

The logo for MoveIt! features a blue stylized arrow icon on the left, pointing right. To its right, the word "MoveIt!" is written in a bold, sans-serif font. "Move" is in grey, "It!" is in blue, and the exclamation point is also in blue. Below "MoveIt!", the word "Upgrading" is written in a bold, orange, sans-serif font.

# MoveIt! Upgrading

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ROSCon 2017 / Vancouver

# About Myself

Since 2016 PhD student at  
Hamburg University, Group TAMS



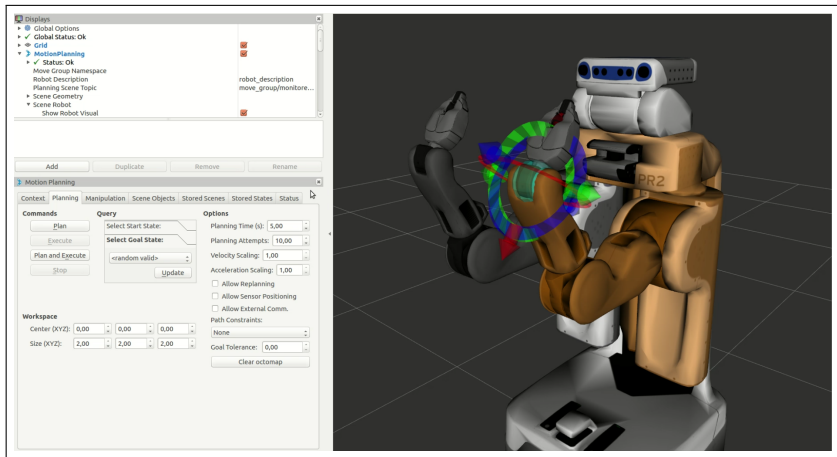
Since 2007 maintainer with the  
Linux Distribution Lunar-Linux

Since 2013 involved with ROS-enabled  
hardware including PR2, UR, Shadow Hands



Joined MoveIt Maintainers in 2016  
after using it for two years

# Out Of The Box



# User Experiences

## The Good

*Yes, of course we use Movelt!  
It works great for our purposes.*

## The Bad

*Yeah, we tried Movelt..  
We didn't get it to work [sufficiently well].  
Now we roll our own code.*

## The In-Between

*Well, we use it for some things.  
For others we had to use other projects.*

# On Stability

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Ulrich Drepper, 2002

*No program which depends on broken behavior deserves protection. If a programmer has found such a discrepancy and changed the application to use it instead of reporting it to the library maintainer s/he gets what s/he deserves.*

# On Stability

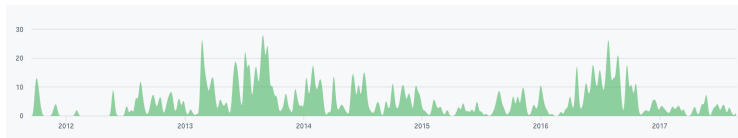
Ulrich Drepper, 2002

*No program which depends on broken behavior deserves protection. If a programmer has found such a discrepancy and changed the application to use it instead of reporting it to the library maintainer s/he gets what s/he deserves.*

- ▶ It's not as simple when your code decides controls for costly robots
- ▶ Stability is essential
- ▶ Correct implementations too
- ▶ We added SONAMEs for library versioning
- ▶ indigo is stable
- ▶ kinetic will stay API compatible
- ▶ lunar is still released from kinetic-level

# The Last Two Years

## The Commit History



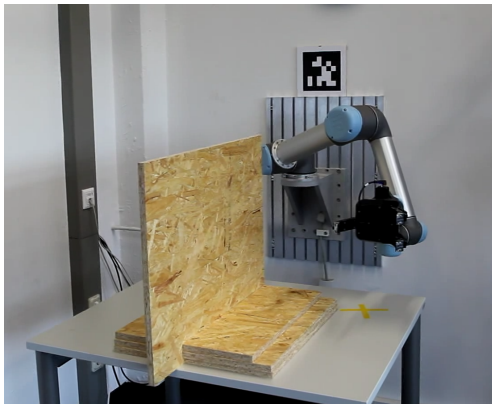
- ▶ Merged code into a central repository
- ▶ Closed 379 pull-requests
- ▶ Fixed many bugs
- ▶ Added many small features to the main project
- ▶ New 2017 Video Montage



