Migrating to ROS 2
Advice from Rover Robotics

in collaboration with ADLINK Technology, AWS RoboMaker, and Intel
Size of our Robots
Applications - Data Collection

Creating a digital twin of a construction site

Detecting debris on a runway

Scanning license plates in a parking lot
Overview

• Our opinion of ROS 2 so far
• What its been like to work in ROS 2
• What we are working on next
ROS 1
Purpose: Share common robotics code, minimize rewrites

ROS 2
Purpose: Share reliable robotics code
What makes ROS 2 more reliable

On Paper
• QOS (quality of service)
• Discoverability
• No ROS Master
• Out of the box zero copy

What’s more important
Professional programmers and maintainers

ROS 2 technical steering committee members with market cap over $1B USD

![Partnerships Logos](image)
ROS 2 Programers and Maintainers

- Fast RTPS
- Cyclone DDS
- OpenSplice
- Connext
- Lidar Drivers
- IMU Drivers
- GPS Drivers

ROS 2 Core Packages

Logos of Intel, Samsung, Tier IV, Rover Robotics, SICK, Ouster, Bosch, Adlink, and eProsima.
Overview

• Our opinion of ROS 2 so far
  • *We think it will become much better than ROS 1 very quickly because of the companies showing support for it*

• What it's been like to work in ROS 2

• What we are working on next
Rover Robotics Re:Mars Demo (June 2019)

- Based on ROS 1 Kinetic
- Very simple example of using ROS navigation stack
- Used a single 2D lidar to navigate
Rover Robotics Pack Expo Demo (Sept 2019)

- 3.5 months after Re:Mars Demo
- Based on ROS 2
- Simple use case of ROS 2 Navigation
Mobile Robot Network Setup

Laptop

RVIZ

Router

Robot

Navigation 2
Robot Localization
Sensor Drivers
ROS 2
Where have we spent time in ROS 2

- Application Code: 20%
  - Navigation 2: 20%
  - Robot Localization: 30%
    - Lidar Drivers
    - IMU Drivers
    - GPS Drivers
    - Rover Driver
    - Fast RTPS
    - Cyclone DDS
    - OpenSplice
    - Connext
  - ROS 2 Core Packages: 30%
DDS ROS 2 Navigation Bringup (over WiFi)
DDS ROS 2 Navigation Bringup (over WiFi)
Latency Comparison Cyclone DDS vs FastRTPS (Small Message Size)
Latency Comparison Cyclone DDS vs FastRTPS (Large Message Size)
Resource Usage  Cyclone DDS vs. FastRTPS

CPU Usage (Array16k)

CPU Usage (%)

Time (secs)

RAM Usage (Array16k)

Memory Usage (MB)

Time (secs)

CPU Usage (Array2m)

CPU Usage (%)

Time (secs)

RAM Usage (Array2m)

Memory Usage (MB)

Time (secs)
Summary

• Our opinion of ROS 2 so far
  • We think it will become much better than ROS 1 very quickly because of the companies showing support for it

• What its been like to work in ROS 2
  • We have had to spend significant time on almost every level of the software stack
  • It’s been slow progress, but we have come a long way since the Dashing release

• What we are working on next
What's next

- ROS 2 Core Packages
  - Fast RTPS
  - Cyclone DDS
  - OpenSplice
  - Connext
- Navigation 2
- Robot Localization
- Lidar Drivers
- IMU Drivers
- GPS Drivers
- Rover Driver

Application Code

- 20%
- 70%
- 8%
- <2%
Our hope by the release of F turtle

Application Code

Navigation 2

Robot Localization

Lidar Drivers

IMU Drivers

GPS Drivers

Rover Driver

Fast RTPS

Cyclone DDS

OpenSplice

Connext

ROS 2 Core Packages

>90%

<5%

<5%

<1%