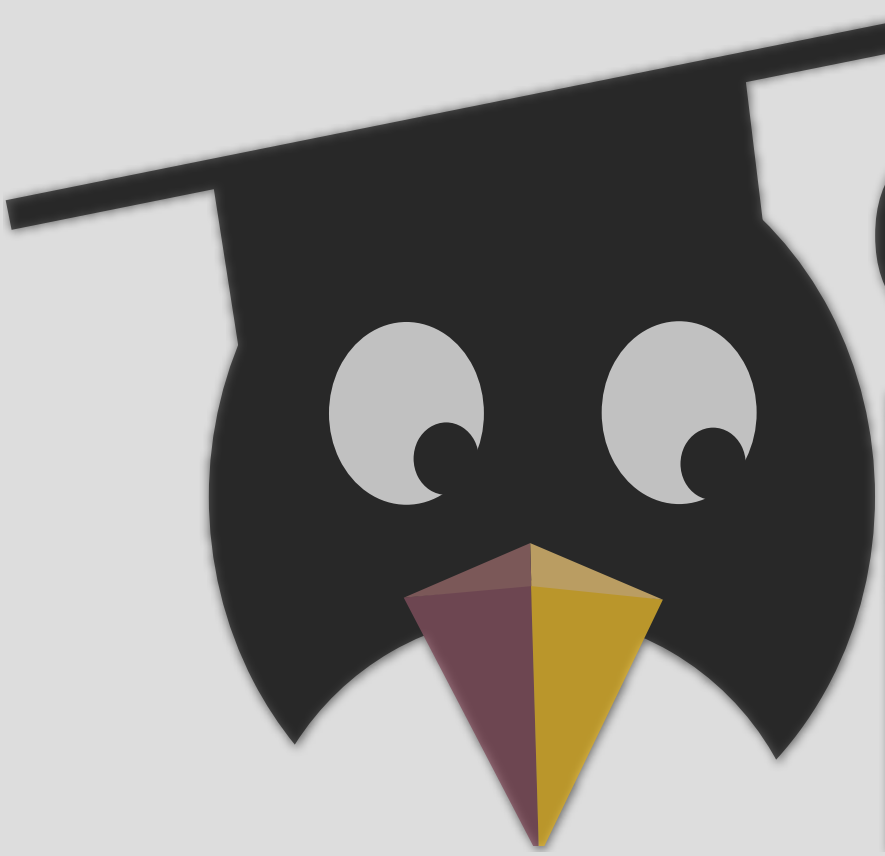

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ELISTAIR
THE TETHERED DRONE COMPANY

Sylvain Pastor

Introduction to ROS2

What is ROS ?

ROS
Robot Operating System

ROS:

- **R**obot **O**perating **S**ystem
- ***Is NOT an operating system*** ☹
- ***Open-source*** robotics middleware suite
  - Frameworks for robot software development *(C, C++, Python, ...)*
    - Tools, Hardware abstraction, low-level device control, IPC, etc…
    - **Not** a real-time OS *(RTOS)*

History:

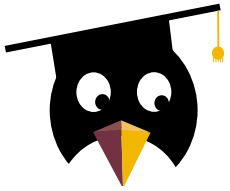
- Before 2007: The first pieces of what eventually would become ROS began coalescing at Stanford University
- 2007: Developed by Willow Garage for its PR2 robot
- Today: Used to develop industrial robots, UGV or UAV, etc.

ROS versions

Versions:

- **ROS 1:**
  - Initially created in 2007 by Willow Garage,
  - **2025 End Of Life**.

