The ROS 2 Vision

For Advancing the Future of Robotics Development

Sep. 21st 2017

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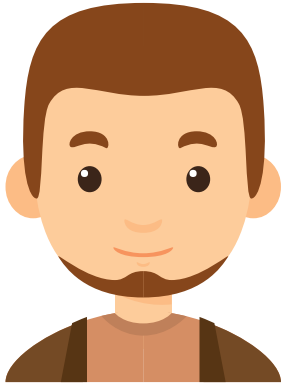
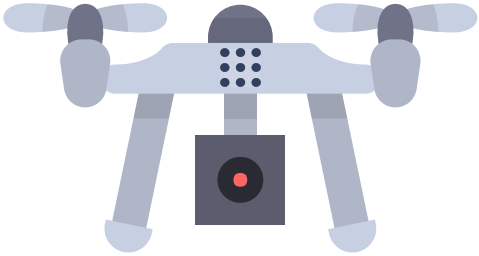
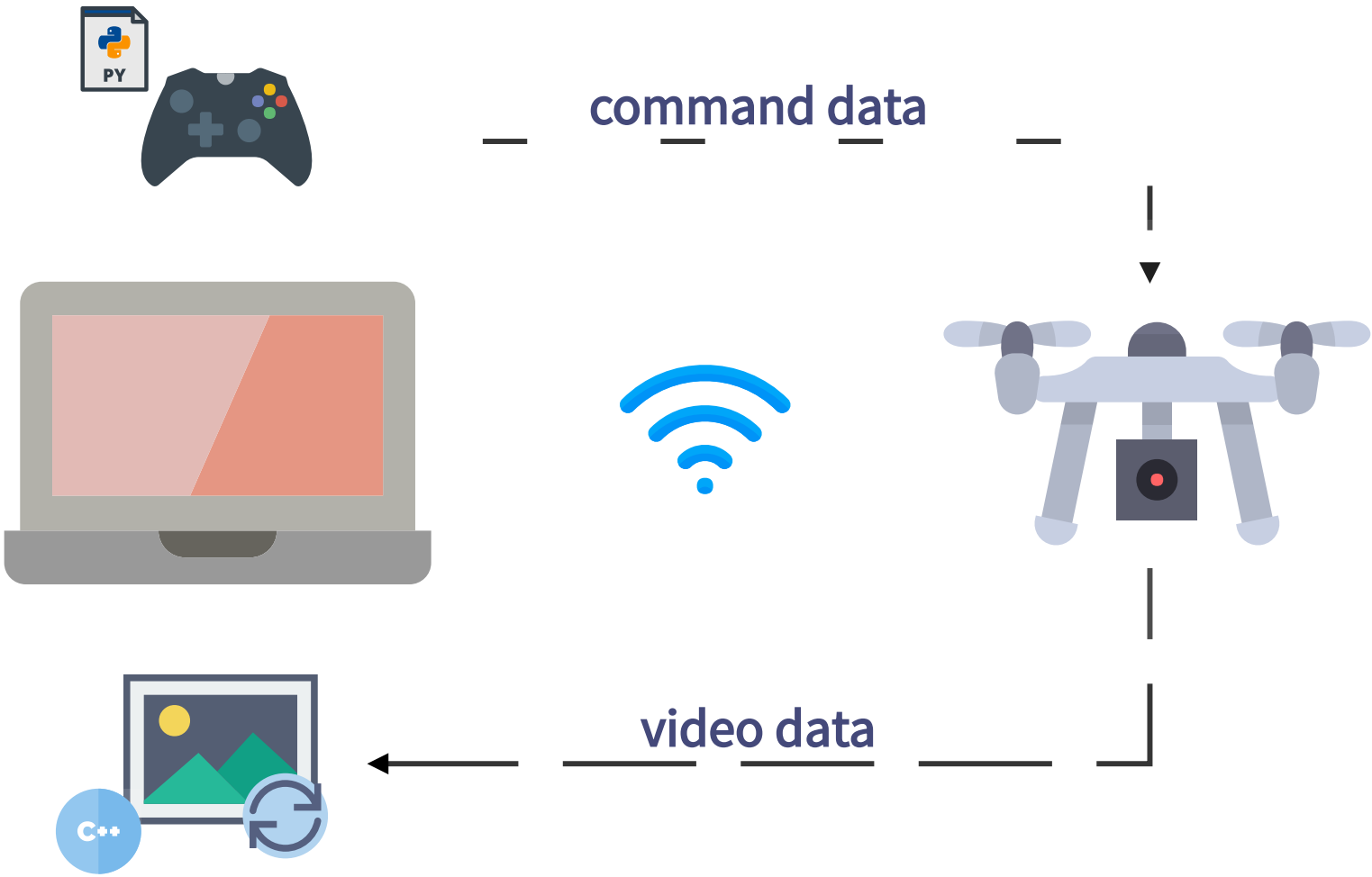
ROSCon 2017, Vancouver, Canada

"Unboxing"

