



ROS-Industrial Consortium Americas 2020 Annual Meeting

March 4–5, 2020
San Antonio, TX

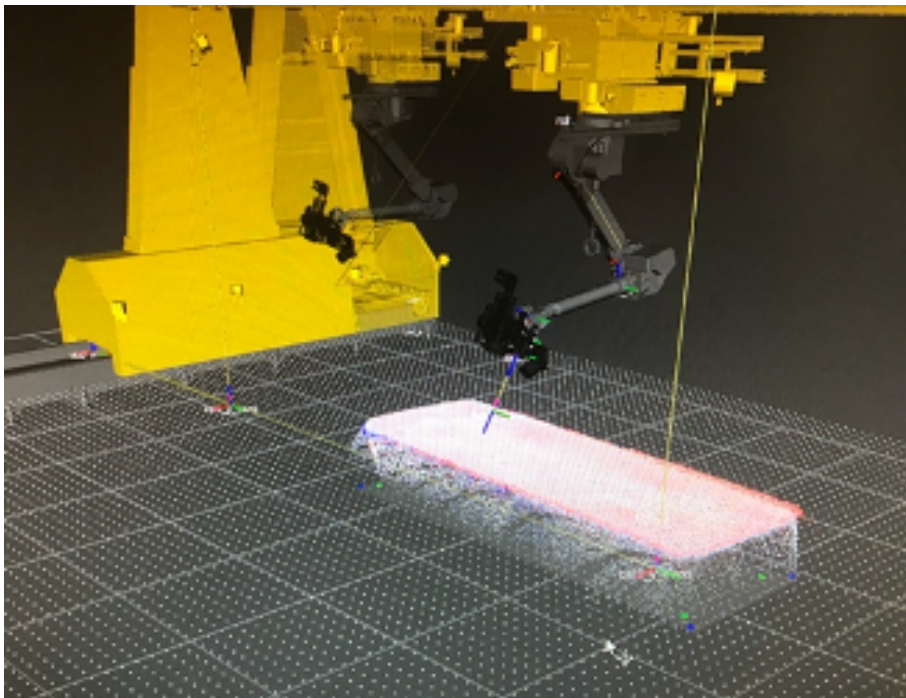


rosindustrial.org





**ROS-Industrial
Consortium
Americas Annual
Meeting 2020**



*Virtual
Representation
of ROS-Based
Production
System*

Advancing ROS for Industry

ROS-Industrial is an open-source project that applies the advanced capabilities of ROS to relevant industrial hardware and robotics applications. Now in its ninth year, ROS-Industrial is helping to enable industrial innovation that was previously infeasible or cost-prohibitive for manufacturing robotics.

Not long ago, it was thought that the primary focus of a ROS-Industrial project was just to drive engagement in the idea that open-source software could be used for industrial robotic applications. This goal has not only been realized, but it could be considered that open-source capability has laid the foundation for the acceleration of some of the most compelling advanced robotics capabilities emerging from the sector.

Each region has made significant contributions to the acceptance and advancement of ROS in the industrial community. In the European Union, steady progress has been realized via the ROSIN initiative, a project funded by the EU's Horizon 2020 research and innovation program, which aims to amplify ROS-Industrial's impact by making ROS-I better and even more business-friendly and accessible. Within the Asia-Pacific region, there has been significant growth in the engagement via their Consortium membership base as well as technical contributions, such as PACKML for ROS2 and a new object recognition and pose estimation capability, as well as significant regional government investment into core open-source capabilities. These ROS-Industrial aligned initiatives, along with the individual contributions of members in the core ROS and ROS2 technical support communities, have combined so that ROS is nearly considered a standard for robotics application development.

Within the Americas specifically, the ROS-Industrial initiative has continued to grow to include new compelling capabilities:

- Optimization-based Path Planning
- Dynamic Part Reconstruction
- Quantitative Reach Analysis
- Hybrid Perception

In addition, ROS2 training was introduced along guidance on the best use of the bridge relative to building an application that performs with regards to expectations. Improved collaboration tools for Consortium members were introduced, and the return of quarterly community meetings, all while maintaining and continuously improving numerous community-based events. These enhancements align with recent feedback to focus on areas of ease of use and facilitating adoptability through training tools and means to enable more efficient collaboration and knowledge sharing.

The ROS-Industrial Consortium Americas and the Consortia in Europe and Asia seek to realize the promise of ROS-Industrial. These goals include:

1. Provide a one-stop location for manufacturing-related ROS software
2. Strive toward software robustness and reliability to meet the needs of industrial applications
3. Combine the relative strengths of ROS and existing technology, combining ROS high-level functionality with the low-level reliability and safety of an industrial robot controller
4. Stimulate the development of hardware-agnostic software by standardizing interfaces
5. Provide an "easy" path to apply cutting-edge research to industrial applications by using a common ROS architecture
6. Provide simple, easy-to-use, well-documented application programming interfaces

The Consortia and their memberships have been actively influencing this strategy. It is evident that this collaboration is leading to tangible benefits that move from university, into industry adopters.

Thank you for participating in the idea of open-source robotics for industry. As with any change, this takes a community to enable the realization of any vision, so thank you for being a part of the ROS-Industrial Community!

Regards,



Matt Robinson

ROS-Industrial Consortium Americas

Objectives

The ROS-Industrial Consortium Americas Annual Meeting convenes Consortium members to review the latest in developments, stakeholder and partner initiatives, sister Consortia activities, as well as review and provide input into the vision and strategic direction of ROS-Industrial.

The event contains both public and non-public days to foster the means to drive awareness and grow the ROS-Industrial network through demonstrations and compelling presentations that highlight the value proposition for what is going on within ROS-Industrial and how the Consortium enables that vision.

Additional objectives beyond a strategic direction and technical activities include:

1. Understand where ROS-Industrial is, technically and sustainably, what has happened in the last year, and what is proposed moving forward.
2. Learn about the latest strategic non-technical initiatives that move the ball forward in use, adoption, and support of ROS-Industrial.
3. Communicate and share what has been beneficial and what has been a challenge during workshops and networking sessions.
4. Continue to provide inputs to the “problem-centric” roadmap to compliment the technical vision. Cast the capabilities of the technical vision against prioritized problems to address a matrix, to ensure resources are focused on the right things.
5. Generate, based on the problems to solve, compelling project topics that can be championed and launched to address the biggest challenges to the membership.
6. Take what has been learned and share it with your organizations. Provide feedback and continue to participate in these events, as well as other meetings that take place throughout the year and in the various regions. Without the engagement of the membership and community, ROS-Industrial will not realize its potential.