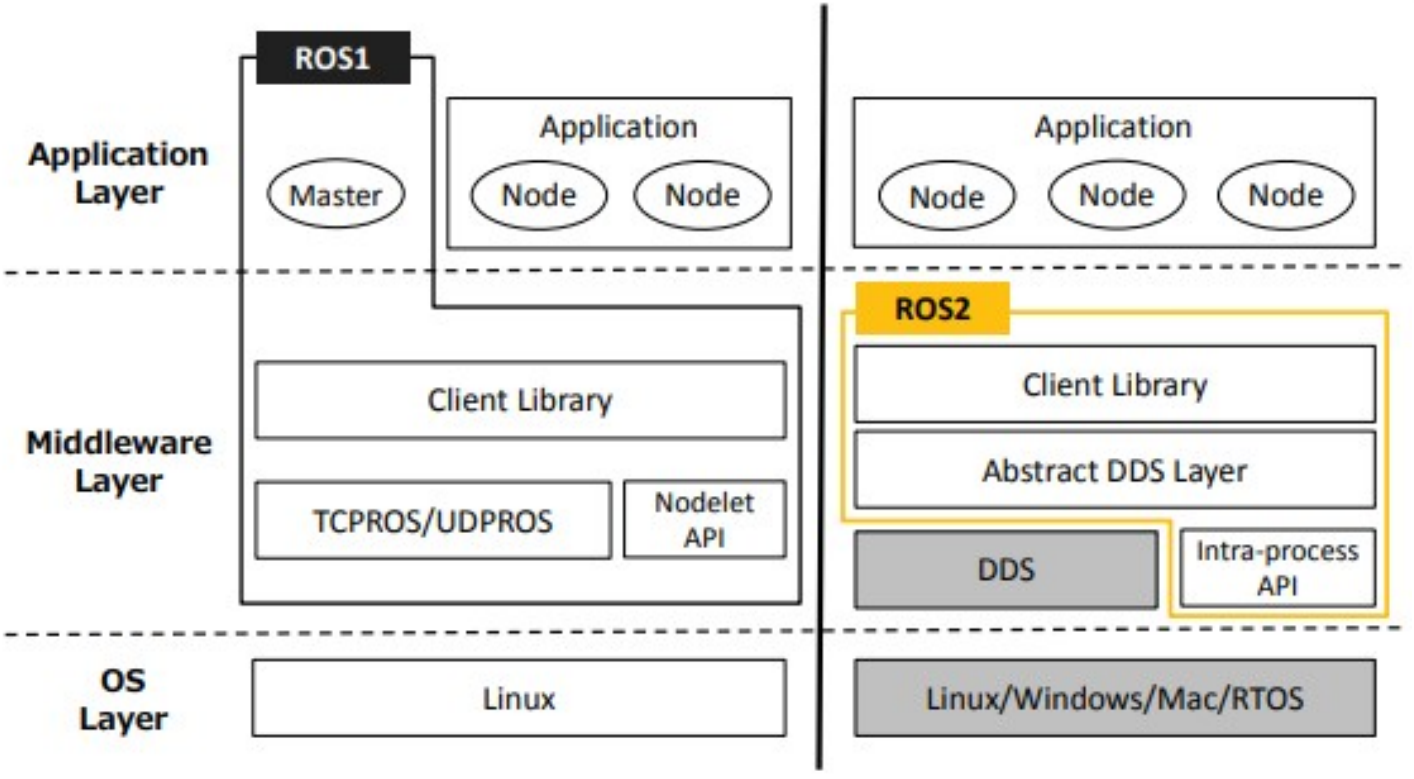
- **ROS 2:**
  - Many radical changes and would have made ROS 1 quite unstable,
  - ROS2 was developed from scratch and is a completely new ROS.