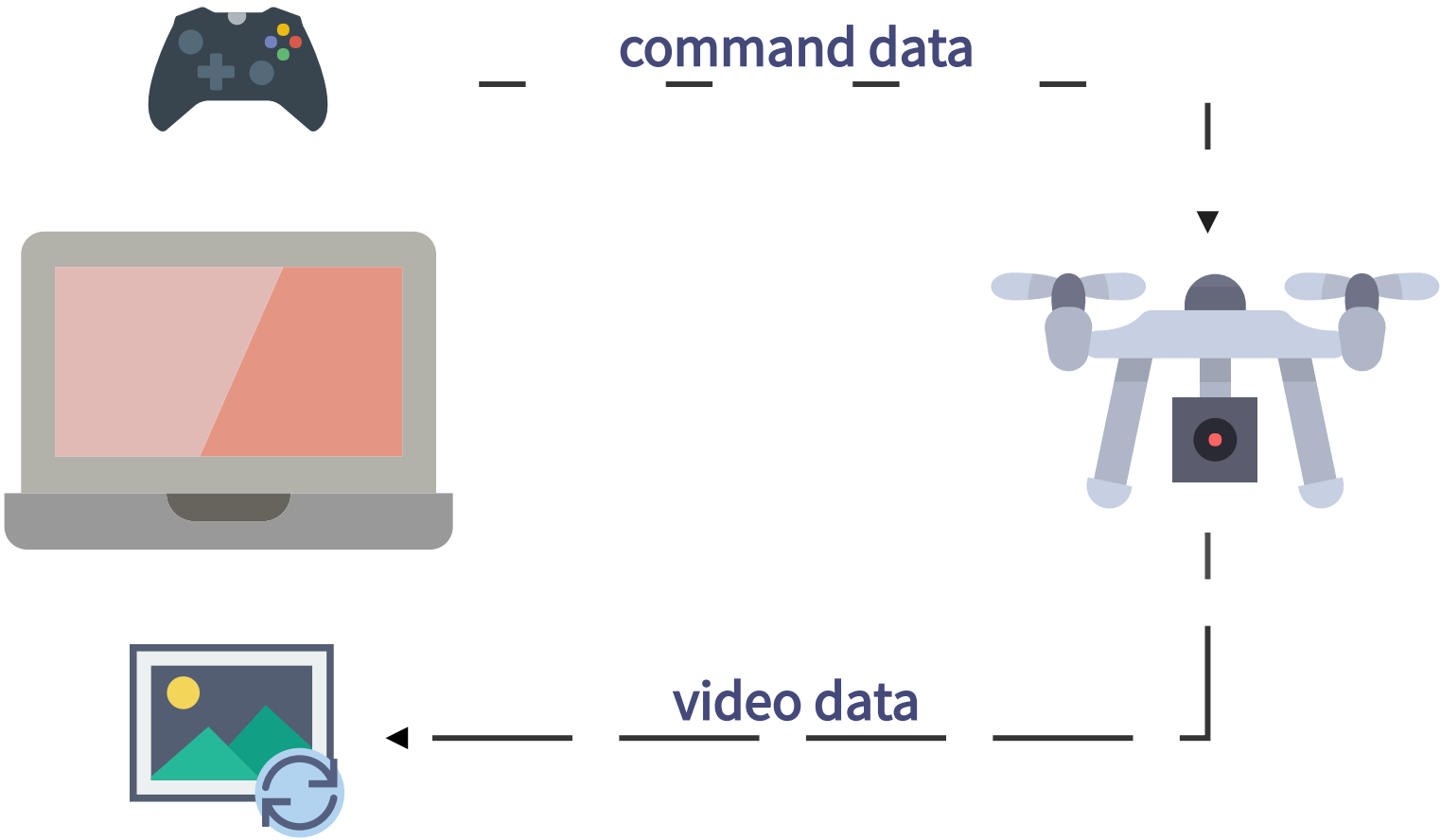




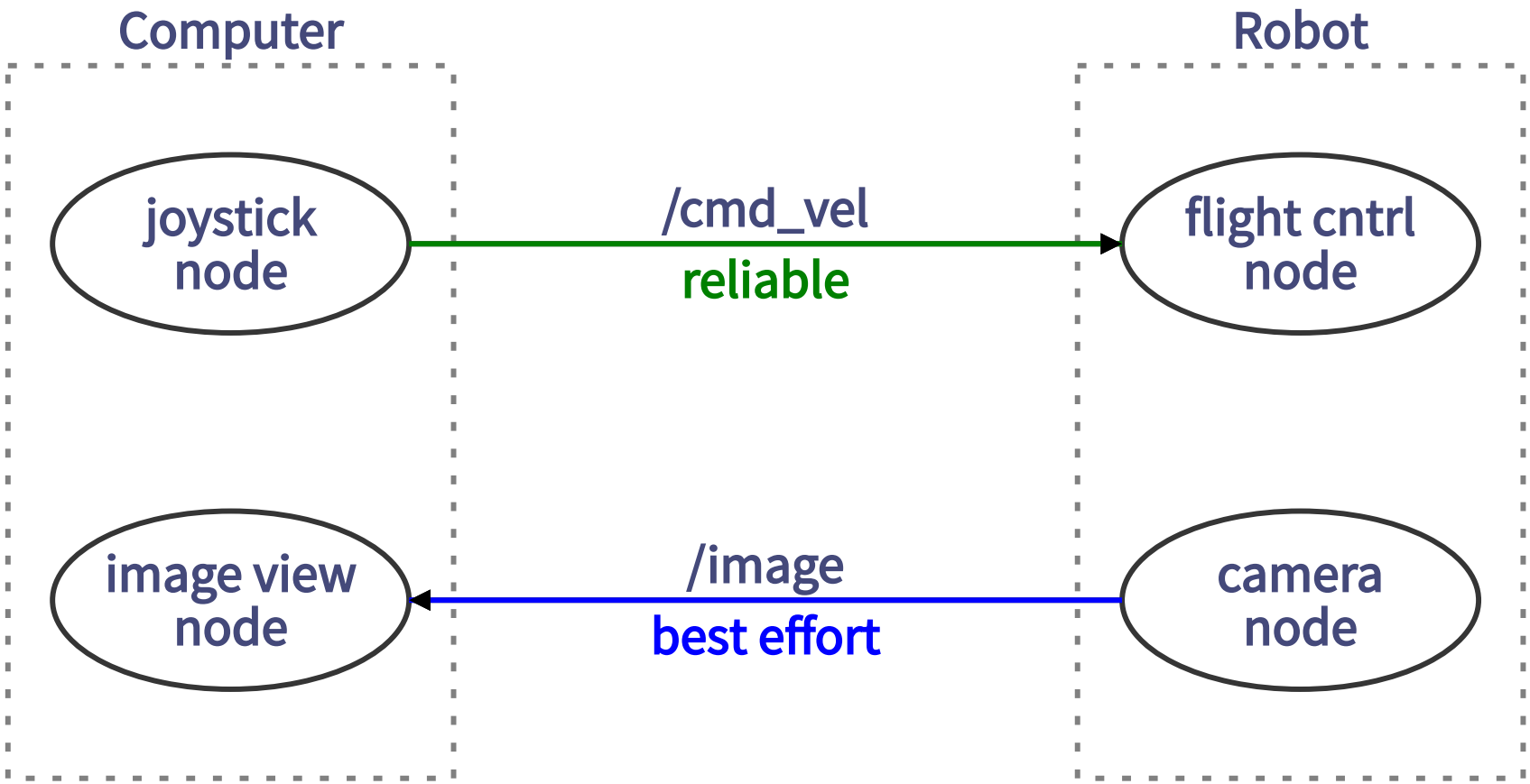
Getting Started



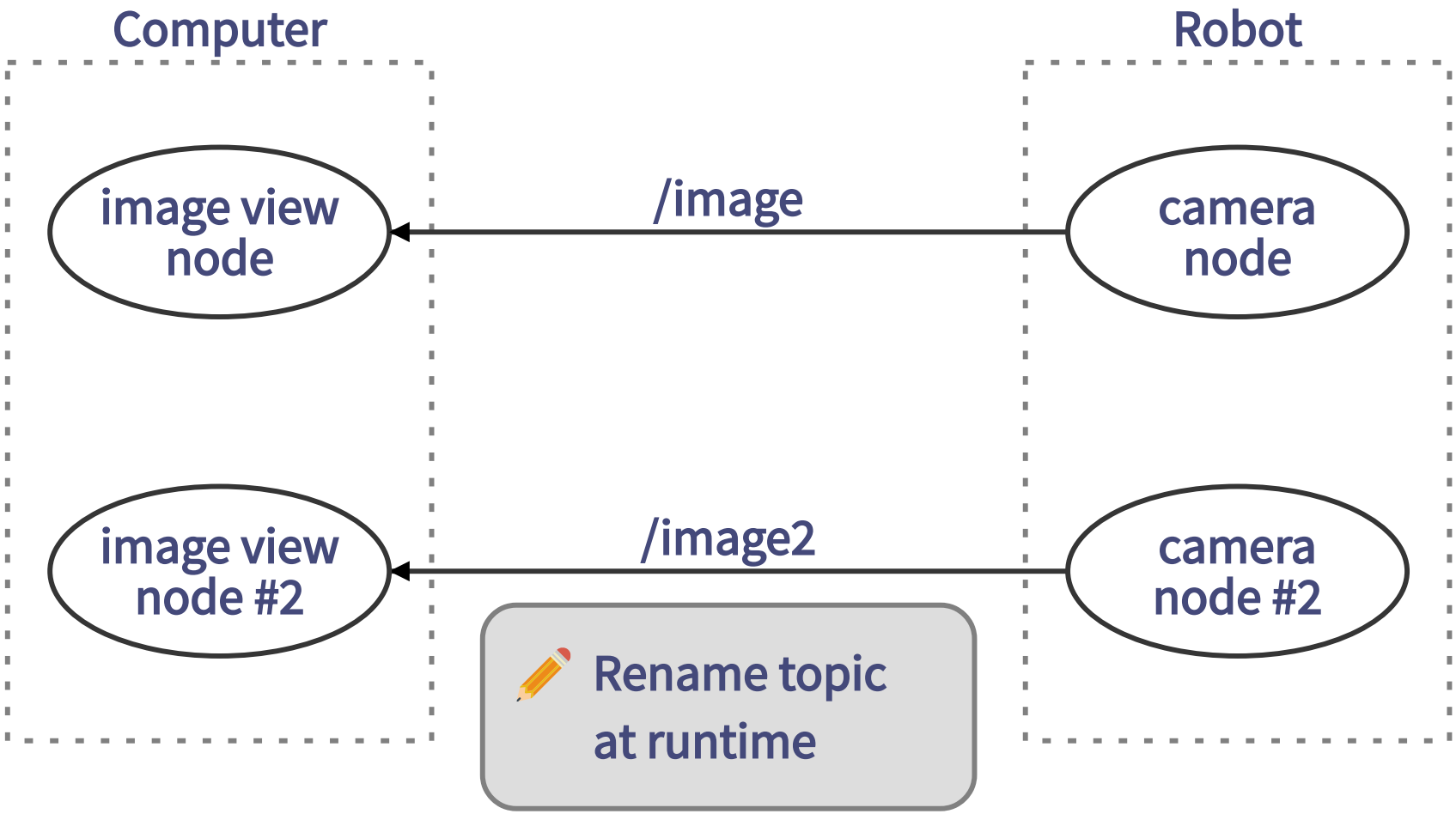
Moving Outdoor



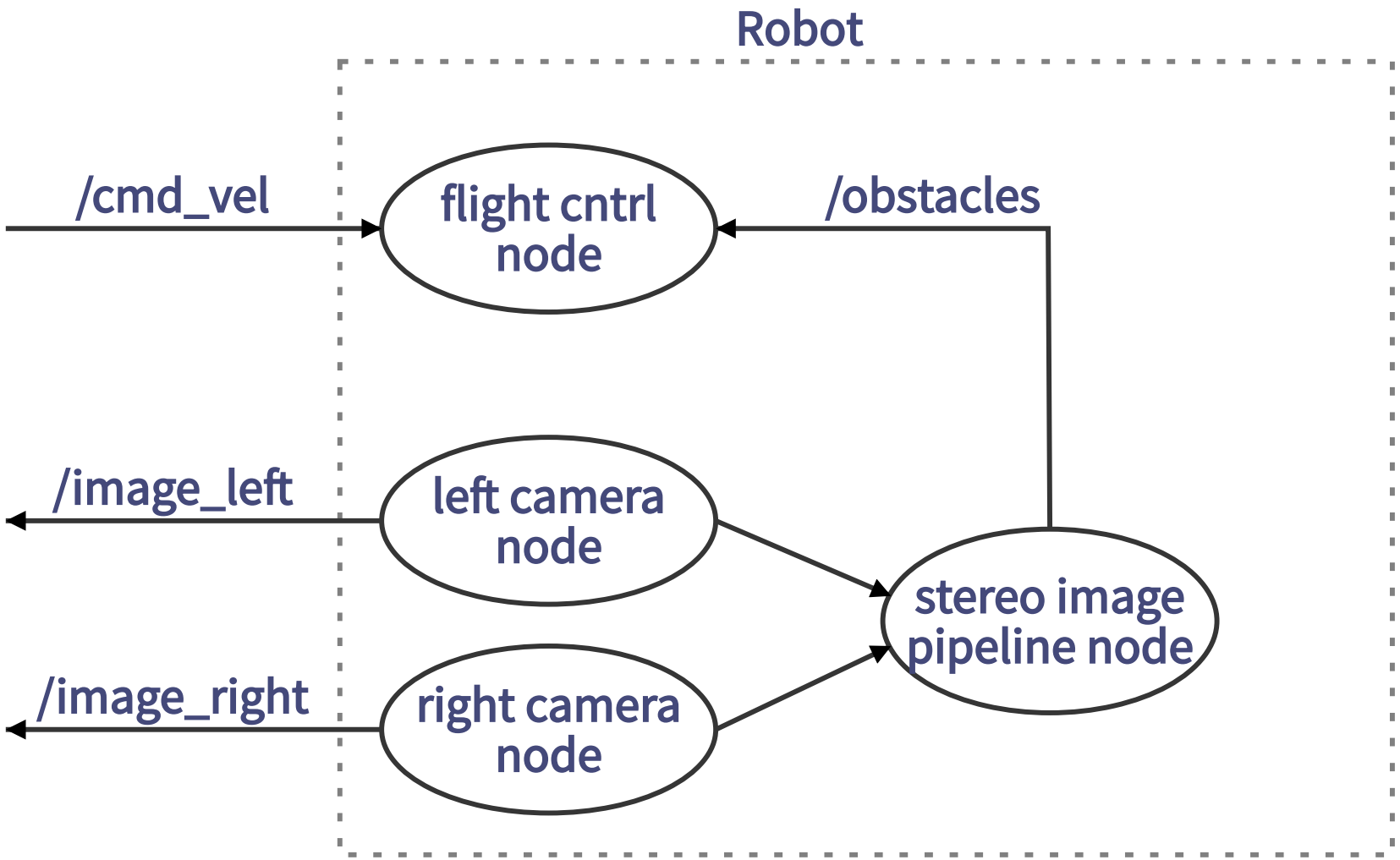
Quality of Service



Extend Capabilities: Hardware



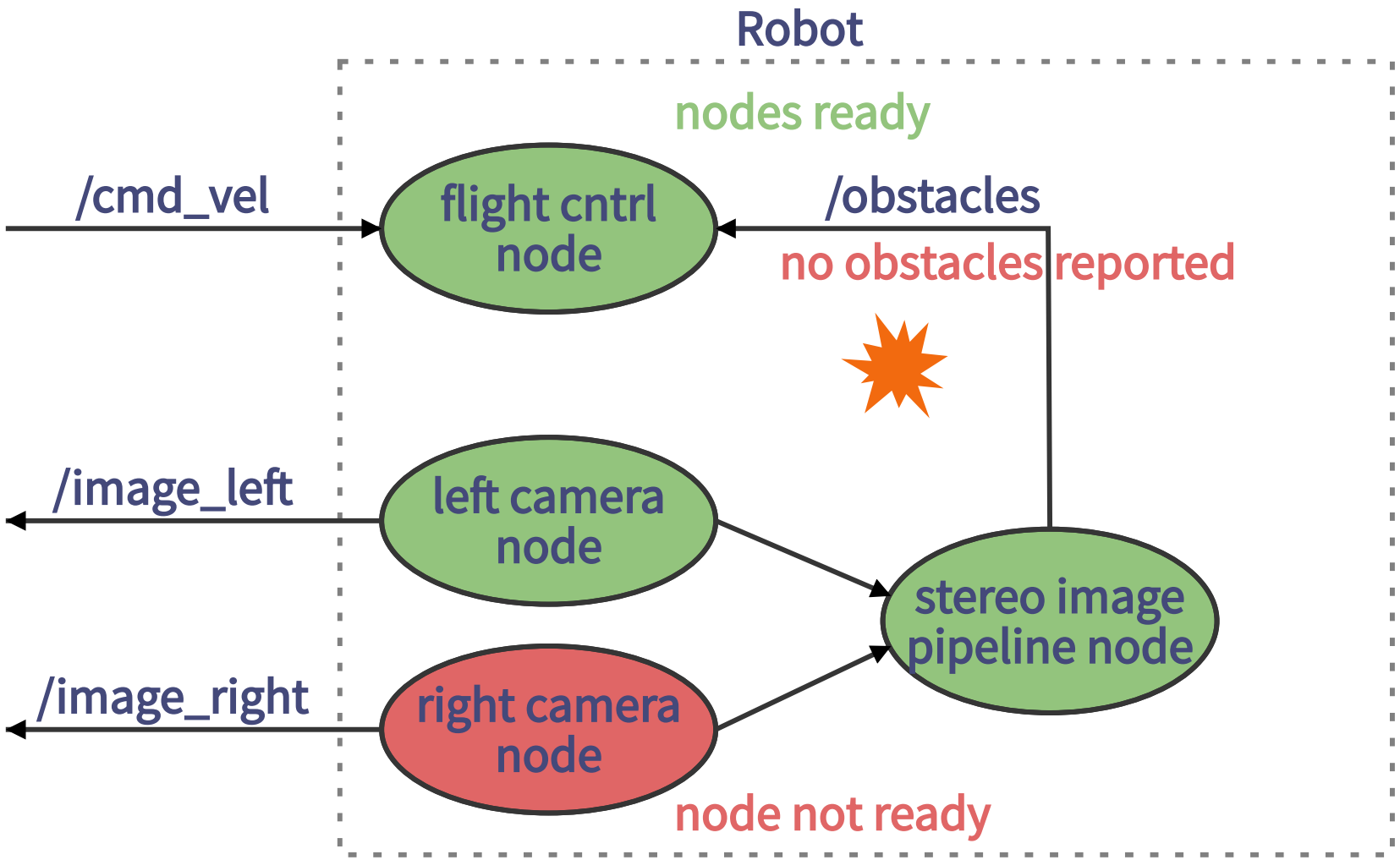
