The Latest Advances In ROS 2

Katherine Scott
Developer Advocate
Open Robotics
@kscottz

ROS Package Downloads

	Year Ending July 2020	Year ending July 2021	YoY Change
Total Packages	402,106	600,660	49.38%
Distinct Packages	16,083	19,884	23.63%
Deb Downloads	395,187,333	**595,524,493**	50.69%
Data Served (TB)	231	156	-32.26%

Direct downloads from packages.ros.org - August 2020 - July 2021

ROS's Use in Research

Total number of papers citing:
"ROS: an open-source Robot Operating System"
(Quigley et al., 2009)

7/2020	**7410**
1/2022	**9260**
Percent Change	**25%**

Source: Google Scholar 2022-01-28

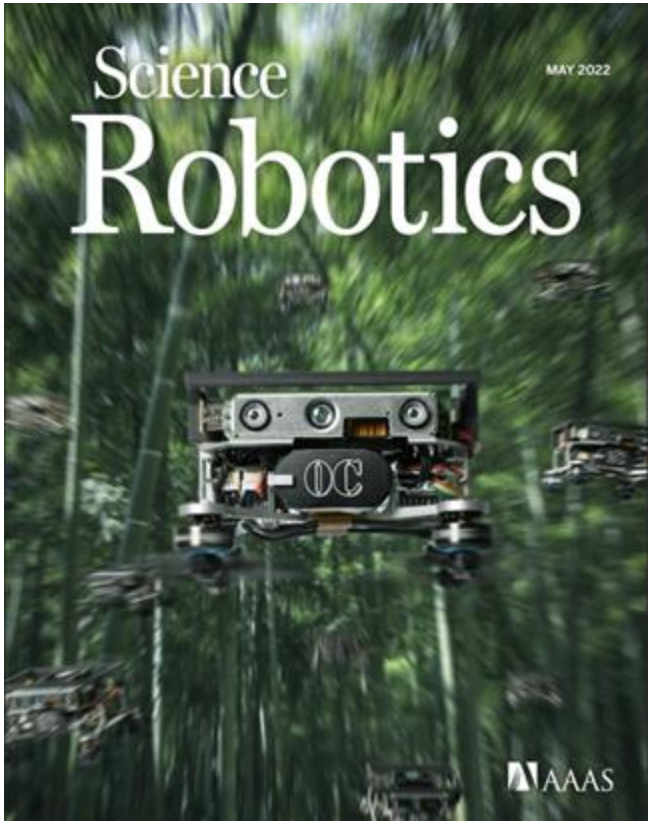
NEW ROS 2 Paper

Design consideration for ROS 2

Five “real-world” applications

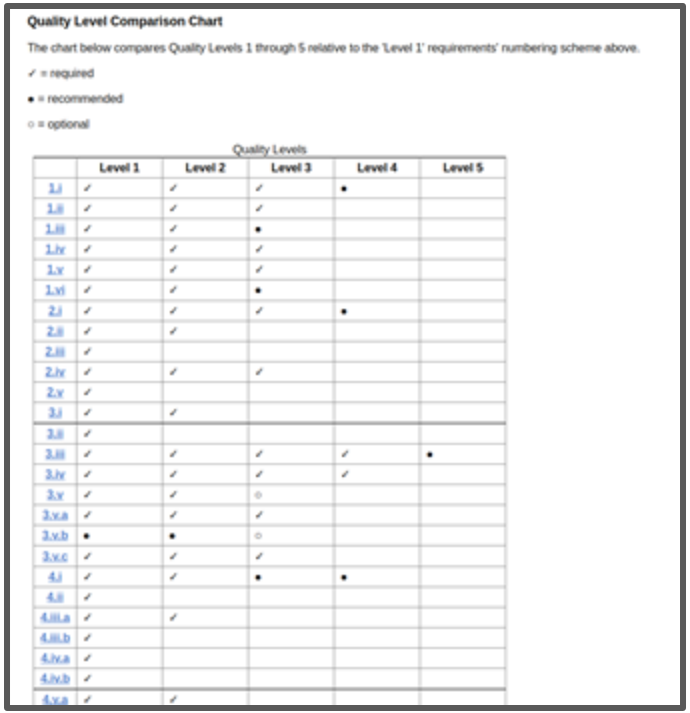
Land, Sea, Air, Space, Industry

PLEASE USE THIS FOR CITING ROS 2



Code Quality

- High code quality for ROS 2 core
- However, packages still lag behind!
- Tests / lint / static analysis / etc
- *Academic code often "poor quality"*
- **REP-2004 Code Quality Declaration**



Quality Level Comparison Chart

The chart below compares Quality Levels 1 through 5 relative to the 'Level 1' requirements' numbering scheme above.

✓ = required

• = recommended

○ = optional

Quality Levels

	Level 1	Level 2	Level 3	Level 4	Level 5
1.i	✓	✓	✓	•	
1.ii	✓	✓	✓		
1.iii	✓	✓	•		
1.iv	✓	✓	✓		
1.v	✓	✓	✓		
1.vi	✓	✓	•		
2.i	✓	✓	✓	•	
2.ii	✓	✓			
2.iii	✓				
2.iv	✓	✓	✓		
2.v	✓				
3.i	✓	✓			
3.ii	✓				
3.iii	✓	✓	✓	✓	•
3.iv	✓	✓	✓	✓	
3.v	✓	✓	○		
3.v.a	✓	✓	✓		
3.v.b	•	•	○		
3.v.c	✓	✓	✓		
4.i	✓	✓	•	•	
4.ii	✓				
4.iii.a	✓	✓			
4.iii.b	✓				
4.iv.a	✓				
4.iv.b	✓				
4.v.a	✓	✓			

Code hygiene: good for you, good for students, good for ROS!

