INTRODUCTION TO ROS2

Building the Future of Robotics software

By Victoria Rotich

What's in store?

1. What is ROS 2?
2. Why ROS 2 (and not ROS 1)?
3. Why ROS 2 Humble Hawksbill?
4. Core Concepts of ROS2
5. Example Workflow
6. ROS 2 Distributions
7. Tools with ROS2 Humble
8. Why start with Humble as a Beginner?
9. Closing & Next Steps

What is

ROS 2 is:

- ROS = Robot Operating System (middleware, not a real OS)
- Provides tools, libraries and conventions for robotics development

ROS 2:

- **Supports building complex robotics systems that can:**

1. **Sense (perceive the environment)**
2. **Plan (decide what to do)**
3. **Act (control motors, arms, wheels, etc)**

- **Successor to ROS1 → designed for modern robotics needs**

vs

Why ROS2 ?

- ROS 1 limitations:

❌ No real-time support (Reached EOL in May 2025)

❌ Weak multi-robot support

❌ Security issues

Why ROS2 ?

- ROS 2 improvements:

✅ Real-time & distributed communication

✅ DDS-based → scalable, reliable messaging

✅ Cross-platform (Linux, Windows, macOS)

✅ Industry-ready

Why ROS 2 Humble Hawksbill?

ROS 2 Humble Hawksbill

- **Released May 23, 2022 (World Turtle Day 🐢)**
- **Long-Term Support (LTS) until May 2027**
- **Compatible with Ubuntu 22.04 LTS**

Q: ***Why do you think compatibility matters?***

Why Compatibility Matters in ROS 2

OS & ROS2 Distro Pairing

Each ROS 2 release is built and tested against a specific Ubuntu LTS.

Example:

- **ROS 2 Humble (2022) → Ubuntu 22.04 LTS**
- **ROS 2 Jazzy (2024) → Ubuntu 24.04 LTS**

Why Compatibility Matters in ROS 2

Dependency Management

- ROS relies on thousands of system libraries (Python, C++, DDS).
- These evolve between Ubuntu versions.
- Using mismatched versions breaks builds, causes missing APIs, or runtime crashes.

Why Compatibility Matters in ROS 2

Long-Term Maintenance

- Humble + Ubuntu 22.04 = both supported until 2027.
- Jazzy + Ubuntu 24.04 = supported until 2029, but ONLY if you upgrade your OS.

Why Compatibility Matters in ROS 2

Community & Packages

- Most third-party packages target the official Ubuntu pairing.
- Straying from this pairing → you’re mostly on your own.

Bottom line:

Use the ROS 2 distribution that matches your Ubuntu LTS.

That’s why Humble is the right choice for Ubuntu 22.04 users.