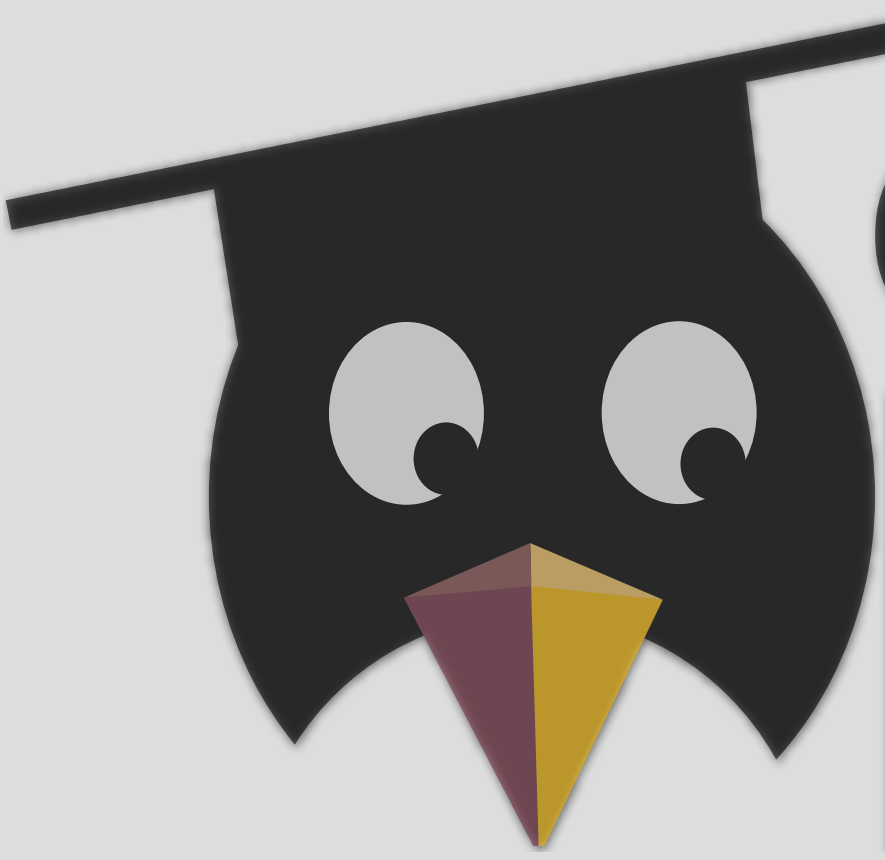
ROS versions

ROS
Robot Operating System

"Many radical changes"



ROS1 / ROS2 architecture



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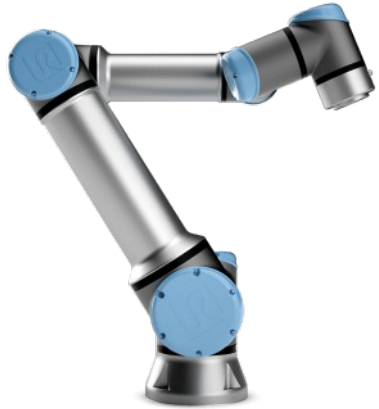
The main basics

ROS2

ROS Definitions

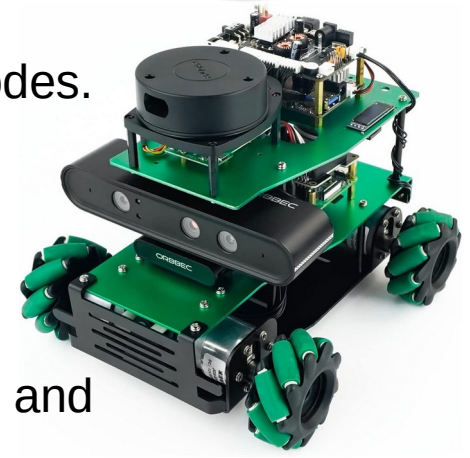
Node:

- Nodes are the fundamental building blocks of a ROS2 system.
- A node is “essentially a single process” that performs computations.
- Each node is designed to perform a specific task within a robotic system, such as controlling a motor, processing sensor data, or communicating with other nodes.
- This modular approach allows the development of complex robotic systems by combining multiple small, reusable and independent nodes.

