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MAGAZINO

A highly flexible navigation framework

Move Base Flex

Sebastian Pütz
Osnabrück University
spuetz@uos.de

Jorge Santos Simón
Magazino GmbH
santos@magazino.eu

Magazino GmbH

Landsberger Str. 234
80687 München

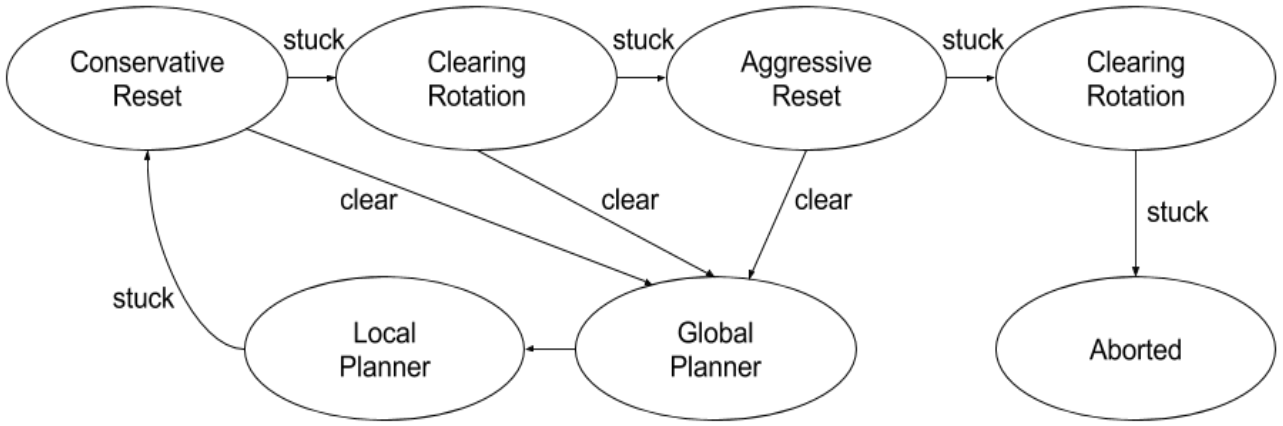
T +49-89-21552415-0
F +49-89-21552415-9

info@magazino.eu
www.magazino.eu

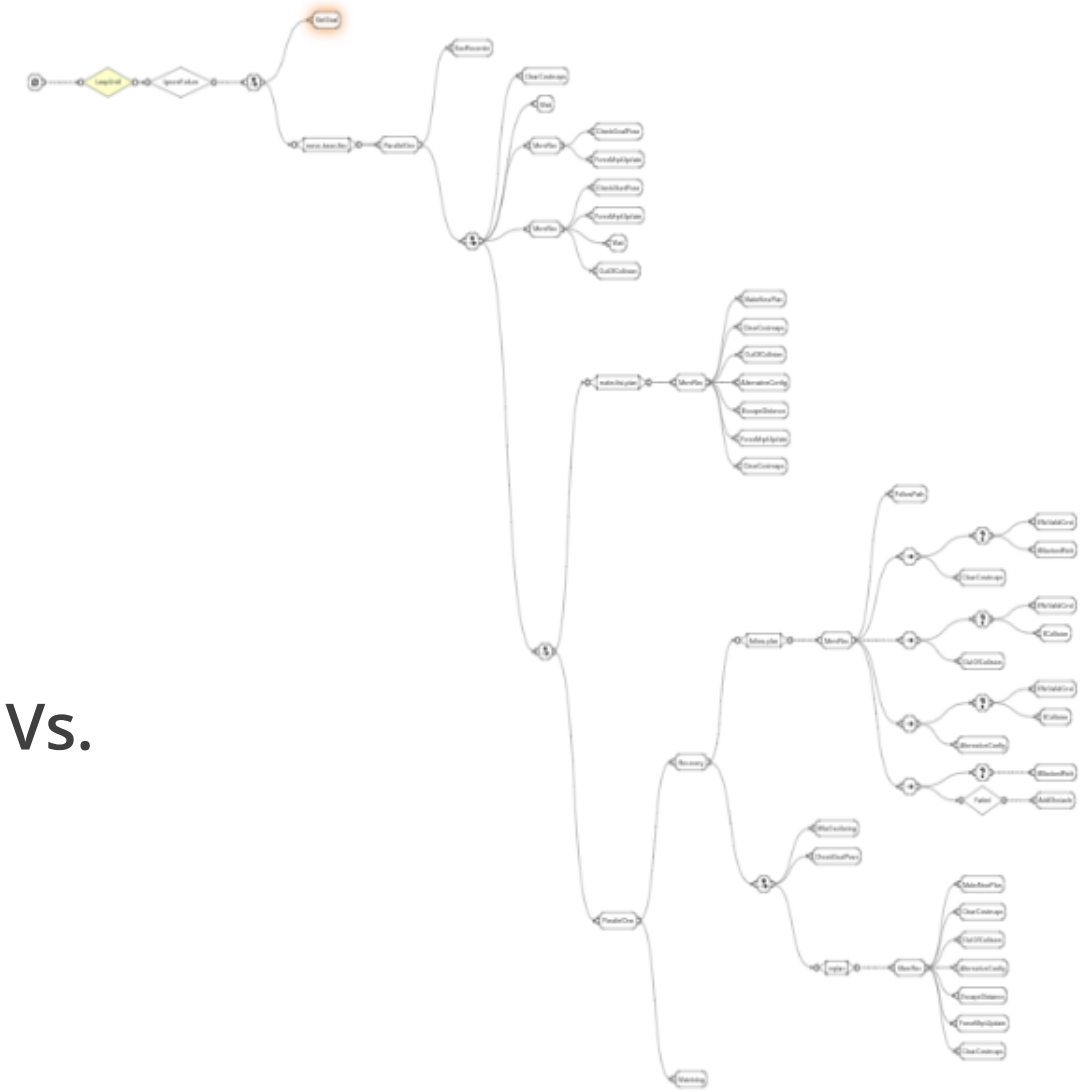
Why Move Base Flex?

