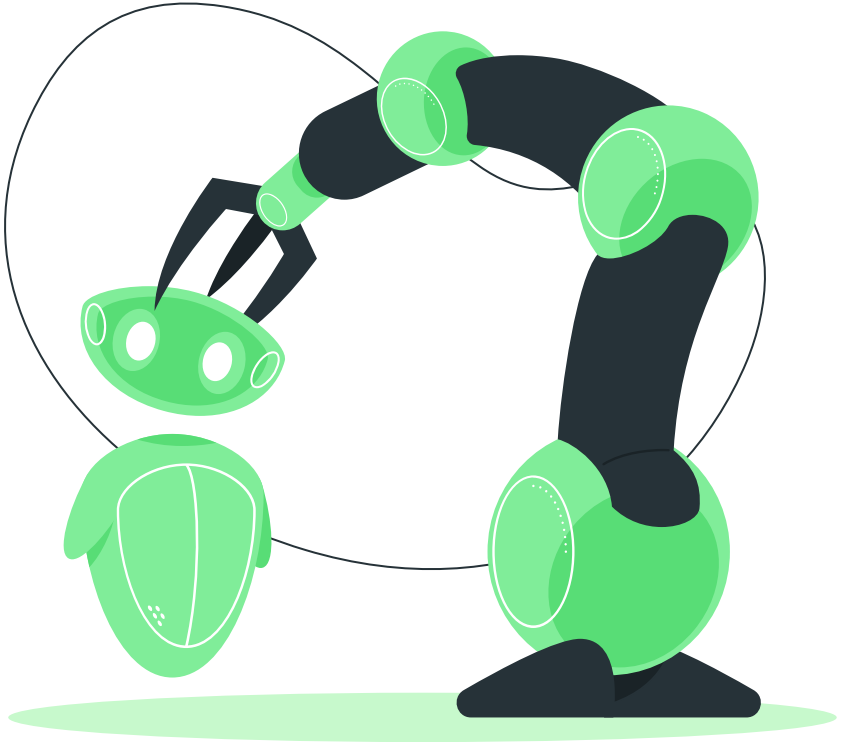
ROS

Robot Operating System



Alex Goldman
Developer Evangelist - Startup Candidate

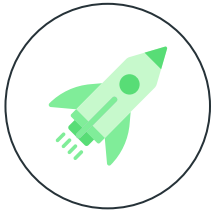
Hi, I'm Alex

Roboticist

M.S. Robotics & Autonomous Systems from ASU
B.S.E Mechanical Engineering from University of Michigan

Denver, Colorado

Live In Denver with Wife (Anna), Dog (Olive), & 2 Cats (Zev & Namira)



