

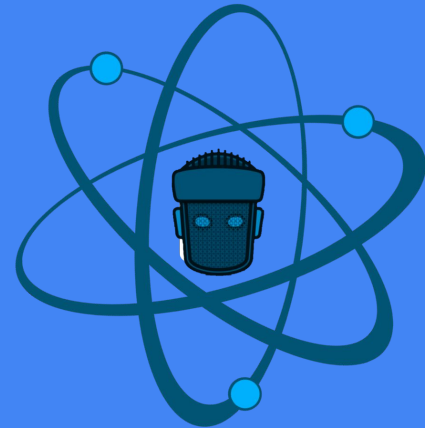
Importance of



and How to get started with it

By A.T.O.M

*Advanced Techtronix
Organization of MAIT*



Problems faced in robotics

- Many different subsystems are required to work in unison
- Each subsystem adds complexity, time & investment to projects
- Different hardware components all require different interfaces.



ROS to the Rescue 💪



Okay, But what is ROS?

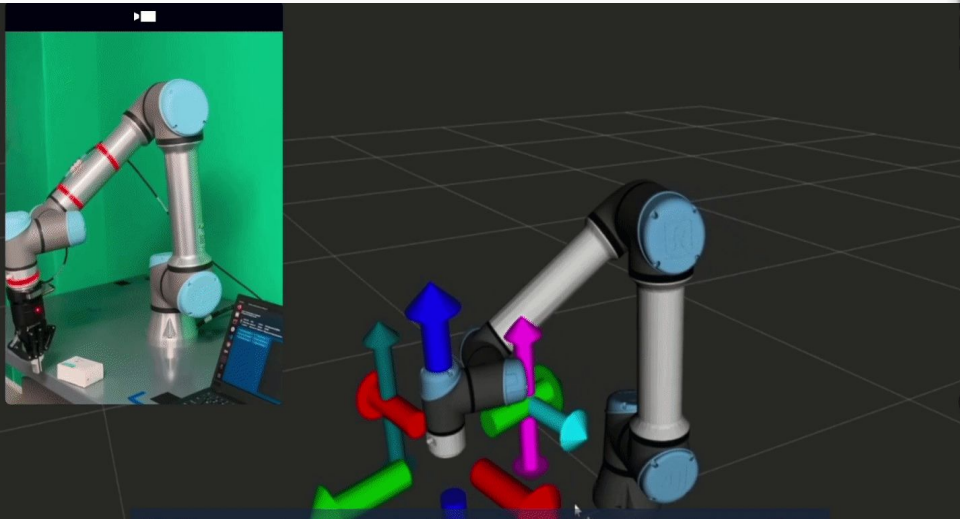
- Stands for Robot Operating System
- It is a set of Open Source software libraries & tools that help you build robot applications.
- It is NOT actually an Operating System but rather a middleware that is generally used with Ubuntu OS.



Advantages of ROS



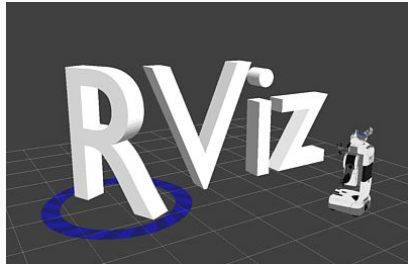
Inbuilt Packages for literally everything



- It has many software packages for different robotics hardware like realsense cameras, LIDARs etc.
- Provides tools like ROS Navigation Stack, Moveit etc. for easier implementation of various robotics algorithms like path planning, localization, motion planning etc.



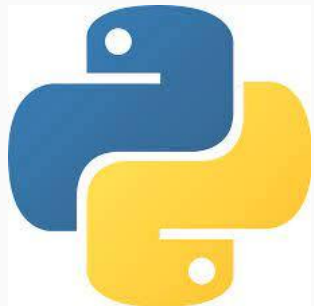
Great Simulation Tools



- Provides tools like simulation tools like Gazebo with physics simulation & high rendering capabilities
- Provides visualization tools like RVIZ for easier visualization of sensor data & view the world from robot's perspective



Language Agnostic



- Provides client libraries for like roscpp, rospy, rclpy for languages like C/C++, python etc.
- There are also many third-party client libraries for other languages like JS, Rust that are not directly maintained by ROS community



ROS IS FREEEEEE

- ROS is Open Source so, it is **COMPLETELY FREE TO USE.**



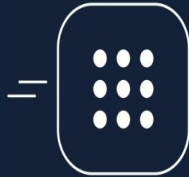
- The FREE also stands for **FREEDOM.**
- Online ROS community is welcoming & really helpful



Flexible & Versatile Architecture

- It's very Lightweight & can be used on Single Board Computers like the Raspberry Pi.
- Provides a distributed architecture in the form of nodes that are portable. This also allows for fleet management
- Is highly MODULAR and PORTABLE.