...because move_base is not FLEX

- Magazino GmbH needed smarter navigation
- Osnabrück University needed extendable framework



Vs.



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The Core Features

- Fully backwards-compatible with current ROS navigation
- Actions for the submodules planning, controlling and recovering, and services to query the costmaps are provided
- Comprehensive result and feedback information on all actions, including error codes and messages from the loaded plugins
- Separation between an abstract navigation framework and concrete implementations

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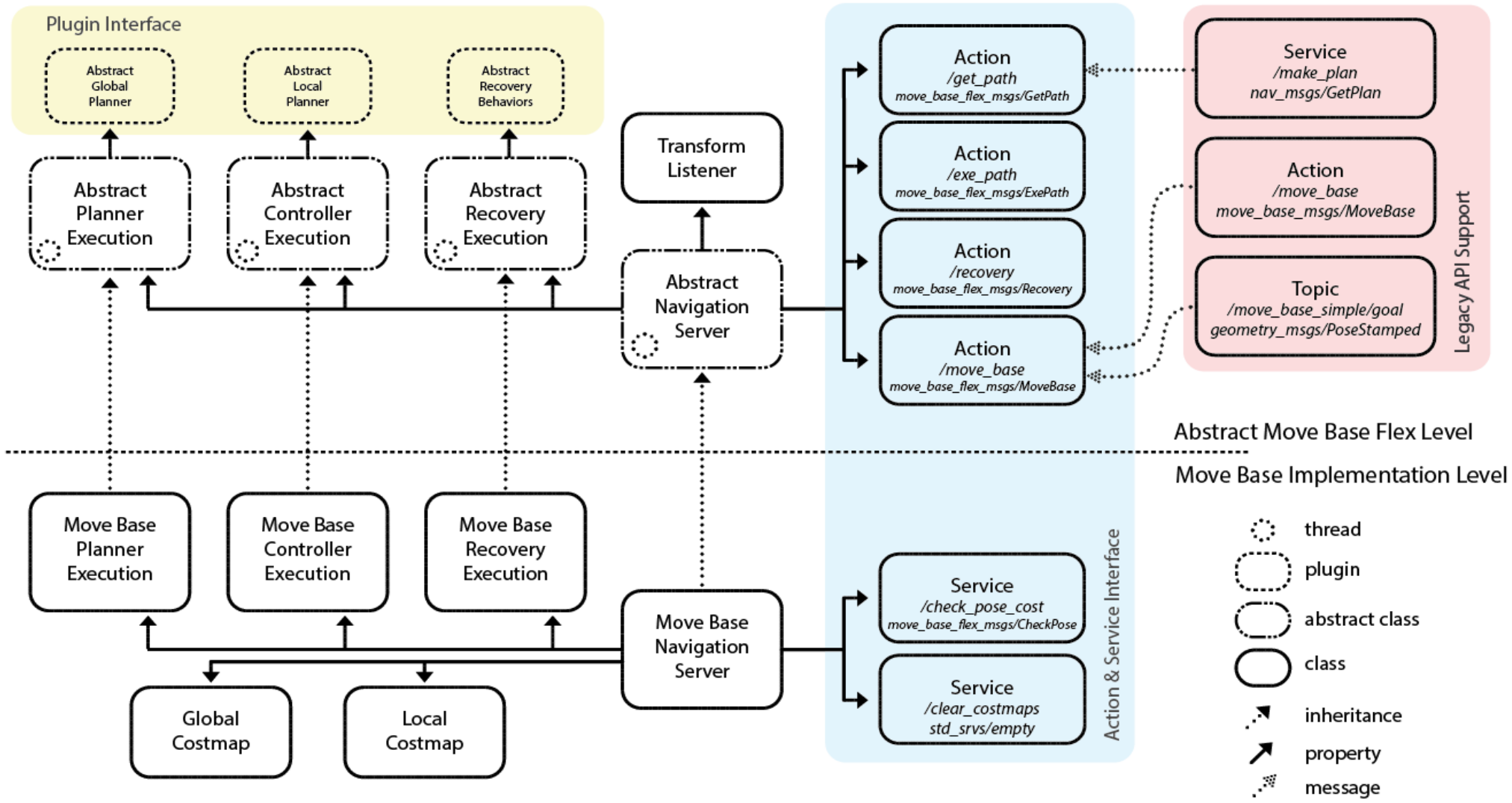
Move Base Flex Architecture