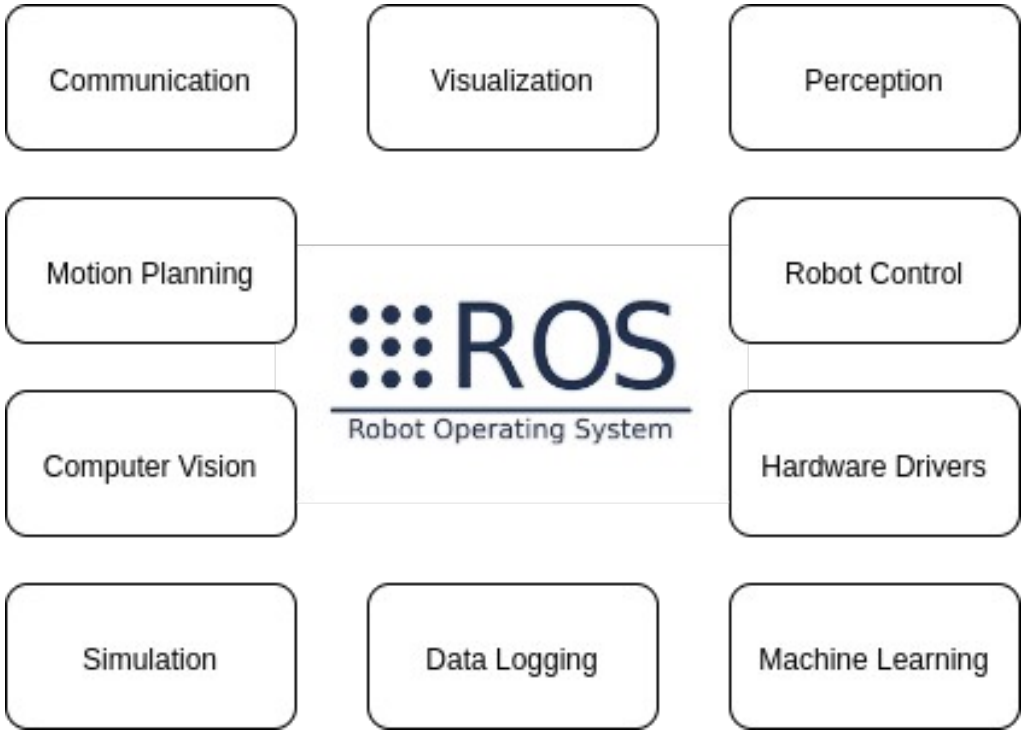


Package:

- A package can include multiple nodes and other resources.
- Packages are designed to be reusable and modular, containing everything needed to run nodes, such as source code, launch files, and configuration files.

