Continuous effort on ROS2-based technology proliferation and industry adoption in Asia Pacific

Darryl Lee
ROS-Industrial Asia Pacific Consortium Manager
09 Nov 2022

The ROS-Industrial Membership Ecosystem

A Global Consortium with regional presence:

Fraunhofer IPA

Fraunhofer IPA, Germany

SwRI Southwest Research Institute

Southwest Research Institute, Texas

A*STAR ARTC, Singapore

Institutes of Higher Learning	Technology Providers
End Users	Solution Providers

ROS industrial consortium asia pacific

3 new members in Asia Pacific…

SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

MITSUBISHI ELECTRIC

dormakaba

Joining 89 members Globally

Managed by Advanced Remanufacturing and Technology Centre ARTC

Advanced Remanufacturing Technology Centre (ARTC)

Leading Public-Private Partnership Research Centre in SE Asia

Officially Opened on 28th January 2015

- **Mission – To Develop and Deploy Advanced Manufacturing Solutions and Upskill Workforce, to Drive Local Industry Competitiveness**
- **Bridging the gap between Research and Industry**
- **Co-Create and Value Capture with Industry through the Implementation of Solutions**

Bridging the Valley of Death in Technology Development

ROS industrial consortium asia pacific

Advanced Remanufacturing and Technology Centre ARTC

Production TRL 9

Development TRL 7

Research TRL 4

Agency for Science, Technology and Research SINGAPORE

A*STAR SERC RIs

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Industry Companies

- ROI
- Productivity
- Value Creation
- Market Demand

Year 1

- New Discoveries
- Fundamental Research
- Publications

Addressing *Valley of Death* in Innovation

- Process Validation & Optimisation
- Conceptualisation of Technologies
- Addressing Industry Core Problems

Accelerating Adoption of Technologies

TRL 1 - 3 | **TRL 4 - 7** | **TRL 8 - 9**

Technology Readiness Level (TRL) is a scale for determining the maturity of a technology

ARTC was created to drive Public Private Partnerships and for translational R&D with industry

The ROS-Industrial Asia Pacific Journey towards excellence

2017

1 **Start of ROS-I APAC Consortium Membership Base**

2nd Annual Workshop and SIRE 2017

Launch of 1st Developer's Training

4 Members Signed

ADLINK Leading EDGE COMPUTING

Tokyo Opensource Robotics Kyokai

TONY ROBOTICS

M8M

2018

2 **Growing Presence of ROS-Industrial Asia Pacific**

1st International Conference – ICRA 2018

Launch of ROS Summer School in APAC

Launch of World ROS-I Day

World ROS-I Day

3rd Annual Workshop and SIRE 2018 with Senior Minister of State

3 Members signed

REPUBLIC POLYTECHNIC

PEPPERL+FUCH

Woodside

2019

3 **Continuous Growth of Membership Base and building ROS 2 capability**

Bootcamp for SP 2019

4th Annual Workshop

First ITAP participating

First ROSCon Participating - Macau

Launch of RECT – Capability Building in ROS2

EMD EPD

6 Members signed

Panasonic

KONICA MINOLTA

SiAA

OMRON

SINGAPORE POLYTECHNIC

SP

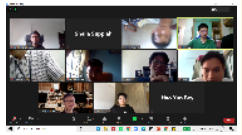
YOKOGAWA

2020

4 **Digital Edition of Events**

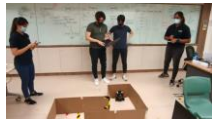
5th Annual Workshop Virtual

Launch of Virtual Trainings



Launch of Developers Meeting Series

Bootcamp for SP 2020



6 Members signed

Johnson & Johnson

DELTA

TDS

SCHAEFFLER

KABAM ROBOTICS

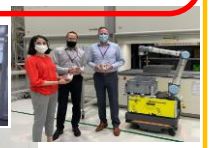
COGNICEPT

2021

5 **Continuing the Proliferation and adoption of ROS**

Showcase of RMF testbed at CAG T3

Local Implementation of Developed ROS2 Modules w/ Industry & Consortium Members



Released of ROS2 EMD and EPD

EMD EPD

4 Members signed

ADLINK LEADING EDGE COMPUTING

Infineon

KYOCERA

SWTC

2022

6 **Establish strong ROS2 development**

Start of ROS2 native platform funding programme

ROS 2

Launched an enhanced Bootcamp with SUTD & SP

ROScon Japan

2 Members signed

MITSUBISHI ELECTRIC

dormakaba

Managed by Advanced Remanufacturing and Technology Centre ARTC

ROS-Industrial Asia Pacific Playing Field

Strategy

ROS 2 - Technical Steering Committee

Alignment with Government Agencies

Alignment between ROS-I Global Consortiums

Technology Roadmapping

Technology

Development of ROS2 Native Platform Technology

Test-bedding opportunities

ROS2 Working Groups

Maintainer of Open-source packages

The proliferation and adoption of ROS

Industry Membership

Collaborative Projects with Members

Focused Technical Project

Consortium Advisory Committee

Outreach

World ROS-I Day

ROS2 Developer Meeting

ROSCon

ROS2 Developer Trainings

Bootcamps with IHLs

ROS-Industrial Annual Workshops

ROS-Industrial Asia Pacific Ecosystem Position

Provide Associated Technologies for operation / industrial use

Robot-related Software Developers

YOKOGAWA ★
KABAM ROBOTICS ★
open robotics ★

Other Related Technologies

OpenCV
Unity
amazon
GAZEBO
MATLAB

- Develop, Assemble, and Build Robotics Hardware and applications
- Project collaborators
- Robotics capabilities building

