Lightning Introspection: Debugging ROS 2 Control with `pal_statistics`

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Duration

Lightning Talk (5 minutes)

Abstract ($\leq$100 words)

This lightning talk introduces the integration of `pal_statistics` into ROS 2 Control, enabling automatic introspection of controller inputs and outputs without additional user code. This feature simplifies debugging by making internal signals immediately available for visualization in tools such as PlotJuggler. We also highlight how `pal_statistics` can be used independently of ROS 2 Control, offering a consistent approach to introspection across ROS 2 nodes. A short demo illustrates a chainable controller computing the sum of two Fibonacci sequences while exposing intermediate states for real-time analysis.

Detailed Description (concise for lightning)

Debugging robotic controllers often requires access to intermediate values that are not exposed via standard command and state interfaces. Without introspection, developers spend valuable time adding custom debug outputs.

To solve this, `pal_statistics` provides a lightweight and efficient way to publish metrics in ROS 2. Recently, ROS 2 Control has integrated `pal_statistics` directly into its controller interface. This means any controller can automatically expose its internal computations (inputs, outputs, intermediate variables) without additional code from the user.

For developers, this translates into:

- Zero-effort introspection: controllers publish debug data out of the box.
- Seamless visualization: tools like PlotJuggler (since v3.10.11) automatically parse these metrics.
- Consistent workflow: `pal_statistics` can be reused independently in any ROS 2 node, ensuring a uniform debugging experience.

In this lightning talk, we briefly show a demo in `ros2_control_demos`: a chainable controller computing the sum of two Fibonacci sequences. While performing its task, the controller uses `pal_statistics` to expose intermediate results, which can be visualized in real time.

Audience Takeaways

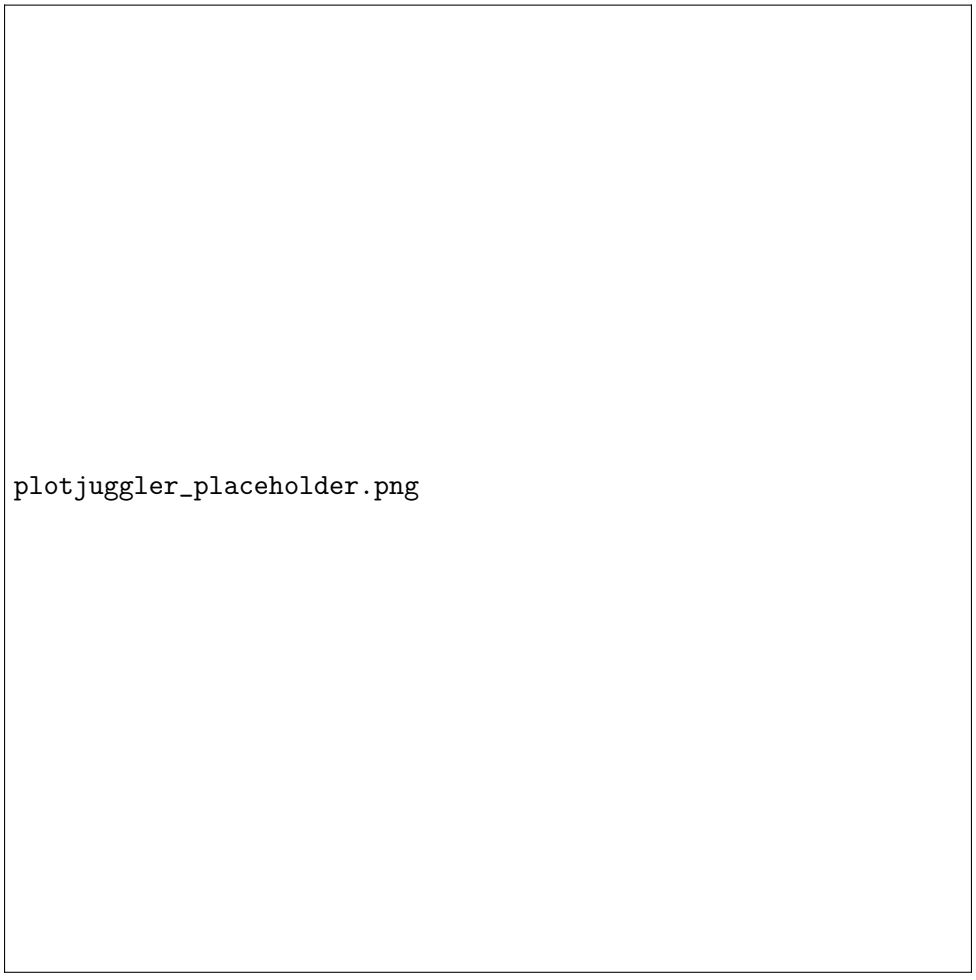
- Learn how introspection is now built into ROS 2 Control.
- See how to leverage `pal_statistics` both inside and outside controllers.

- Understand how debugging becomes faster and more transparent with tools like PlotJuggler.

Resources

- pal_statistics: `https://github.com/pal-robotics/pal_statistics`
- ROS 2 Control: `https://github.com/ros-controls/ros2_control`
- PlotJuggler Changelog 3.10.11: `https://github.com/facontidavide/PlotJuggler/blob/main/CHANGEL`
- Demo: `https://github.com/ros-controls/ros2_control_demos`
- ROS 2 Control integration (introspection.hpp): `https://github.com/ros-controls/ros2_control/blob`
- ROS 2 Control integration (controller_interface_base.cpp): `https://github.com/ros-controls/ros2_c`

Illustration



(Placeholder for a PlotJuggler screenshot)