ROS Packages for Mover4 and Mover6 Robot Arms

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1. Summary

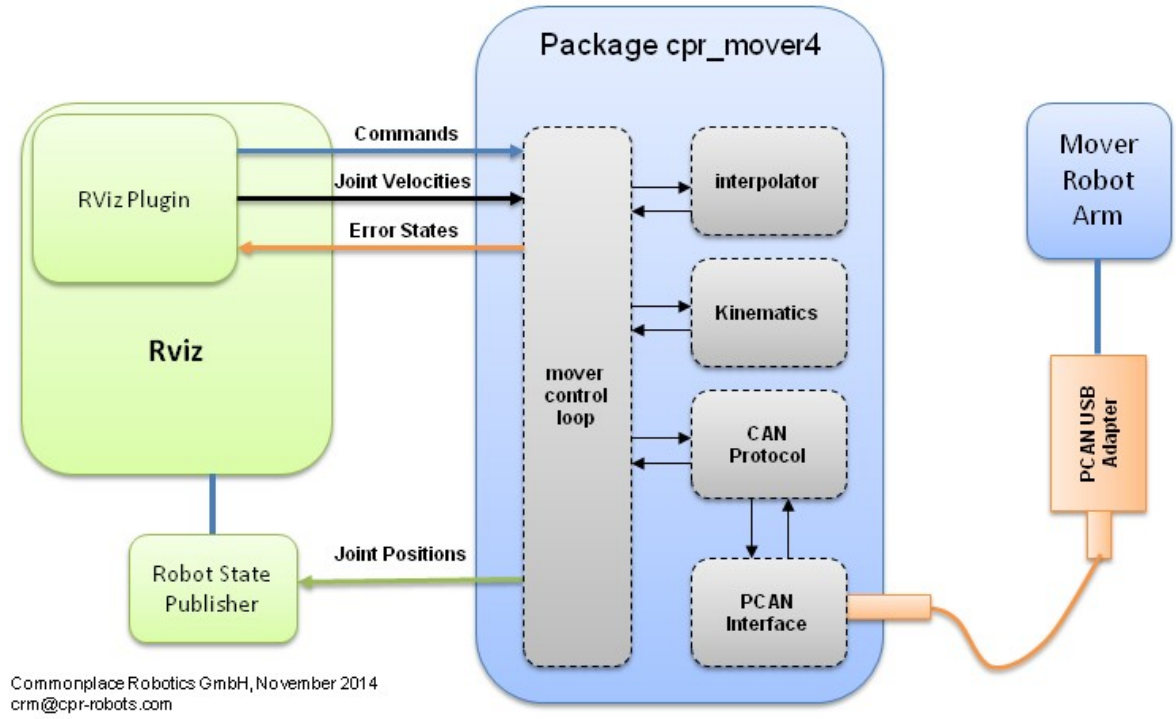
The robot package (cpr_mover) and the RViz plugin (cpr_rviz_plugin) allow to integrate the Mover4 and Mover6 robot arms into ROS environments. An integrated JointTrajectoryAction server allows to perform MoveIt generated motions.