Robots HW & OEM suppliers

CLEARPATH ROBOTICS™ ★
OMRON ★
Panasonic ★
PEPPERL+FUCHS ★
ADLINK ★
DELTA ★
dormakaba ★
MITSUBISHI ELECTRIC ★
LIONSBOT ★
GAUSSIAN ROBOTICS ★

Prosumer

KYOCERA ★
SCHAEFFLER ★

End User

Johnson & Johnson ★
CHANGI airport singapore
Infineon ★
jtc ★

- Provide Problem Statement
- Drive Industrial Application development to suit operational needs
- Testing bedding opportunity

TDS ★

System Integrators

Connect, Fund, Develop Robotics Technology and Capabilities

SG Government Agencies

NATIONAL ROBOTICS PROGRAMME
EDB singapore
Enterprise Singapore
INFOCOMM MEDIA DEVELOPMENT AUTHORITY
GOVTECH SINGAPORE

IHLs

SINGAPORE POLYTECHNIC ★
REPUBLIC POLYTECHNIC ★
SUTD SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN
NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE ★

Other Research Institutes

Centre for Healthcare Assistive & Robotics Technology
Agency for Science, Technology and Research SINGAPORE

ROS-I Consortiums

ROS industrial consortium europe
ROS industrial consortium americas

Associations

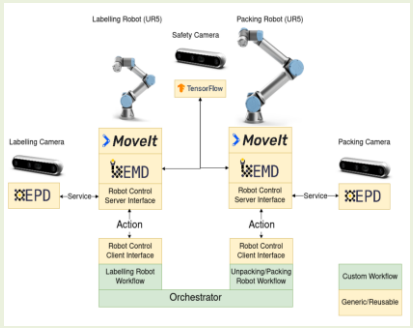
SIAA ★

Managed by Advanced Remanufacturing and Technology Centre ARTC

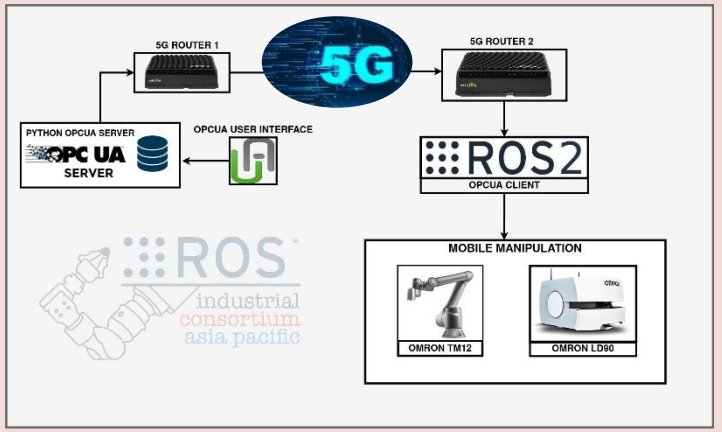
★ *Current Members*

ROS-Industrial Asia Pacific Capabilities and Demo Showcase

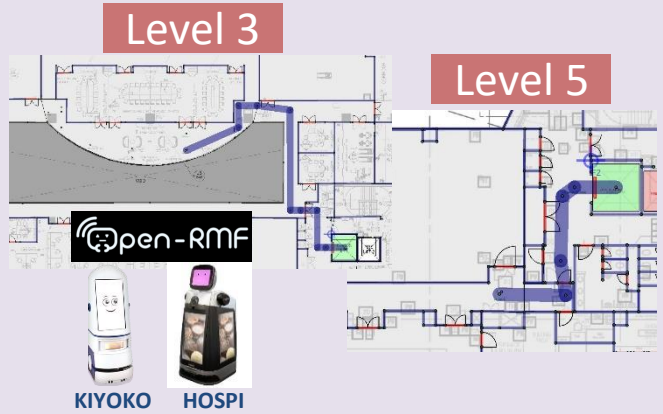
Applications



Flexible Labeling Robotics



5G Industrial ROS



Ushering Robotics with KIYOKO and HOSPI

Platform Capabilities

EPD

(Creator: ROS-Industrial AP)

EMD

(Creator: ROS-Industrial AP)