Move Base Flex Architecture

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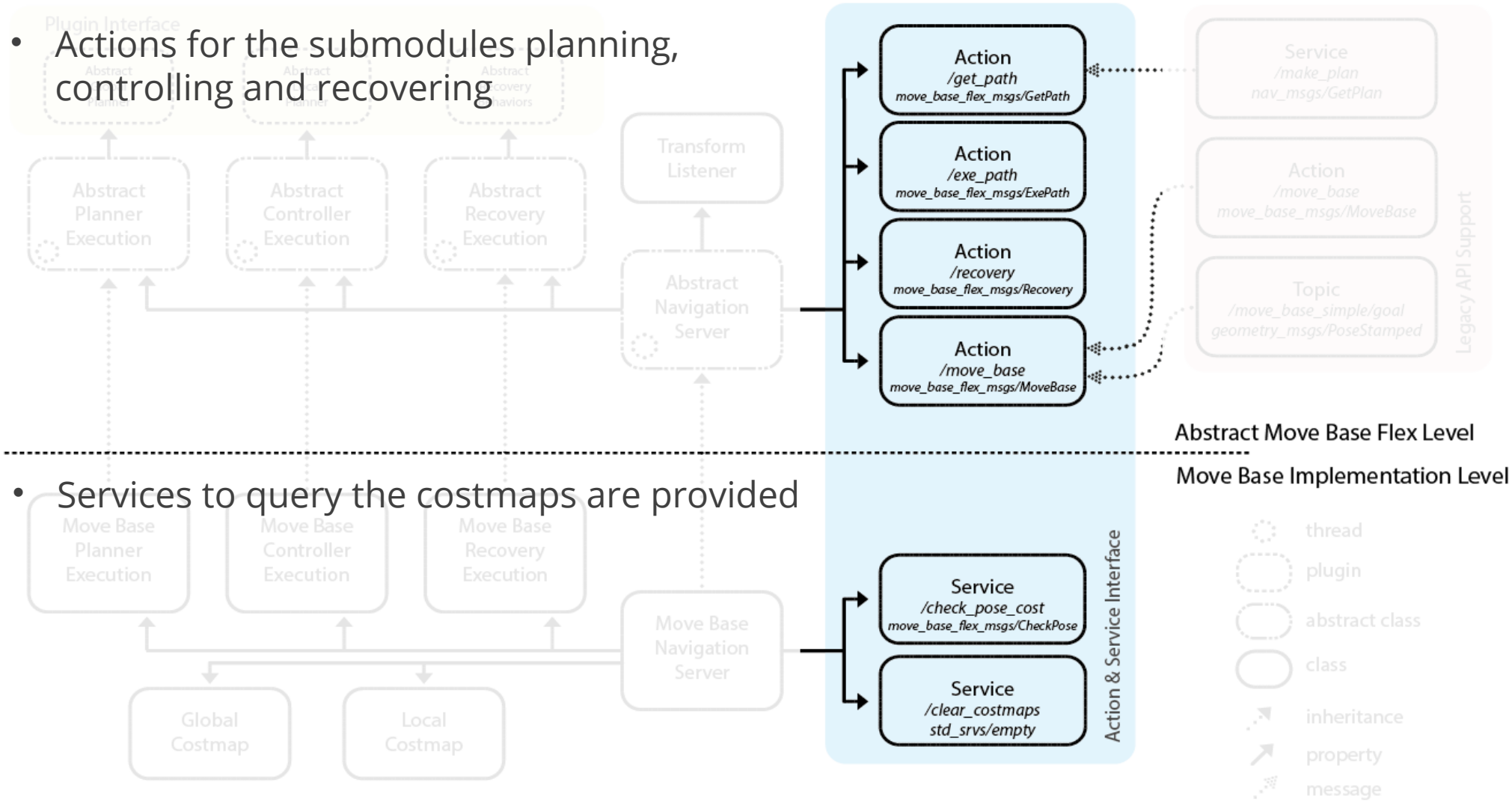