Startup Founder

Founded 3 Startups,
Worked at 2 Startups,
& Led an Internal Startup

Scuba Instructor

300+ Dives around the World, Proposed Underwater

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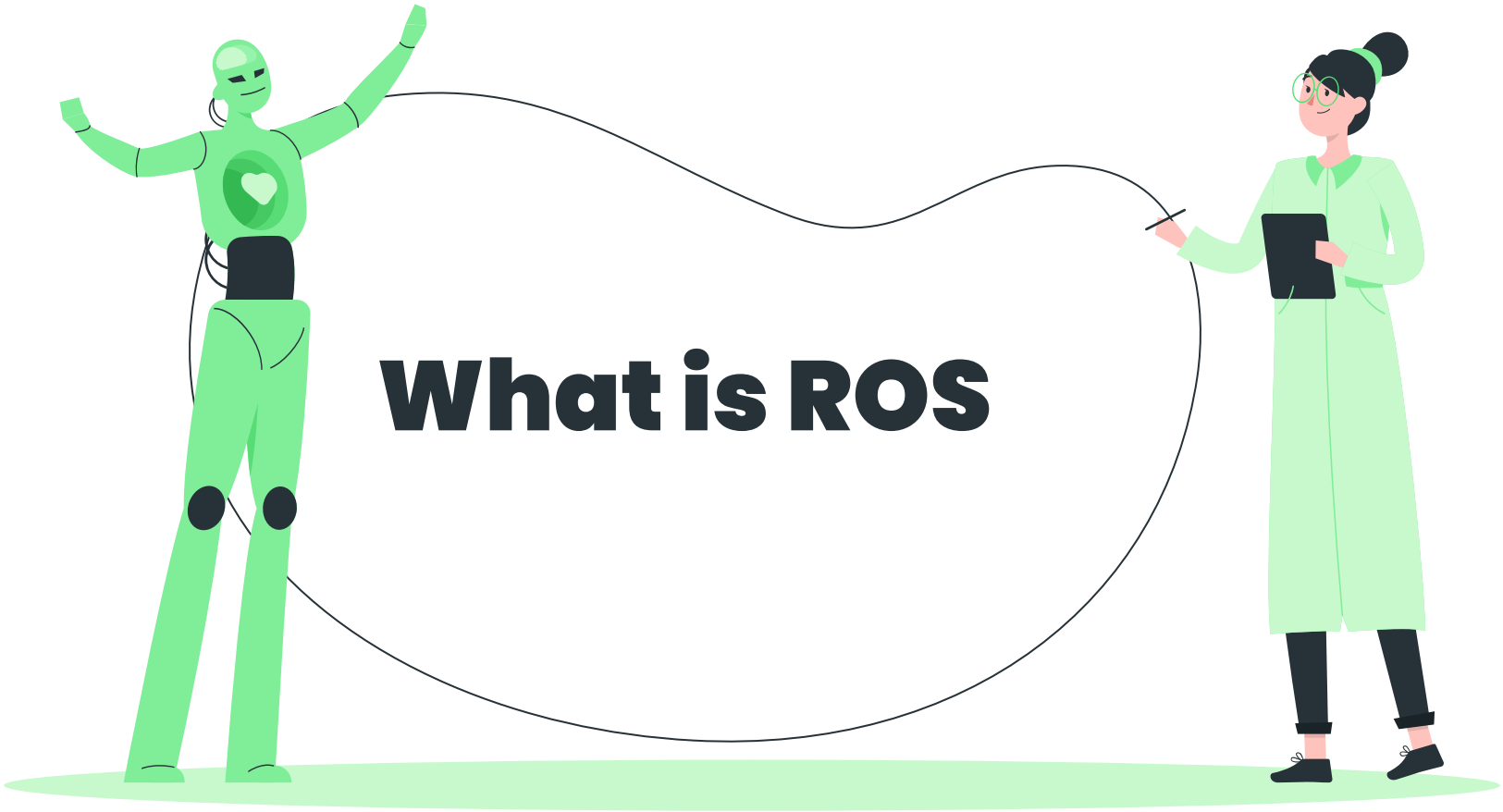
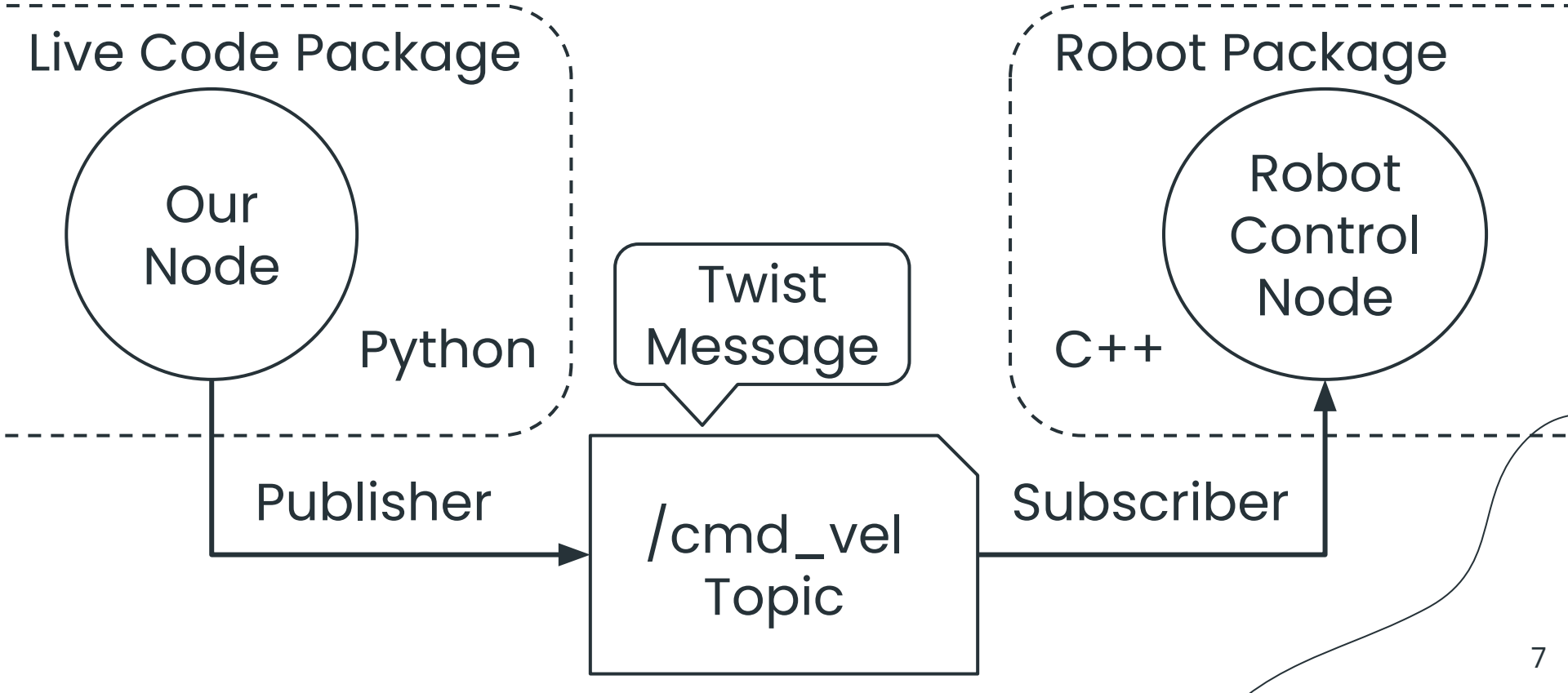

