

# CATBot Kinematic Model in ROS

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Tutorial-4, Tuesday October 11, 2016

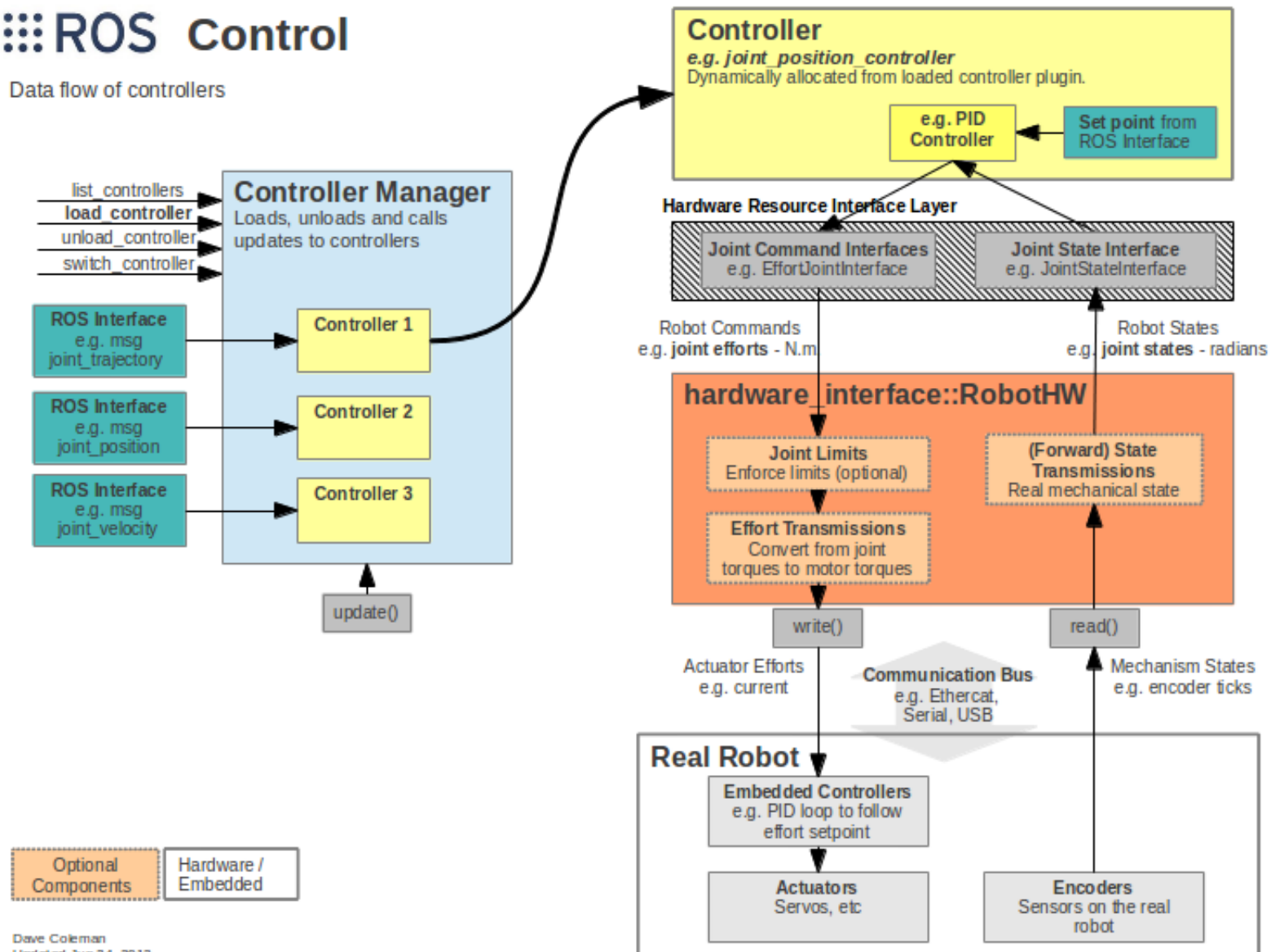
# ROS-Control Package

- `ros_control` ROS Wiki: [http://wiki.ros.org/ros\\_control](http://wiki.ros.org/ros_control)
- Important talk → `ros_control` : An Overview
  - Video : <https://vimeo.com/107507546>
  - Slides: [http://roscon.ros.org/2014/wp-content/uploads/2014/07/ros\\_control\\_an\\_overview.pdf](http://roscon.ros.org/2014/wp-content/uploads/2014/07/ros_control_an_overview.pdf)
- `ros_control` is an interface between ROS and the actuators (actual or simulated) of your robot
- “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, typically a PID controller, to control the output, typically effort, sent to your actuators.” - ROS-Wiki