Extend Capabilities: Software



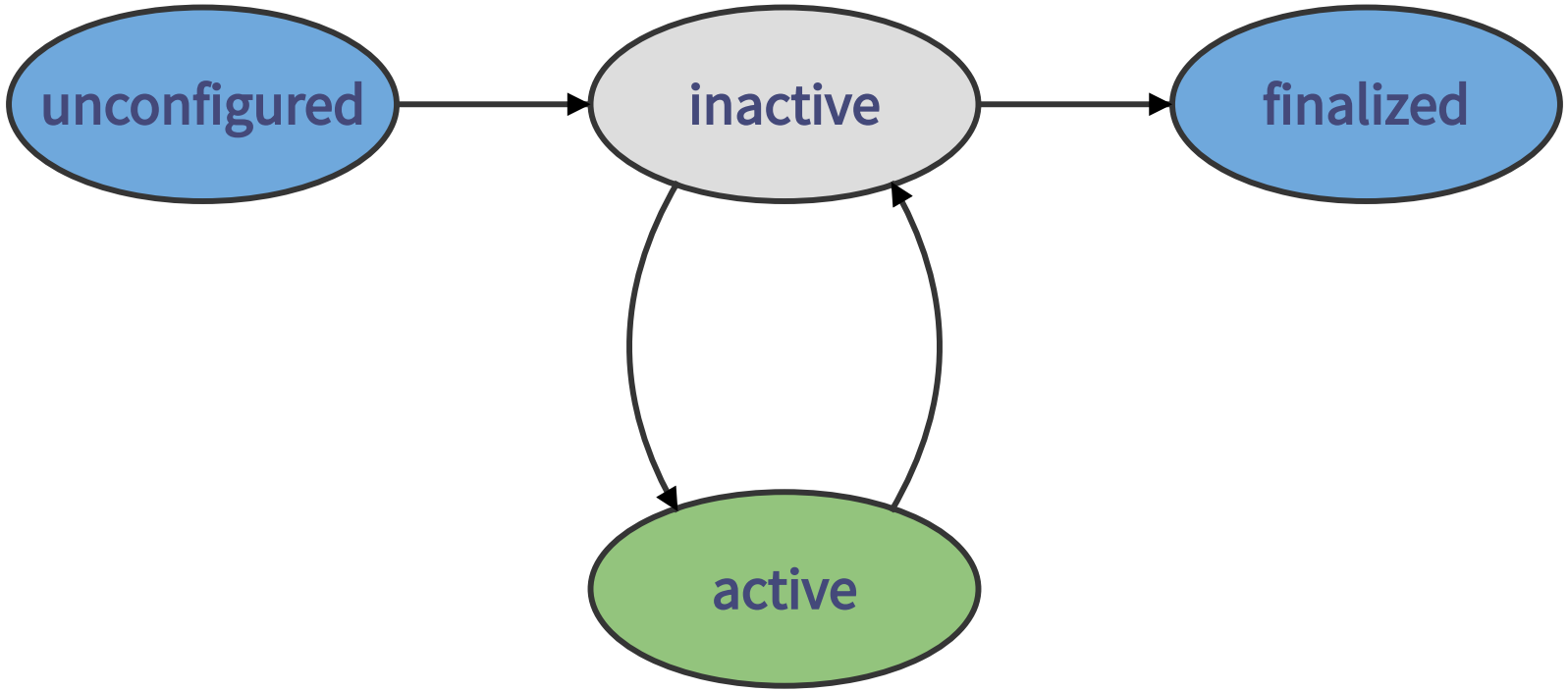
Recap #1

- ✅ Multi-OS support: Linux, Mac OS, Windows
  - ⏳ Binary packages for Mac OS and Windows
- ✅ Different client libraries share common implementation
- ✅ Quality of Service: variety of configuration options
  - ✅ DDS provides even more configuration options, directly accessible
- ✅ Hardware with "native" communication interface
  (no need for separate protocols and driver packages)
- ⏳✅ Event based notifications (rather than need for polling)
- ⏳ Remapping of topics at runtime