Chairs

Matt Robinson – Program Manager, ROS-Industrial Consortium Americas

Paul Evans – Director, SwRI Manufacturing and Robotics Technologies Department

Levi Armstrong – Technical Lead, ROS-Industrial Consortium Americas

President's Message – Southwest Research Institute® (SwRI®)

Innovation in science and technology has been a hallmark of Southwest Research Institute since its earliest days. It is no exaggeration to say we are committed to advancing science and applying technology to benefit government, industry, and all of humankind. That is our mission. Our multidisciplinary, collaborative approach allows us to successfully solve clients' most challenging problems.

Our staff is just as committed today as our founder, Thomas Baker Slick Jr., was in 1947 when he proposed that the betterment of mankind depends on the use of advanced science and technology. His dream of building an internationally respected institution working in research and development has, I believe, been more than realized.

Today, we are a leader among independent, nonprofit research and development organizations. Our staff of approximately 3,000 scientists, engineers, analysts, and support staff continues to accomplish outstanding fundamental and applied engineering and research for clients from diverse segments of government and industry. And we will continue to strive to be the first choice for clients seeking solutions for their most complex problems.

Adam L. Hamilton, P.E., President & CEO, Southwest Research Institute



Day 1 – March 4

Time	Topic	Speaker
7:45	Shuttle Pick Up at Hotel	
8:00	Registration, Light Breakfast	
8:30	Welcome - Intro to SwRI	Paul Evans, Director MRTD, SwRI
8:45	ROS-I Americas Consortium Overview	Matt Robinson, ROS-I Americas Program Manager, SwRI
9:10	Industrial Automation with ROS	Levi Armstrong, ROS-I Americas Tech Lead, SwRI
9:35	Break	
9:55	The Role of the Cloud in the Future of Robotics	Roger Barga, General Manager, AWS Robotics and Autonomous Services, Amazon Web Services
10:20	Robotics Trends & the Impact on Employment	Alex Shikany, Vice President Membership & Business Intelligence, A3
10:50	Panel – “Why Tech is Interested in ROS-I?” Moderated by Levi Armstrong	Joshua Heppner, Lou Amadio, Roger Barga, , Intel, Microsoft, Amazon Web Services
11:30	Lunch Keynote: From Original Inspiration to the Future Vision: A Founders Perspective on ROS-Industrial	Shaun Edwards, CTO, Plus One Robotics
13:00	Lab Tours/Demos – Interactive Demonstrations on the SwRI campus and the Port of San Antonio	Coordinated by Matt Robinson, Paul Evans, and Shaun Edwards, Xyrec, SwRI & Plus One Robotics
17:00	Closing Remarks	Matt Robinson, ROS-I Americas Program Manager, SwRI
17:15	Depart for Dinner	Boiler House at the Historic Pearl

Day 2 – March 5

Time	Topic	Speaker
7:45	Shuttle Pick Up at Hotel	
8:00	Registration, Light Breakfast	
8:30	Welcome & Introductions	Paul Evans, Director MRTD
8:40	RIC-Americas Highlights and What’s in Store for 2020	Matt Robinson, ROS-I Americas Program Manager
9:15	RIC-Europe: Updates from ROS-I in Europe and Highlights from ROSIN Project and Fraunhofer IPA	Ludovic Delval, Research Engineer, ROS-I EU
9:35	RIC-Asia-Pacific: Updates from ROS-Industrial Asia Pacific Consortium	Erik Unemyr, Consortium Manager
9:55	Break	
10:15	ROS-I End-User Panel – “Why ROS?” – Moderated by Matt Robinson	David Leeson, Glidewell Labs, Greg Balandran, Spirit AeroSystems, and Mitch Pryor, UT Austin Nuclear Robotics Group
11:00	Realtime Motion Planning and MoveIt 2	Dave Coleman, CEO / Robotician
11:25	Advancements Within ROS2	Katherine Scott, Developer Advocate
11:50	Lunch Keynote: ROS-I’s Influence on Automation Strategy	Greg Balandran – Manager, R&T Engineered Factory Automation
13:00	ROS-I Vision & Key Focus Areas Workshop	Moderated by: Levi Armstrong & Matt Robinson, ROS-I Americas
14:15	Break	
14:30	Robotics with Windows, Azure, and Visual Studio Code	Sean Yen, Sr. Software Engineer & Lou Amadio, Principle Development Lead – Microsoft
14:55	The Importance of ROS as an Open Source Resource for Rapid Development of “First Code” for the Development of Advanced Robotic Manufacturing Applications	Arnie Kravitz, CTO
15:20	Toward Functional Safety Design for ROS-enabled Systems with Model-Based Design	YJ Lim, Sr., Technical Product Manager
15:45	Break	
16:00	Oil and Gas Robotics Automation	Justin Kinney, Technical Manager Robotics and Mechatronics
16:25	Robot Raconteur: An Interoperable Middleware for Robotics	John Wen, Dept. Head of ECSE & John Wason, Owner
16:50	Ready4ROS: An Open Industrial-grade Platform that Combines PLC And Ros2 Capabilities	Eugen Solowjow, Research Scientist
17:15	Closing Remarks	Matt Robinson, ROS-I Americas Program Manager

Southwest Research Institute – Meeting Host

Southwest Research Institute is a premier independent, nonprofit research and development organization using multidisciplinary services to provide solutions to some of the world's most challenging scientific and engineering problems.

Headquartered in San Antonio, Texas, SwRI is a client-focused, client-funded organization that occupies more than 1,500 acres, and provides more than 2.3 million square feet of laboratories, test facilities, workshops, and offices for approximately 3,000 employees, with an annual research volume of nearly \$674 million.

SwRI conducts contract work for government and industry clients. The Institute consists of nine technical divisions that offer multidisciplinary services in engineering and the physical sciences. The Center for Nuclear Waste Regulatory Analyses, a federally funded research and development center sponsored by the U.S. Nuclear Regulatory Commission, also operates on the SwRI grounds.



Paul Evans – Director, Manufacturing Robotics and Technologies – Southwest Research Institute

Areas of specialization within Paul Evans' department include advanced manufacturing, robotics, automation, machine perception, and process improvement. Over the course of his career, Evans has led and participated in a wide range of robotics and automation programs for both commercial and government customers. Programs relevant to flexible automation and intelligent machines encompass the development and implementation of a variety of robotics systems including custom, large-scale, mobile, underwater, enhanced off-the-shelf, and all the associated controls and perception technologies. Evans' department also initiated ROS-Industrial, an open-source extension of the Robot Operating System (ROS).