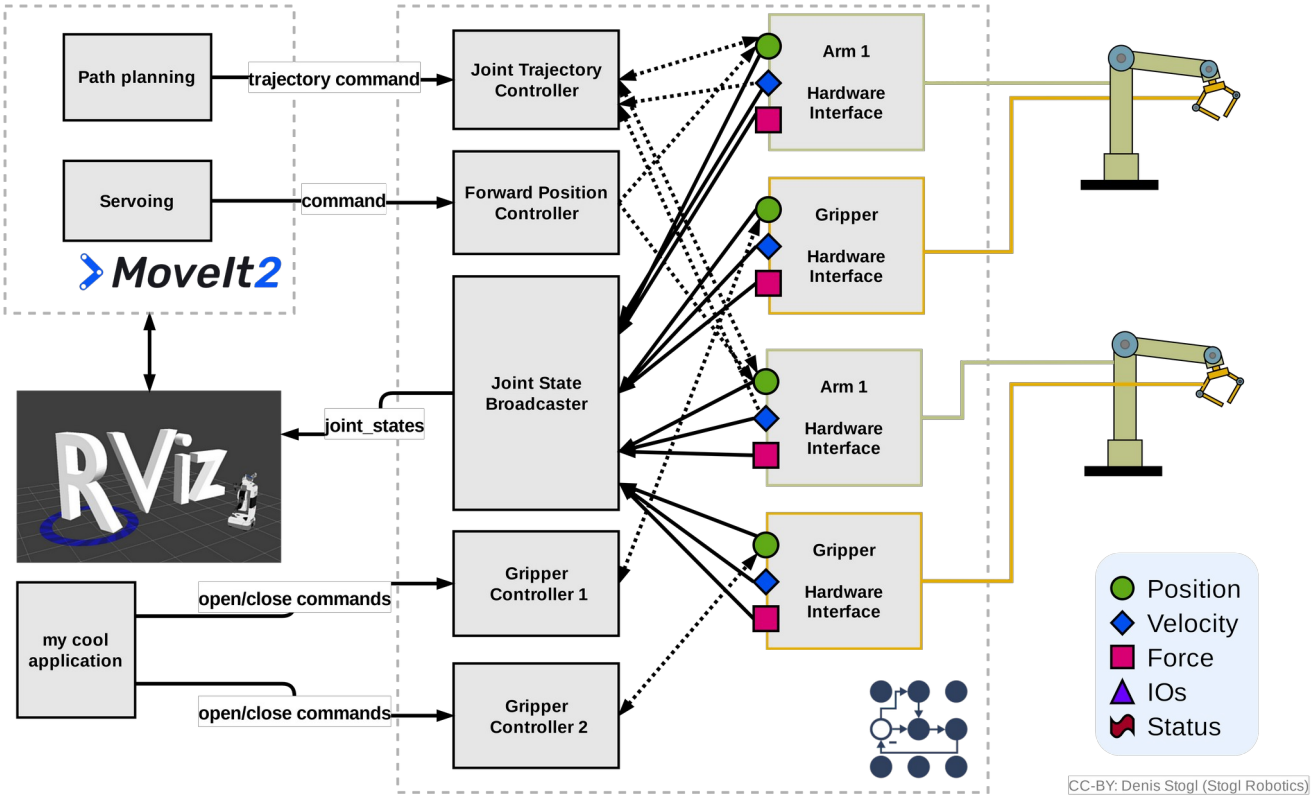


ROS packages



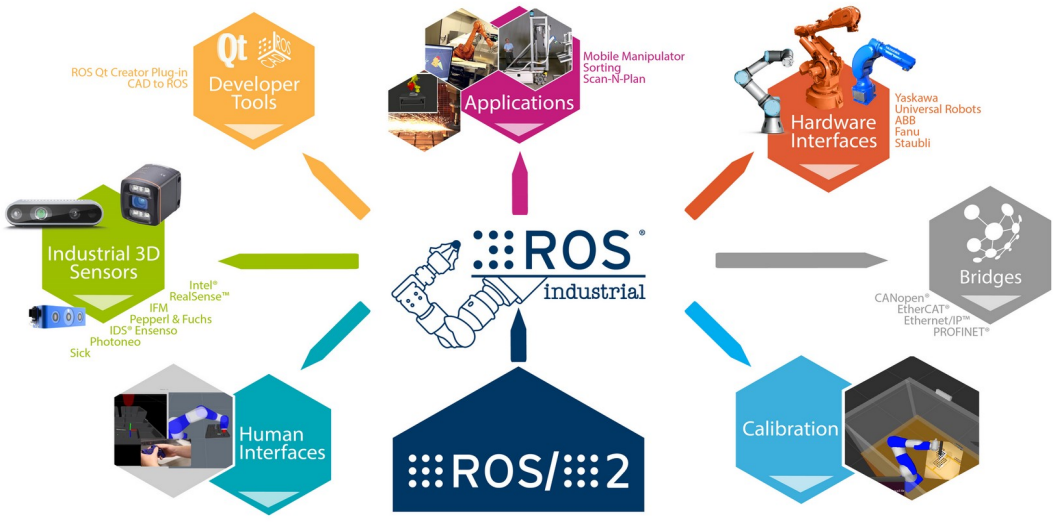
https://index.ros.org/packages/

ROS packages

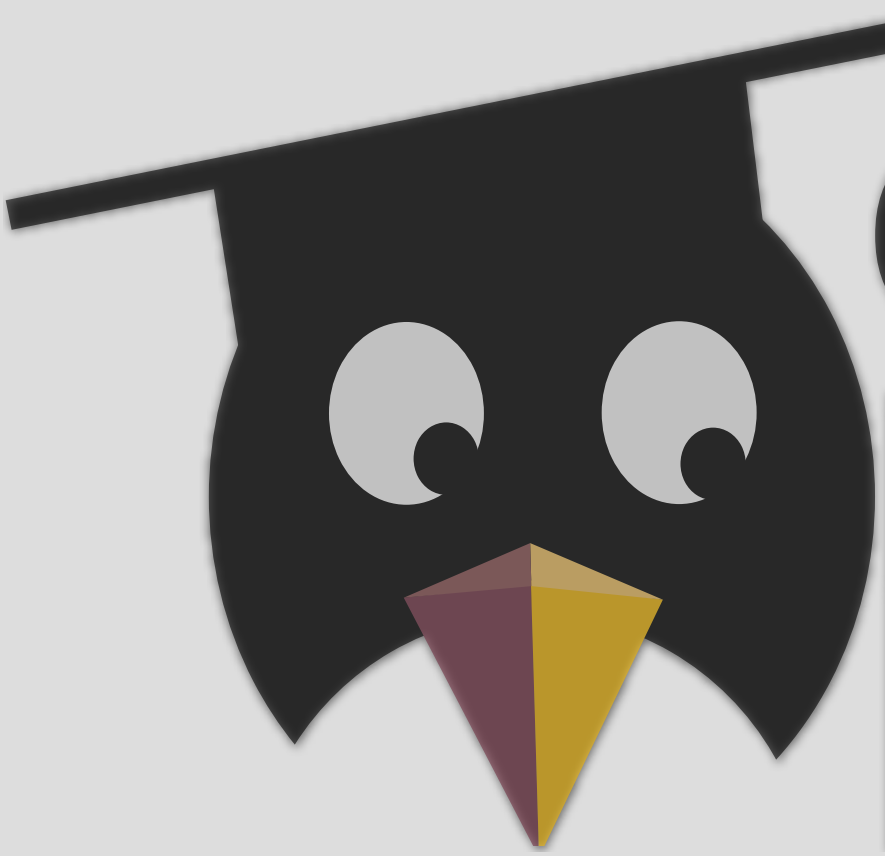


Example application by combining different packages

