



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, eProsimia
- 11:20 – Open Forum

ROS-I Mission



images by Freepik (www.freepik.com)

• Mission

- What do we work on?
- How should our tools work?

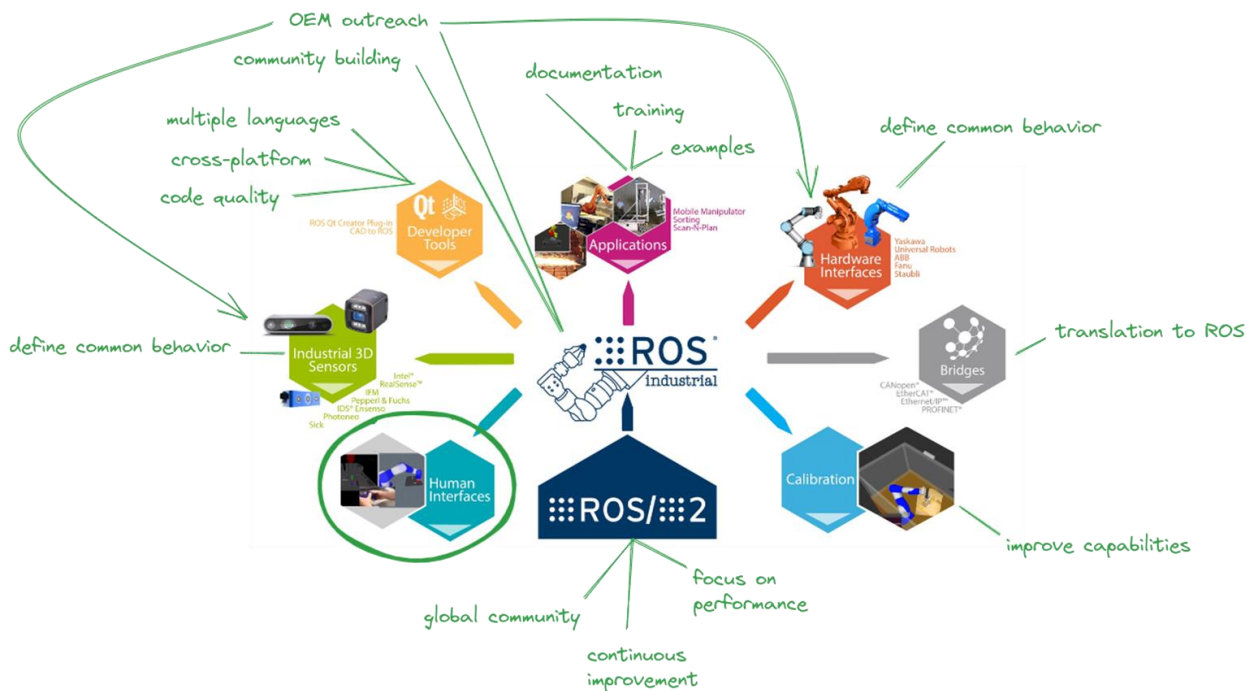
• Where are we now?

• Where do we want to be?



Shaping a Roadmap - Feedback

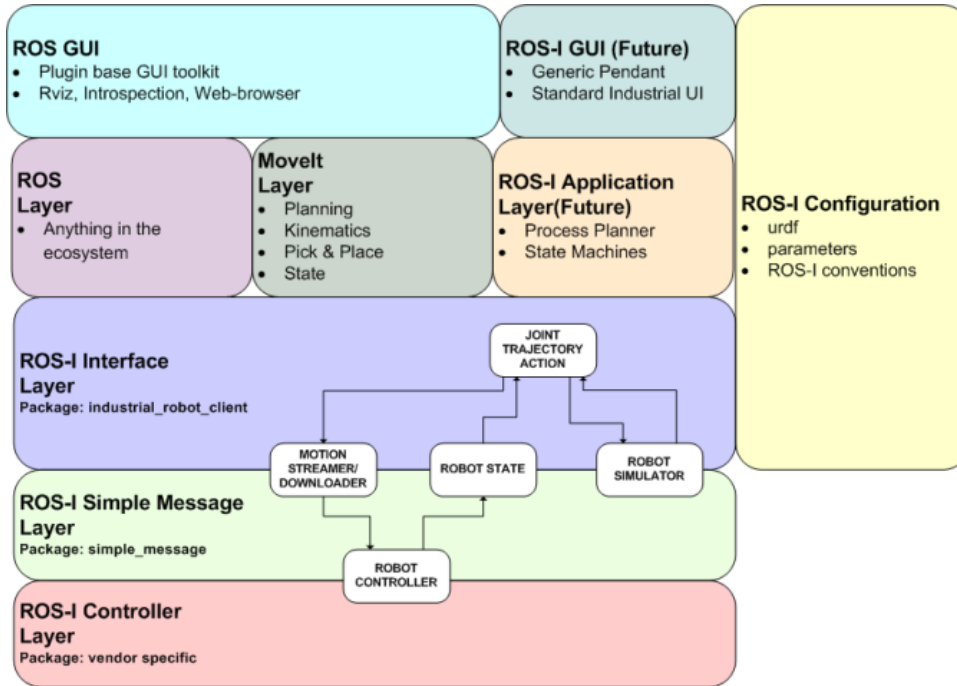
- Workshops over last handful of years providing feedback
- OEM outreach and more resources for education and enable more contributions and leverage on hardware