2 Tested Environments:

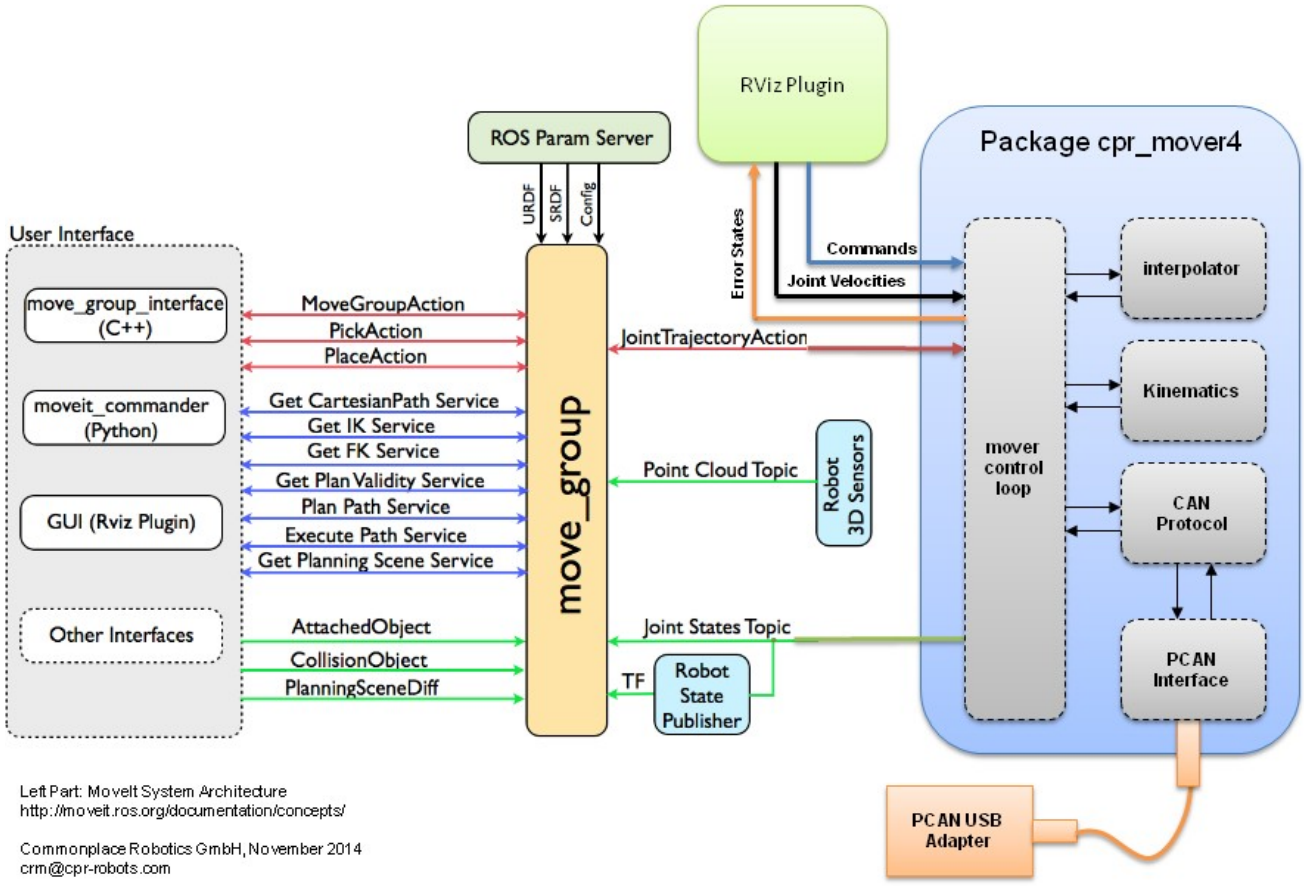
- ROS Indigo, Ubuntu 14.04 LTS

3 Architecture

The standard architecture consists of the core, RViz and the cpr_mover node.



The interaction with MoveIt is shown in the following slide.



2. Download & Installation

2 Package cpr_mover

Download at http://www.github.com/CPR-Robots/cpr_mover
Save in your catkin-src directory, e.g. ~/catkin_ws/src/cpr_mover
Compile with catkin_make

3 Plugin cpr_rviz_plugin

Download at http://www.github.com/CPR-Robots/cpr_rviz_plugin
Save in your ROS workspace, e.g. ~/ros-workspace/cpr_rviz_plugin
Compile with rosmake

4 Peak PCAN USB-Adapter

The robot arm is connected by a Peak Systeme PCAN-USB adapter. To use the adapter the according driver needs to be installed:

- Download the current driver package from Peak

- Extract driver package
- change into the directory, e.g. cd peak-linux-driver-7.10
- make clean
- We want to install the chardev version of the driver: make NET=NO_NETDEV_SUPPORT
- sudo make install
- reboot
- the command cat \proc\pcan should show:

```
*------------- PEAK-System CAN interfaces (www.peak-system.com) -------------
*------------- Release_20140121_n (7.10.0) Mar  3 2014 14:13:14 --------------
*---------------- [mod] [isa] [pci] [dng] [par] [usb] [pcc] -----------------
*--------------------- 1 interfaces @ major 249 found ----------------------
*n -type- ndev --base-- irq --btr- --read-- --write- --irqs-- -errors- status
32    usb -NA- ffffffff 255 0x001c 00000000 00000000 0000000c 00000000 0x0000
```