ROS-Industrial Consortium & Introduction

ROS-Industrial has grown to be the default open-source advanced robotics development framework for manufacturing applications. The support of the research community, regional governments around the world, and industrial solution providers and end-users, has enabled significant growth. The Consortium has been instrumental in fostering this growth and setting forth the direction for continued success.



Matt Robinson – Program Manager, ROS-Industrial Consortium Americas

Matt Robinson is the Program Manager for the ROS-Industrial Consortium Americas. In this role, Robinson is setting the strategy and vision to align the open source development community with industry needs to deliver innovative and sustainable advanced robotics solutions ready for factory deployment. Prior to this, Robinson was team leader for Caterpillar's Manufacturing Technology Automation Research where he led development and deployment of automation tools to improve the performance and productivity of Caterpillar manufacturing facilities around the globe. During this time, Robinson also led manufacturing value stream design initiatives that led to the deployment of over 50 robotic/automated manufacturing systems. Robinson has led developments for automated materials joining processes for titanium and other challenging dissimilar material combinations for high temperature applications. Robinson has a Master's Degree in Welding Engineering from Ohio State University.

Industrial Automation with ROS

Manufacturers of aerospace parts, excavators, and other industrial equipment require large automated manufacturing systems for painting, surface-finishing, inspection, and more. These systems often employ a gantry outfitted with an industrial manipulator to extend the work envelope over many meters. Due to their sheer size and associated costs, these systems must perform multiple operations to ensure adequate return on investment. Automating these large, multi-use-systems has challenges including motion planning for redundant kinematics, calibration of 3D scanning sensors, environment management, user-interface, and collision monitoring. Southwest Research Institute will share its experiences applying ROS to implement several complex automation systems for large-scale manufacturing processes.



Levi Armstrong – Tech Lead, ROS-I Americas

Levi Armstrong is the Technical Lead for the ROS-Industrial Consortium Americas and the group leader of the Collaborative Systems Section at SwRI. Armstrong has developed technical knowledge in optimization-based motion planning, meshing, collision detection and calibration to develop custom automation solution for industry. Prior to his current role, Armstrong was an engineer at Bell Textron focusing on low-cost composite manufacturing to leverage automation in the areas of drilling, routing, deburring, machining, and heat treatments to meet aerospace engineering specifications. He holds a B.S. and M.E. in Aerospace Engineering from the University of Texas at Arlington.

The Role of the Cloud in the Future of Robotics

This presentation will illustrate the role of cloud services to develop robots, partitioning functionality between the physical robot and the cloud, iteratively test robot performance through simulation in the cloud, and operate robots in production through fleet management services. Throughout the presentation Dr. Roger Barga will use customer requirements and examples. We will close with a forward looking discussion on possible new features and services to unlock new use cases.



Dr. Roger Barga – General Manager, AWS Robotics and Autonomous Services, AWS

Dr. Roger Barga is General Manager of AWS Robotics at Amazon Web Services. He is also an Affiliate Professor at the University of Washington, where he is a lecturer in the Data Science and Machine Learning programs. Barga holds a Ph.D. in Computer Science from Oregon Institute of Technology.

Robotics Trends & the Impact on Employment

Automation technology is rapidly advancing how we do business across the world. In this presentation, Alex Shikany will highlight some of the most recent and important trends in the global robotics, vision and AI industries that are opening doors to new applications areas and stretching the boundaries of what's possible. Shikany will also highlight the true impact robotics and automation has on employment and offer A3's vision on why the automation industry will usher in a bright future for not only its direct stakeholders, but the world at large.



Alex Shikany – Vice President Membership & Business Intelligence, A3

Alex Shikany is the Vice President of Membership & Business Intelligence for the Association for Advancing Automation (A3). He manages membership and business intelligence initiatives, serving A3's 1,275 member companies from around the world. Shikany also runs the day to day operations of RIA, the Robotic Industries Association and AIA, the world's largest vision and imaging trade group, both of which are part of A3. Additionally, he researches and reports statistics for the global robotics, machine vision, and motion control markets and develops white papers for the automation industry on key issues such as the impact of robots on employment. Shikany is a frequent speaker at industry events around the world, and is an alumnus of Michigan State University where he received his undergraduate and MBA degrees. Shikany has 10 years of experience in marketing, brand strategy, and market research, eight of which have been in the automation industry.

Panel – “Why Tech is Interested in ROS-I?” Moderated by Levi Armstrong



Dr. Josh Heppner – Intel

Dr. Josh Heppner is the Robotics/Controls Technical lead in the Industrial IOT Group at Intel Corporation. He has Master of Science and doctorate degrees in mechanical engineering from the University of California, Berkeley, and holds over 35 patents. He started his career in packaging modeling and design then moved to R&D in advanced manufacturing delivering industry best feature sizes. He now specializes in system engineering, focusing on real-time enabling, manufacturing, robotics and AI integration.



Lou Amadio – Microsoft

Lou Amadio is a Principal Software Development Lead in the Core Operating Systems group focusing on Robotics at Microsoft Corporation. He led the effort to enable ROS on Windows and is working to expand Microsoft's ROS1 and ROS2 portfolio as well as working with customers to deploy ROS on Windows and ROS with Azure.

Lunch Keynote: From Original Inspiration to the Future Vision: A Founder's Perspective on ROS-Industrial

ROS-Industrial just celebrated its ninth birthday. The origin story of ROS-Industrial is one of many large and small contributions from both individuals and organizations. In the beginning, we had great hope for what ROS-Industrial would become. Some of the early vision came true, while other aspects have been less successful. As we contemplate the future of ROS-Industrial, we should consider some of that early vision; what early ideas might make more sense for a mature open source project. Of course, we should also consider new ideas for the future as well. With the scale and scope of the current ROS-Industrial community, there is great potential. More resources don't guarantee success and in some cases it makes it harder. Now more than ever, we need inspiration, leadership, and passion to continue the disruption that ROS-Industrial has created. The future of ROS-Industrial is ours to create.



Shaun Edwards— CTO, Plus One Robotics

Shaun Edwards has over a decade of experience in developing and deploying advanced robotics automation. His work while at Southwest Research Institute included developing some of the largest robotic systems in the world. He also had the honor of serving as a visiting researcher at Willow Garage, where he founded and led the worldwide development team for the ROS-Industrial open source program. As CTO of Plus One Robotics, Edwards leads a talented team solving the problems of logistics companies.



