

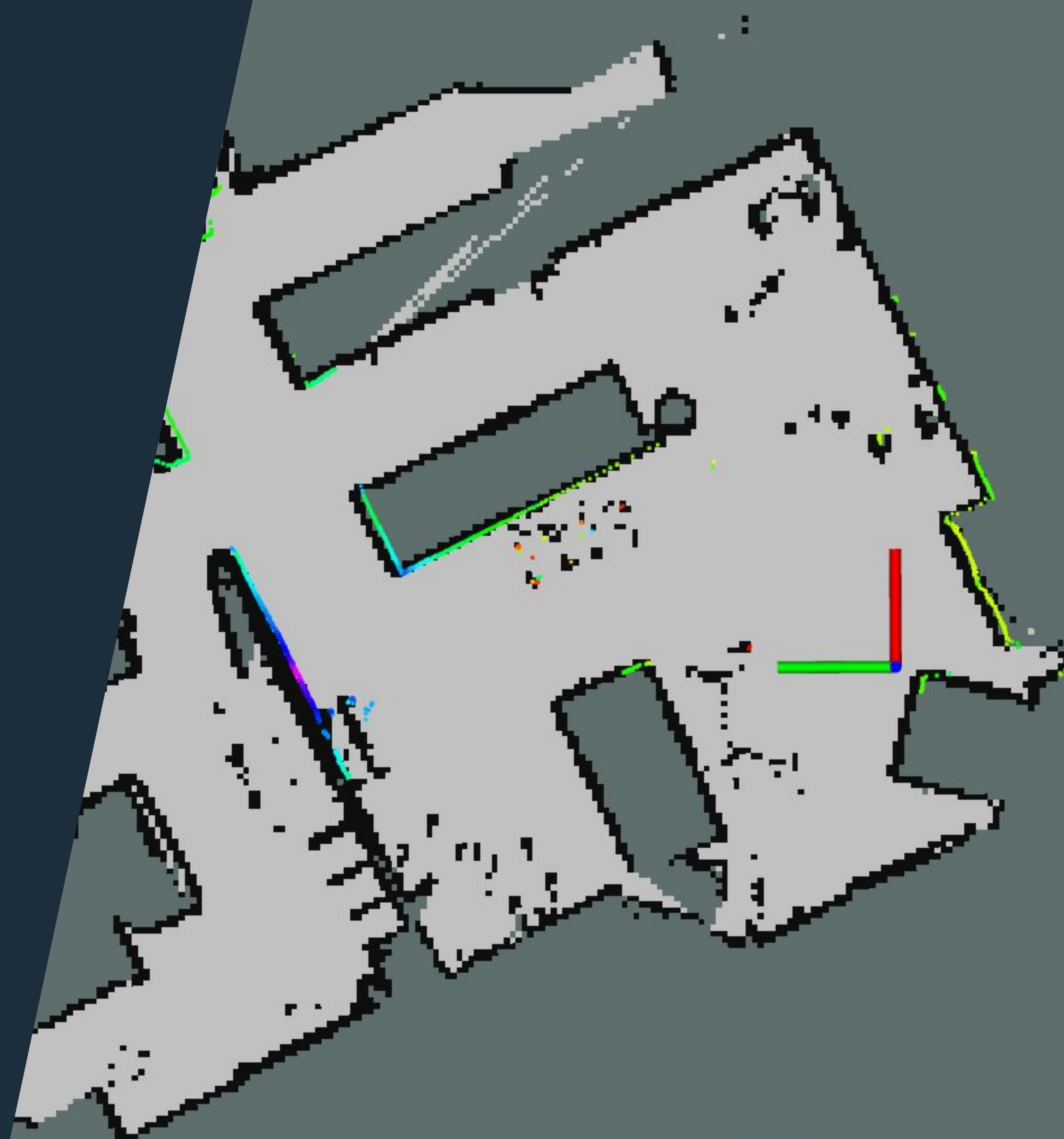
# ROS2 Navigation

The leading robot navigation framework

Steve Macenski

Open-Source Robotics - Lead Engineering

Samsung Research America





# WhoAmI

Open Source Robotics Lead @ Samsung Research

- Develop and Maintain 50+ ROS 1 and ROS 2 packages
- ROS2 Technical Steering Committee & Navigation Project Lead

Former Robotics Lead @ Simbe Robotics

I think about production navigation systems; perception, SLAM, planning, and sensor fusion



