A Proposal for a Reference ROS2 Hardware Interface Implementation

Jeremy Adams
adamsj@objectcomputing.com

12/8/2020

OBJECT COMPUTING

WHAT WE DO

We use technology to unlock **business value** for our clients.

Analytics & Machine Learning

Unlock insights, accelerate growth, and strengthen your competitive advantage by transforming data into actionable strategies.

Blockchain Solutions

Achieve supply chain transparency, cryptographic security, and scalable growth through our portfolio of enterprise blockchain solutions.

Software Engineering

Expert software engineering services to meet our clients' complex and evolving business and technical requirements.

IoT & Industrial IoT

Modernize your industrial equipment and enable seamless connectivity across your digital ecosystem with our real-time analytics and predictive maintenance solutions.

Cloud Transformation

Build transformative solutions that ensure interoperability, leverage smart and reusable technologies, and optimize cloud spend.

Systems Integration

Establish full interoperability between devices and applications in real-time, to deliver performance, reliability, scalability, and security.

objectcomputing.com

ABOUT ME

- Worked on many different robotic platforms
  - UAV
  - UGV
  - AMR
  - Industrial manipulation

- Primarily embedded systems

- Interested in
  - performance of the system
  - best practices in software engineering
  - robust and flexible solutions

- Have seen a lot of ways different industries handle similar problems

objectcomputing.com

# L-3: Flight computer (Linux-based custom framework and custom real-time Linux)

Cutlass
Tube-launched Small Expendable

Viking 400
Mid-Tier - Expeditionary Unmanned Aircraft System

Mobius
Medium Altitude Long Endurance - Optionally Piloted Vehicle

L3 Unmanned Systems

objectcomputing.com

ASI: custom robotics framework

objectcomputing.com
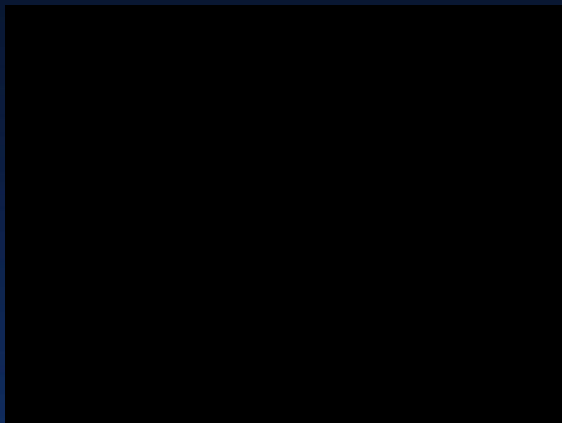
ASI: Indoor Platforms (Jan 2016)
ROS1, ROS2 (Alpha 2), and custom framework