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



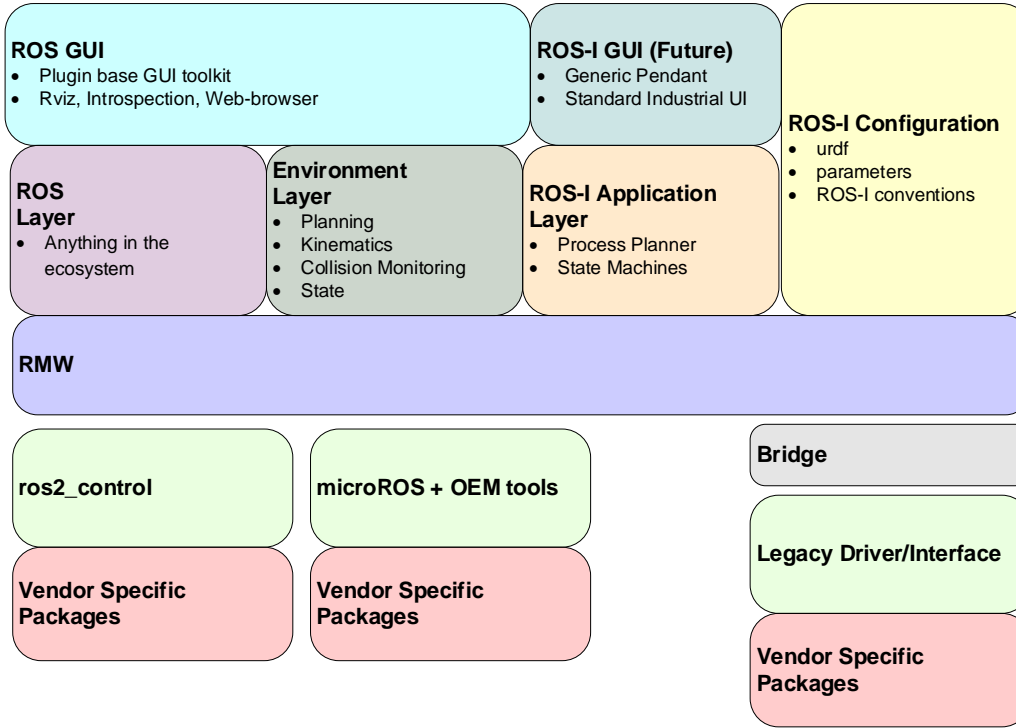
ROS 1

ROS-Industrial High Level Architecture - Rev 0.02.vsd

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

ROS 2



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 -

Tool Path Planner Package Refactor #147

marip8 started this conversation in Show and tell

marip8 on Jul 19, 2021 Maintainer edited ...

There are a number of issues with the current structure of the tool path planner package that make it difficult to use effectively. The maintainers of this repository have put together the following plan for improving the usability of the tool path planning package:

Issues with Current Implementation

- Not all planners work correctly (specifically the surface walk and eigen value edge planners)
- Planners of the same general type (i.e. raster, edge) don't produce consistent results
- Not flexible for expanding to new types of planners
- Lots of code duplication
- Duplication of parameters for planners
- Little documentation

Goals of Design Update

- Create architecture and development plan for repository
- Define expected behavior of planners
- Enforce expected behavior of planners
- Write meaningful unit tests
- Fix issues in planner operation
- Reduce code duplication
- Add new features for tool path generation
- Allow for easy configuration and usage of all planners
- Create GUI for configuring and using planners

Design Update Roadmap

Strategy for Development



Environment Layer (Movelt, Tesseract, Dart, etc.)