Especially below the ndev word there should be -NA-

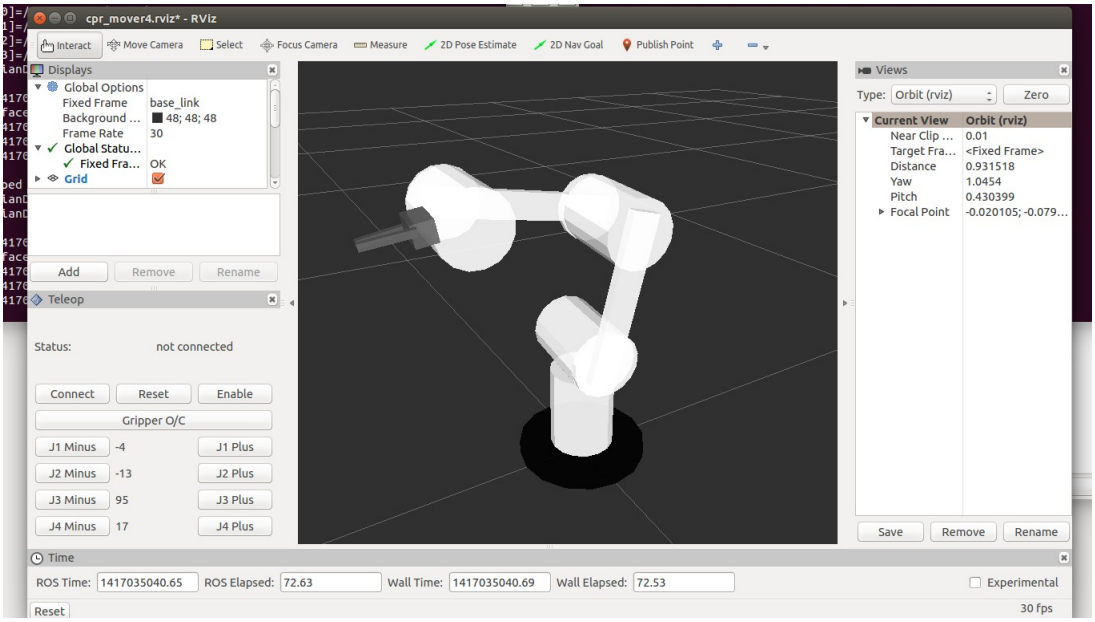
When the adapter is recognized by the OS the red LED on the adapter is on. When the adapter is connected by the software, it blinks slowly. When data is transmitted it blinks faster.

3. Start

- Start roscore
- Open a terminal and cd into the cpr_mover directory: cd ~/catkin_ws/src/cpr_mover4
- Start the node: rosrun cpr_mover cpr_mover
- If the package does not start: source ./devel/setup.bash
- Open a second terminal and cd into the plugin directory: cd ~/ros_workspace/cpr_rviz_plugin/
- Start RViz: roslaunch cpr_mover4.launch
- The CPR plugin should be loaded, otherwise load with the menu entry.

Now move the simulated robot. If this on moves connect the real robot:

- Press “Connect” in the RViz plugin. The status changes from “not connected” to another value
- Press “Reset”: This button loads the hardware joint status, the 3D graphics adapts. Also the status changes
- Press “Enable”: Not the status changes to “0x00” or “No Error” and the robot can be moved now.



4. Interface Specification

Publishing Information takes place in cpr_mover::CommunicationROS() within the robot cycle time (standard: 20 Hz).

1 JointState Publisher

Type: sensor_msgs::JointState

Name: /joint_states

Provides the 4 or 6 joint values of the robot in radian. The values are setpoint values, not the hardware values. Joint names are Joint0 to Joint3.

2 Error Code Publisher

Type: std_msgs::String

Name: /CPRMoverErrorCodes

Provides a string with the current status of the robot arms hardware joints, the error codes.

3 Joint Velocity Subscriber

Type: sensor_msgs::JointState

Name: /CPRMoverJointVel

When there are no points to replay from the actionServer, the robot reacts to the jog values in these messages. The values in msg->velocities[] are percent values with respect to the maxJointVelocity defined in the source code. The allowed range is [-100.0 .. 100.0].

4 Commands Subscriber

Type: std_msgs::String

Name: /CPRMoverCommands

The Mover reacts to commands received with these messages. Commands are:

- Connect
- Reset
- Enable

5 ActionServer

Type: actionlib::SimpleActionServer<control_msgs::FollowJointTrajectoryAction>

Name: cpr_mover/follow_joint_trajectory