ROS Industrial



ROS-Industrial is an open-source project that extends the advanced capabilities of ROS to manufacturing automation and robotics.



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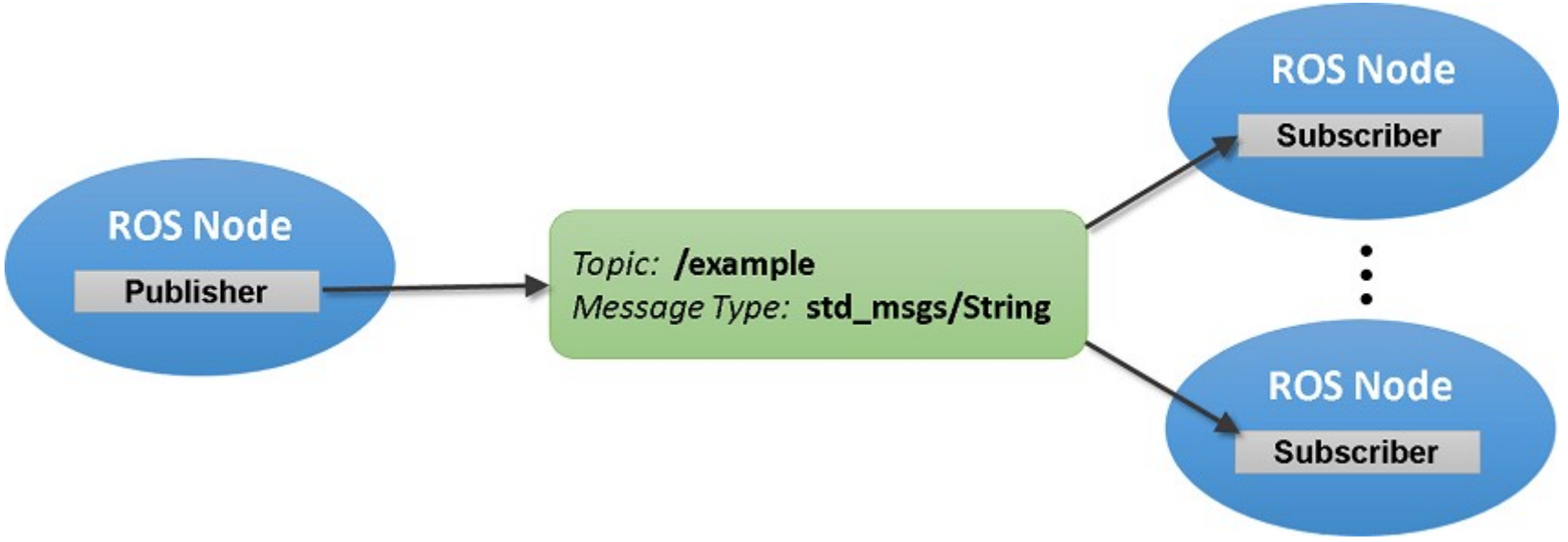
ROS IPC