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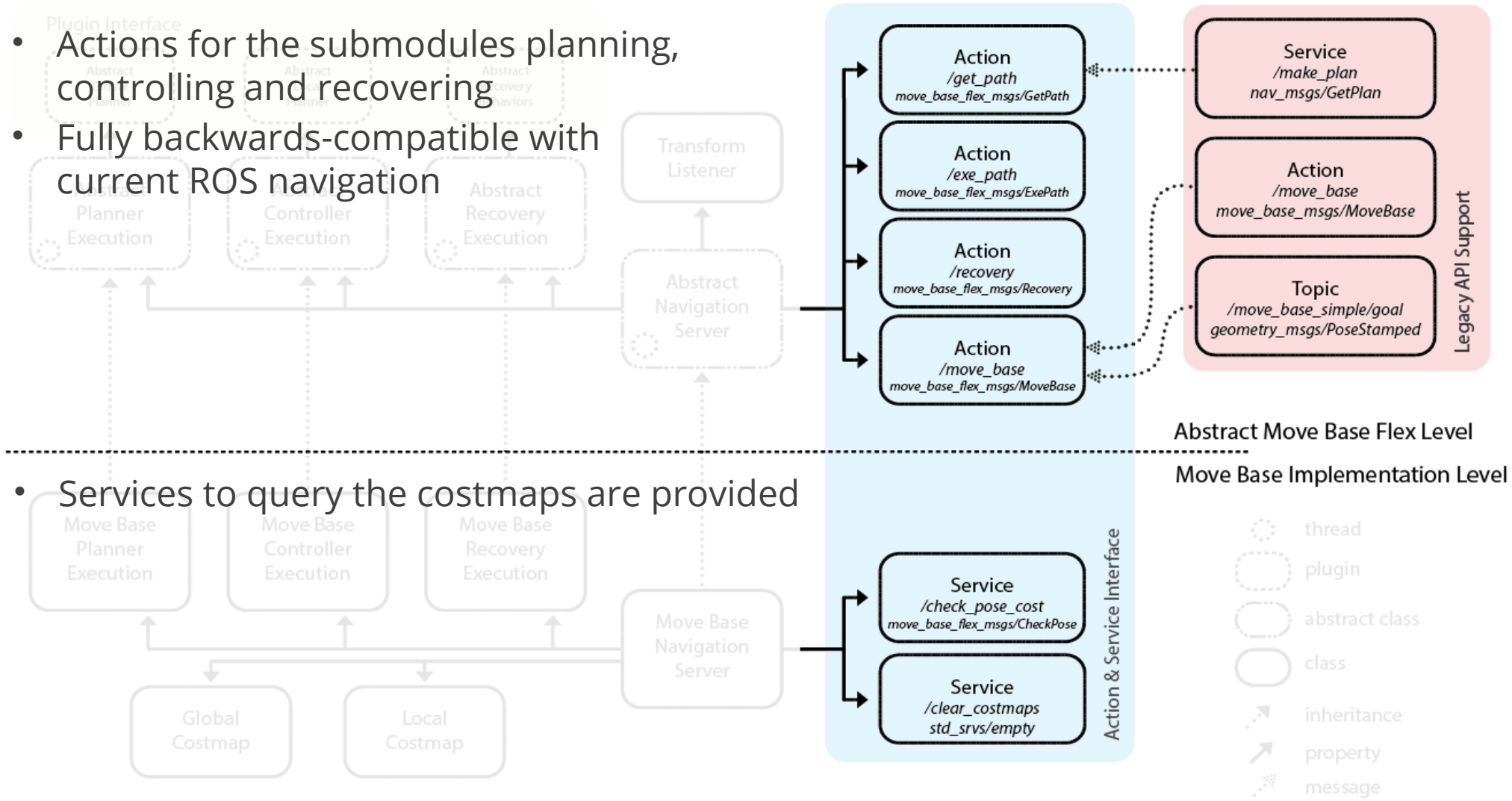
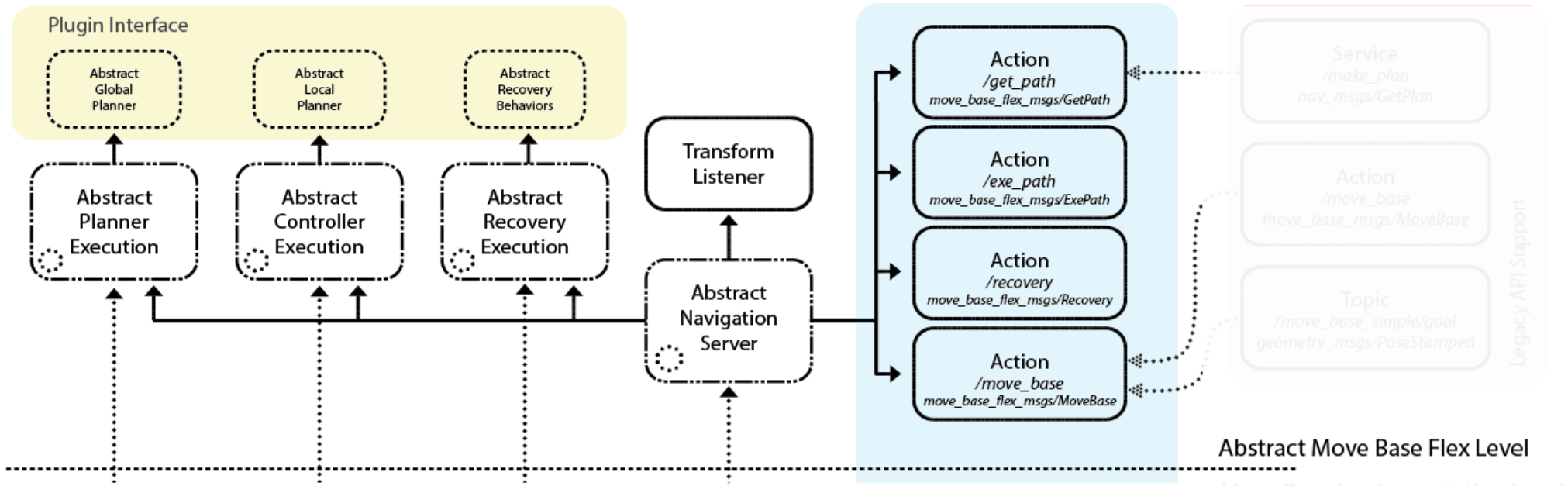
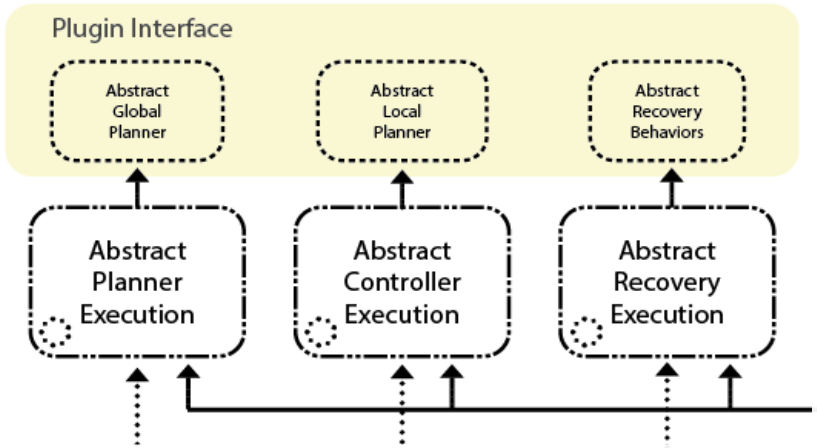


Move Base Flex Architecture



- The abstract execution classes contain the main execution logic
- They are not bound to any map representation
- Thereby, the system can easily be used for other approaches