RIC-Americas Highlights and What's in Store for 2020

This session is an overview of the last year related to the ROS-Industrial Consortium Americas, including updates to training, strategic initiatives, changes upcoming, and technical highlights and developments. This will include a review of the "Health of the Consortium." Technical highlights will include new capabilities that are in the pipeline that should deliver unique capabilities to the membership and community.



Matt Robinson – Program Manager, ROS-Industrial Consortium Americas

Matt Robinson is the Program Manager for the ROS-Industrial Consortium Americas. In this role, Robinson is setting the strategy and vision to align the open source development community with industry needs to deliver innovative and sustainable advanced robotics solutions ready for factory deployment.

RIC-Europe: Updates from ROS-I Europe and highlights from ROSIN project and Fraunhofer IPA

The latest highlights from the ROS-Industrial Conference 2019 will be presented. Additionally, we will discuss the progress report on the Focused Technical Projects and ROS bug study as part of the EU-funded ROSIN project.



Ludovic Delval – Research Engineer, ROS-I EU - Fraunhofer IPA

Ludovic Delval graduated with an M.Sc degree in Mechatronic from the Engineer School of Arts et Metiers Paristech (France). From 2013-2017, he worked as software developer for Altran on Airbus Innovations robotics research activities. He took part in the European project SAFARI focused on safety and security with collaborative robots in a manufacturing plant using ROS. He joined Fraunhofer IPA in August 2017 in the Software Engineering and System Integration group where it contributes to ROS-I developments and dissemination through teaching and conference speaking.

RIC-Asia-Pacific: Updates from ROS-Industrial Asia Pacific Consortium

This session offers an overview of the past year related to the ROS-Industrial Consortium Asia Pacific including activities in training, membership, and industry engagement. It will also cover activities and key focus areas going forward to increase industry adoption of ROS in the region.



Erik Unemyr – Program Manager, ROS-I AP

Erik Unemyr manages the ROS-Industrial Consortium Asia Pacific, where he aims to proliferate ROS adoption and advanced robotic applications to be successfully deployed in industry and commercial applications. He received his master of science degree from Chalmers University of Technology, Sweden. Prior to ROS-Industrial, he spent the majority of his career in industrial MNCs delivering software and hardware products all the way from concept to mass-production. Unemyr holds seven patents in the fields of printing applications and image processing.

ROS-I End-User Panel: “Why ROS?” – Moderated by Matt Robinson

This session focuses on diverse applications of ROS-Industrial with a panel discussing use cases ranging from factory automation to integration of robotics in hazardous environments in addition to automotive manufacturing and beyond.



Gregorio Balandran – Manager, R&T Engineered Factory Automation, Spirit AeroSystems

Gregorio Balandran is an engineer manager and initiative leader for the Research and Technology (R&T) group focuses on engineered factory solutions. Balandran received bachelor’s and master’s degrees from the University of Oklahoma where he focused on research in Automation and Intelligent Manufacturing Systems (AIMS) and industrial robotics. Balandran has over 12 years of experience in the field of robotics and over 10 years of experience in the aerospace industry. Furthermore, he has experience in successfully implementing ROS-I solutions in production and leading a new team to leverage ROS-I to build global platforms for engineered factory solutions.



Dr. Mitch Pryor – UT Austin Nuclear Robotics Group

Dr. Mitch Pryor earned his BSME at Southern Methodist University in 1993. After graduating, he taught math and science courses at St. James School in St. James Maryland before returning to Texas. He completed his Master’s (1999) and Ph.D. (2002) at UT Austin with an emphasis on the modeling, simulation, and operation of redundant manipulators. Since earning his Ph.D., Pryor has taught graduate and undergraduate courses in the mechanical and electrical engineering departments as well as led and conducted research in the area of robotics and automation in Mechanical Engineering, Petroleum Engineering and the Nuclear Engineering Teaching Laboratory. He has worked for numerous research sponsors including, NASA, DARPA, DOE, INL, LANL, ORNL, Y-12, and many industrial partners. He is a co-founder of the Nuclear Robotics Group and the Drilling & Rig Automation Group. Both are interdisciplinary research efforts to deploy robotics in hazardous, uncertain environments to perform manufacturing, material handling and other tasks. Pryor is a member of ROS-Industrial, IEEE, ASME, PGE, and ANS. He is an officer on the executive committee of the ANS Robotics and Remotes Systems Division.



David Leeson – VP, Engineering, Glidewell Laboratories

David Leeson received the British Institute for Electrical and Electronics Engineers’ renowned Lord Austin Prize for Manufacturing Engineering in 2004, and graduated top of class with a BSME from Loughborough University in England, followed by an MSc specializing in automation from Cranfield University. Leeson worked in the automotive industry on projects spanning high performance road cars to Formula One racing.

Realtime Motion Planning and MoveIt 2

Achieving both fast computations and planning for complex global motion is a hard problem. This is one of the main development goals of MoveIt 2, thanks to the enabling ROS2 technology. In this talk, we will consider what is real-time and why it's difficult to achieve with global motion planning. A hybrid approach will be proposed as well as our roadmap to achieve it.



Dr. Dave Coleman – CEO, PickNik

Dr. Dave Coleman is CEO of PickNik Consulting. Coleman has 13 years of experience working in the field of robotics automation and is a leader in the open source ROS community. His insights into robot-agnostic platforms that work for different morphologies, different theoretical approaches, and different end-user technical requirements give him a well-rounded understanding of the needs of powerful robotic software. He has worked for all types of robotics companies including Google Robotics, Open Robotics, and Willow Garage.

Advancements Within ROS2

This talk will cover recent and upcoming features of ROS2 and why they are important to the industrial community. We will also discuss software engineering practices and tools that are being used to improve the robustness and reliability of projects in both ROS1 and ROS2. The talk will conclude with a discussion about future projects and where we require feedback from the industrial community.



Katherine Scott – Developer Advocate, Open Robotics

Katherine Scott is the developer advocate for Open Robotics, the makers of Robot Operating System (ROS) and the Gazebo simulation platform. Scott is the former analytics lead at Planet Labs and Strateos and was a co-founder of Tempo Automation and Sight Machine. She serves on the board of the Open Source Hardware Association and holds degrees in electrical engineering, computer engineering, and computer science.