”Key points” for building your ROS system

ROS2

ROS intercommunication

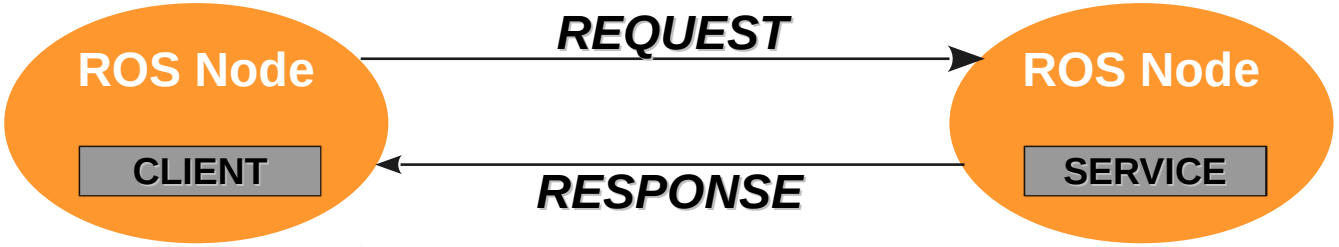
Publication/Subscription mechanism

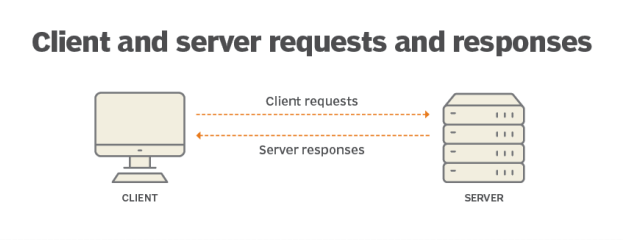


- A node **publishes** a string data in a topic named “/example”,
- Nodes **subscribe** to the “/example” topic to receive string data.

ROS intercommunication

Service (Request/Response) mechanism





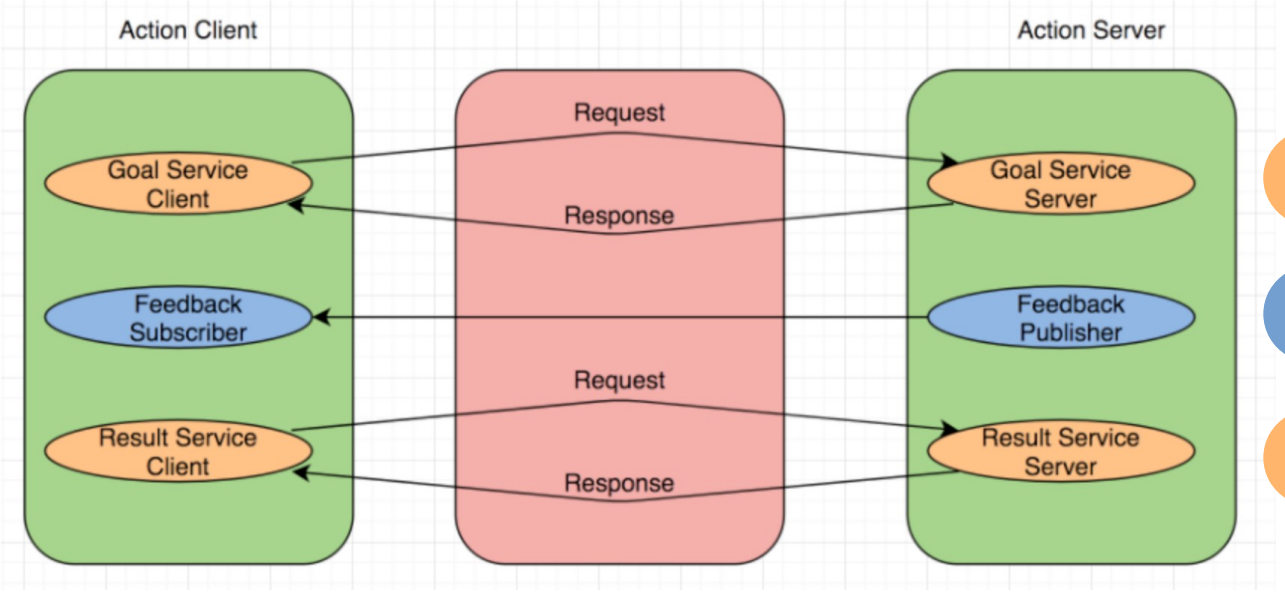
- The client node sends a request to the service,
- The service node returns a response to the client node.

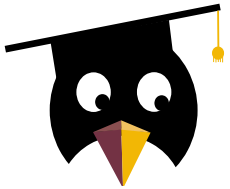
ROS intercommunication

Publisher/Subscriber + Service = ????

ROS intercommunication

Goal mechanism





ROS intercommunication

2

Distributed applications