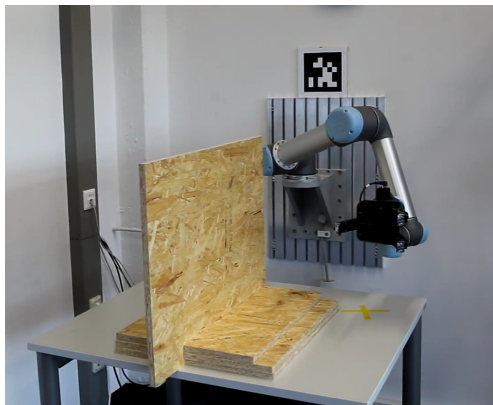
## Upgrade to Current Release for

- ▶ Numerous bug fixes
- ▶ Visual Collision Matrix in Setup Assistant
- ▶ Synchronous Planning Scene Updates
- ▶ Start State Validation for Execution Action
- ▶ Interactive Trajectory Display
- ▶ Minimum-distance solutions in ikfast plugin
- ▶ Alternative Time Parametrization
- ▶ ...

# Movelt by Example



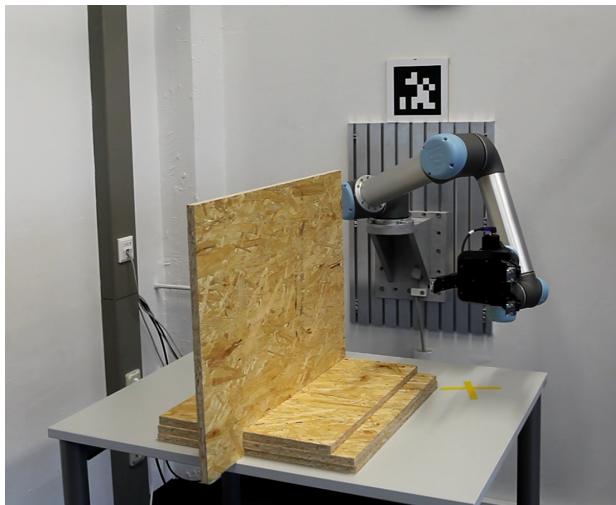
# Movelt by Example



## Where to go from here

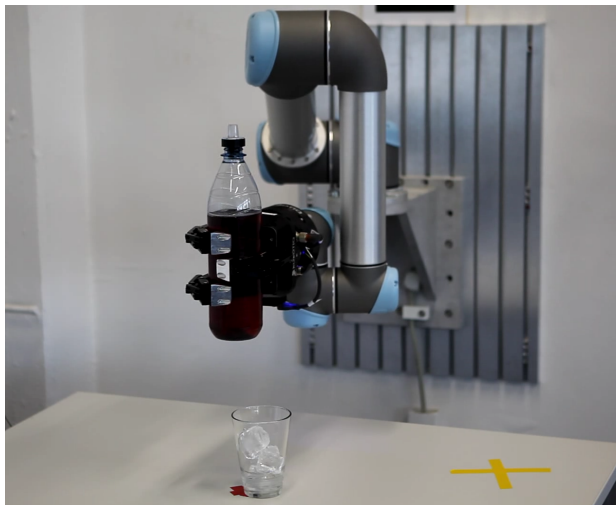
- ▶ Choose Joint State Targets
- ▶ Add Padding
- ▶ Reduce Joint Limits
- ▶ Configure different OMPL planners
- ▶ ...

## Upgrade with STOMP



[http://wiki.ros.org/industrial\\_moveit](http://wiki.ros.org/industrial_moveit)

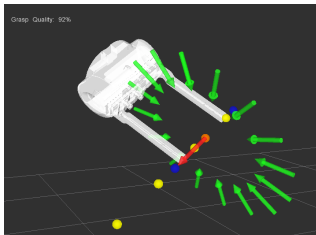
## Upgrade with Descartes



<http://wiki.ros.org/descartes>

# Upgrade Grasping

- ▶ Grasping is the most frequent request but **no solved problem**
- ▶ MoveIt supports your solutions in **your scenario**
- ▶ Universal and affordance grasping requires perception models