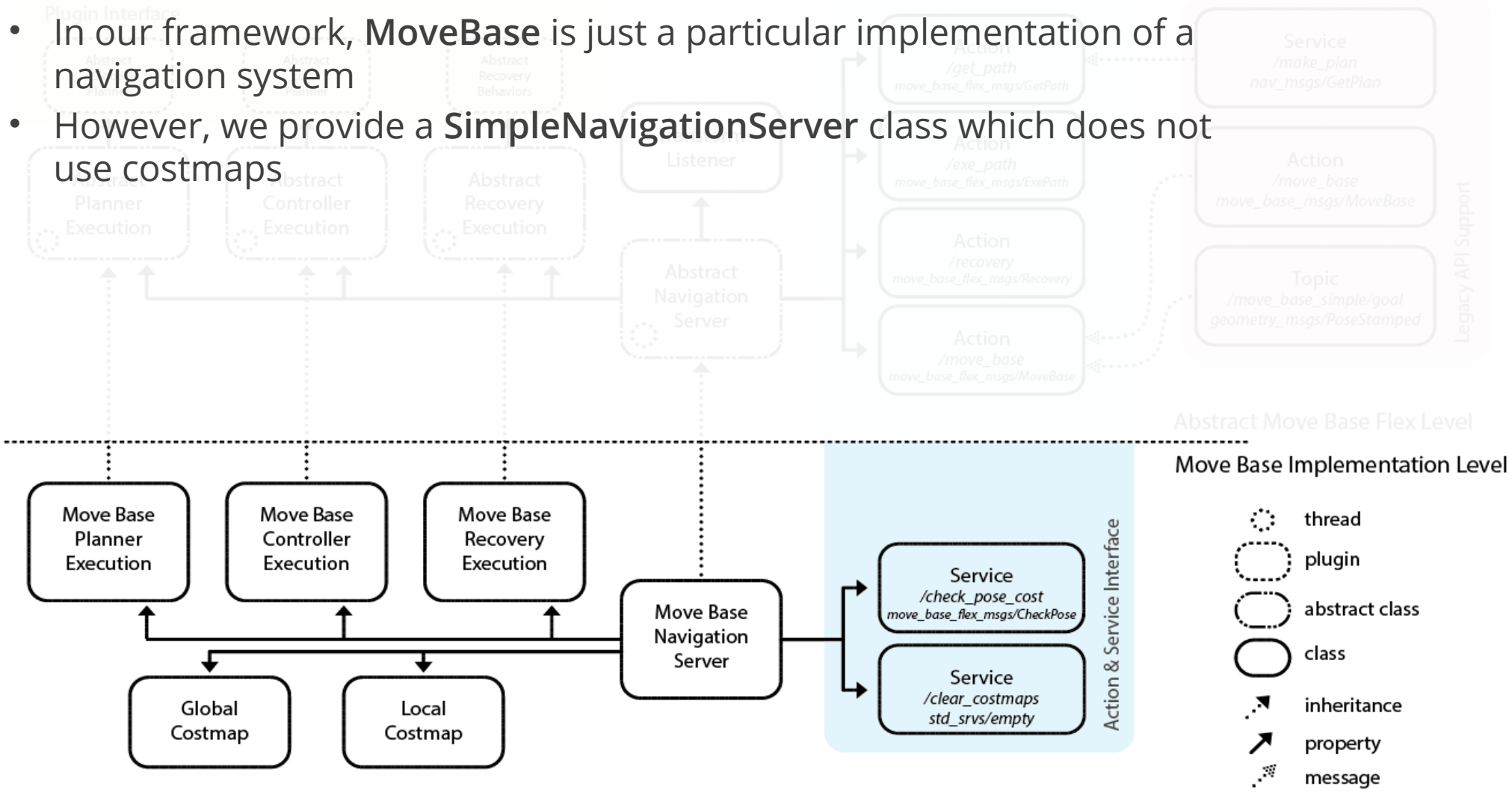
Move Base Flex Architecture



- Based on abstract execution classes
- The interfaces in the nav core inherit the abstract interfaces
- These abstract interfaces provide a richer interface
- We extended the nav_core without breaking plugin API
- The new abstract interfaces allow plugins to return valuable information

Move Base Flex Architecture

- In our framework, **MoveBase** is just a particular implementation of a navigation system
- However, we provide a **SimpleNavigationServer** class which does not use costmaps