bit.ly/ROS2Quality

REP-2000: Distro Lifecycle

4/2021

5/2021

NOW

11/2022

5/2023

5/2023

5/2025

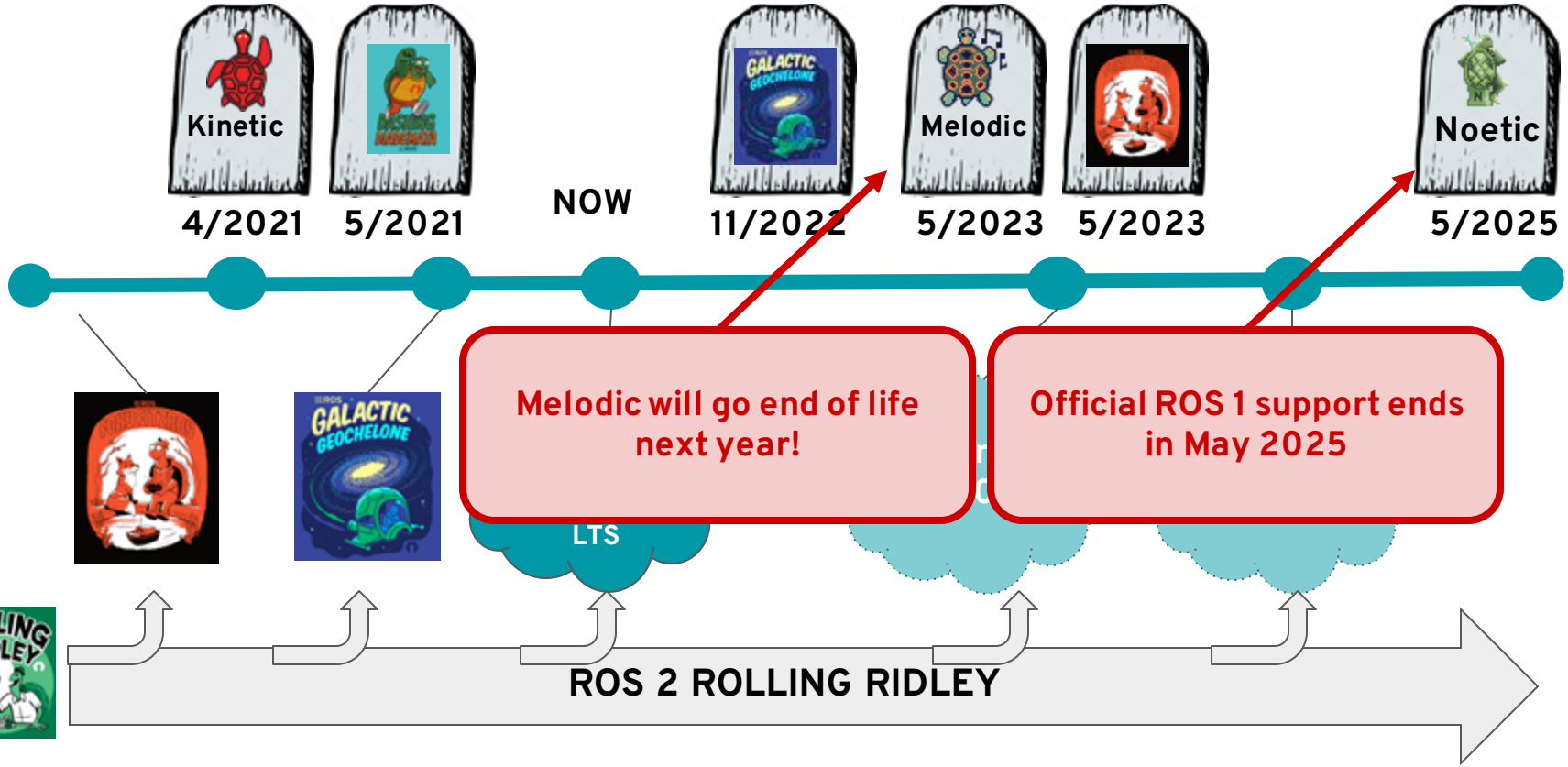
ROS 2 Humble Hawksbill 5/2022 LTS

I Turtle 5/2023

J Turtle 5/2024

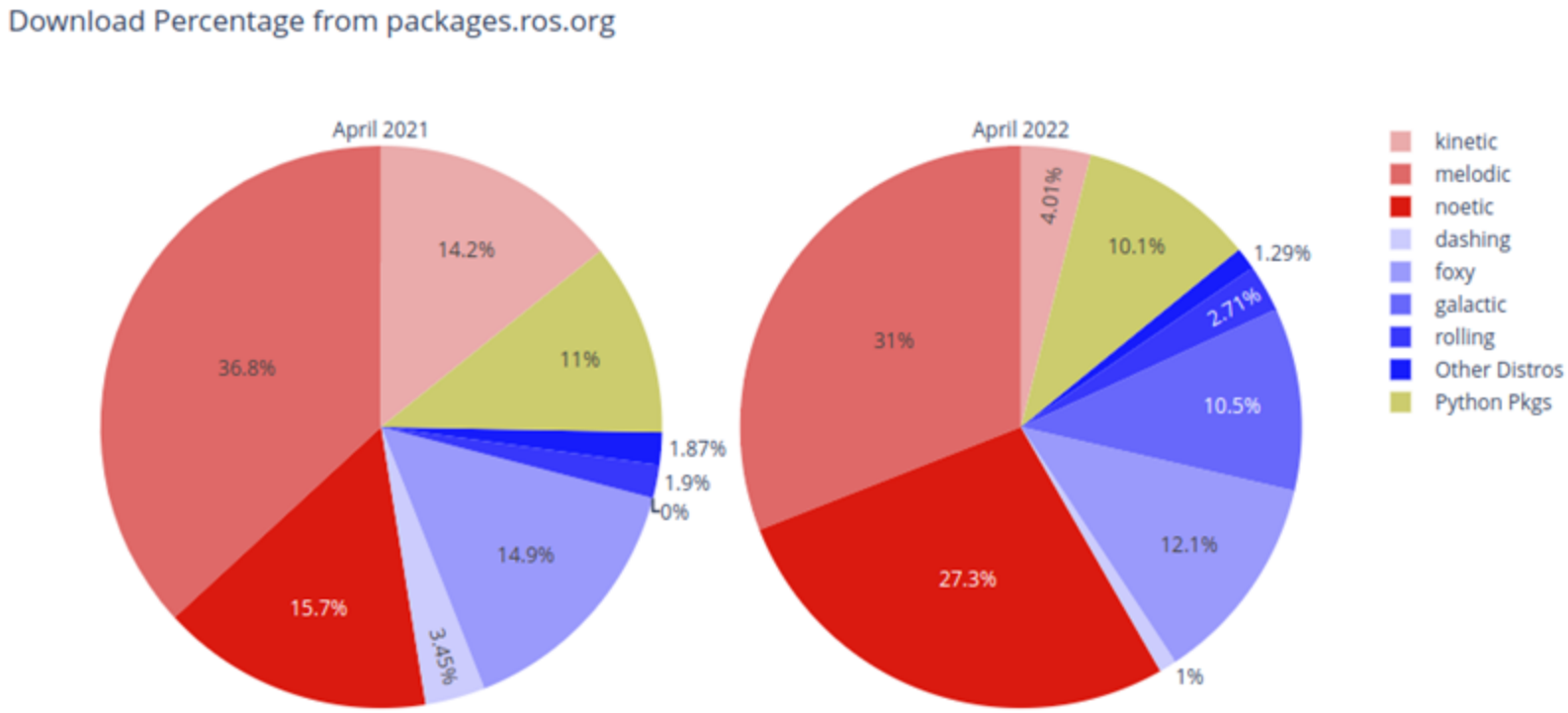
ROS 2 ROLLING RIDLEY

REP-2000: Distro Lifecycle



YOU SHOULD BE THINKING ABOUT MOVING TO ROS 2

