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

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A Global Consortium with regional presence:

3 new members in Asia Pacific...

Joining 89 members Globally
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
Managed by ARTC was created to drive Public Private Partnerships and for translational R&D with industry

- ROI
- Productivity
- Value Creation
- Market Demand
- New Discoveries
- Fundamental Research
- Publications
- Process Validation & Optimisation
- Conceptualisation of Technologies
- Addressing Industry Core Problems

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

1. Start of ROS-I APAC Consortium Membership Base
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
3. Continuous Growth of Membership Base and building ROS 2 capability
   - First ITAP participating
   - Bootcamp for SP 2019
   - Launch of RECT – Capability Building in ROS2
4. Digital Edition of Events
   - 4th Annual Workshop Virtual
   - Launch of Virtual Trainings
5. Continuing the Proliferation and adoption of ROS
   - 5th Annual Workshop Virtual
6. Establish strong ROS2 development
   - Start of ROS2 native platform funding programme
   - Local Implementation of Developed ROS2 Modules w/ Industry & Consortium Members

- 4th Annual Workshop
- First ROSCon Participating - Macau
- Launch of Developers Meeting Series
- Bootcamp for SP 2020
- Released of ROS2 EMD and EPD
- ROSCon Japan
- Launch of World ROS-I Day
- 3 Members signed
- 4 Members signed
- 6 Members signed
- 2 Members signed

- 1st International Conference – ICRA 2018
- 2nd Annual Workshop and SIRE 2017
- 3rd Annual Workshop and SIRE 2018 with Senior Minister of State
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022

2017 Managed by
2018
2019
2020
2021
2022

- 4 Members Signed
- 3 Members signed
- 3 Members signed
- 6 Members signed
- 2 Members signed

- Pepperl+Fuchs
- Panasonic
- Validyne
- Republic Polytechnic
- SiAA
- Bosch Sensing & Control
- Infineon
- OMRON
- Adept Robotics
- Adept Robotics
- SIAE
- Mitsubishi Electric
- Dormakaba
- Adept Robotics
- Adept Robotics
- Toyota Technological Institute, Arizona
- M8M
- Tokyo Denki University
- Adept Robotics
- Adept Robotics
- Adept Robotics
ROS-Industrial Asia Pacific Playing Field

Strategy

- ROS 2 - Technical Steering Committee
- Alignment with Government Agencies
- Alignment between ROS-I Global Consortiums
- Technology Roadmapping

The proliferation and adoption of ROS

Technology

- Development of ROS2 Native Platform Technology
- Test-bedding opportunities
- ROS2 Working Groups
- Maintainer of Open-source packages

Outreach

- World ROS-I Day
- ROS2 Developer Meeting
- ROSCon
- ROS2 Developer Trainings
- Bootcamps with IHLs
- ROS-Industrial Annual Workshops

Industry Membership

- Collaborative Projects with Members
- Focused Technical Project
- Consortium Advisory Committee

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ROS-Industrial Asia Pacific Ecosystem Position

Provide Associated Technologies for operation / industrial use

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

Robot-related Software Developers

Robots HW & OEM suppliers

System Integrators

ROS-I Consortiums

SG Government Agencies

IHLs

Other Related Technologies

ROS

Prosumer

End User

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

Other Research Institutes

Associations

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Current Members
ROSI-Industrial Asia Pacific Capabilities and Demo Showcase

**Applications**

- **Flexible Labeling Robotics**

**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)

**5G Industrial ROS**

**Ushering Robotics with KIYOKO and HOSPI**

**Level 3**

**Level 5**
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

Key Work-streams

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!