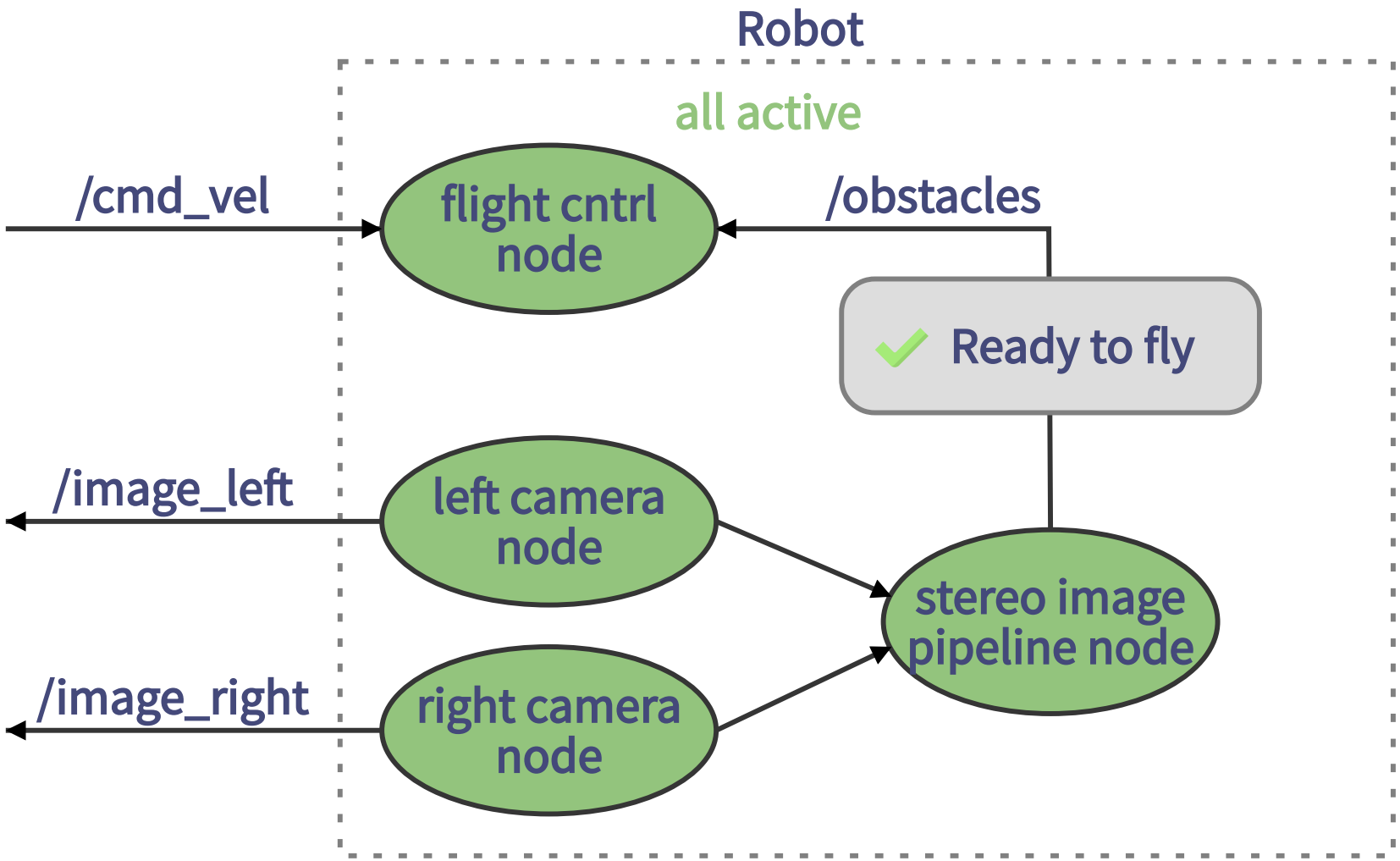
Undeterministic Startup



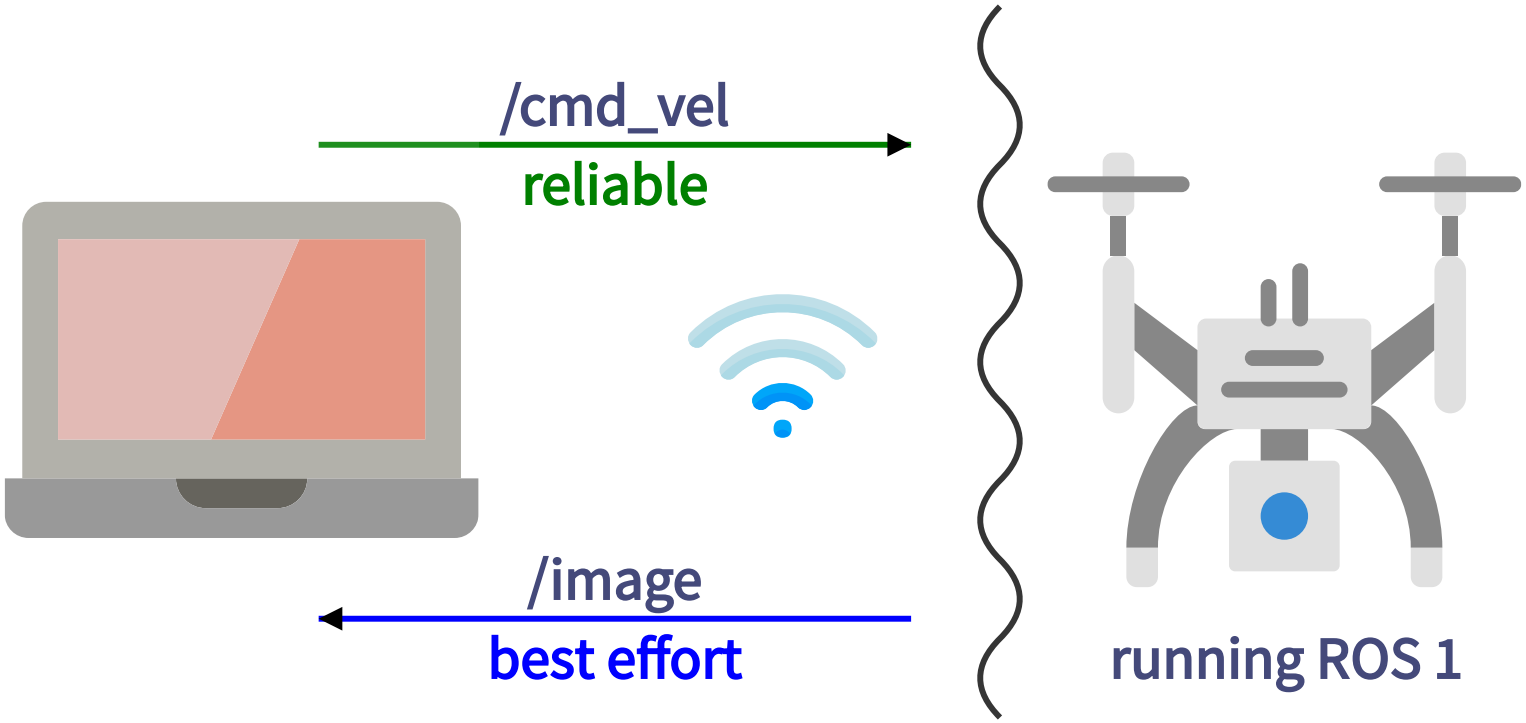
Lifecycle State Machine



Deterministic Startup



Coexistance with ROS 1



Usage Patterns of the "ros1_bridge"

Beta 2

- TurtleBot 2 demo
- Robot using ROS 2 onboard
- Computer uses ROS 1 tools,
  leverage existing ROS 1 packages

Beta 3

- HSR demo (see ⚡ talk)
- Robot using ROS 1 onboard
- Computer uses ROS 2 tools,
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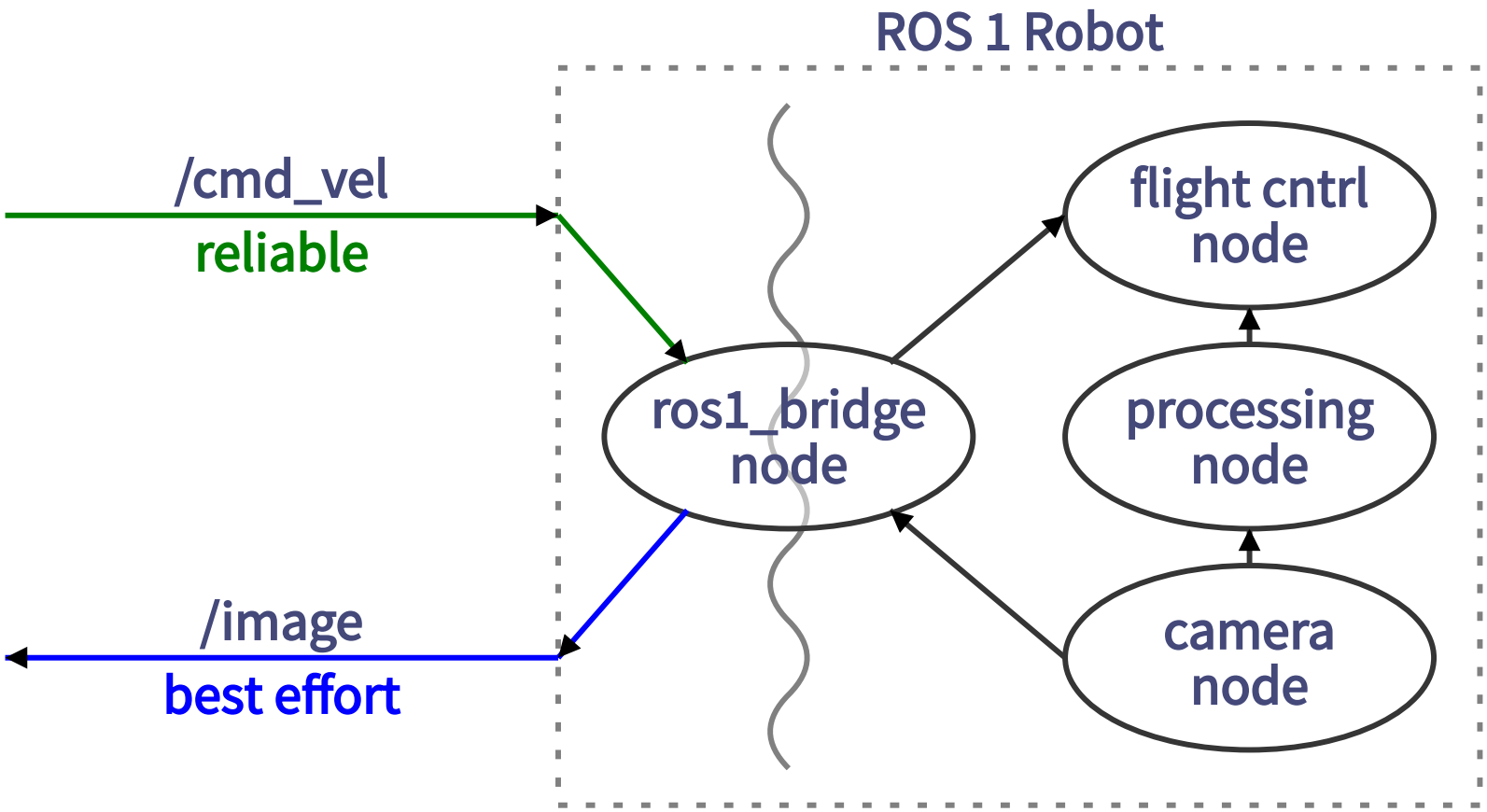
  of the communication protocol

