Moving robot joints using ROS Controllers in Gazebo

⇒ For each joint we need to attach a controller that is compatible with the hardware interface mentioned inside the transmission tag.

⇒ The ROS Controller mainly consist of a <u>feedback mechanism</u> that can receive a set point and control the output using the feedback from the actuator.

⇒ ROS Controller interacts with the hardware using hardware interface.

ROS Controller → ==Hardware Interface== → Real or Simulated hardware

⇒ The hardware interface is a ==Software representation of the robot== and its abstract hardware.

⇒ The resources of the hardware interface are actuators, joints and sensors.
   ↳ Some resources are <u>read only</u> and some <u>write compatible</u>.

ros_Control

" A set of packages that includes ==Controller interfaces==, ==Controller manager==, ==transmissions== and ==hardware_interface.=="
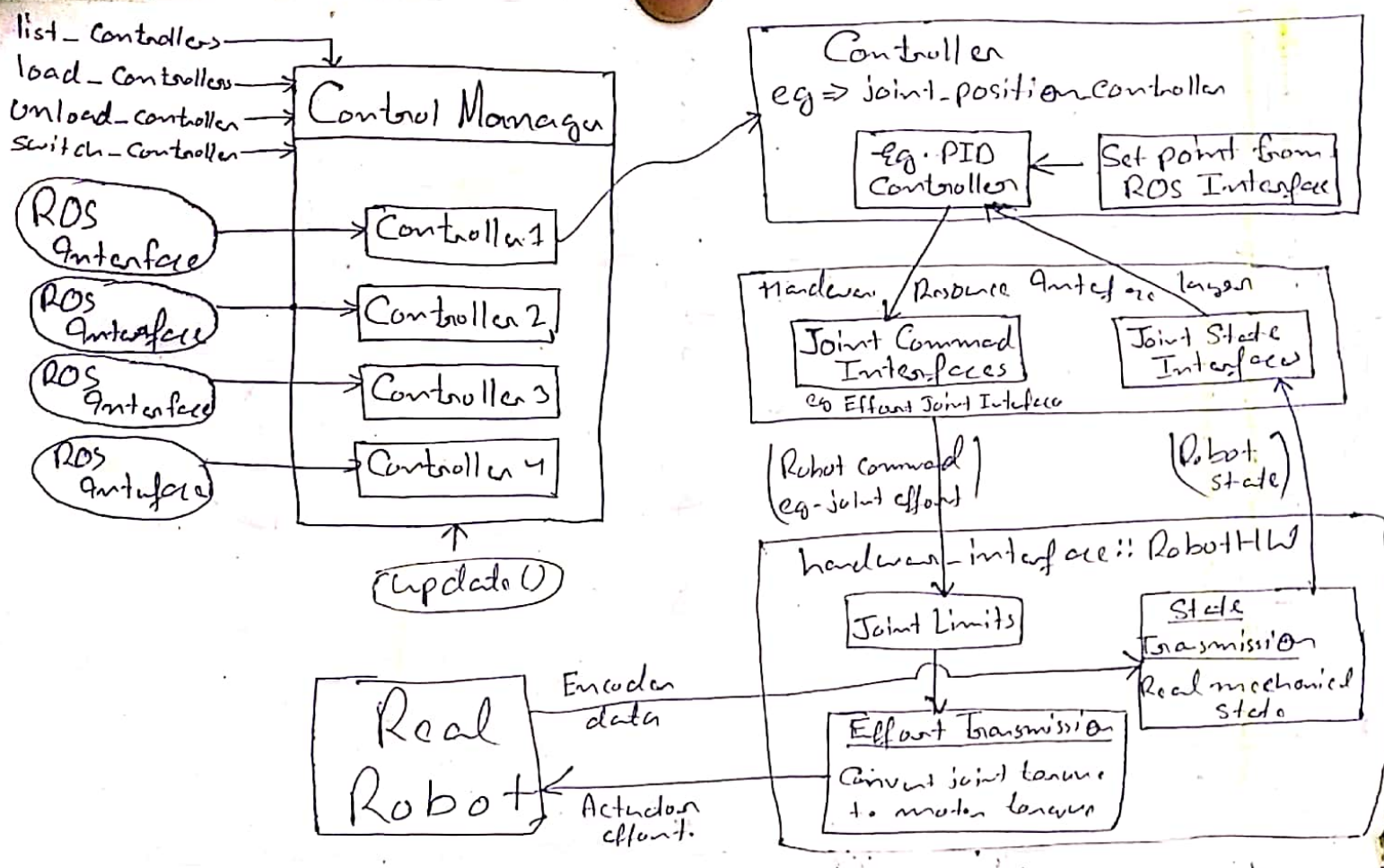
⟹ The ros_control packages takes as input the joint state data from your robot's actuator's encoders and an input set point.

└➤ It uses a generic control loop feedback mechanism, to control the output.

⟶ { typically: Position, Velocity and effort }

★ Data flow of ros_control and Gazebo

⟹ "In addition to the transmission tags, a ==Gazebo plugin== needs to be added to your URDF that actually ==parses the transmission tags and loads the appropriate hardware interfaces and control manager"==

list_ Controllers
load _ Controllers
Unload_ controller
Switch_ Controller

Control Manager

- Controller 1
- Controller 2
- Controller 3
- Controller 4

ROS Interface
ROS Interface
ROS Interface
ROS Interface

(update ())

Real Robot

Encoder data

Actuator effort.

Controller
eg ⇒ joint_position_controller

Eg. PID Controller ← Set point from ROS Interface

Hardware / Resource Interface layer

Joint Command Interfaces
eg Effort Joint Interface

Joint State Interface

(Robot command)
(eg- Joint effort)

(Robot state)

hardware-interface :: RobotHW

Joint Limits

State Transmission
Real mechanical state

Effort Transmission
Convert joint torque to motor torque

hardware_interface

⇒ When you make your robot support one or more of the standard interfaces, you will be able to take advantage of a large library of Controllers and work on the standard interface.

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