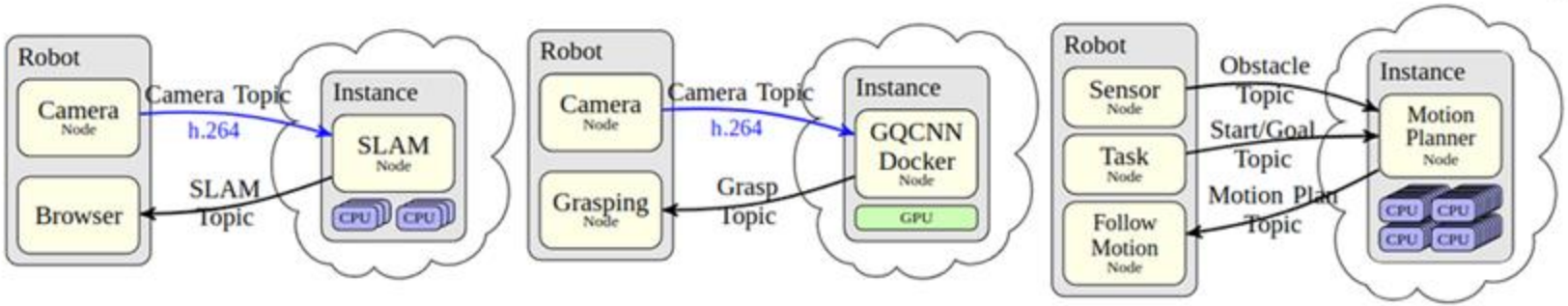
ROS 2 Transition as of 4/2022



ROS 2 Humble Hawksbill

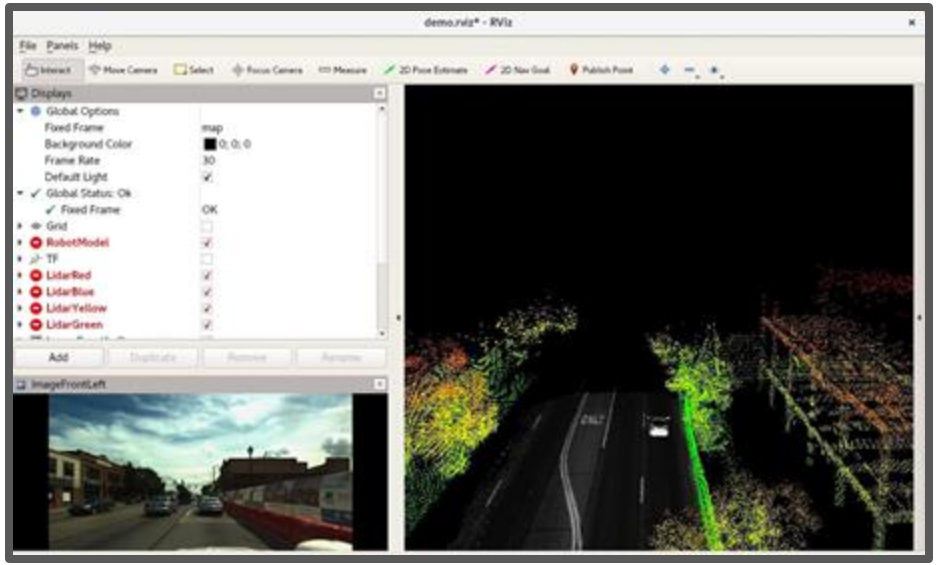
- Long term support until 2027
- Docker containers available
- Lots of new docs and great features
- TONS of features from the community
- **ROS Bridge is Gone – It is only getting harder from here on out**