Lunch Keynote: ROS-I's Influence on Automation Strategy

Spirit AeroSystems Inc. is one of the world's largest tier-one manufacturer and supplier of aerostructures to both the commercial and defense sectors. Spirit strives to be a trusted partner for its customers. Spirit's Research and Technology (R&T) group expands multiple research sectors to drive innovative solutions to improve overall quality, safety, productivity, and cost. The R&T sector has recently expanded to develop "Engineered Factory" global solutions to enable Spirit to continue to be a leader in the design, development, and manufacture of complex structures for the aerospace industry. Over the last eight years, Spirit has invested in ROS-I solutions with measurable success. Leveraging the ROS-I libraries, Spirit was able to mature technology rapidly and address key issues that were not solvable using traditional robotics solution methodologies. Production implementation of open source platforms with proper sustainability and maintainability has been challenging, however, the benefits gained using ROS-I is now influencing the overall automation strategies in robotic application and autonomous mobile platforms.

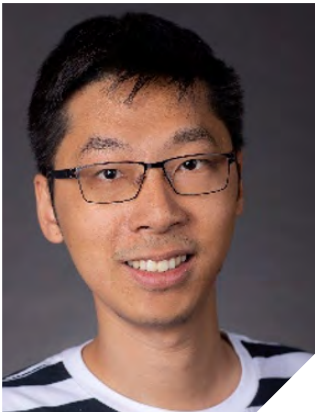


Gregorio Balandran – Manager, R&T Engineered Factory Automation, Spirit AeroSystems

Gregorio Balandran is an engineer manager and initiative leader for the Research and Technology (R&T) group focused on Engineered Factory solutions. Balandran received bachelor's and master's degrees from the University of Oklahoma where he focused on research in Automation and Intelligent Manufacturing Systems (AIMS) and industrial robotics. Balandran has over 12 years of experience in the field of robotics and over 10 years of experience in the aerospace industry. Furthermore, he has experience in successfully implementing ROS-I solutions in production and leading a new team to leverage ROS-I to build global platforms for engineered factory solutions.

Robotics with Windows, Azure, and Visual Studio Code

It is now possible to use Visual Studio Code and Azure to develop your ROS applications. This will be an overview about the creating a ROS project and debug your ROS application in Visual Studio Code, how to deploy your ROS application in Azure services for simulation and training, and how to deploy your ROS application to a physical device running Windows 10 IoT and leverage hardware-accelerated machine learning.



Sean Yen Sr. – Software Engineer, Microsoft Corporation

Sean Yen is a senior software engineer at Microsoft Corporation with many years of experience developing features on in-vehicle infotainment, retail POS, and mobile device management for the Windows product family. He is the lead developer behind ROS on Windows and is Microsoft's designated handler of ROS2 Technical Steering Committee.



Lou Amadio – Principal Development Lead, Core Operating Systems group, Microsoft Corporation

Lou Amadio is Principal Development Lead in the Core Operating Systems group working on 'Edge Robotics' at Microsoft Corporation. Amadio has worked on consumer and enterprise robotics products, including Microsoft Robotics Studio. The Edge Robotics team is building software to help customers and system integrators create safe, secure, and manageable robotics solutions using Open Source Robotics Stacks with Microsoft Client and Cloud Technologies.

The Importance of ROS as an Open Source Resource for Rapid Development of “First Code” for the Development of Advanced Robotic Manufacturing Applications

Both ROS-I and ROS-M align tightly to strategy at Advanced Robotics for Manufacturing (ARM) and provide an advantage when developing robotic manufacturing work cells. Arnie Kravitz will discuss the importance of ROS-I to ARM and the impact it has had on funded projects. As an introduction, Kravitz will discuss the ARM Institute, technical 2020 goals, and its investment and technical roadmaps.



Arnie Kravitz – CTO, The ARM Institute

Kravitz is the CTO of Advanced Robotics for Manufacturing (ARM). In this role, Kravitz drives ARM's technical vision to help the organization fulfill its mission of increasing U.S. global competitiveness by accelerating innovative technologies that make robots more accessible to U.S. manufacturers. He achieves this goal, in part, by convening experts and stakeholders from among ARM's industrial, academic, nonprofit, and government partners.

Toward Functional Safety Design for ROS-enabled Systems with Model-based Design

Production designs need to comply with industry standards such as ISO 26262 or DO-178B/C. Engineers must verify that the design meets the requirements, is functionally correct, complies to certification standards, and is correctly implemented. Simulation with model-based design is a key capability to help understand the behavior of complex designs. This talk explains how to use model-based design in Simulink for ROS-enabled robots. We will discuss about an architecture to develop application software, keeping in mind the requirements for functional safety of autonomous systems. This architecture uses ROS to interface with sensors to get data for algorithmic testing and uses automatic code generation to deploy the algorithm to the ROS network. We will also show the model-based design workflow in Simulink together with verification and validation techniques to achieve higher quality and productivity.



Dr. YJ Lim – Senior Technical Product Manager, MathWorks

Dr. YJ Lim is a Senior Technical Product Manager of robotics and autonomous systems at MathWorks. Dr. Lim has over 20 years of experience in robotics and autonomous systems, specifically in robotic software development, VR & AR for medical devices, and autonomous logistics. Before joining MathWorks, Dr. Lim worked at Vecna Robotics based in Cambridge, MA as a Senior Project Manager focused on Vecna's advanced robotics system development. Prior to Vecna, Dr. Lim served as the chief innovation officer at Hstar Technologies, a firm focused on agile mobile robotic platform and healthcare service robotics system. Dr. Lim also led development teams at Energid Technologies, a firm that provides engineering services and products for advanced robotic, machine vision, and simulation applications, for robotic software development. Dr. Lim received his Ph.D. in mechanical engineering from Rensselaer Polytechnic Institute.

Oil and Gas Robotics Automation

ROS-I is an agile development platform for the development of industrial robotic architectures for modular multi-purpose robotic handling systems in oil and gas drilling operations.

National Oilwell Varco is a leader in the design and manufacture of oilfield drilling equipment with a large part of their product portfolio the design, manufacture, and supply of heavy mechanized pipe handling equipment. As the industry has evolved, and various technologies have accelerated and converged (electronics, communications, sensors, actuators, big data, machine learning), there have been increasing demands for drilling equipment manufacturers to bring technological solutions to the market quicker to increase safety, reduce risk, at the same time increasing performance and efficiency.

NOV has worked to introduce robotic systems to completely remove personnel contact with drilling materials (manually handling drill pipe, application of pipe lubricants and dope, containment of drilling mud), and ultimately completely automated drill floors so they are personnel free. A critical part of this process has been to develop core components of the system in a rapid and agile manner. It is in this area of development where the use of ROS-I has been a key enabler.