Messages,
Topics

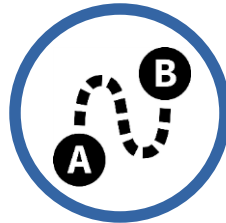
ROS 1 / ROS 2 / Middleware Layer



Independent of ROS



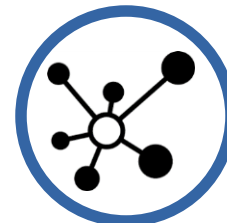
Collision
Detection



Motion
Planners



Kinematic
Solvers

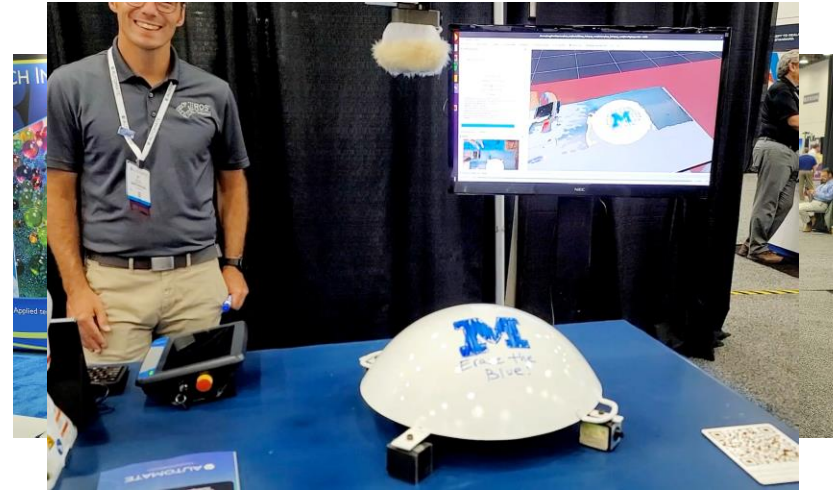
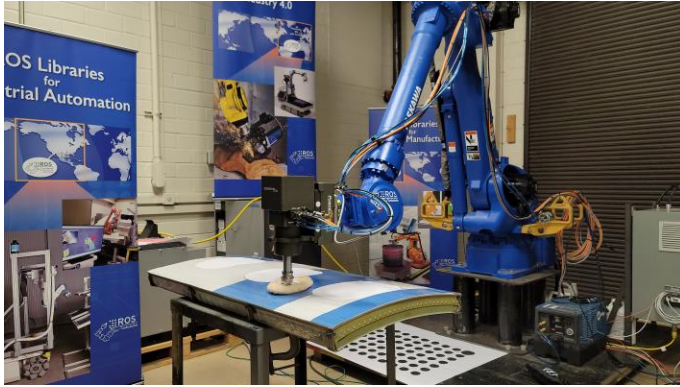


Connectivity
Structure

Build ROS1
or ROS2,
these are
independent

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

Teaching Application



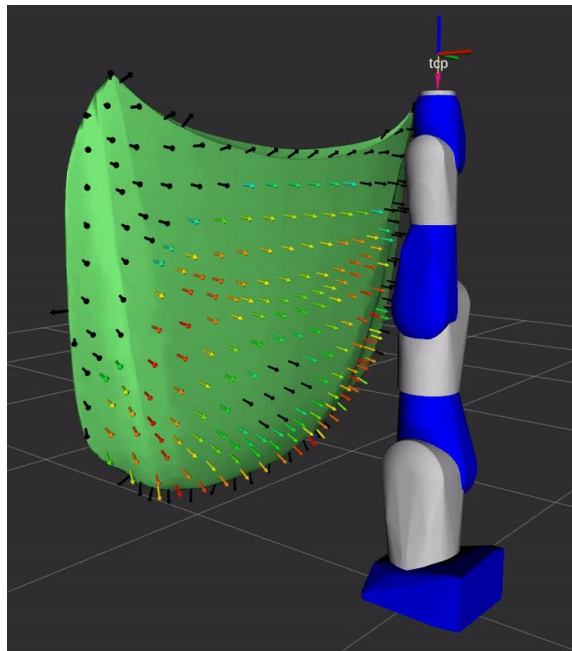
https://github.com/ros-industrial-consortium/scan_n_plan_workshop
Developers' Meeting Overview: <https://youtu.be/GgTxvlaekjE>

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

Advanced Manufacturing Technology

ROS-Industrial is an open-source project with the mission to extend the advanced capabilities of ROS to manufacturing automation and robotics.



Software Infrastructure

The ROS-Industrial Community and the Consortium are developing a common software infrastructure consisting of drivers, motion planning, robot simulations, development tools and more.