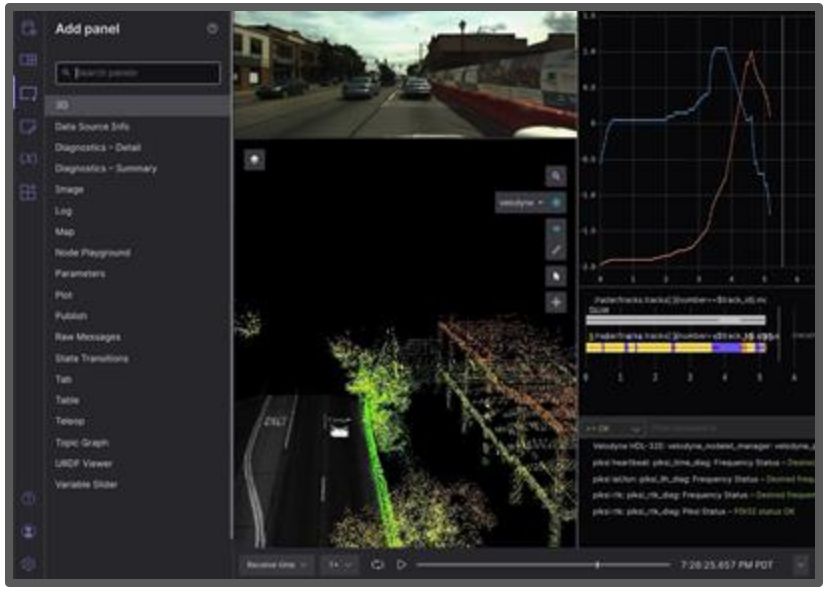
FogROS 2 UC Berkeley / Ken Goldberg



User Friendly

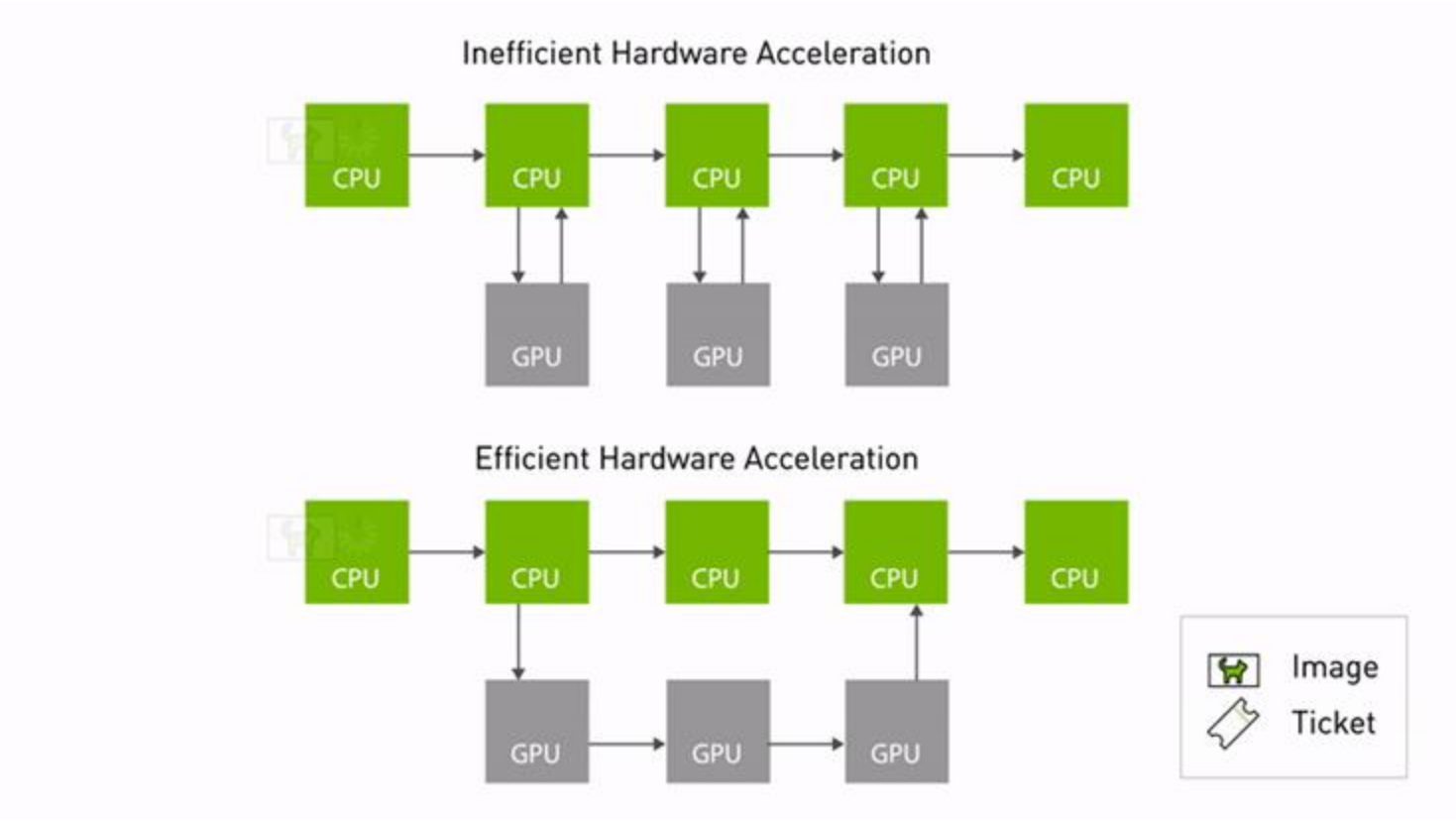
Community and companies are filling in the gaps