objectcomputing.com
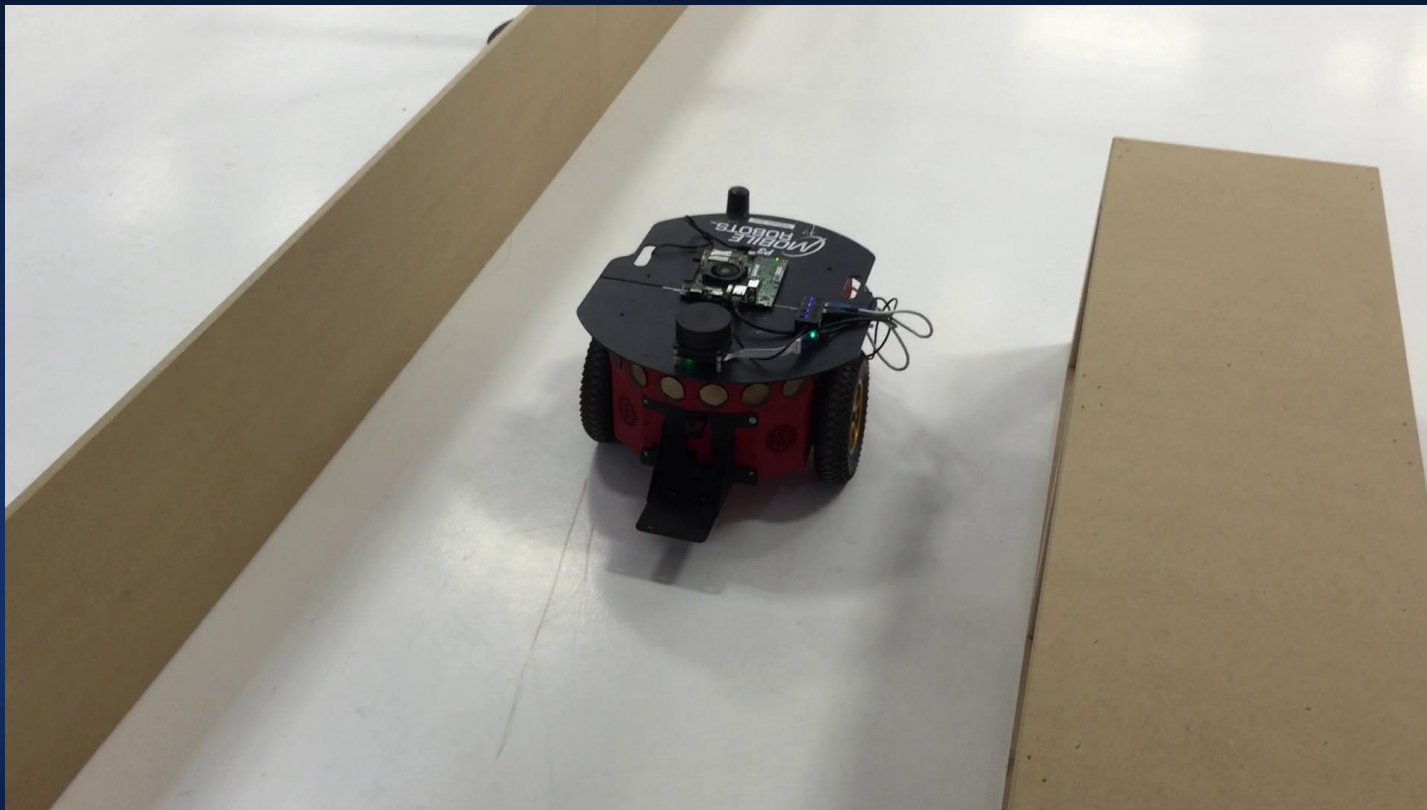
Honeywell: Truck Unloader and Packet Picking Cell
ROS and PLCs and then custom framework