- ▶ Some projects provide grasps you can “feed” to MoveIt

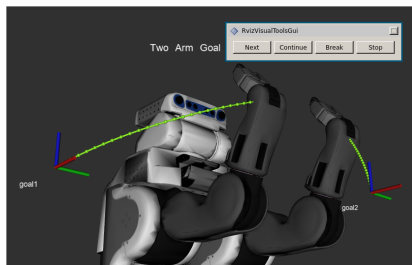
[https://github.com/davetcoleman/moveit\\_simple\\_grasps](https://github.com/davetcoleman/moveit_simple_grasps)

<https://www2.ccs.neu.edu/research/helpinghands/code.html>

[https://github.com/TAMS-Group/moveit\\_gpd\\_pick\\_object](https://github.com/TAMS-Group/moveit_gpd_pick_object)

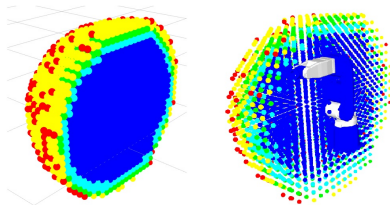
# Upgrade Visualization

## MoveIt Visual Tools



[https://github.com/ros-planning/moveit\\_visual\\_tools](https://github.com/ros-planning/moveit_visual_tools)

## Reuleaux

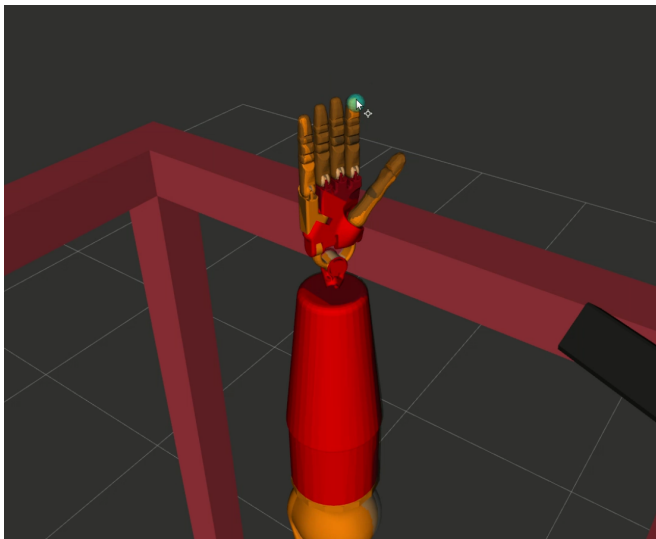


<https://github.com/ros-industrial-consortium/reuleaux>

## BiolK - A kinematics\_base plugin

- ▶ New Inverse Kinematics Plugin
- ▶ Master Thesis by Philipp Ruppel at TAMS
- ▶ Based on Genetic Algorithms & Particle Swarm Optimization
  
- ▶ Efficient parallelized implementation
- ▶ Improves on TraclK in success rate **and** performance
- ▶ Allows for intuitive approximate solutions
- ▶ Handle multiple goals (including secondary objectives)
- ▶ Better generic support for  $\neq 6$ DOF





# BioIK

## Various Goal Types

- ▶ Position
- ▶ Orientation
- ▶ Pose
- ▶ LookAt
- ▶ JointVariable
- ▶ CenterJoints
- ▶ MinimumDisplacement
- ▶ KeepContact
- ▶ BalanceCenterOfMass
- ▶ AvoidJointLimits
- ▶ (Min|Max)Distance
- ▶ Lambda

## Available at

[https://github.com/TAMS-Group/bio\\_ik](https://github.com/TAMS-Group/bio_ik)

Official release coming soon

Save The Date!

World  
  
Day 2017

- ▶ Takes place at **October 18th**
- ▶ Event Locations at
  - ▶ Verb Surgical, San Francisco Bay Area
  - ▶ Magazino, Munich, Germany
  - ▶ Shadow Robot, London, UK
  - ▶ SwRI, San Antonio
  - ▶ ...

Join The Event!

# Upgrade MoveIt!

## Upgrade Your Experience

Check current releases

## Upgrade Your Possibilities

Consider third-party components

## Upgrade MoveIt!

Contribute working time and/or useful modules

MoveIt is a default for robotic manipulation in ROS.  
Please help us move forward!

Questions?



Many Thanks to  
All original authors - All maintainers  
Everyone who contributed time & effort  
Philipp Ruppel - Norman Hendrich  
Henning Kayser - Benjamin Scholz