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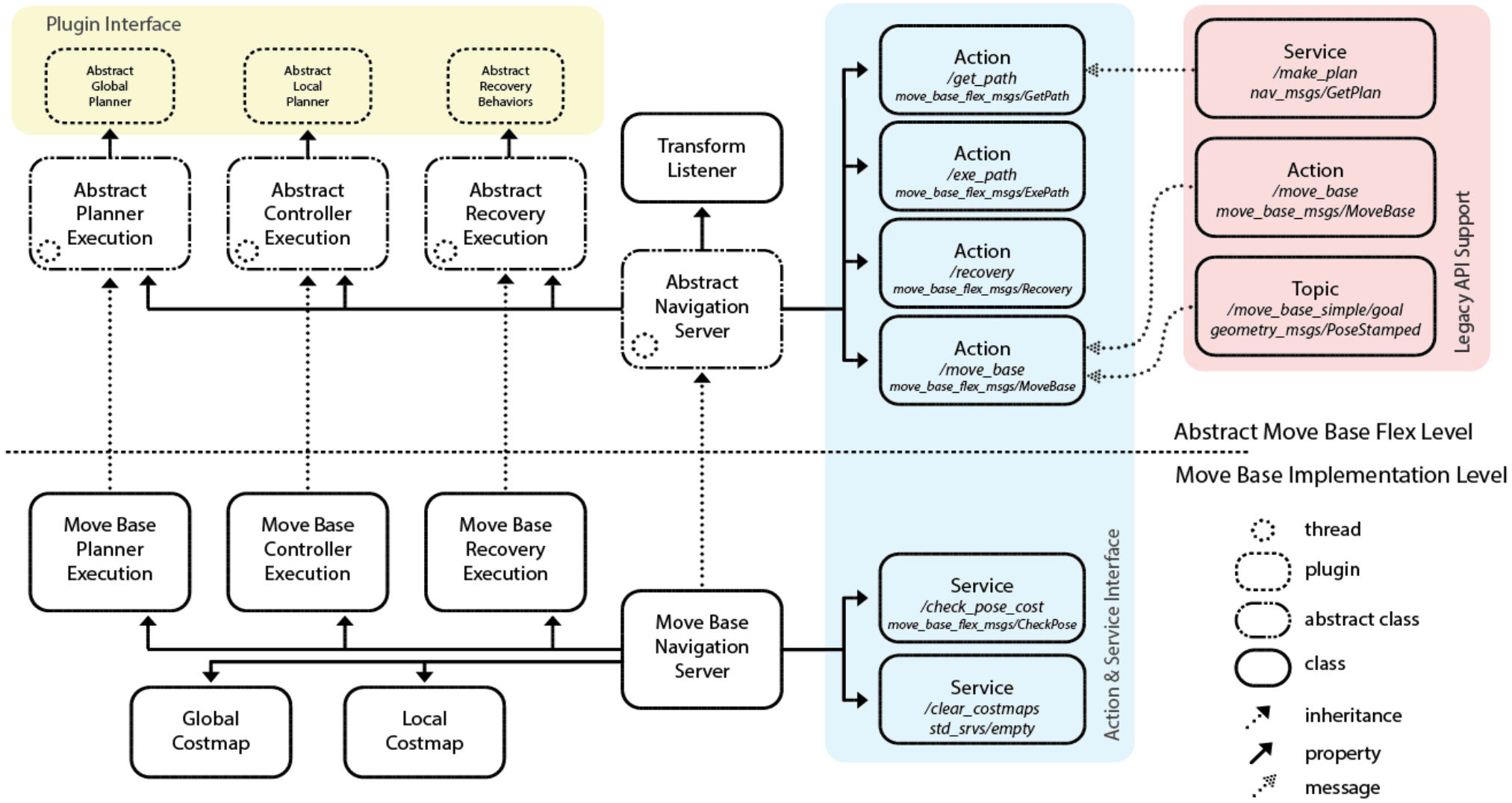
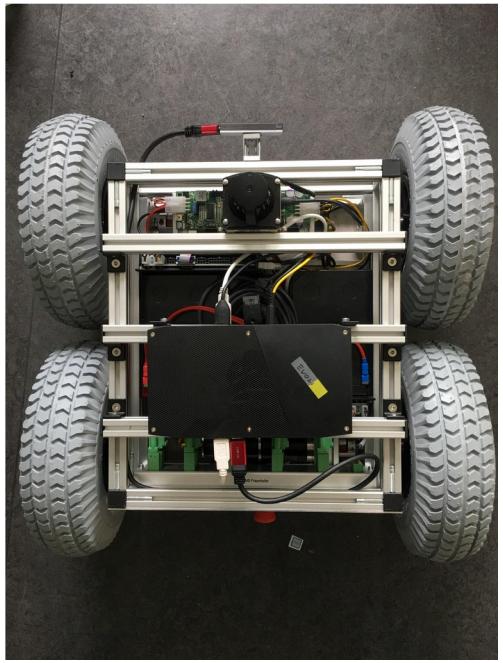
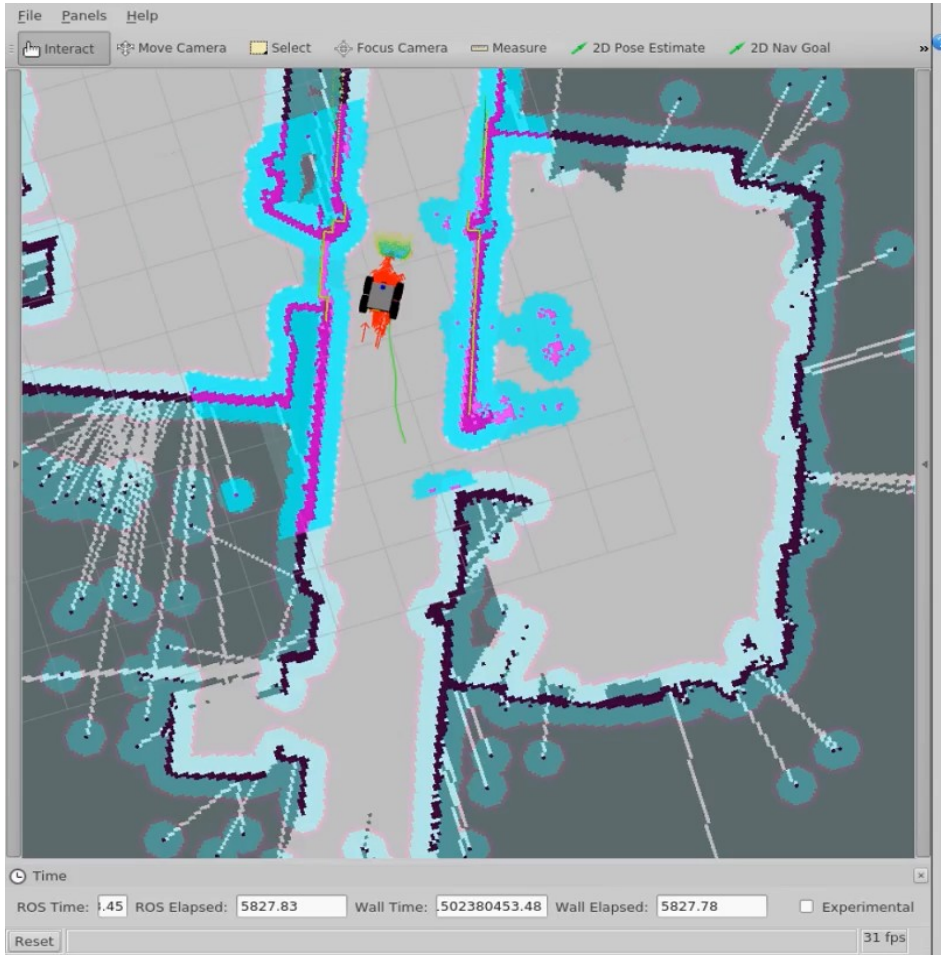
Move Base Flex Architecture

