  • PushCorp
  • Yaskawa

• SwRI Scan-N-Plan core software demo and UI review
Job Shop Automation for the Foundry

• Goal – To enable an intuitive agile automation solution for the high mix environment of the foundry
  • Ease of use
  • Able to handle a broad range of parts without a ton of upfront programming on the teach pendant
  • Reduce reliance on part specific tooling
  • Robust

• Extend the Scan-N-Plan framework built on by 4 prior milestones of ROS-I FTP to realize capability at an SFSA member site in collaboration with a broad team
Robotic Blending Milestone 5

FTP Champion: SFSA

Scan-N-Plan Process

M5 – Reconfigurable Process; Improved Performance, Characterization Based Processing; Ease of Use/Set UP; Distributed (Cloud)

Refer to links for milestone 4 outcomes:
- Video: https://youtu.be/PWCpehyKnTY
- 1-pg. description: ros-i.org/scan-n-plan

Motivation/Objective
- **Motivation:** Manual blending/surface finishing is a repetitive motion injury risk. If >80% of the work could be automated, this risk would be greatly reduced.
- **Objectives:**
  - Reconfigurable Work Flow – Fast & Easy Set Up/Configuration
  - Shop Floor Capable
  - Characterization Based Path Planning
  - Improve 3D segmentation
    - Time & Resolution to Enable Improved Performance
  - Improved Performance – Human in the Loop
  - Documentation!

Scope of Work

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<tr>
<th>SwRI</th>
<th>Iowa State</th>
<th>Yaskawa</th>
<th>PushCorp</th>
<th>SFSA/FCS</th>
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<tbody>
<tr>
<td>• Project mgmt</td>
<td>• Human in the loop region selection</td>
<td>• Furnish test cell</td>
<td>• Furnish Grinding Equipment</td>
<td>• Provide Functional Requirements</td>
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<td>• ROS software dev</td>
<td>• Interpolation from riser to bulk material</td>
<td>• Production solution integration</td>
<td>• Use Cases</td>
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<td>• Host 1st meeting</td>
<td>• Replicate solution at their lab</td>
<td>• On-Site workcell support</td>
<td>• Sample Materials</td>
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<td>• On-site support for final demos</td>
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<td>• Provide Site for End of Project Demo</td>
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Metrics for success:
- **Hardware Demos at Each Participant Site:** Add value to real/surrogate production parts; speed of configuring to new set ups, ease of setting up new parts

Cost/Schedule

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<tr>
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<th>Month 1-2</th>
<th>Month 3-4</th>
<th>Month 5</th>
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<td>Soft. Development</td>
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<td>@SFSA</td>
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Testing on Metal for Boundary Detect

- Paint, Chalk and Marker
- Various Colors
- Evaluate Land and Lift Off
  - Only do work inside boundary
Video
SWORD Update

• Michael Ripperger/Matt Robinson
Vendor-specific products

+ rich configuration introspection
+ high-fidelity simulation
+ direct control
  - limited programming capability
  - vendor only

Existing offline planning products

ROS/Open-source

+ hardware agnostic
+ automated motion planning
+ tool paths from meshes
+ optimization
+ collision avoidance
+ steep learning curve

???
SWORD

- Advanced robotics tools in a CAD environment

- Goal
  - Enable manufacturing engineers to deploy robotics for complex applications

- Differentiators
  - Embedded in CAD environment (maintain digital thread)
  - Advanced robotics capabilities
  - Vendor agnostic
  - Loose integration with ROS
  - Scriptable
Current State

**motion configuration**
- motion group definition
- IK solver configuration
- cartesian TCP dragger

**environment creation**
- scene modeling
- convex hull creation
- convex decomposition
- allowed collision matrix generation
- collision detection/visualization

**motion planning**
- waypoint generation
- motion planner configuration
- motion planner pipeline configuration
- trajectory visualization/introspection

**export artifacts**
- export to:
  - URDF
  - SRDF
  - tesserae
  - robot native program
SWORD + OSS

• Built on open-source libraries
  • Bug fixes contributed to OSS libraries
  • New features developed

• Learning tool
  • Visual, interactive
  • Avoids cumbersome setup
  • Easy to see results of changing configuration/parameters

• Entry-point to advanced robotics capability
  • Produce artifacts for use in ROS, OSS libraries
Questions?

- Michael Ripperger
- Southwest Research Institute
- michael.ripperger@swri.org
Member Share

- Pablo Garrido Sanchez, eProsima - ROS 2 Integration on Embedded Devices: overview and alternatives
Open Forum

• Topics?
Resources for the Community

• ROS-Industrial
  • Home: rosindustrial.org
  • Documentation: wiki.ros.org/industrial
  • Code: https://github.com/ros-industrial; https://github.com/ros-industrial-consortium
  • Training: http://ros-industrial.github.io/industrial_training/
  • ROSin: http://rosin-project.eu/
• Upcoming Events (https://rosindustrial.org/events-summary/)
Thank You!

• Provide feedback
• Seek out ways to collaborate
• Engage your supplier/partners on ROS use
• Reach out if you need help

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Reference