Project Updates

- Robotic Blending M5
- SWORD



Job Shop Automation

Robotic Blending Milestone 5

ROS-Industrial Focused Technical Project

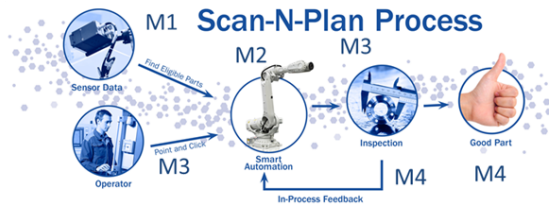
rosindustrial.org

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



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

SwRI	Iowa State	Yaskawa	PushCorp	SFSA/FCFS
<ul style="list-style-type: none"> •Project mgmt •ROS software dev •Host 1st meeting •On-site support for final demos 	<ul style="list-style-type: none"> •Human in the loop region selection •Interpolation from riser to bulk material •Replicate solution at their lab 	<ul style="list-style-type: none"> •Furnish test cell •Production solution integration •On-site workcell support 	<ul style="list-style-type: none"> •Furnish Grinding Equipment •Evaluation of parts to process •Support Integration 	<ul style="list-style-type: none"> •Provide Functional Requirements •Use Cases •Sample Materials •Provide Site for End of Project Demo

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

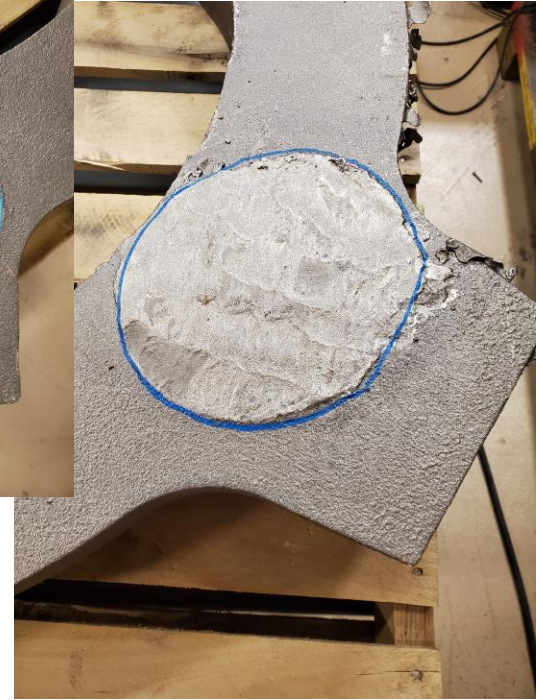
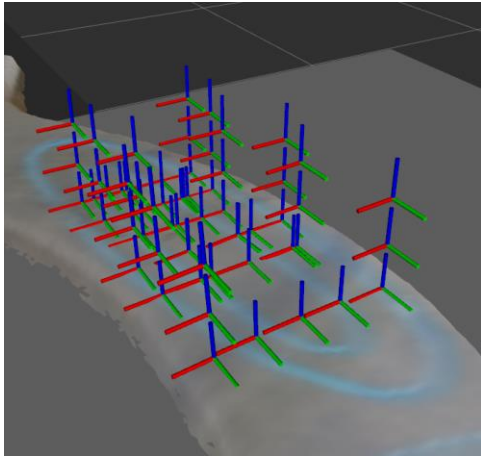
Cost/Schedule