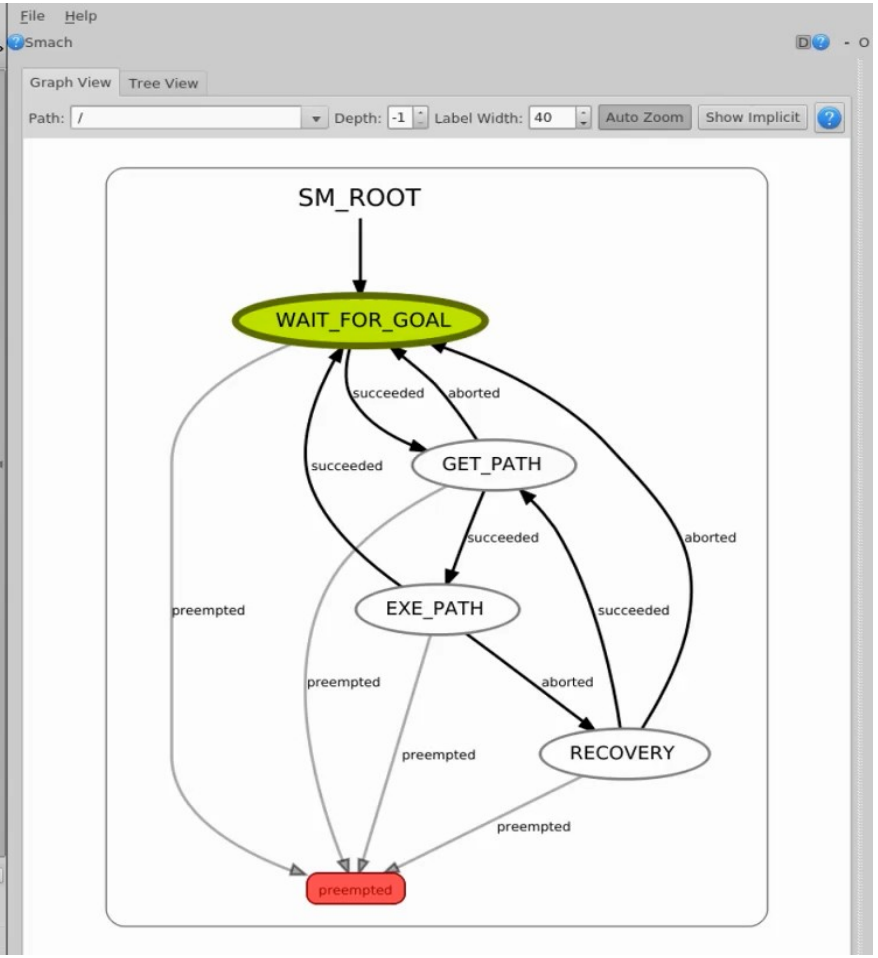


Move Base Flex mbf_2d_nav

global_planner,
local_planner

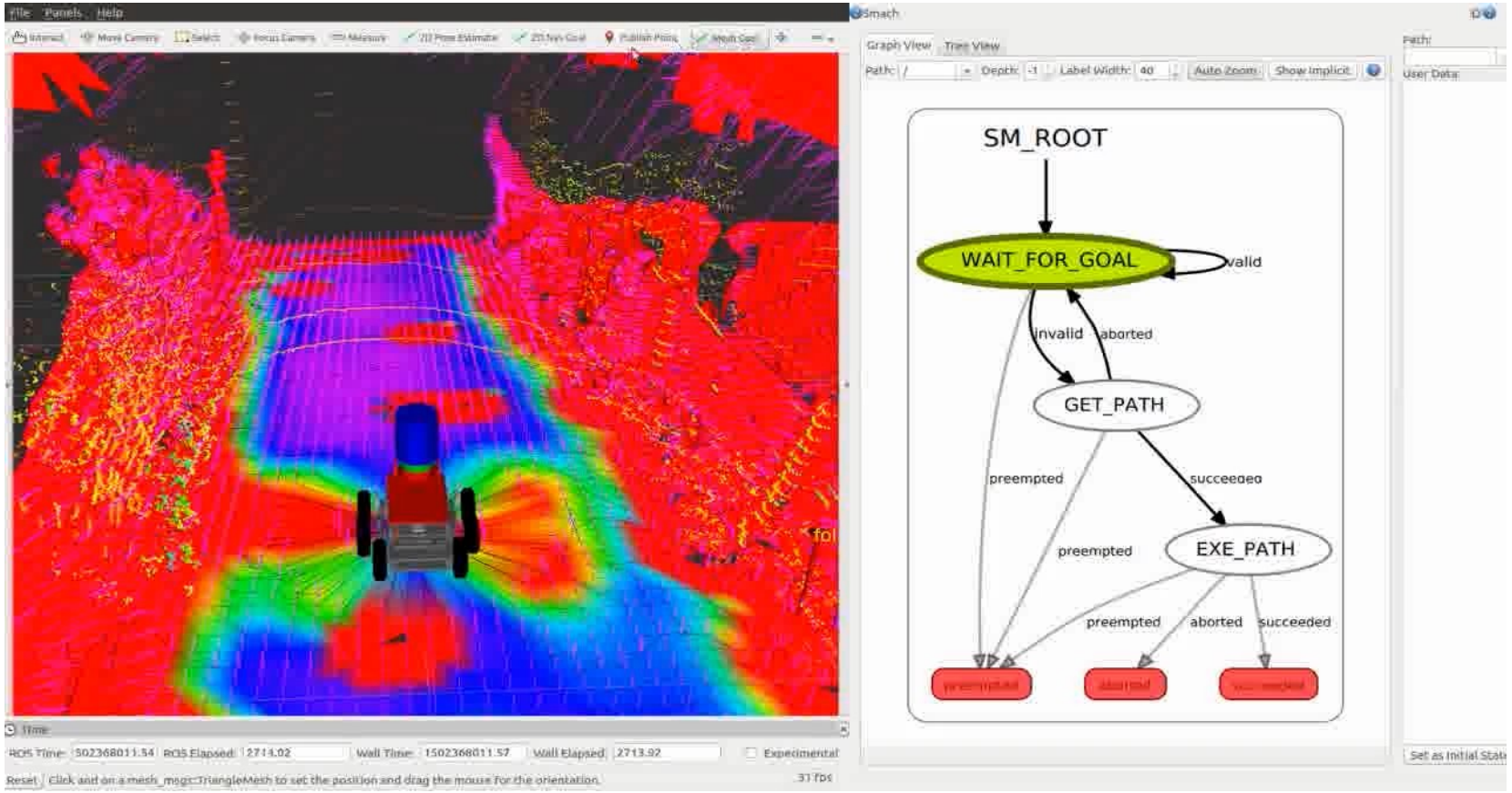






Move Base Flex mbf_simple

mesh_planner



Starting with Move Base Flex

- Old good move_base action and services are there, but…
- …now you can use individual components: escape, query maps…
- Easy start with the SMACH tutorial in the Wiki: http://wiki.ros.org/move_base_flex/Tutorials
- More tutorials comming sonn!
- Try other executives: Scripts, Behavior Trees…