Justin Kinney – Technical Manager, Robotics and Mechatronics, National Oilwell Varco

Justin Kinney is a controls engineer who has held numerous posts in oil and gas and controls engineering companies throughout his career. He graduated from Texas A&M University in 2005 with a B.S in Computer Engineering, before starting his career with National Oilwell Varco as a controls field service engineer working on crane control systems. Kinney moved into software engineering, working on NOV's proprietary distributed control system, Amphion, as a lead engineer before becoming a commissioning manager for a number of major drilling contractors in South Korea shipyards from 2010 through 2016. He helped deliver a number of the most technically advanced drill ships on time and on budget.

From 2016 until 2018, Kinney spent time outside of oil and gas working as a lead controls engineer and project manager in controls and automation projects, before returning to NOV where he is currently leading NOV's efforts in bringing high precision robotic control into drilling applications as the Technical Manager for NOV Robotics and Automation.

Kinney is a pragmatic and creative problem solver and has a broad wealth of knowledge and experience in systems engineering.

Kinney and his family live west of Houston in Katy. He is married to Myunghee and has a 2-year old daughter, Ariana.

Robot Raconteur: An Interoperable Middleware for Robotics

Easy, rapid, and secure integration of robots, sensors, peripherals, and simulation software from multiple vendors and platforms has been the holy grail for industrial robots. Robot Raconteur® (RR) is a middleware technology developed over the past decade toward that goal. RR is a powerful open-source communication framework for robotics, automation, build control, and the Internet of Things. RR utilizes an “augmented object oriented” data model which is specialized for use with robotics and automation applications. This data model uses “Service Definitions” to create interoperable, polymorphic, and reusable, data types. The framework is vendor, platform, architecture, and software language independent, with official support for C++, ANSI C, Python, MATLAB, C#, Java, JavaScript (Bridge.NET transpiler), LabView, and ASP.NET. RR can operate together with other middleware technologies such as ROS through the RR-ROS bridge. A particular strength of RR is its ease of use. This talk will present several implementation examples illustrating its ready deployment and the interoperability between robots from different vendors.



John Wason – Owner, Wason Technologies

John Wason is the founder of Wason Technology, LLC. He received his Ph.D. in Mechanical Engineering from Rensselaer Polytechnic Institute in 2011. He has worked on numerous projects involving complex, distributed, multidisciplinary systems. Wason specializes in development of automation control software, mechatronic interfaces between mechanical hardware and computer control systems, dynamic simulation, microtechnology, and control design.



Dr. John Wen – Department Head of ECSE, Rensselaer Polytechnic Institute

Dr. John T. Wen is the Head of the Department of Electrical, Computer, and Systems Engineering at Rensselaer Polytechnic Institute. From 2013-2018, he was the Head of the Department of Industrial and Systems Engineering. From 2005-2013, he served as the Director of the Center for Automation Technologies and Systems (CATS), a New York state designated Center for Advanced Technology. Wen led the New York state participation in the Advanced Robotics for Manufacturing (ARM) Institute and serves on the ARM Technical Advisory Council. His research is in the area of control theory and applications for dynamical systems, particularly for challenging problems that lie at the intersection of multiple disciplines.



William Lawler – Rensselaer Polytechnic Institute (RPI)

William Lawler graduated from Rensselaer Polytechnic Institute in Electrical Engineering in 2017. He is currently with the RPI Manufacturing Innovation Center as a Software Engineer where he works on a number of robotic manufacturing projects.

Ready4ROS: an Open Industrial-grade Platform that Combines PLC and ROS2 Capabilities

This talk will discuss how ROS is used within Siemens in various projects. ROS is an important tool for advancing capabilities of autonomous machines. We will present the integration of ROS into our R&D workflow and benefits that ROS provide in such a context. Moreover, examples will be provided for interfacing ROS with other tools. Different projects will be shown, which use ROS functionality. Finally, we will conclude with an outlook and our opinion on how ROS could become even more relevant in the future.



Dr. Eugen Solowjow – Research Scientist, Siemens

Dr. Eugen Solowjow is a Research Scientist at Siemens' Central Research division, Corporate Technology, located in Berkeley, California USA. His research interests cover machine autonomy (e.g. robot learning), perception, controls, as well as edge and embedded AI. Solowjow serves as PI and PM for Siemens internal and U.S. government-funded research. Prior to joining Siemens, he received a Ph.D. from TU Hamburg, Germany and was a visiting scholar at U.C. Berkeley.

Demonstrations

Hololens 2 & ROS: Human-Robot Interaction

Lou Amadio & Sean Yen

Microsoft Corporation

Microsoft will be demonstrating a Mobile Platform with ROS on Windows, using a Hololens 2 for Human/Robot interaction.



Industrial Robotics Applications: MATLAB and Simulink

YJ Lim

MathWorks

This demo explains a complete autonomous robotics workflow that allows an engineer to easily learn and apply the many functional domains of robotics. We will walk through the development of a robot arm pick-and-place application. Some of the topics covered include:

- Developing kinematic and dynamic models of robots
- Perception algorithm design using deep learning
- Multi-sensor fusion for accurate localization
- Gazebo co-simulation for sensor models and environment simulation
- Path planning with obstacle avoidance
- Supervisory logic and control using Stateflow®