What is ROS

ROS is NOT an Operating System

ROS Concepts

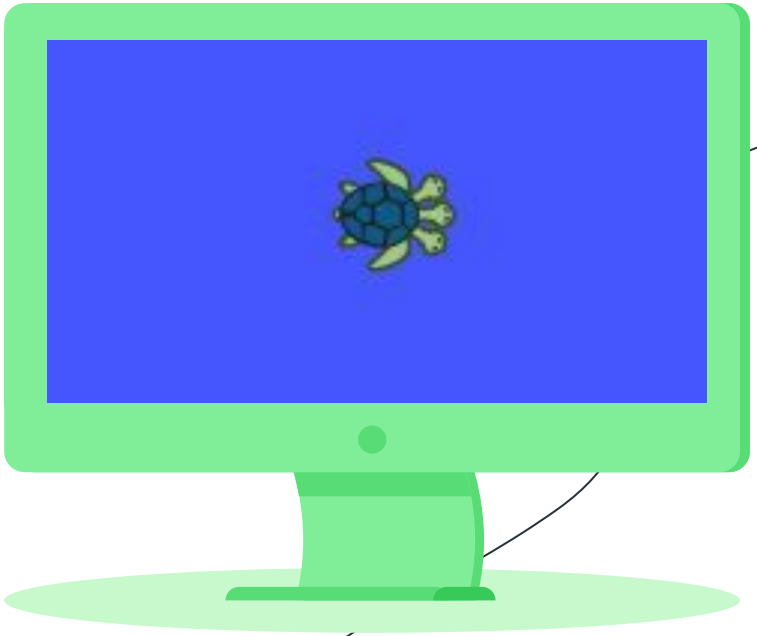
- **Client Libraries** - C++ & Python
- **Packages** - Organizing Unit of Software
- **Nodes** - Runtime Processes
- **Messages** - Communication Data Structure
- **Topics** - Pub/Sub Message Routing
- **Services** - Request/Reply Message Routing