Nav2

(Creator: Intel, Samsung, UC San Diego and Locus Robotics)

Open-RMF

(Creator: Open Robotics)

ROS2

ROS2 Native Platform Technology Development

ROS industrial consortium asia pacific

ARTC SIMTech I²R NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE SUTD SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Eco-system Collaborative R&D

- Lower the technology adoption barrier
- Increase the success rate of robotics deployment
- Uplift capabilities of the robotics ecosystem

Strong Support from both Supply and Demand Sides

Infineon, Johnson & Johnson, CHANGI airport group, Panasonic, JM Vistec System Pte Ltd, OMRON, GLOBOTIX, LIONSBOT, TDS, TRANSFORMA, AUGMENTUS, pba, MYR LABS, Weston Robot, HANDPLUS ROBOTICS, HAN'S ROBOT, SiAA, OCEANIA ROBOTICS, HOPE technik

Key Work-streams

ROS 2

Technologies for Robotic Performance Optimization

- Reduce prototype iterations by testing their robotic systems early for more advanced use cases and conditions.
- Enable end users to evaluate the suitability of robot deployments prior to deployment to avoid long ramp-up times or commissioning
- Achieve full visibility, debottlenecking and system-level performance optimization of RMF deployments

Technologies for High Performance Safe Robot Operations

- Enable robots to perform their tasks in the vicinity of humans and obstacles
- Enable robots to perform tasks more quickly in areas with more restricted movement
- Improve performance of mobile manipulators from stop-and-go to manipulate-on-the-move

Technologies for Auto-configurable Generic Robotic Workspaces

- Production systems can be setup in significantly shorter time with automatic workspace high-fidelity creation
- Self-correction reduces downtime or production fallout/quality issues over time
- Lower TCO using multiple low-cost sensor improvement to achieve higher precision

Technologies for ROS 2 Native Robot Controller

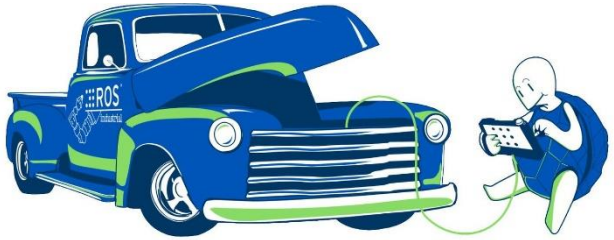
- ROS2-based controller customizable for any type of X-DOF robotic applications and robots/peripherals

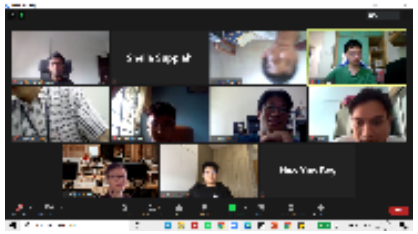
What we do to be the most committed ecosystem player

Student Bootcamp

- Over 80 students trained since 2018
- Train future roboticists
- Launched an enhanced bootcamp with both SUTD and SP this year
  - Involve more IHLs
  - A platform for industry organisations to participant in giving back

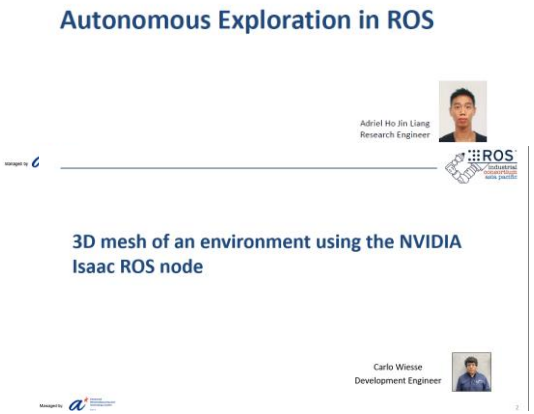
World ROS-I Day





- Uniquely ROS-Industrial
- 24 Hours hackathon – 3 Regions
- Resolve open REPs and packages on repo
- An estimated 10 ROS-Industrial engineers participate in the event around the clock

Developer Meeting



- Technical presentation on topics relevant to ROS
- Rotation among the 3 regions
- Quarterly basis

These efforts **emphasise** ROS Industrial Asia Pacific's **commitment to proliferate ROS** and anchor its role as one of the **most committed ecosystem players** in open-source Robotics.

ROS-Industrial AP went to ROSCon 2022!

- The largest ROS developer conference comprises technical talks, tutorials and booth showcases
- 800 Participants from 38 Countries
- ROS-Industrial Consortium Asia Pacific demonstrated a multi-robot manipulation system

Key Takeaway

- Good community platform for passionate developers to engage and discuss
  - Common challenges & experience
  - Standards & Best Practice
  - Limitation & future of ROS
- Multi-robot arm manipulation & Human-robot collaboration are still technically challenging fields in ROS.
- Increasing demand for standardisation
- A strong need to understand the hesitance of the industry migrating to ROS2

Thank you!