- 5 month PoP
- Team Orgs: 6
- SFSA Funding+ in-kind

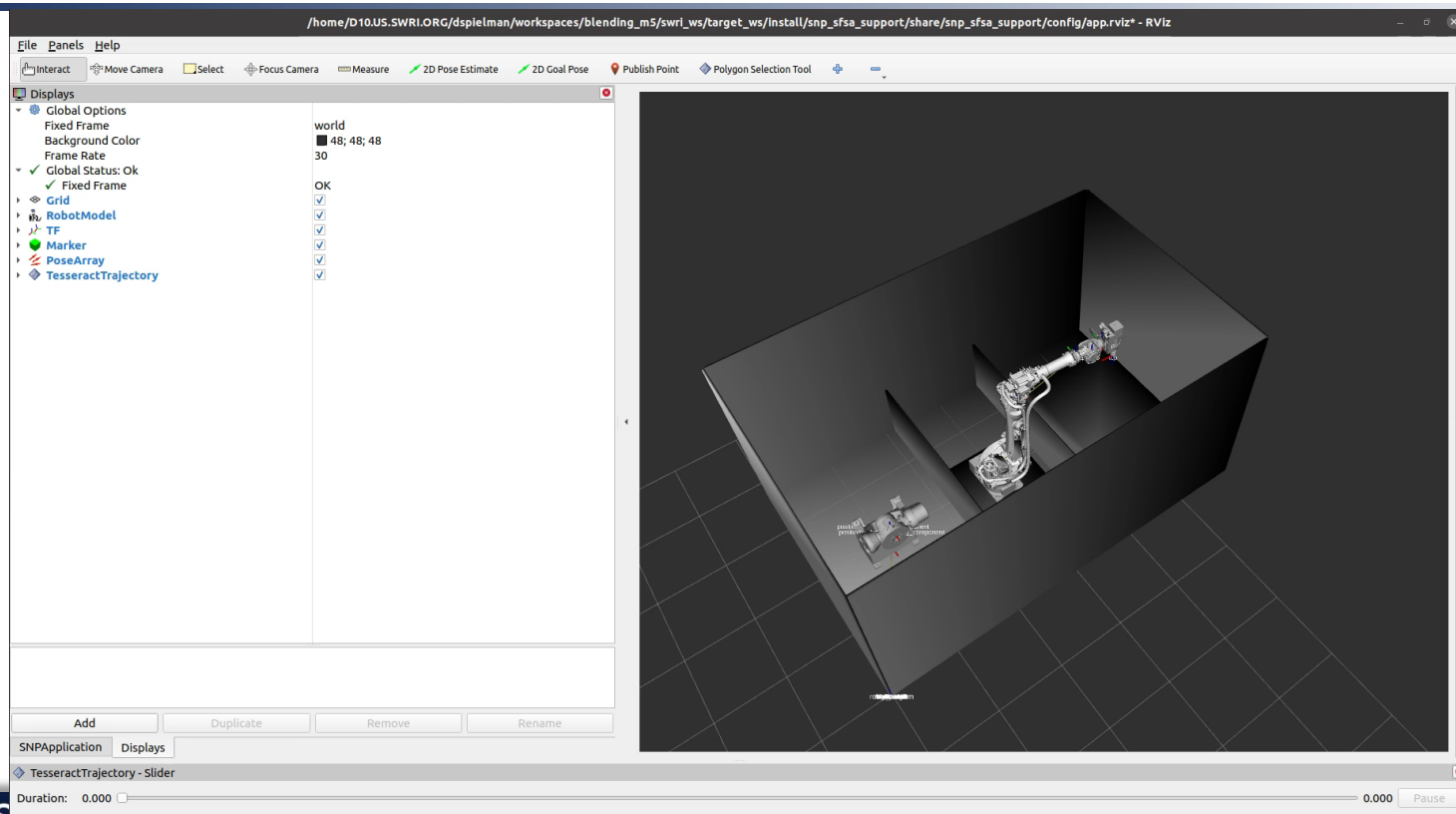
	Month 1-2	Month 3-4	Month 5
Soft. Development			@SFSA
Tech Transfer	@SwRI	@ ISU	Partner
Site Demos			
Reports/Documentation			