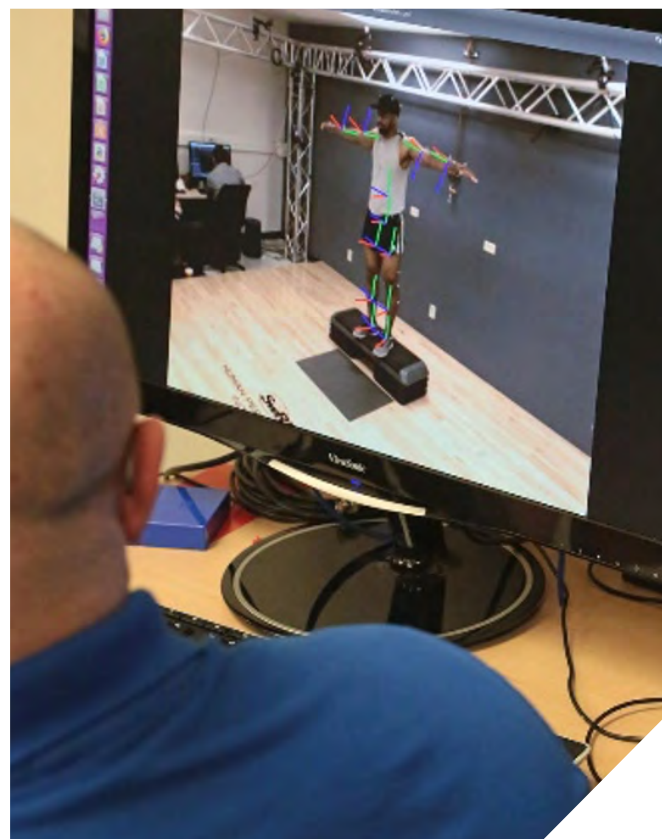


Markerless Motion Capture: Human Performance

Kase Saylor & Travis Thompson

Southwest Research Institute

SwRI has developed a markerless biomechanical assessment technology, which will allow for the accurate biomechanical assessment of individuals in their natural performance environment using off-the-shelf video cameras and computer hardware. This capability allows quantitative assessment of biomechanical performance during training, rehab, and in operational and competition environments.



Ranger Localization: Unmanned Systems

Daniel D’Souza

Southwest Research Institute

Operating an automated vehicle, whether on a public road, a closed campus, or an industrial facility, requires accurate and precise knowledge of the vehicle’s position – localization. Traditional localization methods use satellite systems like GPS or registration methods like HD maps. But even augmented GPS lacks the precision necessary for all kinds of driving, and signals can be affected or even blocked by underpasses, tunnels, or buildings. And high-quality HD maps typically require huge amounts of data and tedious manual editing. SwRI’s Ranger system overcomes all of these challenges with an inexpensive ground-facing camera, custom lighting, and proprietary algorithms to provide high-precision localization on many types of surfaces in a wide variety of conditions. Ranger builds automatically optimized maps using robust surface feature detection to provide precise localization within 2 cm—without GPS or LIDAR.



Mobile Scan-N-Plan Demonstration: Manufacturing Robotics & Technology

Colin Lewis & Jerit George

Southwest Research Institute

Mobile Scan-N-Plan – Mobility in manufacturing applications is an emerging area of development, but mobile robots within factories still have limited capabilities. This demonstration seeks to showcase a number of novel capabilities, including mobility. In ROS2, where localization is achieved, process planning and machine learning-based segmentation enable a high mix process application process representative of a surface coating process you may see in an actual factory.

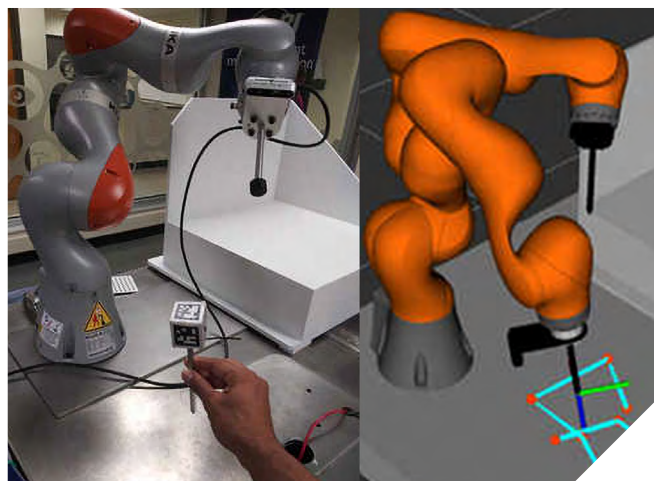


Robot Programming by Visual Demonstration

Ben Greenberg

Southwest Research Institute

This demonstration showcases a simplified robot programming method based on visual demonstration of desired motion paths. This method consists of having an operator hold a pencil-shaped pointing tool that is equipped with visual markers that allow a visual system to track its location. The location information, along with a graphical interface, allow the operator to teach desired robot trajectories that can be executed to perform a variety of tasks. The goal of this project was to investigate the tools, feedback, and workflow that can facilitate programming methods that remove the difficulties of traditional robot teaching methods that required many hours of tedious waypoint programming and lack flexibility.

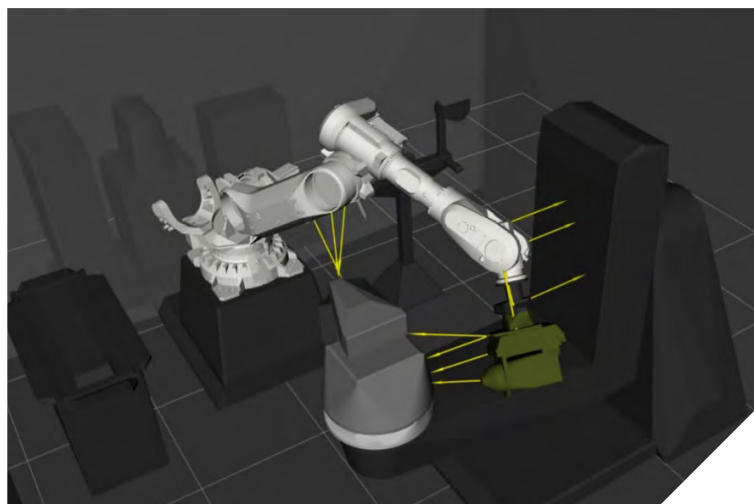


Large Part Multi-Process Finishing

Michael Ripperger

Southwest Research Institute

In recent years, advancements in the array of open-source tools enable the processing of larger components with greater degrees of variation. This demonstration features a traditional automation cell augmented with a high-resolution 3D camera that enables complete part reconstruction, rationalization of the incoming part variation, and intelligent process selection based on the variation of the features to be processed as they are presented. This application leverages a number of novel applications of open-source libraries to implement a value delivering robotic implementation.



SLED – Real-time Methane Leak Detection

Heath Spidle

Southwest Research Institute

Smart Leak Detection System/Methane (SLED/M) technology is able to detect methane leaks in real time, from aboard a drone. SwRI developed SLED/M with Department of Energy National Energy Technology Laboratory funding. SwRI also developed SLED technology, winner of an R&D 100 Award in 2017, which uses cameras and artificial intelligence to detect liquid hydrocarbon leaks on pipelines and facilities, such as pump stations.



Improved Situational Awareness in Teleoperated Systems

Cassidy Elliott, Adam Pettinger, Guy Zidner

University of Texas at Austin
Nuclear Robotics Group

This demonstration is about an operator's improved situational awareness in teleoperated systems. We have connected two 360 degree 4K action cameras facing in opposite directions to provide full-field coverage of the remote site. The video is live streamed either in raw or compressed formats to the operator's side. The two streams are blended together and displayed using an RViz plugin. We also demonstrate a second RViz plugin, which facilitates rendering the 3D content of RViz in an Open Source Virtual Reality HDK2 headset. By integrating the panoramic vision and VR in teleoperated applications, the operator is able to naturally survey the remote site and perceive depth information of the virtual 3D scene.