# ROS-Control Package

## ROS Control

Data flow of controllers



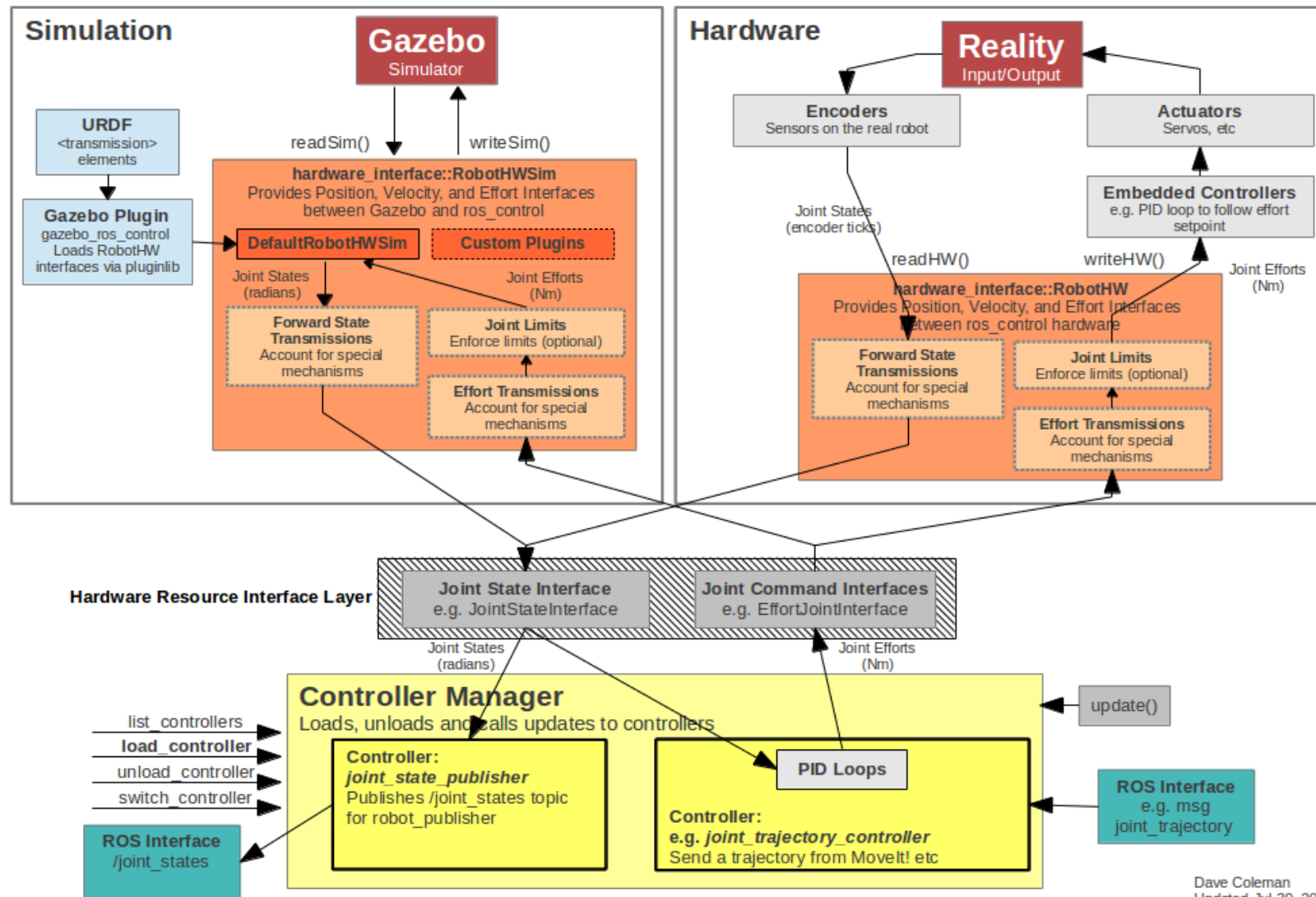
Dave Coleman  
Updated Jun 24, 2013

# Gazebo-ROS-Control Package

- Gazebosim tutorial: [http://gazebosim.org/tutorials/?tut=ros\\_control](http://gazebosim.org/tutorials/?tut=ros_control)
- gazebo\_ros\_pkgs is a stack that aids in the integration between ROS and gazebo.
- gazebo\_ros\_control is a package inside that stack that is responsible for connecting ros-control with a robot model spawned in gazebo
- Using gazebo\_ros\_control, we will simulate CATBot in gazebo and control it using a ROS node (kinematics\_model\_teleop node)

# Gazebo-ROS-Control Package

GAZEBO + ROS + ros\_control



Dave Coleman  
Updated Jul 30, 2013

# catbot\_control Package

- Modified URDF: There are some modifications to be made to the URDF file in order to prepare it for linking to ros-control and gazebo:
  - We add a <transmission> tag for each wheel joint
  - We add a <gazebo> tag referencing each wheel link
  - We add a <plugin> tag to load gazebo\_ros\_control plugin
- Added .yaml configuration file:
  - This file is loaded as a ros parameter
  - This is used by controller\_manager to manage (load and unload) joint controllers, and also load the appropriate controller type and interface

## catbot\_control package: kinematics\_model\_teleop node

- This node is used to take input from key strokes inside a terminal and transform it to commands sent to the joint controllers.
- It publishes to the command topics for the controllers
- It performs non-blocking input operations (input with timeout)
- Check the code, which is documented. You'll find it inside the src directory of the package `catbot_control`

