Some fancy title

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1 Initial project description

This project will focus on extending the functionality of the Simple Open EtherCAT Master [SOEM] library inside a ROS2 environment.
SOEM: https://github.com/OpenEtherCATsociety/soem

1.1 Phase 1

1.1.1 Description

Developing a ROS2 Node to serve as an EtherCAT Master using the SOEM library. The Node would be responsible for the following:
- Control of the EtherCAT Finite State Machine [FSM].
- Control of slave CiA-402 FSMs.
- Providing Messages, Actions, and Services on the ROS2 network from the EtherCAT network, to facilitate reading and writing to the EtherCAT network parameters.

Developing an RQt integrated explorer for the parameters presented by the EtherCAT Master Node. It would provide the following:
- Ability to select specific slave parameters and collate them in a collected view.
- Ability to view and set parameters through the collected view.

Developing an RQt integrated control panel for the EtherCAT server Node. It would provide the following:
- Ability to send each specific state changing command to the network or specific slave.
- Ability to select network or specific slave state and have it automatically change.
- Ability to view the state of each part of the EtherCAT network.

1.1.2 Investigation

- How to achieve easy ROS2 integration of various EtherCAT drives compliant to the CiA-402 communication profile.
- How to fascilitate updating of EtherCAT network parameters through a ROS2 integrated interface.
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1.1.3 Experimentation

- Connecting devices from different manufacturers and verifying discovery results against manufacturer specifications.
- Setting and verifying network parameters through a basic interface.

1.1.4 Components

- ROS2 EtherCAT Server Node
- RQt Network Parameter Explorer
- RQt Network and Slave FSM Controls

1.2 Phase 2

1.2.1 Description

Developing a generalized quality parameter for evaluating movement profiles and developing a generalized procedure for estimating setup friction within the CiA-402 profile, if possible.

Developing an interface for running predefined movement profiles. It would provide the following:

- Planning of typical motion profiles (synchronous).
- Assignment of slave(s) to run during movement.
- Graphing of the expected versus achieved movement.
- Information about expected and achieved movements.

1.2.2 Investigation

- How to quantify the quality of an achieved movement profile.
- How to generalize friction estimation using CiA-402.

1.2.3 Experimentation

- Examination using disturbed vs undisturbed drive movement.
- Comparison of friction values calculated using different methods.
- Running the developed compliance screening.

1.2.4 Components

- RQt Profile Movement Control Panel
- RQt EtherCAT CiA-402 Compliance Tester