Testing on Metal for Boundary Detect

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

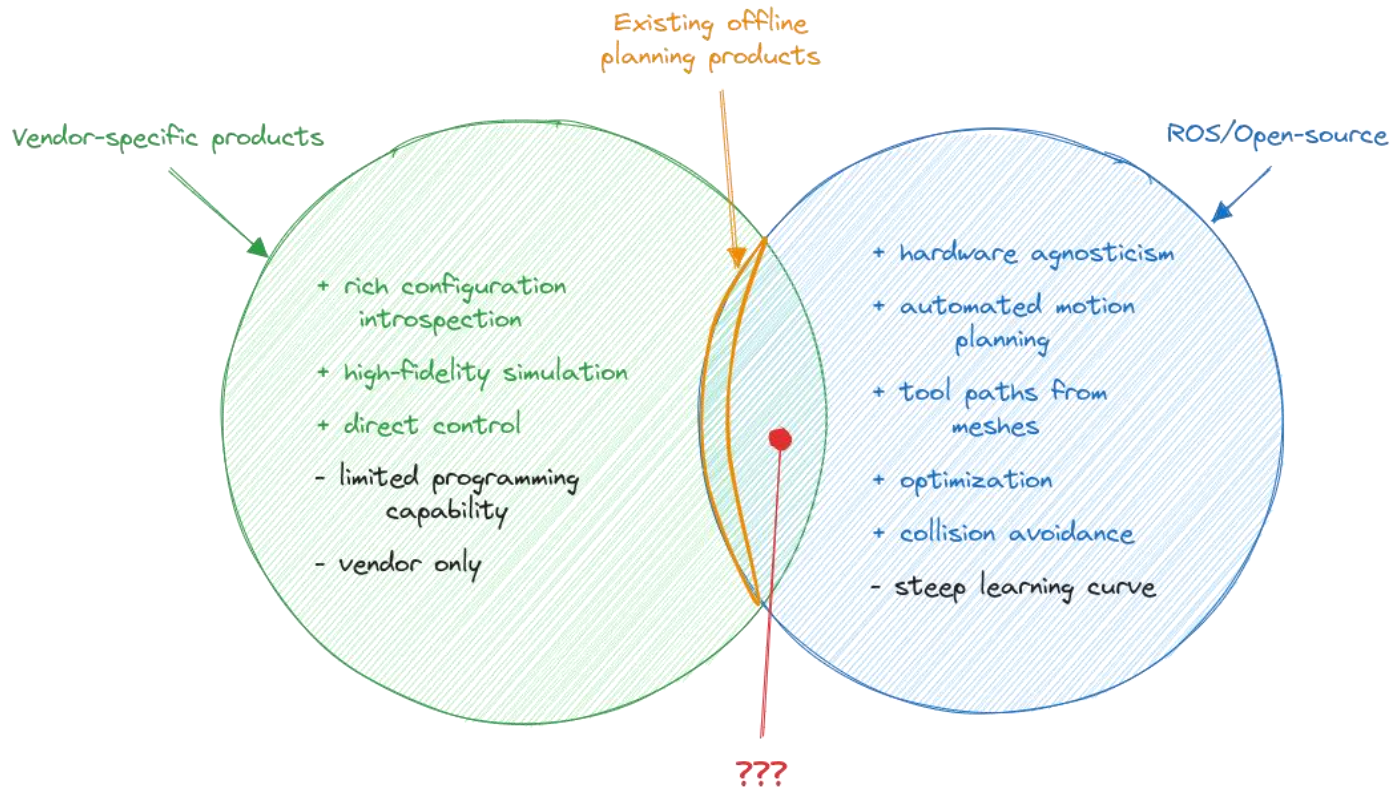


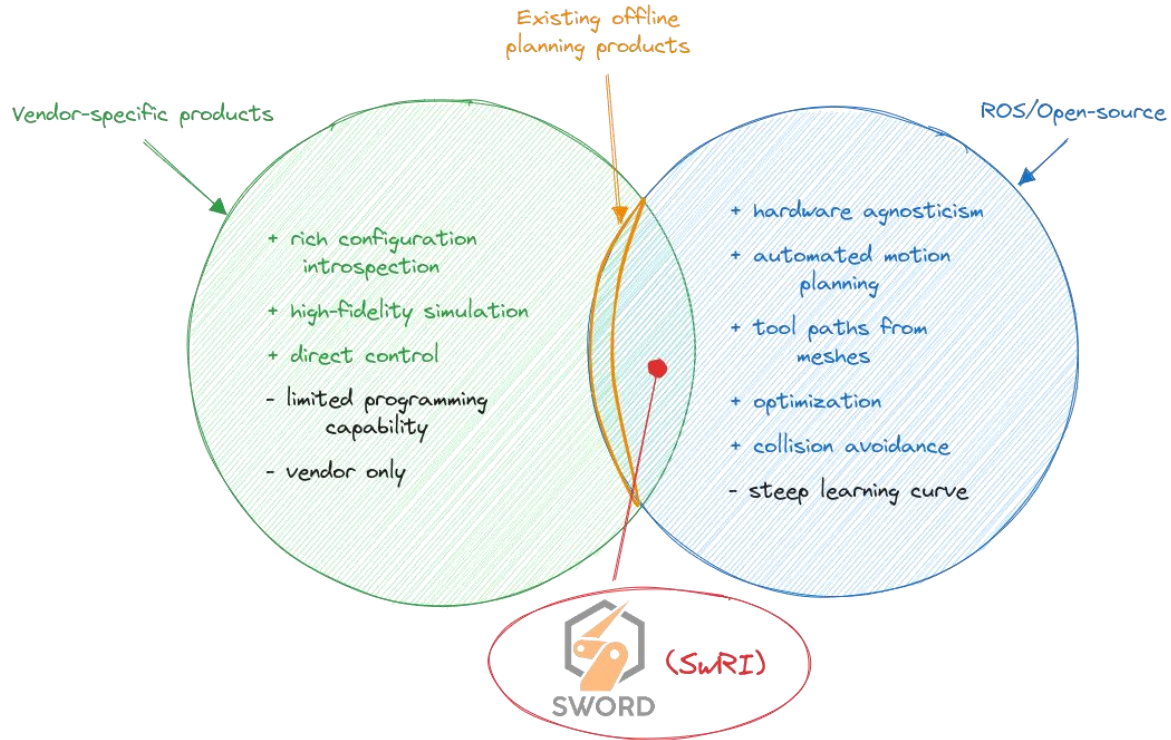
Video



SWORD Update