Usage of the "ros1_bridge"



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Beta 3

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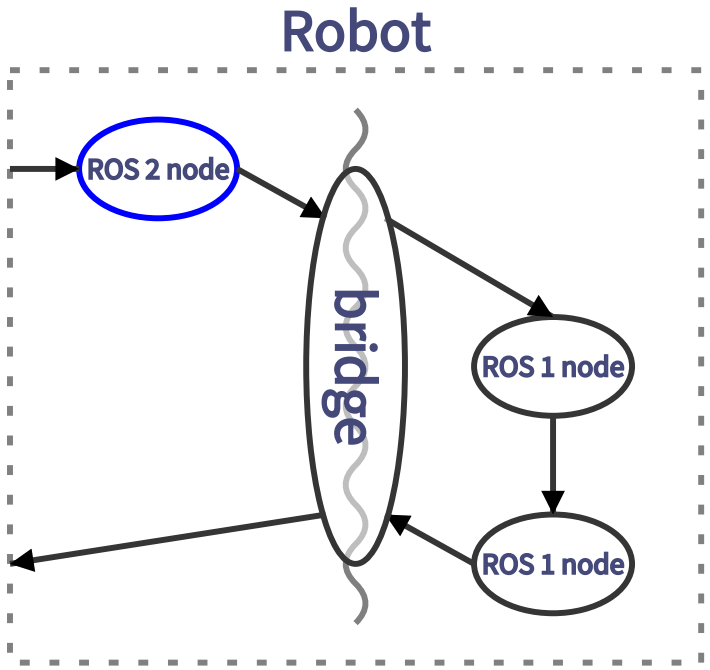
- Incrementally migrate a ROS system