Stereo Depth



ROS used in Industries

Lets see how ROS works...

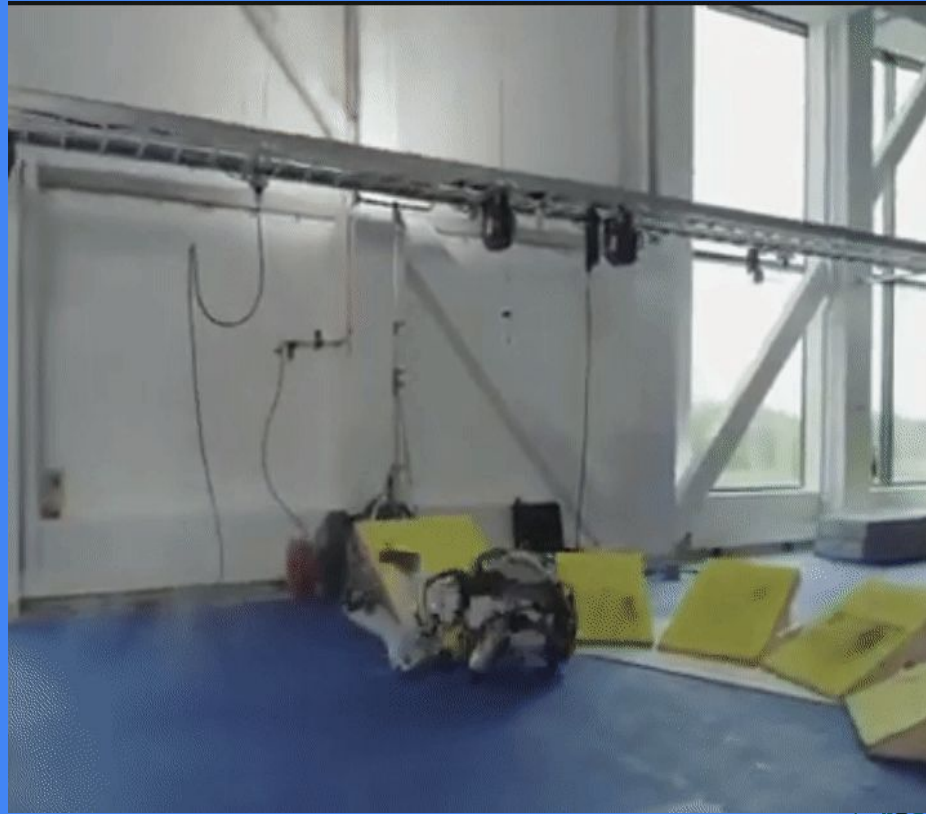
What is simulation based robotics development?