- Michael Ripperger/Matt Robinson





[1] <https://intrinsic.ai/>

[2] <https://picknik.ai/studio/>

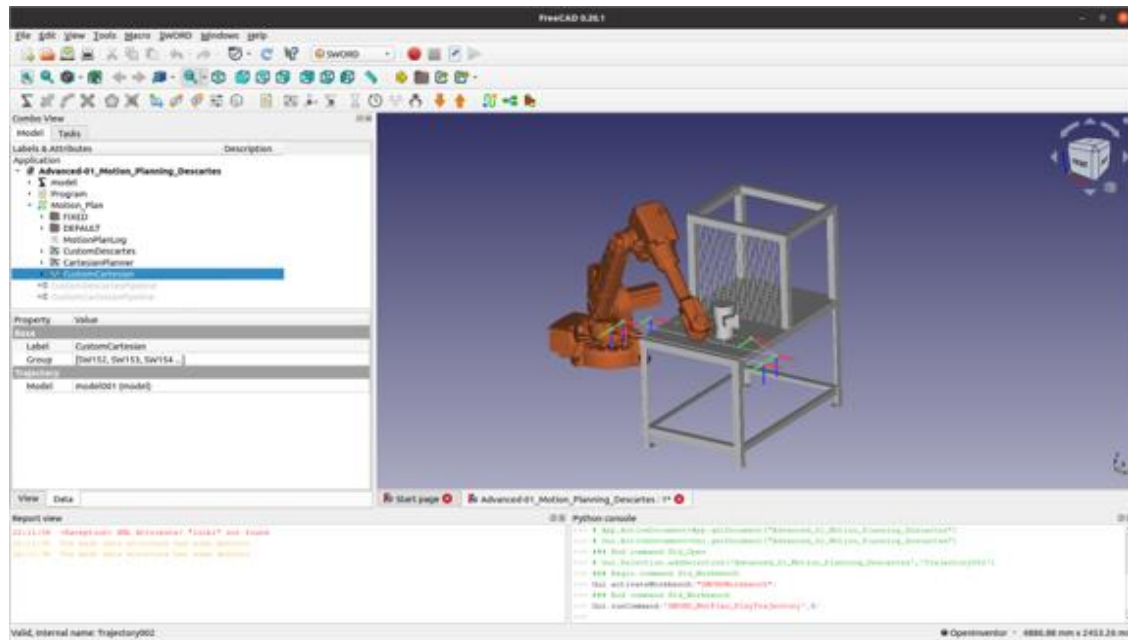
+ Flowstate (Intrinsic) [1]

+ MoveIt Studio (Picknik) [2]