objectcomputing.com

HOW DO WE USE ROS NOW WITH OUR ROBOT HARDWARE?

```
19
2^19   std_msgs/Header header
2 2^19   std_msgs/Header header
2 2 2^19   std_msgs/Header header
2 2 2 20     std_msgs/Header header
2 2 2 21
2 2 2 22     string[] name
2 2 2 23     float64[] position
2 2 2 24     float64[] velocity
2 2 2 25     float64[] effort
```

```
CHANGELOG.rst
CMakeLists.txt
README.md
doc
include
package.xml
plugins
src
```
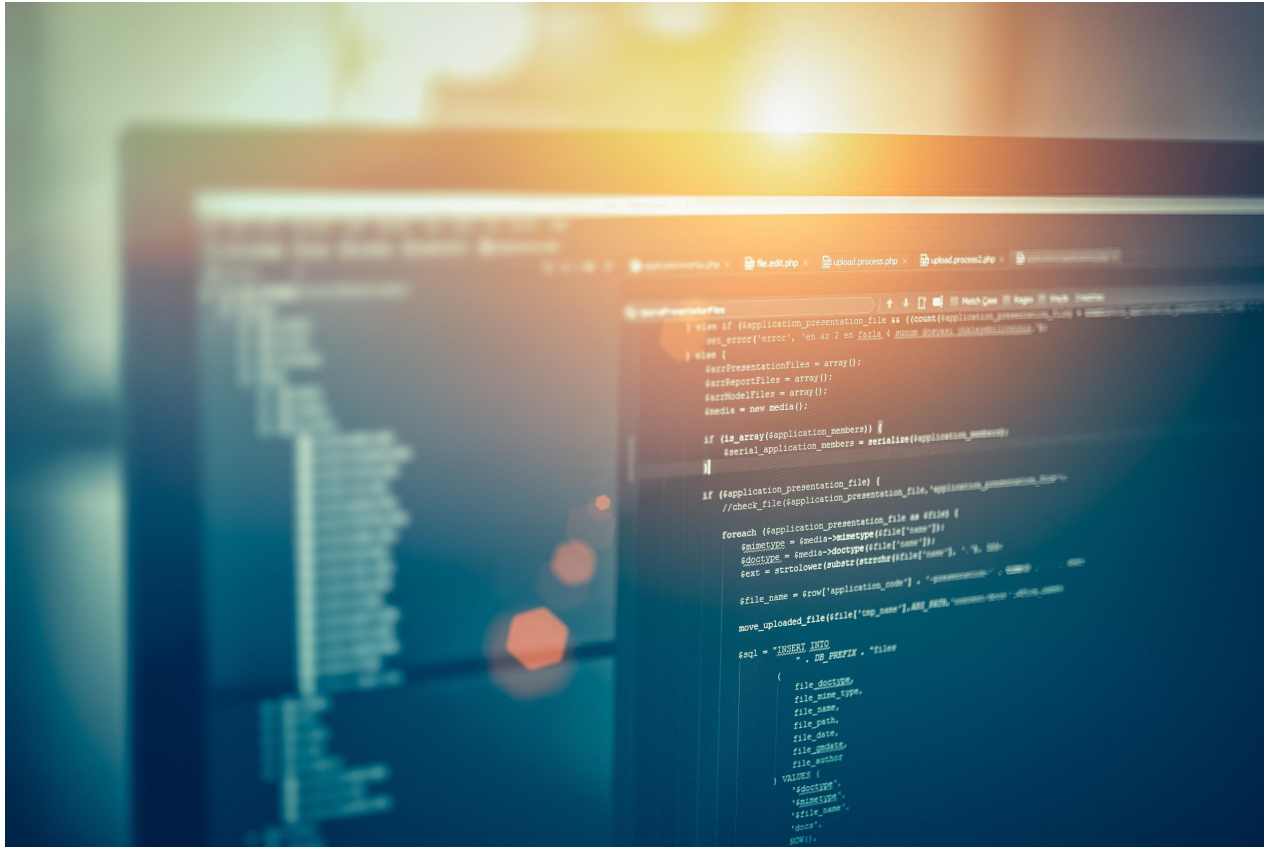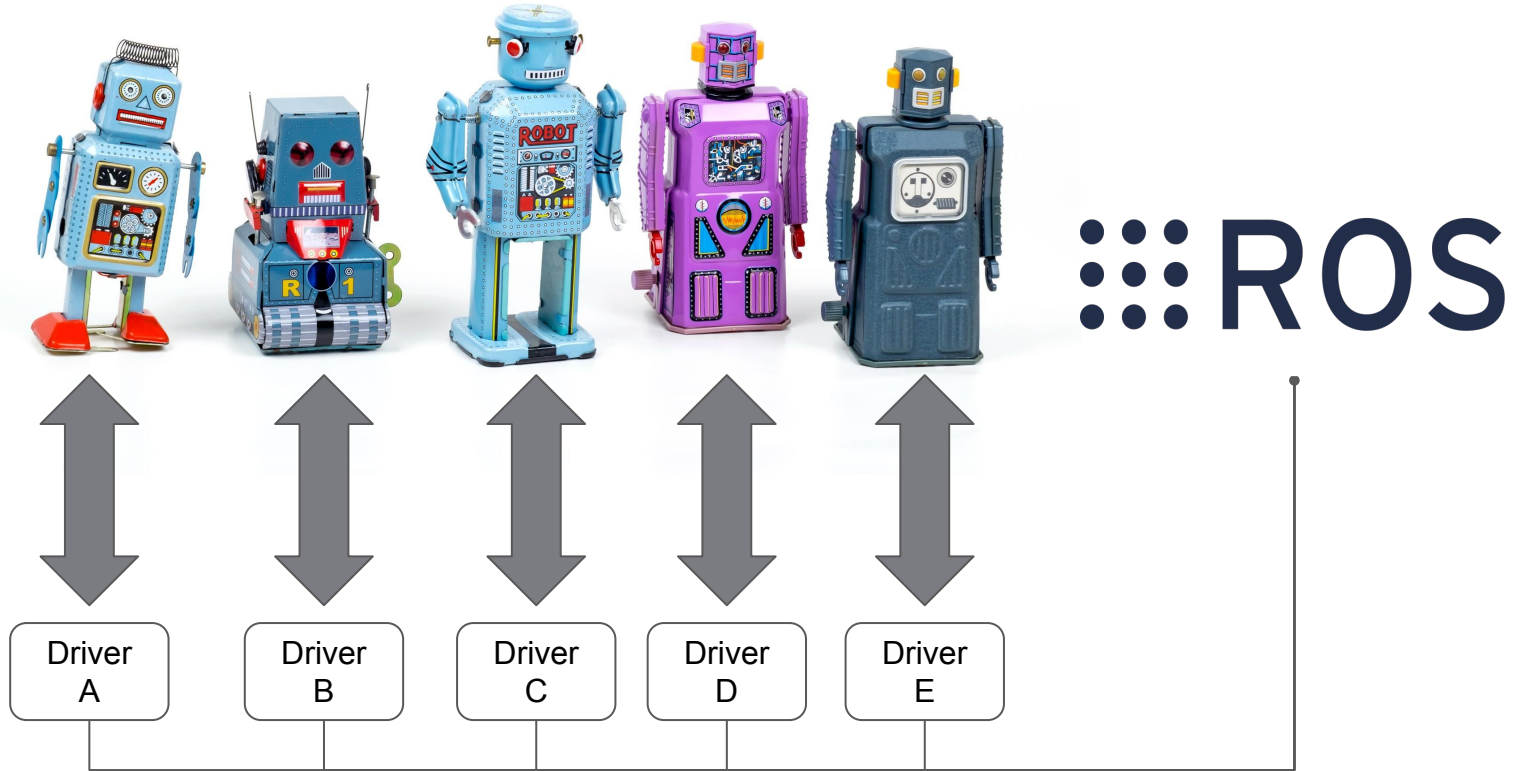
Node