With Simulation

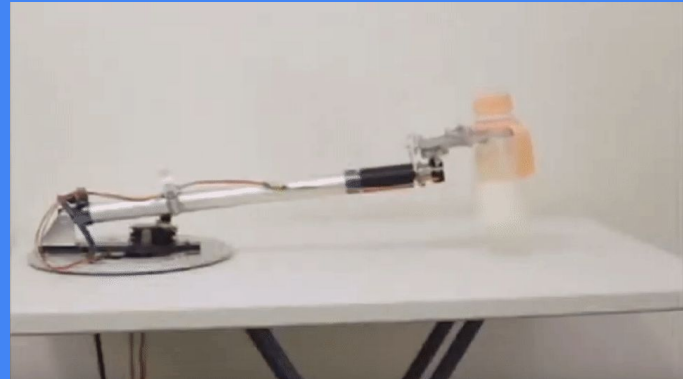


Without Simulation

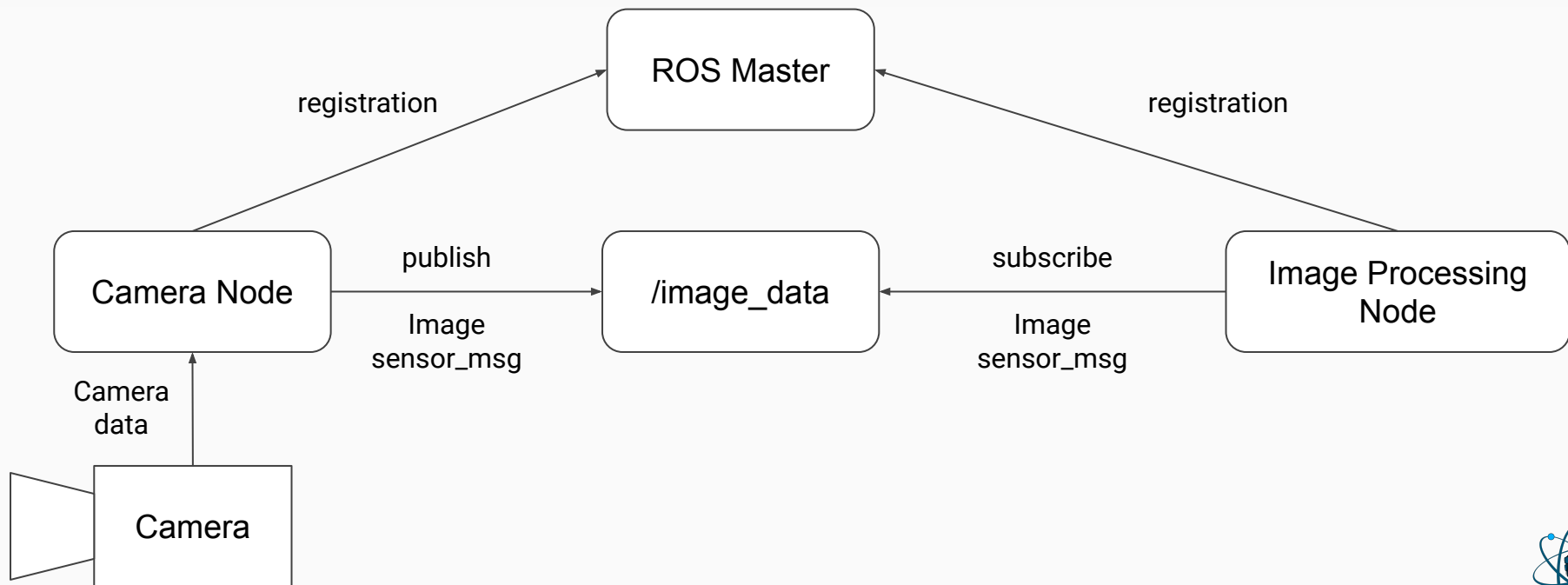


Advantages of Simulation Robotics

- Proof of concept and proof of design
- Reduce integral cost
- Help multiple people to work on robotics projects even in absence of hardware
- Prevents damages to robot as well as surroundings



ROS Architecture



ROS Terminologies

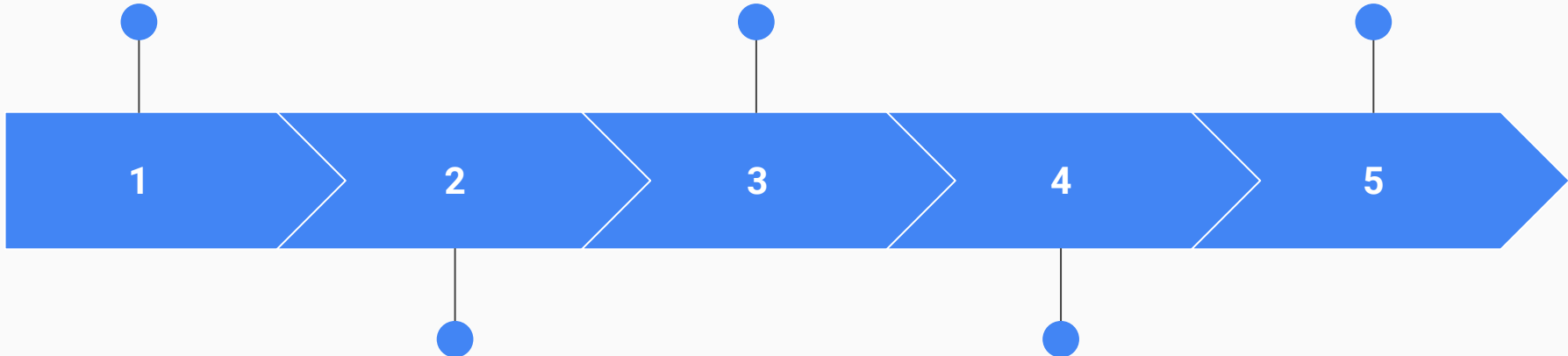
- ROS workspace
- Catkin
- ROS packages
- ROS nodes
- ROS Master
- ROS topics
- ROS messages
- ROS launch files



Create CAD design for
the Robot model

Create different software
stacks/packages for the
robot using ROS

Fabricate the robot
& bring it to life



Simulate the robot
model in a simulator like
Gazebo, CoppeliaSim

Develop electronics,
sensor systems &
hardware interfaces of
the robot



Next steps

Install Ubuntu

Install ROS on Ubuntu

Create a basic project on ROS