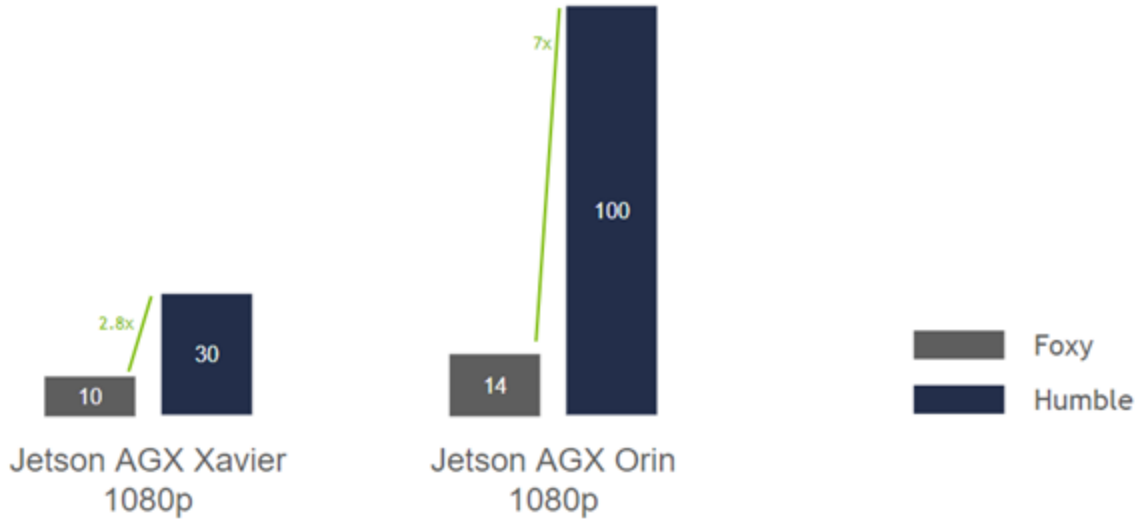


foxglove

Hardware Support => FAST PERCEPTION

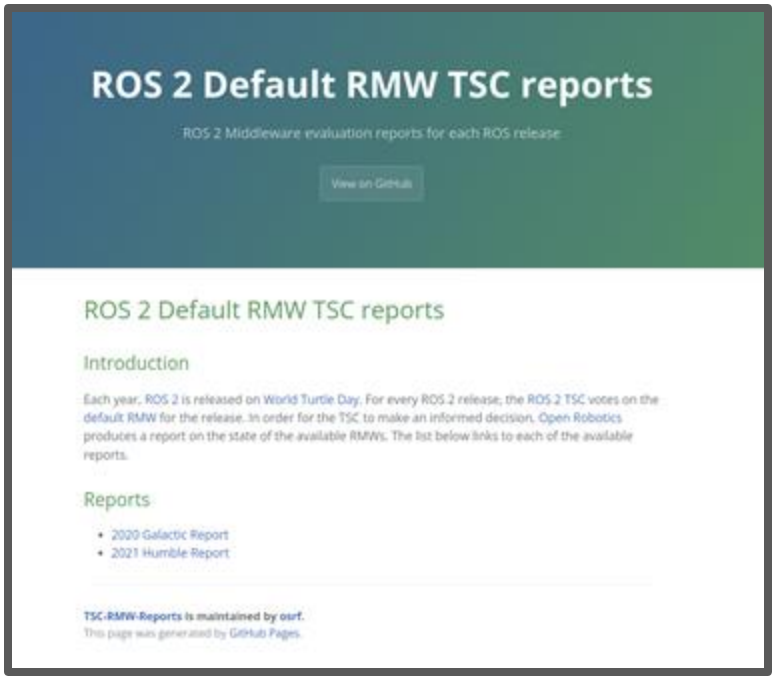


10x ish Speedup



type adapt framework performance comparison

Middleware Selection in Humble



osrf.github.io/TSC-RMW-Reports

zenoh