objectcomputing.com

HOW DO WE USE ROS NOW WITH OUR ROBOT HARDWARE?

objectcomputing.com
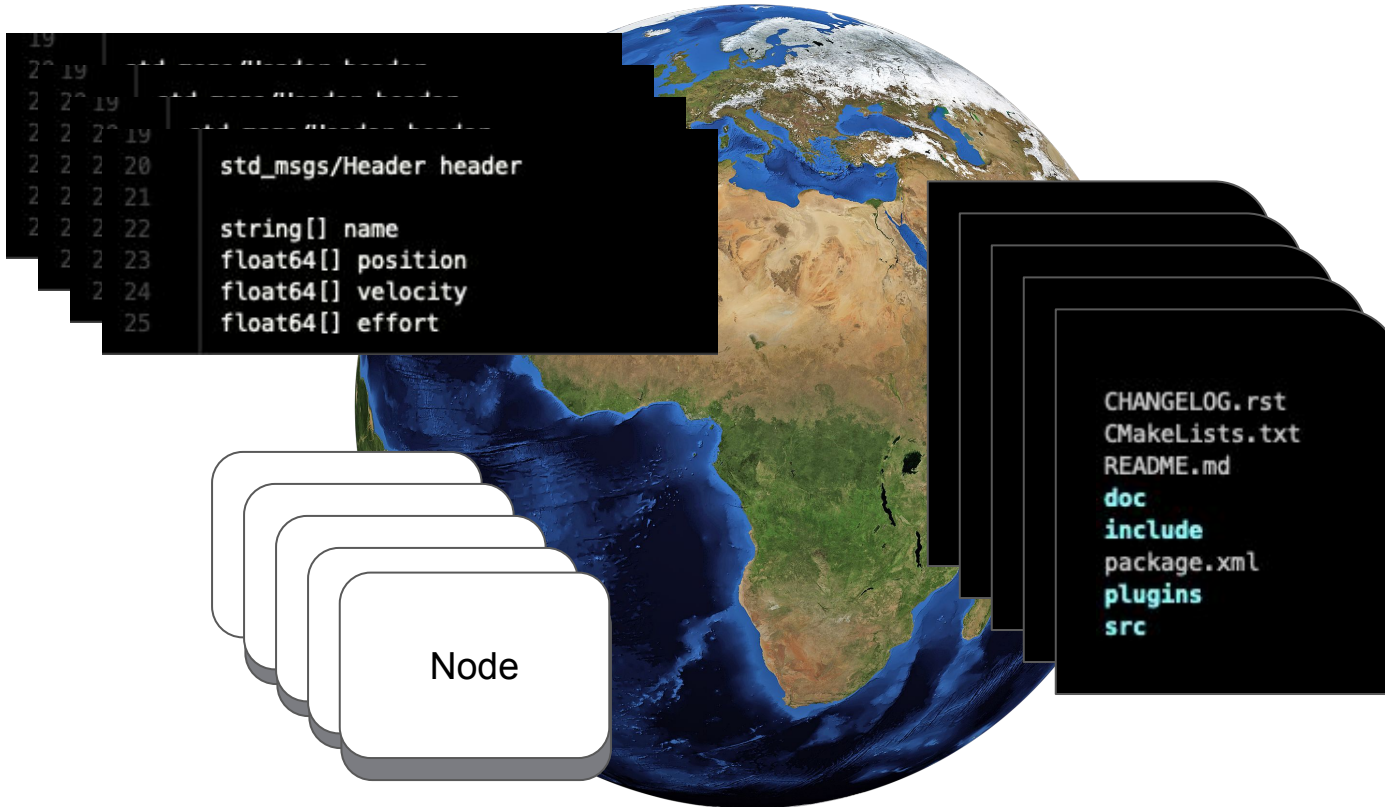
HOW DO WE USE ROS NOW WITH OUR ROBOT HARDWARE?