ROSCon 2018

ROSCon 2019



TechCrunch Sessions 2020



NASA Asteroid Redirect Mission



National Geographic



## OVERVIEW

- ROS
- Navigation2
- Projects
- Resources



# ROS2

## A Collaborative Production-Ready Robotics Software Framework

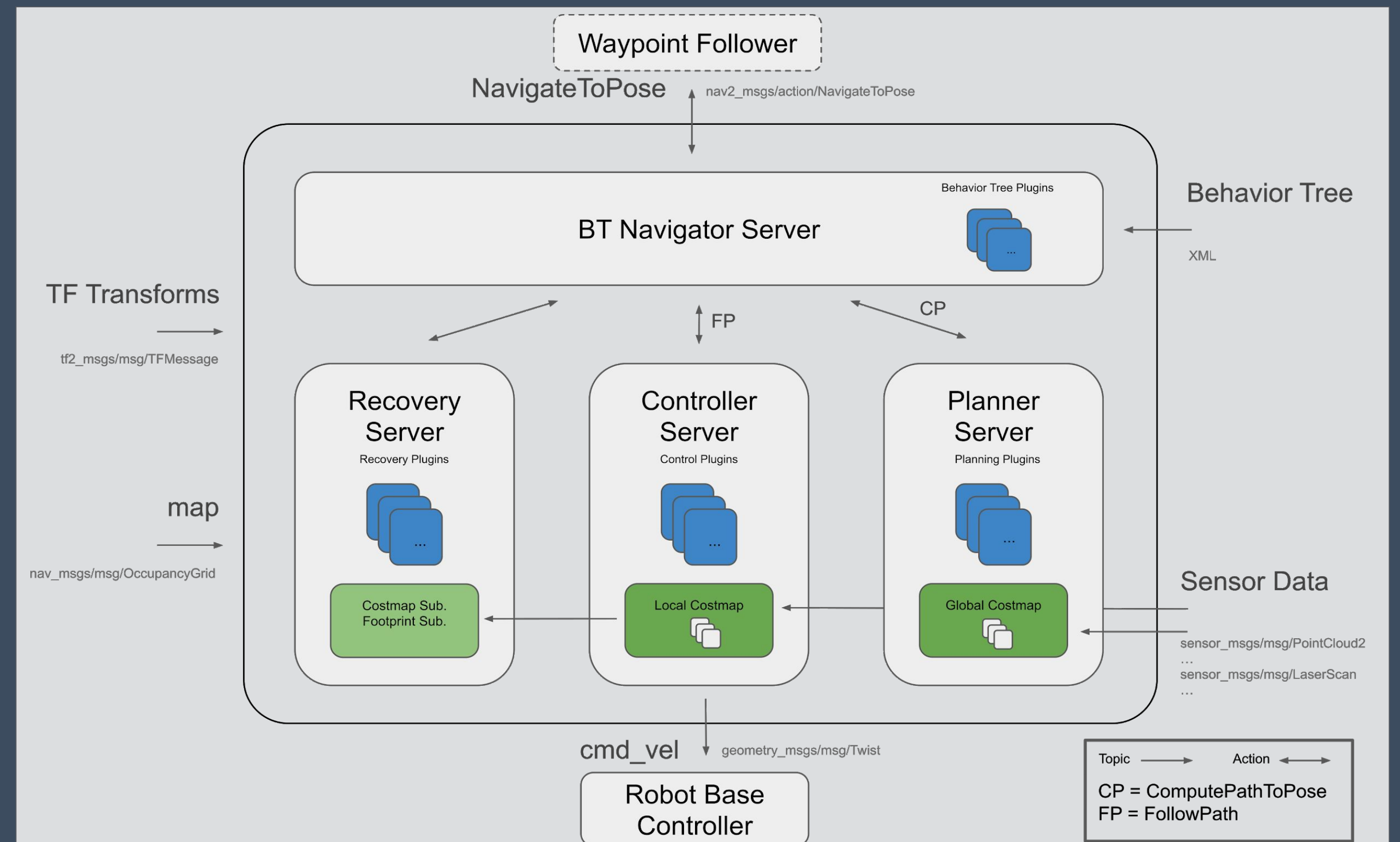
- Inter and Intra-Process Communications
- Well designed interfaces for modularity
- Widespread adoption in industry / academia
- Extensive ecosystem of software and tooling
- Patterns for designing systems
- Embedded, multi-platform, real-time compliant
- Robot algorithms; navigation, manipulation, autonomous cars



# Navigation2

## World's Leading Autonomous Mobile Robot Navigation Framework

- Behavior Tree Navigation
- Independent Modular Servers
- Sensor processing for collision avoidance
- Local trajectory and path planner plugins
- Recovery behaviors
- Positioning system agnostic





# Navigation2 Demos

# Marathon Experiments

- 40 km of autonomous navigation
- 2 industrial robots
- Human-filled environment

<https://arxiv.org/abs/2003.00368>



# Projects

- 1. Configuration Assistant Tool
  - GUI for aiding in complex configuration process
- 2. Navigation Re-branding and Website
  - Develop new logo, branding, and website
- 3. New Planner and Controller Algorithms (**open for other algorithm proposals**)
  - Pick 1: iLQR, MPC, OMPL, Hybrid-A\*, Route planner, D\* or variant, ...
- 4. Port Grid Maps to ROS2 & Design Environment Model
  - Port grid\_maps to ROS2 and design base-costmap replacement
- 5. Advanced Navigation Testing Framework
  - Implement modern testing framework and increase test coverage
- 6. 2D/3D Localization Improvements
  - Replace or substantially improve on localizers
- 7. Navigation Dynamic Obstacle Integration
  - Create integrations with machine learning tools and navigation



# Background - Who's Using it?





**GitHub Organization:** <https://github.com/ros2.git>

**ROS2 Documentation:** <https://index.ros.org/doc/ros2>

**Navigation2 Documentation:** <https://navigation.ros.org/>

**Navigation Slack:** [navigation2.slack.com](https://navigation2.slack.com)

**Questions?**

**Feel free to reach out to us on ROS Discourse or Slack.**



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