ROS 2 Humble Hawksbill

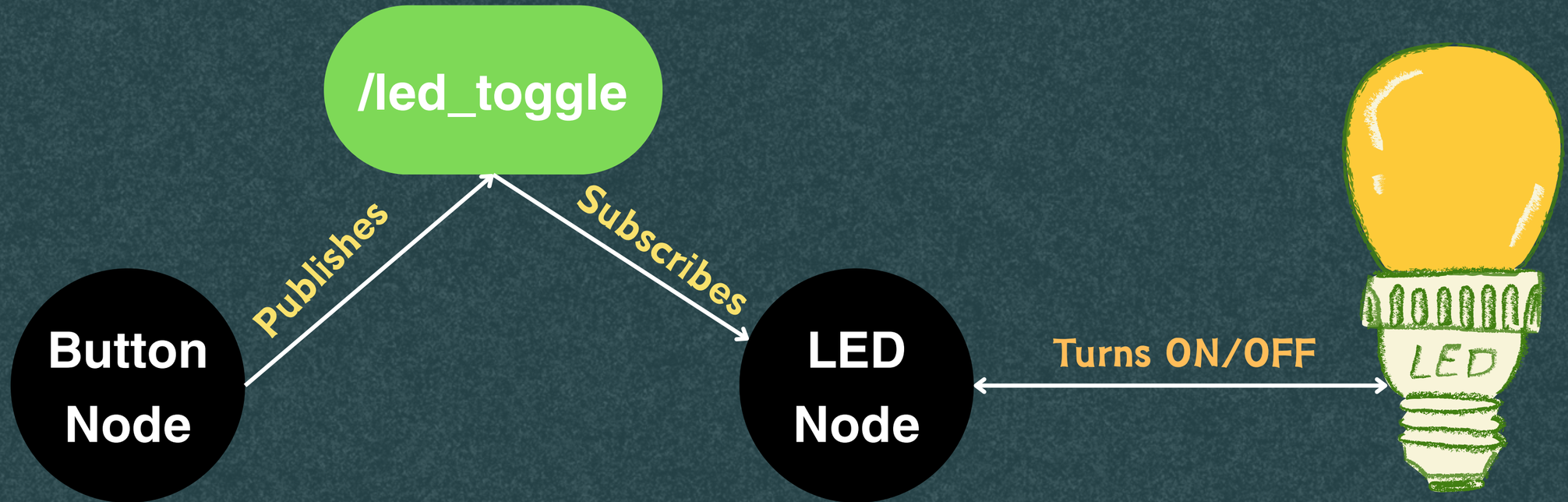
✅ Stable & reliable for long-term projects
✅ Widely adopted in research & industry
✅ Large community + extensive tutorials
✅ Modern features: real-time communication, better security, improved simulation tools

Core Concepts of ROS2

- Node → Program that does one task
- Topic → Channel for communication
- Message → Data exchanged between nodes
- Service → Request/Response
- Action → Long tasks with feedback
- Parameter → Node configuration values
- Launch File → Start multiple nodes easily

Example Workflow

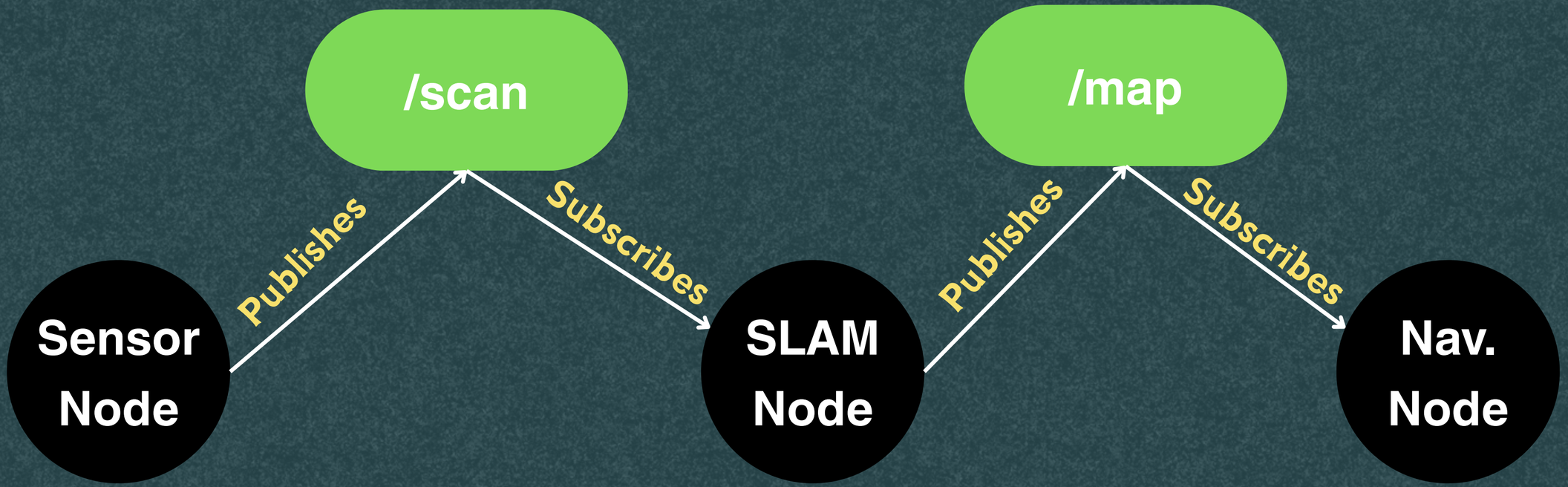
Button controlled LED



Sends “ON” or “OFF” message

Example Workflow

Robot with LiDAR



Other ROS 2 Distributions

23/5/2025 → 12/2026

23/5/2024 → 5/2029

23/5/2023 → 4/12/2024

5/6/2020 → 20/6/2023

More Distributions...