HOW DO WE USE ROS NOW WITH OUR ROBOT HARDWARE?

Driver
A

Driver
B

Driver
C

Driver
D

Driver
E

objectcomputing.com

WHAT NEEDS DO THESE ASPECTS OF ROS FULFILL?

- Reuse – saves time & money

- OSS – gives some understanding of how to use

- OSS – offers the ability to modify what's there

- Hardware – pick hardware that meets the required needs

objectcomputing.com

but ...

13

WHAT'S NOT WORKING?

- Device features not keeping up with need

- Inconsistent experiences

- Lacking precise communication of needs to vendors

- Hardware vendors control their own code, but ROS community is limited in its influence

objectcomputing.com

WHAT'S NEW THAT WE CAN USE?

- ROS2 on more than Ubuntu

- ROS2's software quality

- ROS community ↑ purchasing power

- DDS intended for distributed computing
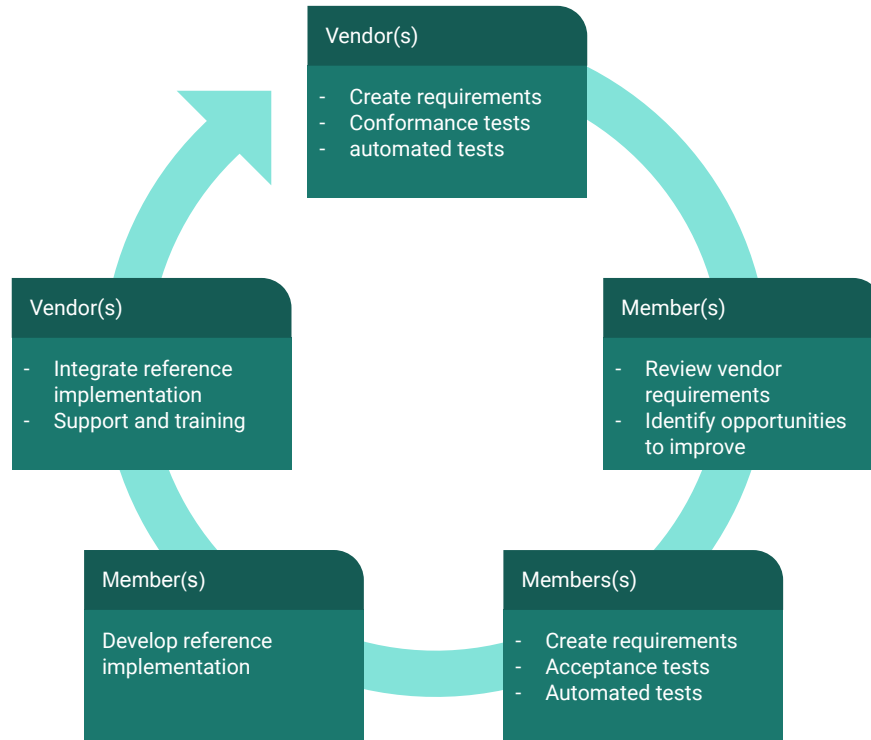
- ROS community has device user experience

objectcomputing.com

How can the needs of the community more effectively be represented in the offerings of the hardware suppliers?

25

Proposed

objectcomputing.com

SPECIFICATION AND REFERENCE IMPLEMENTATION

Vendor(s)
- Create requirements
- Conformance tests
- automated tests

Member(s)
- Review vendor requirements
- Identify opportunities to improve

Members(s)
- Create requirements
- Acceptance tests
- Automated tests

Member(s)
Develop reference implementation

Vendor(s)
- Integrate reference implementation
- Support and training

objectcomputing.com

LET'S CONNECT

📞 +1 (314) 579.0066

✉ info@objectcomputing.com
adamsj@objectcomputing.com

🔍 objectcomputing.com