Live Code Example



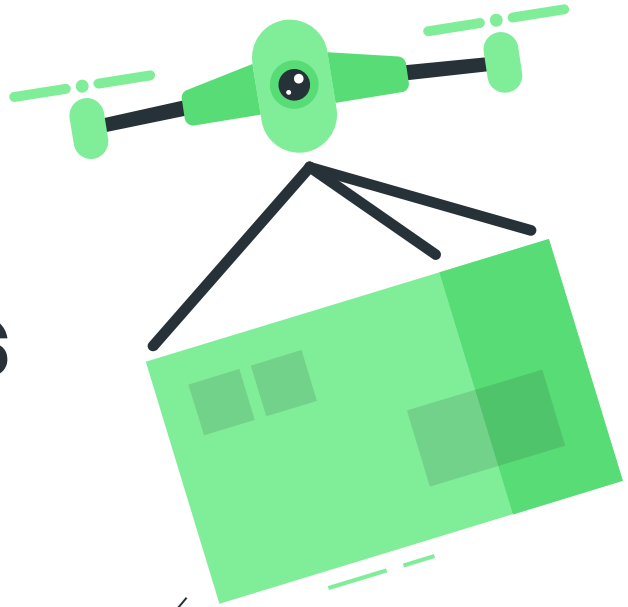
Live Coding Demo

Moving Turtles

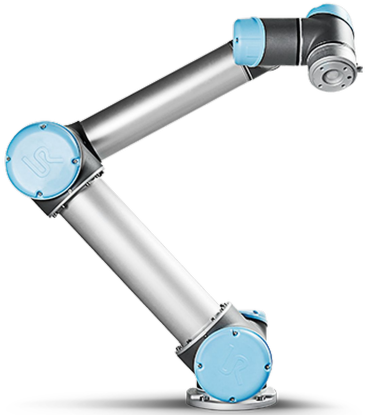


Why ROS Matters

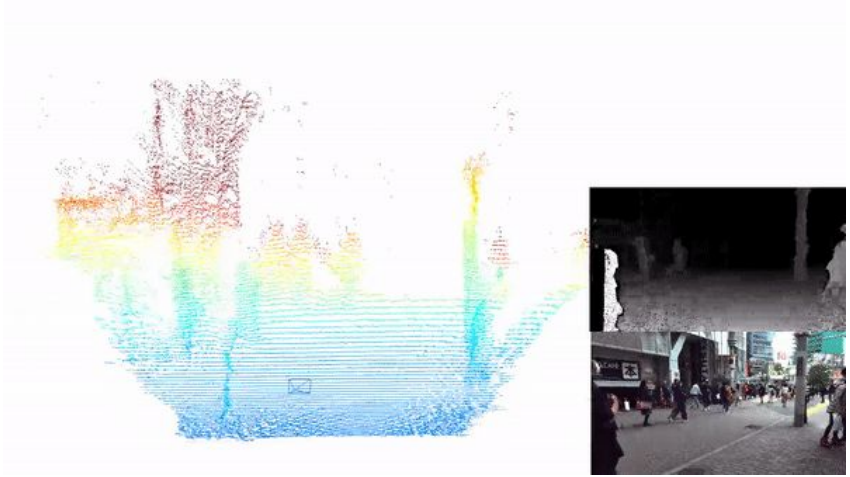
- Robots
- Sensors
- Software



Robots

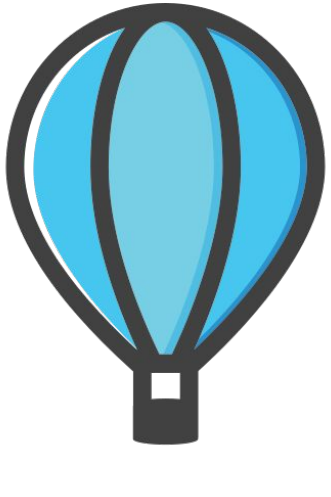


Sensors



Software Ecosystem

MoveIt

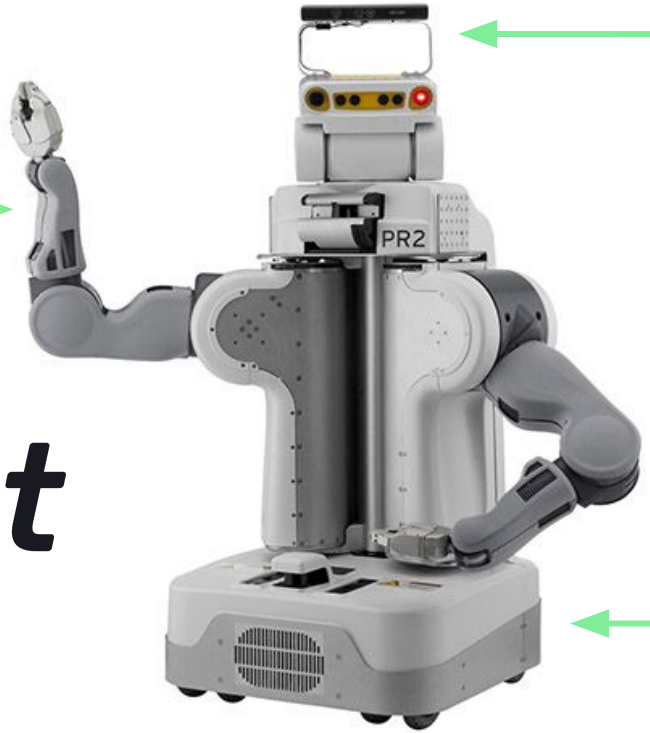


OpenCV

PX4 autopilot

NAV 2

Putting it All Together



MoveIt

OpenCV

NAV2

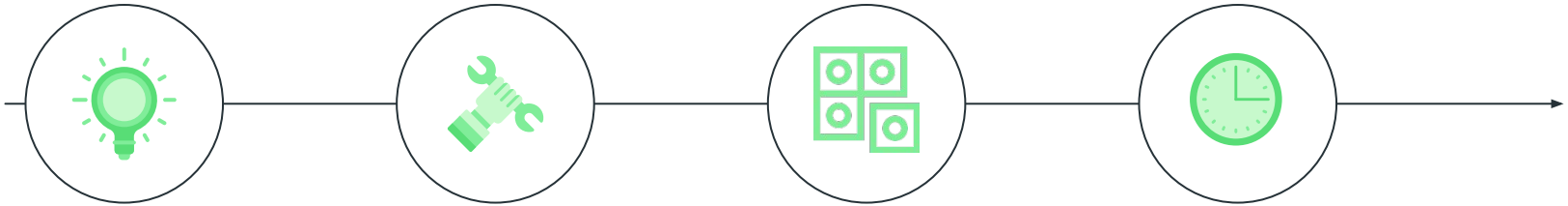
Benefits for Startups (or anyone)

Leverage Prior Work

Use working & supported open source technology

Interchangeable Systems

Upgrade and change components as needed



Hardware Agnostics

Use commercial hardware or build your own

Time to Market

Get to market quicker and for less cost

Questions?

https://github.com/auman66/live_code_interview

Auman66@gmail.com

Sources and credits are on the following slides

Sources

- ROS Concepts Slide
  - https://www.ros.org/
  - http://wiki.ros.org/ROS/Concepts
- Robots Slide (left to right, top to bottom)
  - Turtlebot 3 Burger - https://emanual.robotis.com/docs/en/platform/turtlebot3/overview/
  - DJI Maveric - https://www.dji.com/mavic-3
  - UR5e - https://www.universal-robots.com/products/ur5-robot
  - uDrone - https://web.asu.edu/jdas/home
  - ANYmal - https://www.anybotics.com/anymal-autonomous-legged-robot/
- Sensors Slide (left to right)
  - GPS - http://www.holybro.com/product/pixhawk-4-gps-module/
  - Stereolabs Zed & GIF - https://www.stereolabs.com/zed-2/
  - Velodine Lidar - https://velodynelidar.com/products/puck/
- Software Ecosystem Slide
  - https://moveit.ros.org/
  - https://opencv.org/
  - https://px4.io/
  - https://navigation.ros.org/
- Putting it All Together Slide
  - PR2 - https://robots.ieee.org/robots/pr2/

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