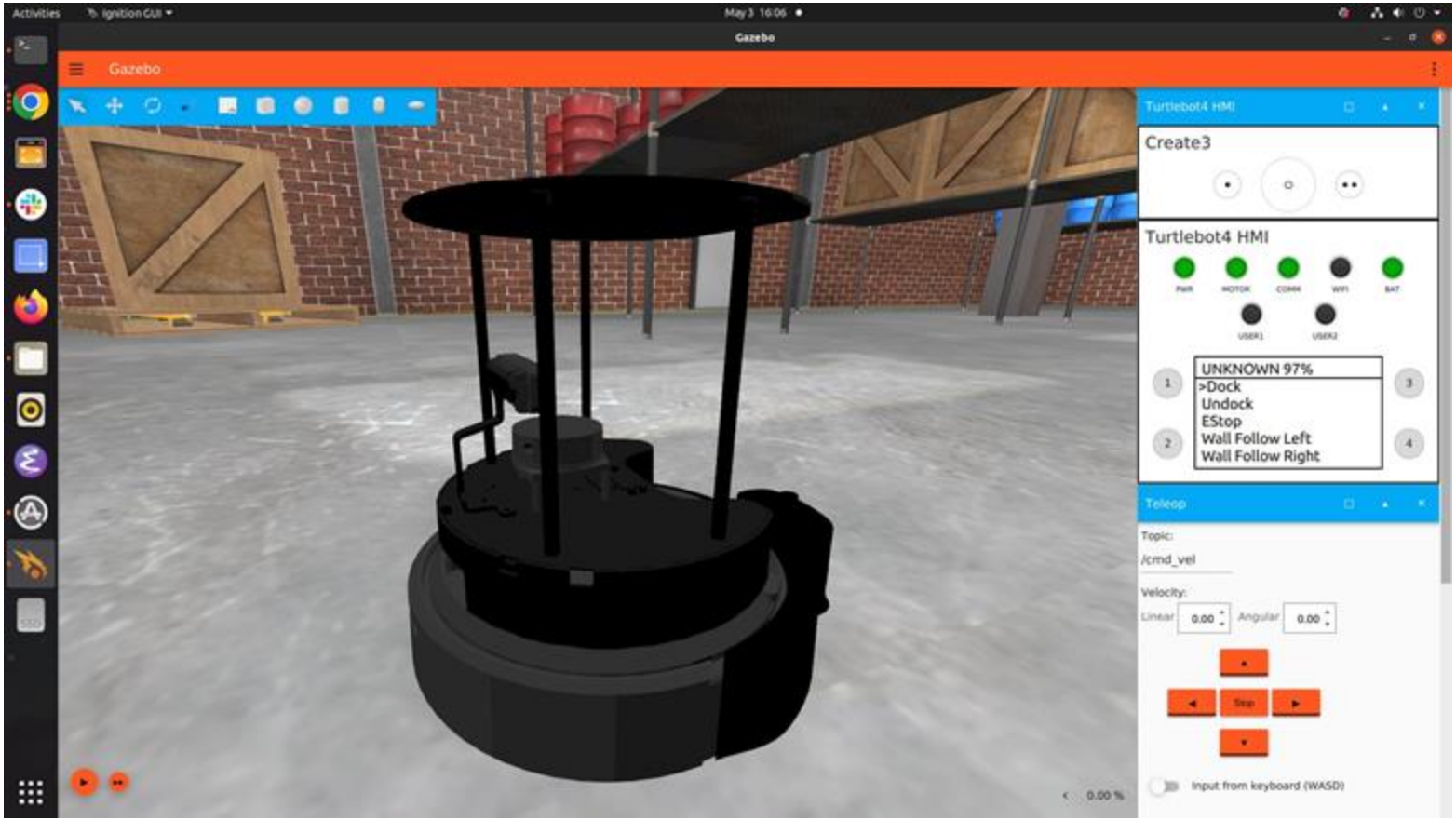
iceoryx

Cyclone DDS

TurtleBot 4 is Launch

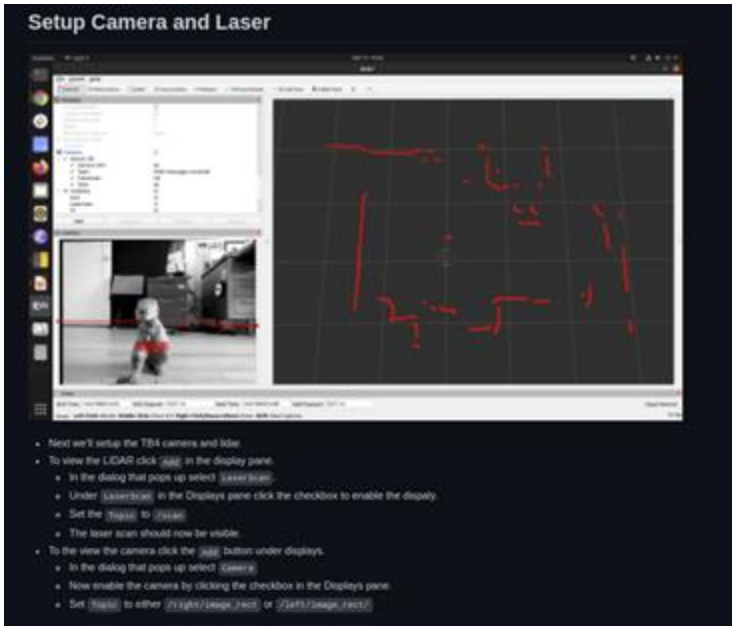
Great Suite of Hardware

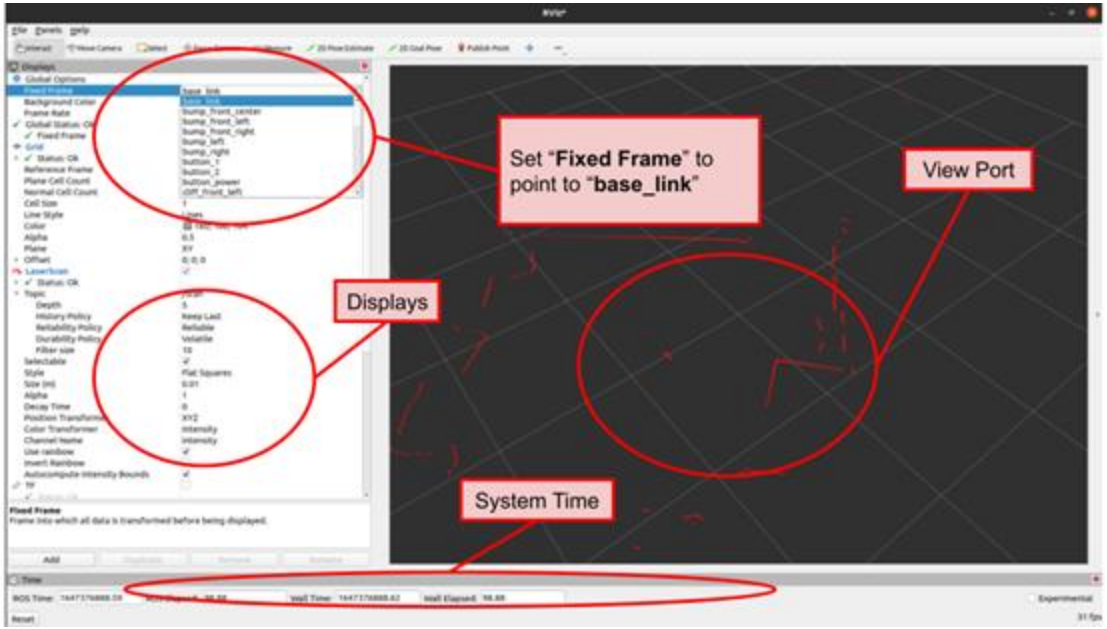
LUXonis



bit.ly/TB4Sim

Lessons – coming soon



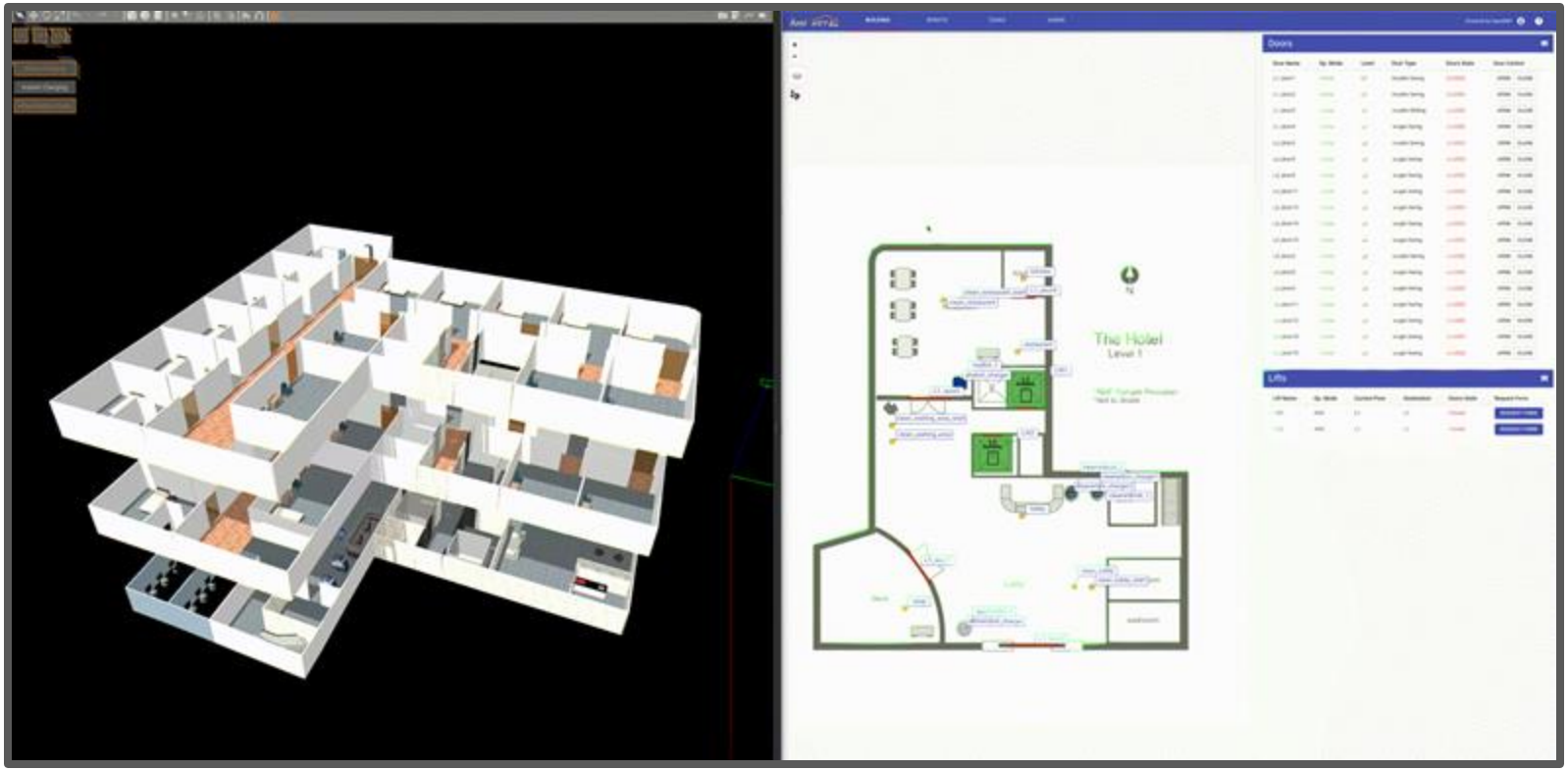


bit.ly/TB4Lesson

Looking Ahead: Multi-Robot / Multi-Fleet

- New Product: OpenRMF
- Primarily Singapore Team (ROMI-H)
- Layer on top of ROS for heterogeneous robot fleets
- Agnostic of robot software
- Integration with infrastructure
- See: ***Open-RMF.org***