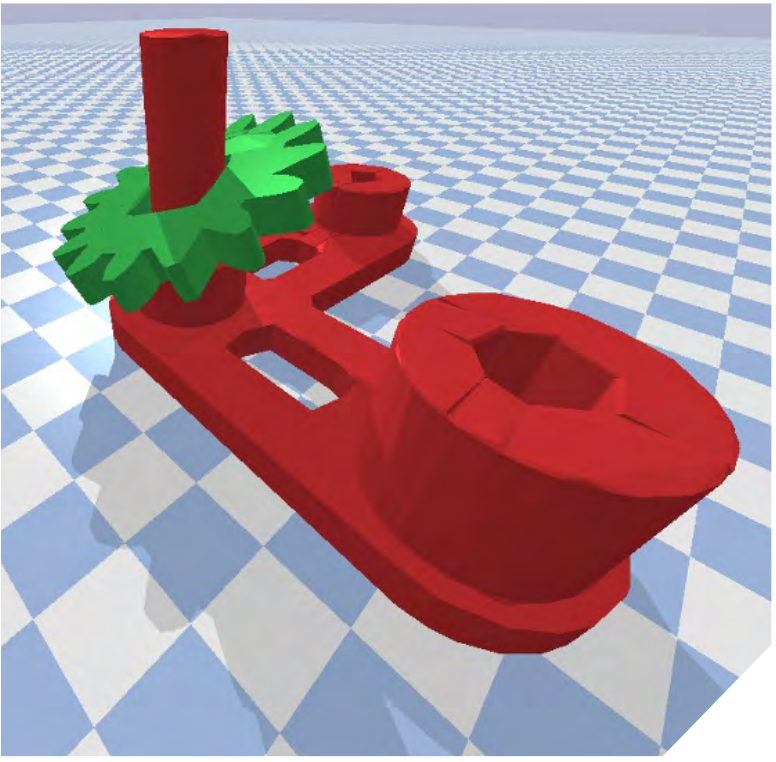


Reinforcement Learning for Assembly: Manufacturing Robotics & Technology

Syed Ridhwaan

Southwest Research Institute

This work seeks to demonstrate autonomous assembly on standardized benchmark tasks while investigating ability to learn general policies independent of physical component size. This project looks into applying a combination of ros_control combined with reinforcement learning to realize a capability that may be generalized across families of assembly tasks.



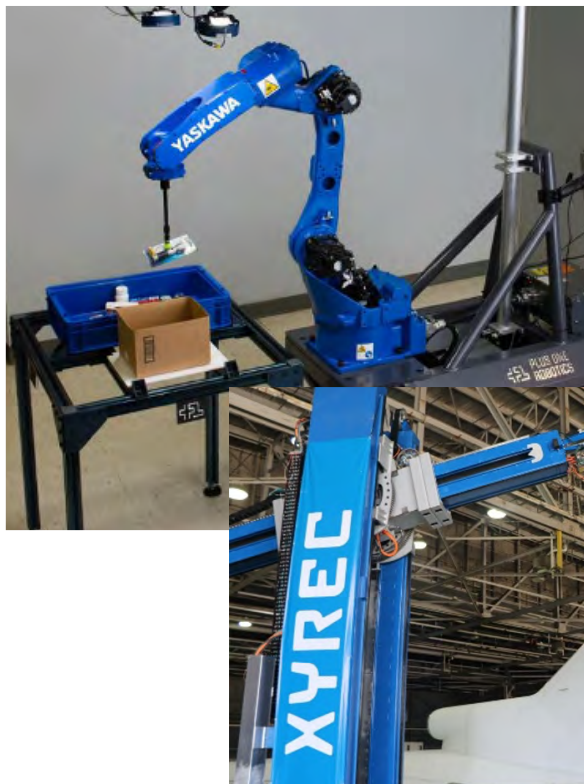
Tour of Partner Sites at the Port of San Antonio

Through the implementation of high-performance manipulators with advanced vision capabilities, Plus One robots bridge the gap between steady state volume and surge.

Plus One's novel approach to human/robot collaboration and supervised autonomy ensures the systems are scalable, flexible, and fault tolerant.

Xyrec - XYREC BV (previously named LR Systems) develops large robotic solutions for maintenance on commercial and military aircraft and helicopters. One of the solutions, the Laser Coating Removal Robot (LCR) is a state-of-the-art, sustainable, high performance paint stripping solution.

With the introduction of autonomous solutions in the maintenance chain of capital goods, the company is committed to sustainability and the reduction of CO₂ emissions in addition to enhanced employment opportunities: through stimulation of local capability development, improved profitability and competitiveness of the industry.



Hosted by
Shaun Edwards,
CTO, Plus One Robotics

Hosted by **Paul Evans,** Director, Manufacturing
Robotics & Technologies Dept., Southwest Research Institute

Accommodations and Welcome Dinner

Meeting attendees can extend their stay to include the weekend. San Antonio offers many family-friendly amenities, and the Courtyard San Antonio SeaWorld®/Westover Hills is a close drive to nearby theme parks, downtown, and other San Antonio sites.

Hotel Address:

Courtyard San Antonio SeaWorld®/Westover Hills
11605 State Highway 151
San Antonio TX 78251

A shuttle will be provided to and from the hotel on March 4 and 5, departing at 7:45 a.m. both days.

For participants that drive to the Southwest Research Institute campus, a shuttle to and from dinner will be available. It will make a stop on campus after the dinner en route to the hotel.

The Welcome Dinner will be held at Boiler House Texas Grill & Wine Garden at the historic Pearl Brewery complex. This dinner is open to all attendees. Dinner start time for those that may need to arrive separately is approximately 6:30 p.m. March 4.

The location of the Boiler House Texas Grill & Wine Garden is:
312 Pearl Pkwy Bldg. 3, San Antonio, TX 78215.
Tel: 210-354-4644

Web: <https://boilerhousesa.com/>



Thank you to our Members

ROS-I is supported by an international Consortium of industry and research members. The ROS-Industrial Consortium Americas Annual Meeting is supported by the membership. Thank you to all of the members for their continued support of ROS-Industrial and the open source industrial robotics community!