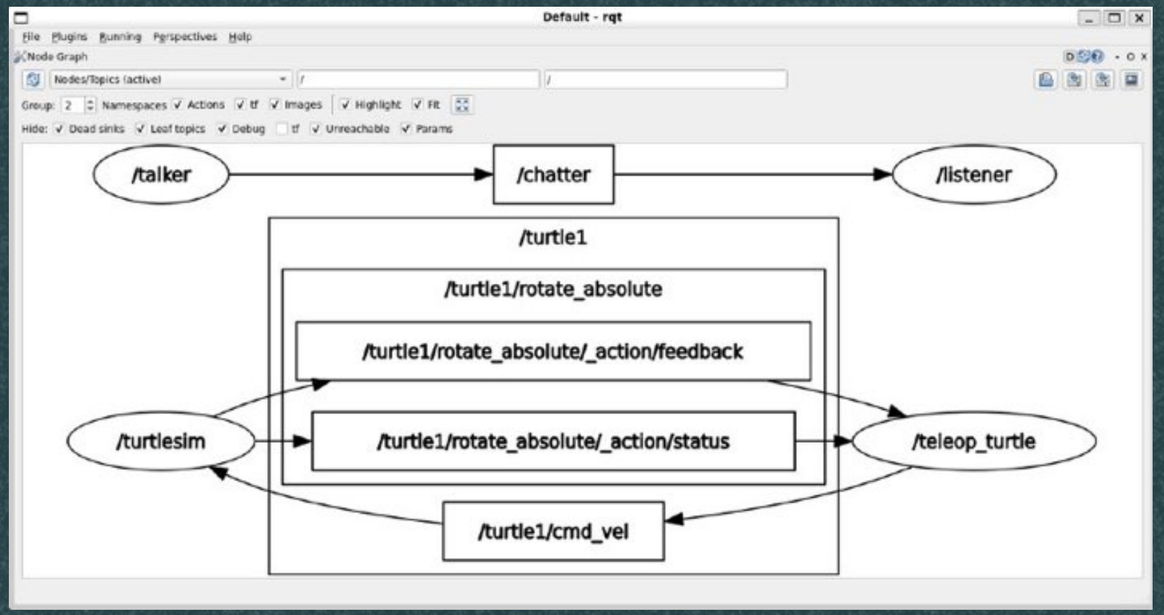
Tools with ROS2

Simulation

Visualization

Tools with ROS2

Navigation & Path Planning



Visualization, monitoring and Interaction

Why start with Humble?

- Long support window = reliable foundation
- Large community = easier learning
- Most tutorials, packages, and examples use Humble
- Balanced: stability + modern features

Closing

- ROS 2 = modern robotics framework
- Humble = best starting point (stable, LTS, widely supported)
- Learn the core concepts first
- Experiment with simulations (Gazebo, RViz)

🚀 Start building your own robotics applications

Resources

1. Introduction to ROS2 Blog post
2. ROS 2 Humble Installation Guide
3. Raspberry Pi Setup

So, what's next ?

1. **Install ROS 2 on your laptop**
- Start with ROS 2 Humble (Ubuntu 22.04 recommended).
- Follow the official installation guide.

2. Install ROS 2 on Raspberry Pi
- Great for hands-on robotics projects.
- Use Ubuntu Server (22.04 LTS) on Raspberry Pi.
- Keep it lightweight for sensors/actuators.

Session

THANK YOU