Looking Ahead: Open-RMF



bit.ly/OpenRMFBook

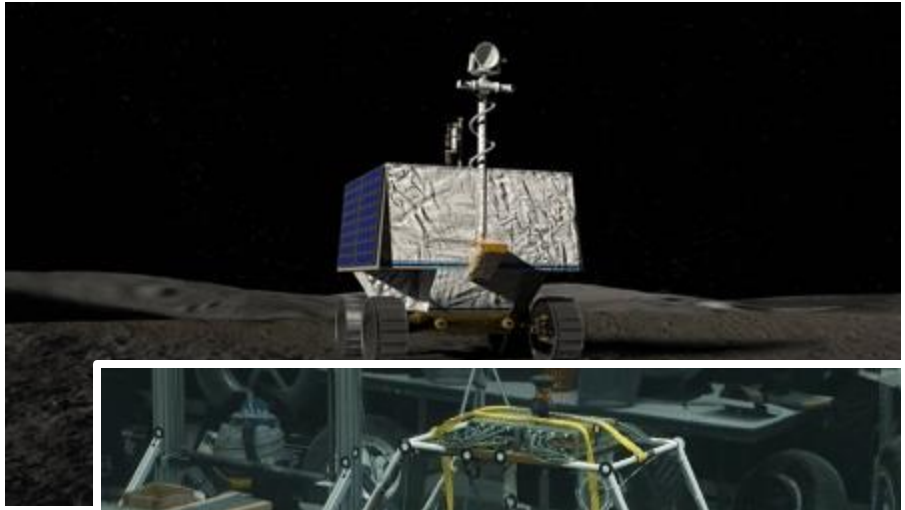
Looking Ahead: Space

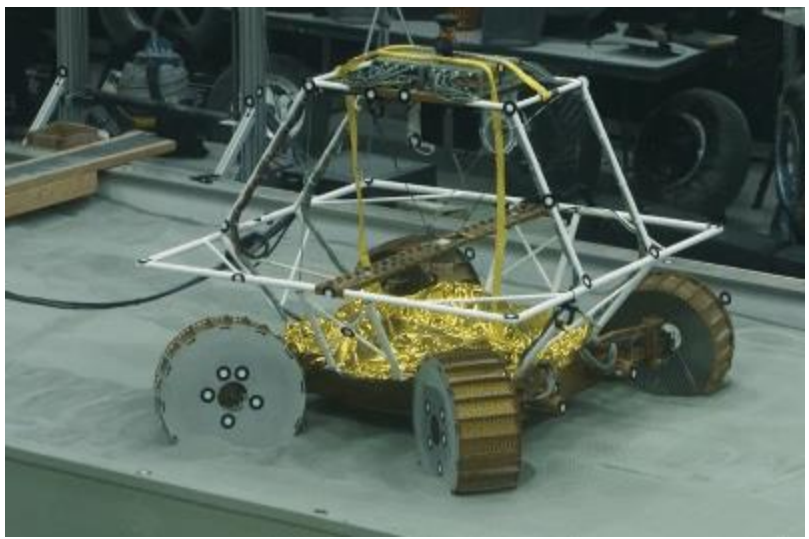
Volatiles Investigating Polar Exploration Rover, or VIPER

Moon mission late 2023

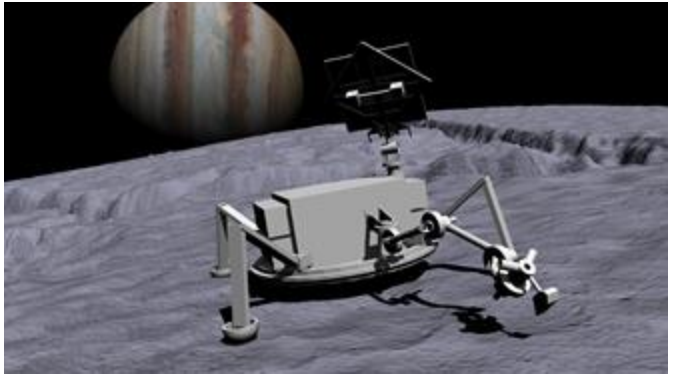
"With all the incoming data from the rover, the MOC team makes use of a web-based data visualization platform developed by NASA called Open Mission Control Technologies. The Open MCT software is open source, making it freely available not only for space missions like VIPER, but other applications in the public and private sectors."

"Collaborations with industry are also feeding into key aspects of VIPER's software operating system. Rather than creating only custom code, the rover's flight and ground-based software will make extensive use of open source software, including key components adapted from the ***Robot Operating System 2 (ROS 2)*** *which is widely used in everything from robot vacuum cleaners to autonomous drones and self-driving cars. "*





Looking Ahead: Space ROS



Europa Lander Simulation

"The NASA Ames Intelligent Systems Division's Ocean Worlds Autonomy Testbed for Exploration Research and Simulation (OceanWATERS) software team announced their 9th public release of the OceanWATERS open source software on December 13, 2021"

bit.ly/OceanWATERS

Astrobee

"Three NASA Astrobee free-flying robots have been operating inside the International Space Station (ISS) since 2019. T Astrobee's flight software performs vision-based localization, provides autonomous navigation, docking and perching, manages various sensors and actuators, and supports human-robot interaction with co-located astronauts via screen-based displays, light signaling, and sound."

bit.ly/astrobee

Space ROS

NASA, Blue Origin and industry partners are collaborating to develop the Space Robot Operating System (Space ROS) which is an open-source software framework the space robotics community can use to develop flight-quality robotic and autonomous space systems.

https://bit.ly/SpaceROS

New and Noteworthy!

f1tenth.org

Student Run
ROS+Autoware

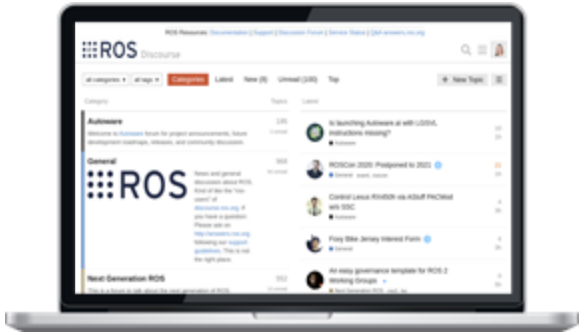
New and Noteworthy: Indy Autonomous Challenge

Stepping stone to

IndyAutonomousChallenge.com

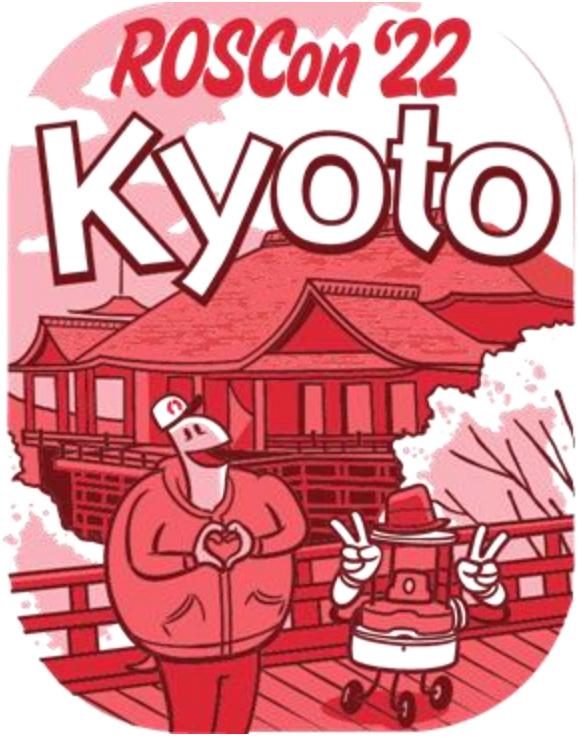
INDY AUTONOMOUS CHALLENGE
OCT. 23, 2021

Shameless Self Promotion



discourse.ros.org

answers.ros.org



THANKS!
@openroboticsorg
@rosorg
@kscottz
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