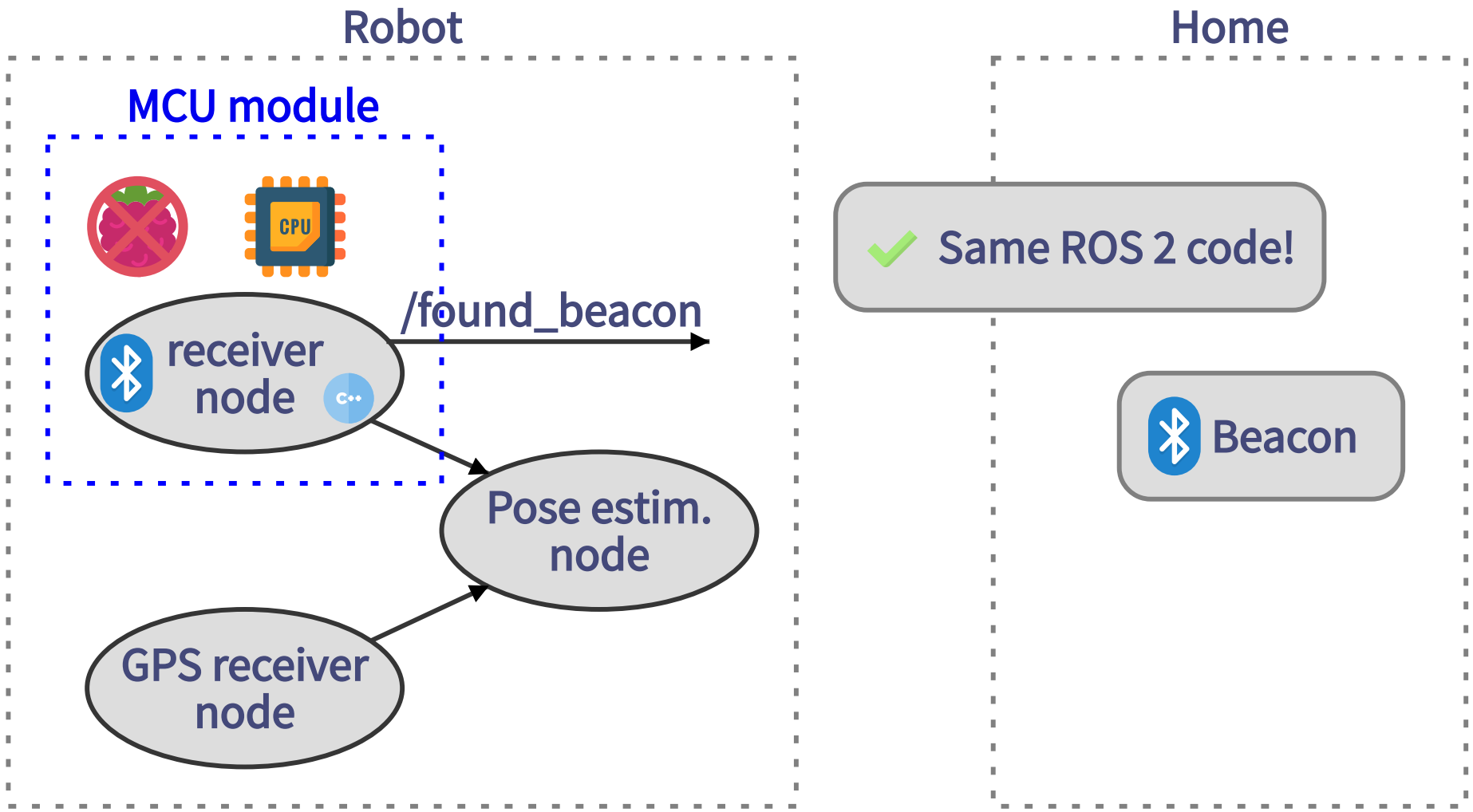


Multi Robot

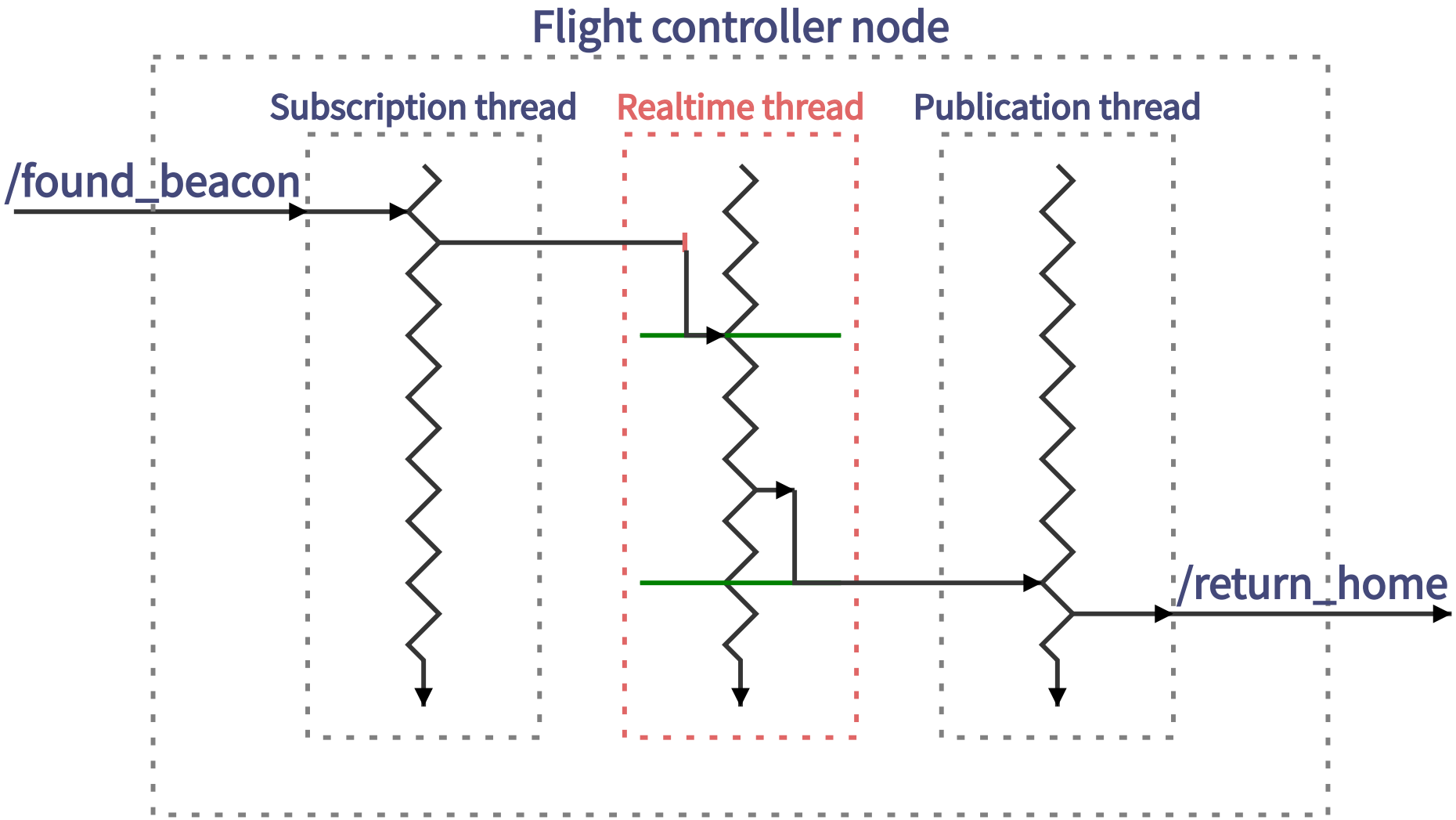
- Distributed discovery useful for on-demand robot-to-robot comm.
  - All current ROS middleware implementations support it
  - As long as all robots use the same comm. protocol
    they can communicate (independent of the vendor)

- Quality of Service settings to tailor the comm. for the specific scenario
  (see eProsima's talk @ 11:35)
- Dynamic remapping of topics enables various different approaches, e.g.:
  - Flip namespaced robot spec. topics to be "global"
    `/robotA/pose` → `/pose`
  - Subscribe to a specific topic from a group of robots
    `/**/pose` or `/floor2/*/pose`

Adding a Custom Sensor



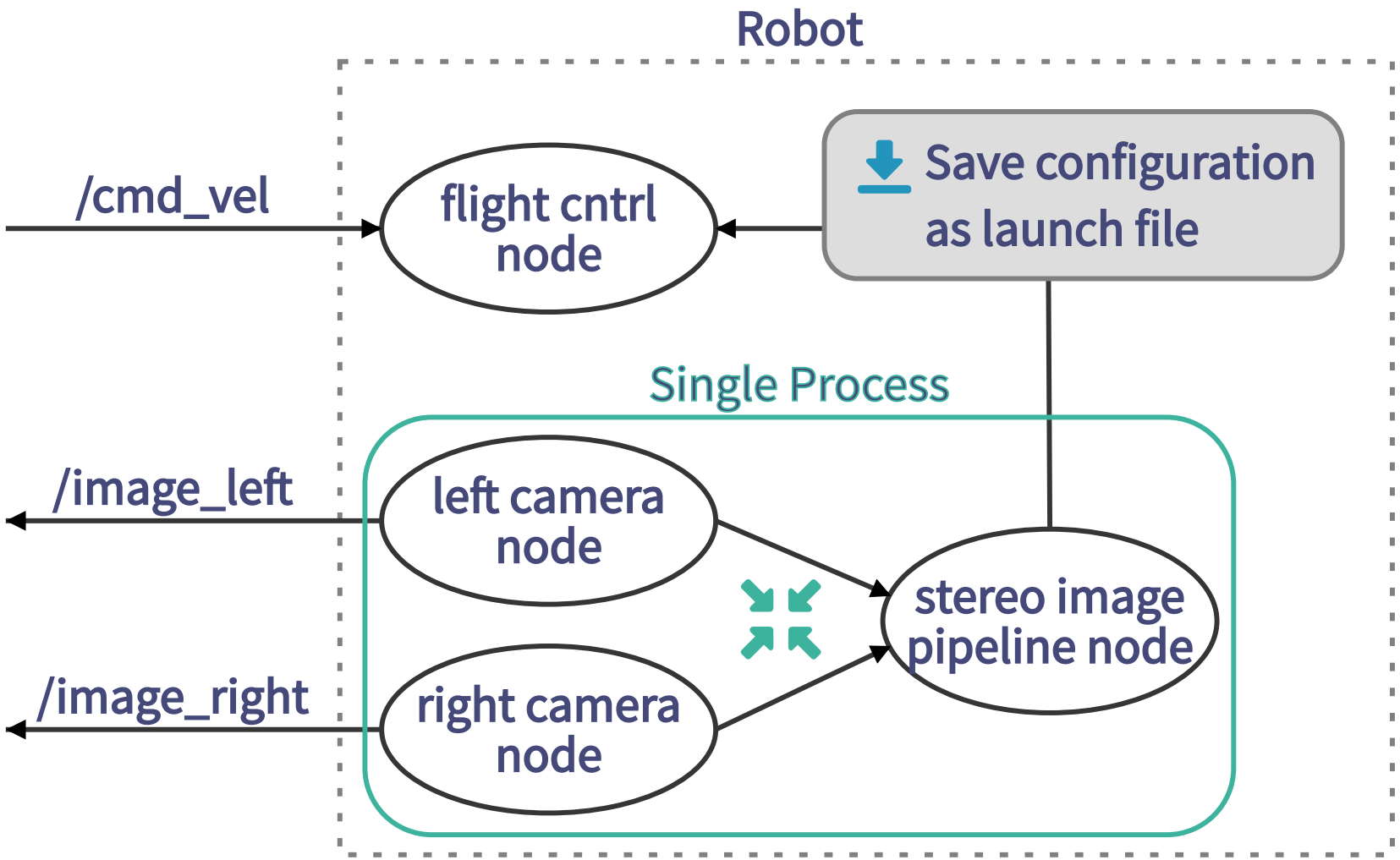
Flight Controller Internals



Recap #2

- ✅ Lifecycle nodes
- ✅⏳ Basic Python-based launch files
  - ⏳ Launch utilizing lifecycle state machine
- ✅ Dual-home bridge to exchange msgs / srvs between ROS 1 and ROS 2
  - ⏳ More configuration options
- ⏳ Multi robot benefiting from the communication protocol: distributed discovery, configurable QoS, dynamic remapping
- ⏳ "Native" communication protocol with micro controllers (DDS-XRCE)
- ✅ Proof of concept for real time support using custom allocators
  - ⏳ No usage of real time kernel yet, no continuous testing