# Launch File

- To do the work of running the associated nodes:
  - controller\_manager
  - Gazebo
  - Rviz
  - robot\_state\_publisher
  - kinematics\_model\_teleop
- Also to load and attach files to parameters :

  - robot\_description
  - diff\_catbot\_kinematics.yaml



# CATBot: Kinematic Model Demonstration

- Run the launch file `diff_catbot_kinematics.launch` using `roslaunch`
- Put the terminal in focus
- Start playing around with the input:
  - 8 : increase vehicle forward linear velocity
  - 2 : increase vehicle backward linear velocity
  - 6 : increase vehicle clockwise angular velocity
  - 4 : increase vehicle counter-clockwise angular velocity
  - 5 : set all velocities to zero and stop wheels
  - 7 : increase forward left wheel velocity
  - 1 : increase backward left wheel velocity
  - 9 : increase right forward wheel velocity
  - 3 : increase right backward wheel velocity
  - / : shutdown this node and reset terminal settings to normal input

# References

- <http://wiki.ros.org/urdf/XML/Transmission>
- [http://gazebosim.org/tutorials/?tut=ros\\_urdf](http://gazebosim.org/tutorials/?tut=ros_urdf)
- [http://wiki.ros.org/ros\\_control](http://wiki.ros.org/ros_control)
- [http://gazebosim.org/tutorials/?tut=ros\\_control](http://gazebosim.org/tutorials/?tut=ros_control)

# Exercises

- Write a node that subscribes to `/catbot/joint_states` and extracts information about odometry from wheel joint velocities, and then re-publishes them as `nav_msgs/Odometry` message on a topic named `/catbot/odom`
- Add visualization for `Odometry` on `rviz` to visualize the odometry published on `/catbot/odom`