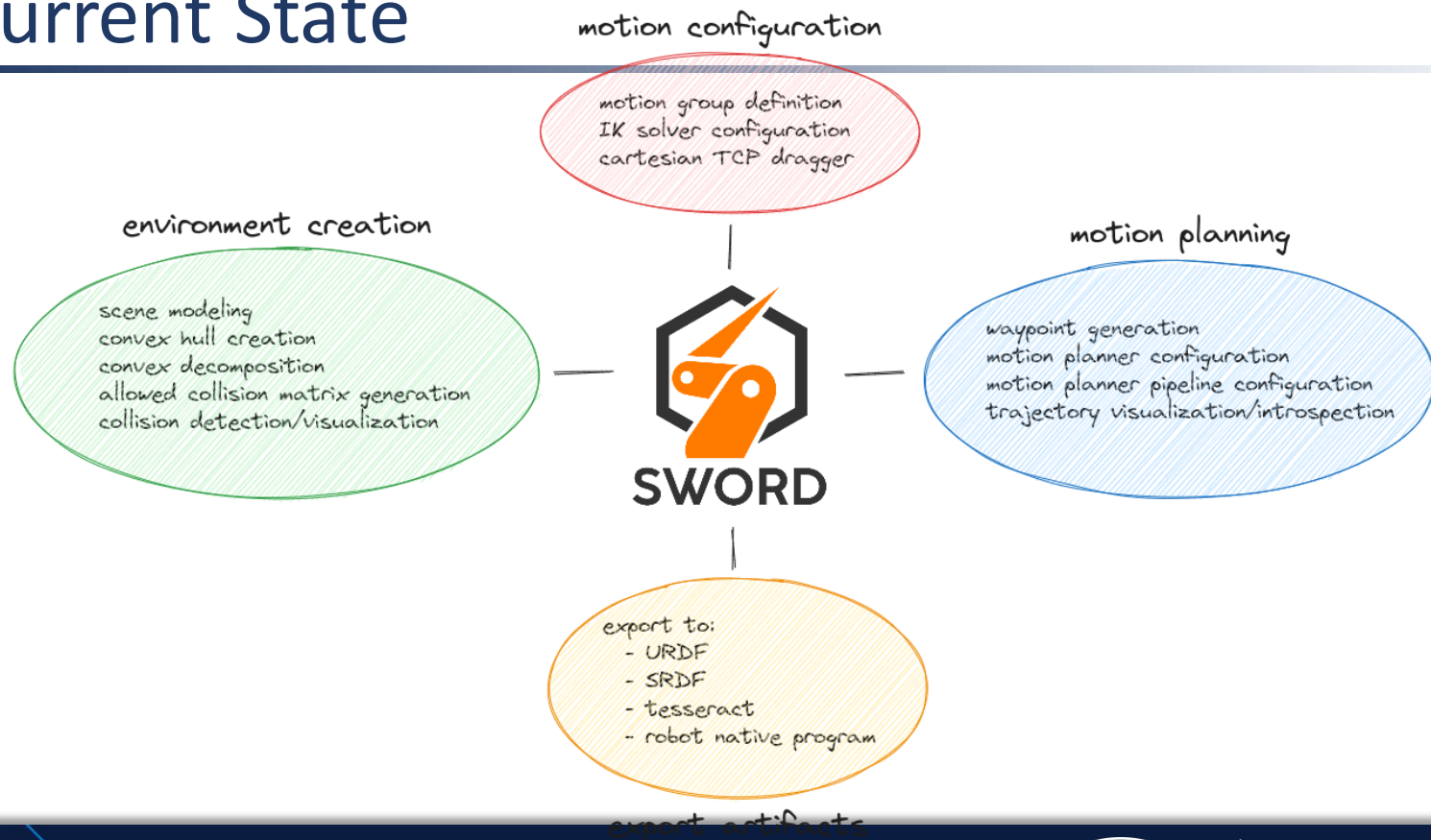
+ robotics start-ups

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



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

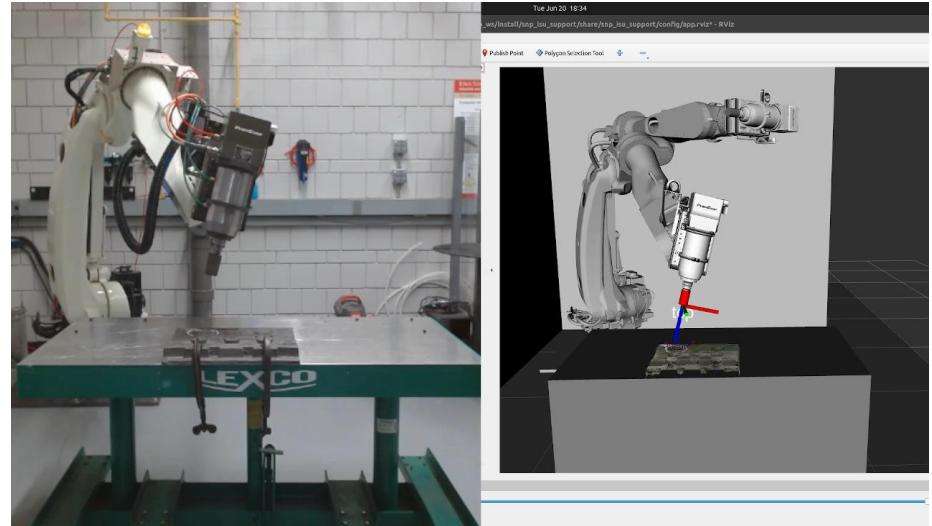


Member Share

- Pablo Garrido Sanchez, eProxima - ROS 2 Integration on Embedded Devices: overview and alternatives

Open Forum

- Topics?



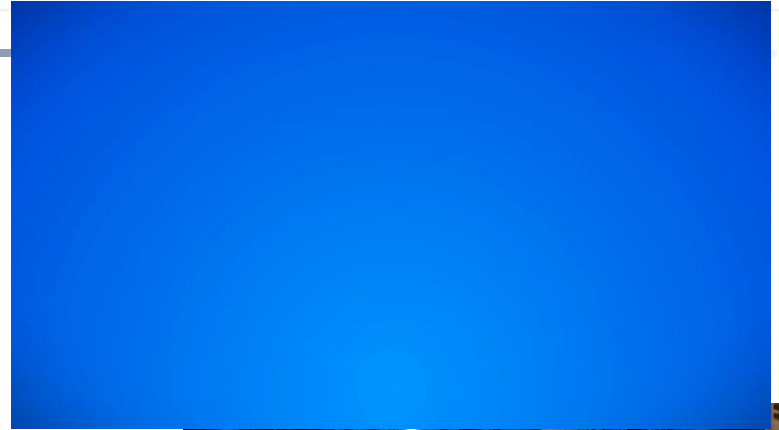
Resources for the Community

- 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

Matt Robinson
matt.robinson@swri.org
robotics.swri.org
rosindustrial.org



Reference