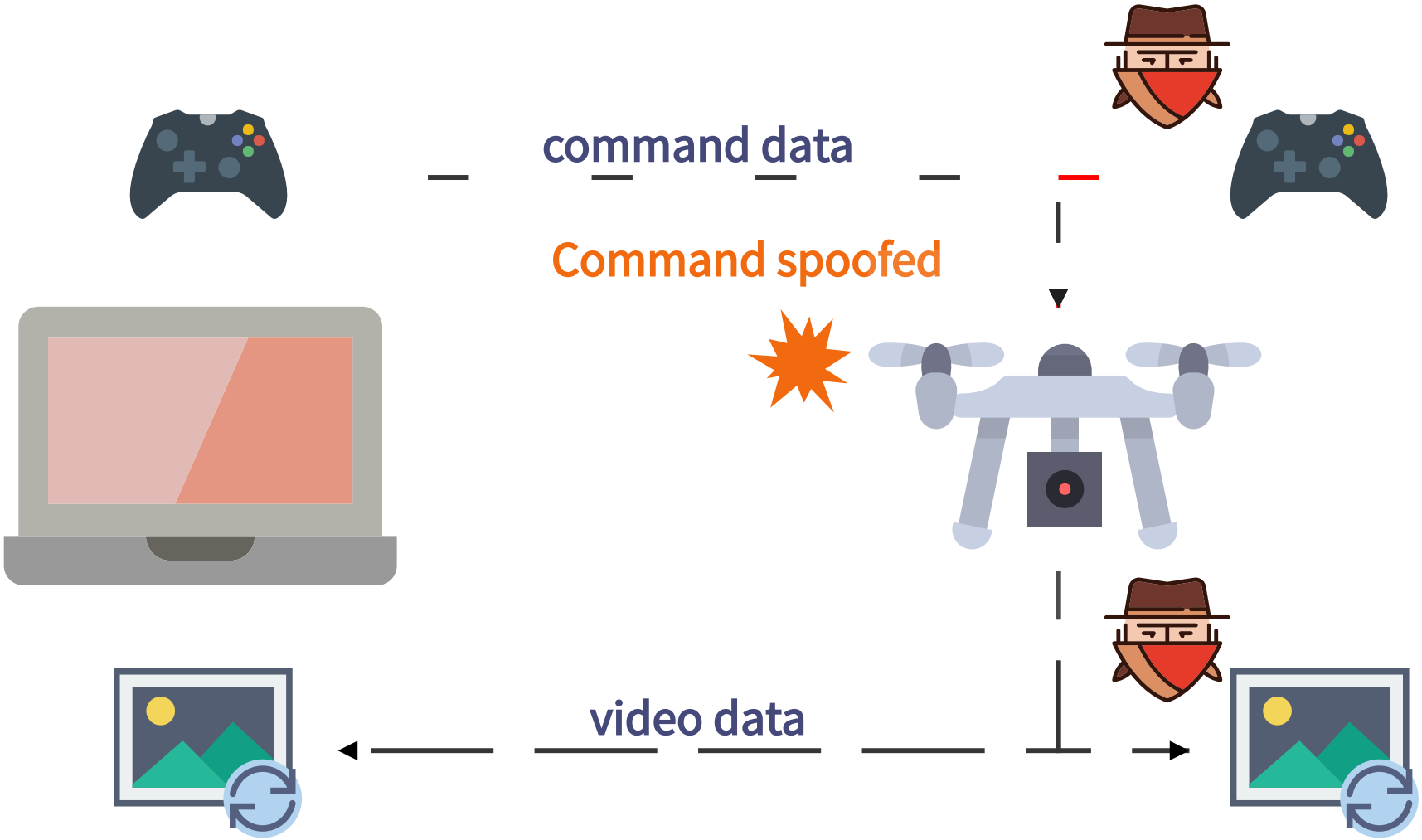
Process Layout Decision



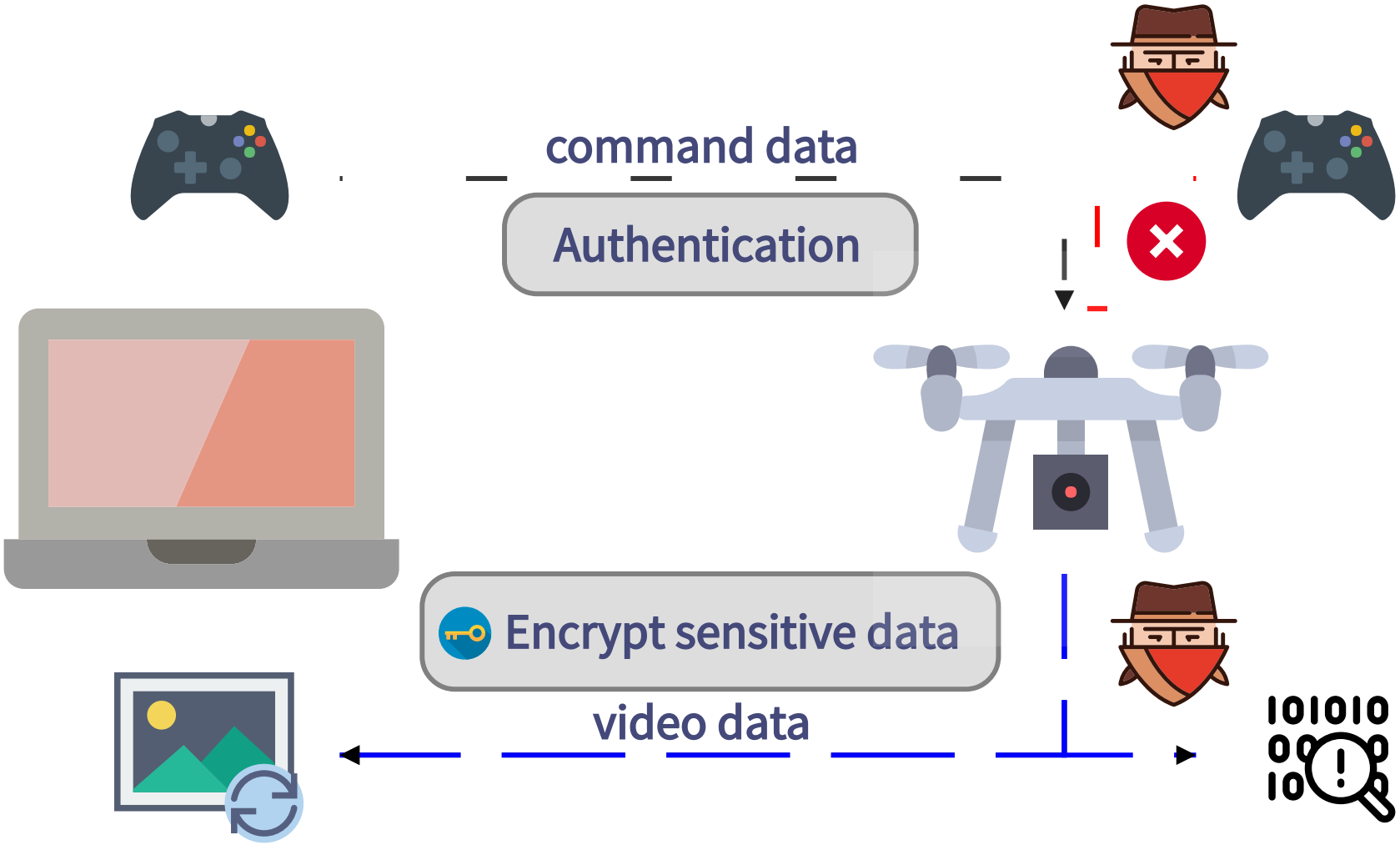
Fault Tolerance and Fallback Behaviors

Fallback behavior #2:
switch to monocular det.

Unsecure System



Securing the System



Validation and Certification

- Use certified hardware components (which talks DDS)
- Use certified DDS implementation
- Use certified / validated software components

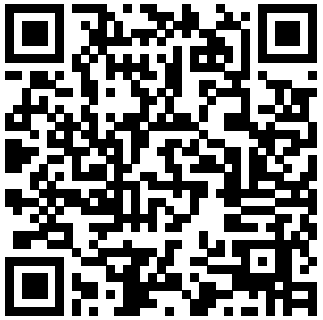
- Select only the subsystems of ROS 2 which are required for the use case
- Build your own subsystem on top

  → Reduced effort to validate the custom application by
  - Using certified subsystem
  - Reducing footprint as much as possible

Recap #3

- ✅ Choose process layout at deploy time
  - ⌛ Support from launch to easily configure this
- ⌛ Event based system providing the infrastructure for fault detection, no tooling yet
- ✅ Security following the DDS-Security standard
  - ⌛ Fine grain configuration
- ⌛ None of the ROS 2 development is certified
  - ✅ But it can interoperate with certified implementations

Questions...



For more information go to:
ros2.org

open robotics