Writing a simple SMACH for Move Base Flex

Description: In this tutorial you learn how to set up a SMACH to use Move Base Flex for flexible and more specific navigation tasks. Using a SMACH lets you easily include your navigation tasks into your global robot behavior state machine. We will use RViz to receive a goal pose as the first input for the SMACH.

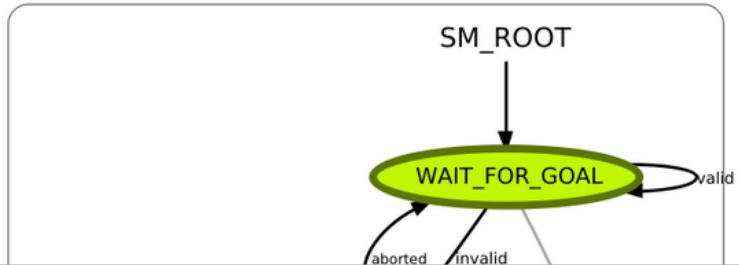
Keywords: smach, move_base_flex, navigation, planning, state machine

Tutorial Level: ADVANCED

1. Description

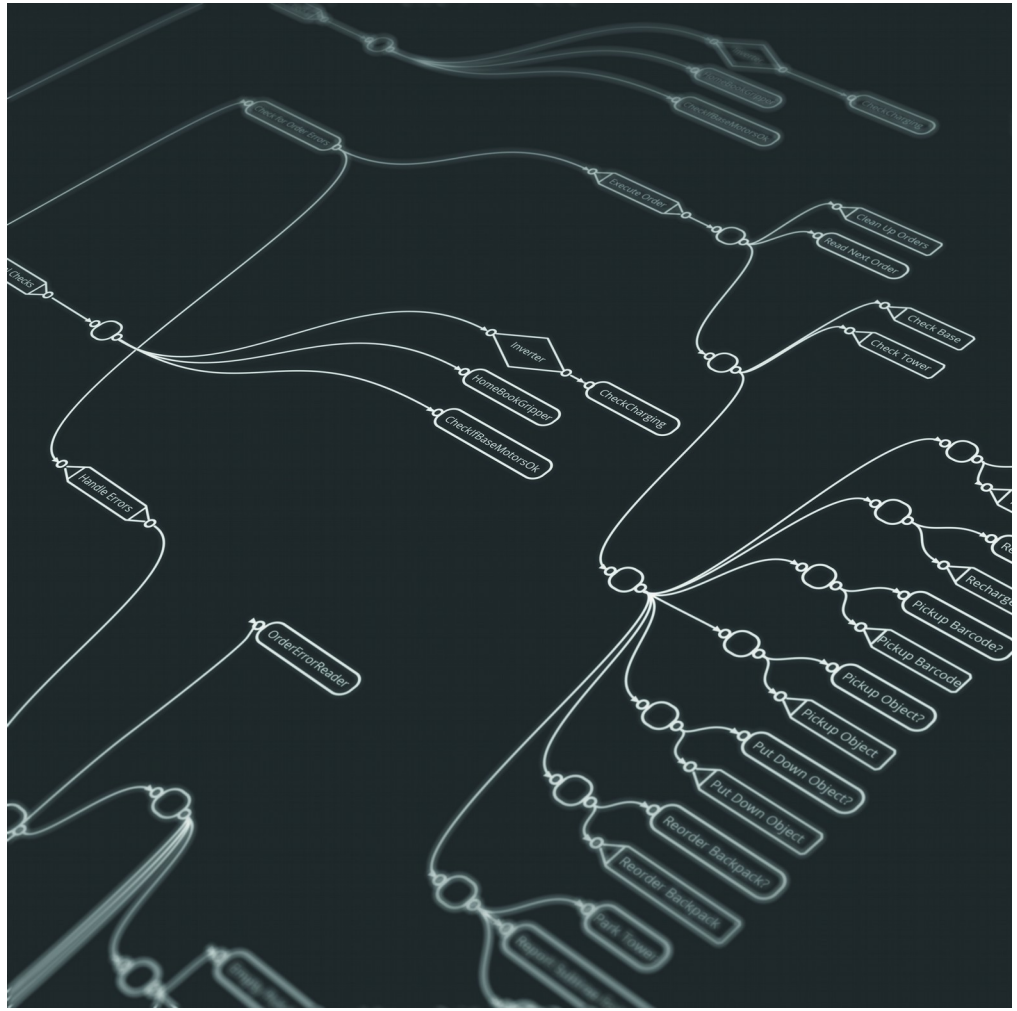
In this tutorial we address the actions *GetPath*, *ExePath* and *Recovery* provided by Move Base Flex. While *GetPath* runs the global planner searching for a path to the target pose, *ExePath* runs the local planner executing the planned path. The *Recovery* action can be used to execute various behaviors for error handling during planning and controlling. We connect these actions by setting up a SMACH state machine using Simple Action States. In addition to the actions described above, the implementation of a state that receives a navigation goal by the user is required. The target pose can be easily set via the visualization tool RViz and published on a specific topic.

1.1 SMACH State Machine



What to do with Move Base Flex

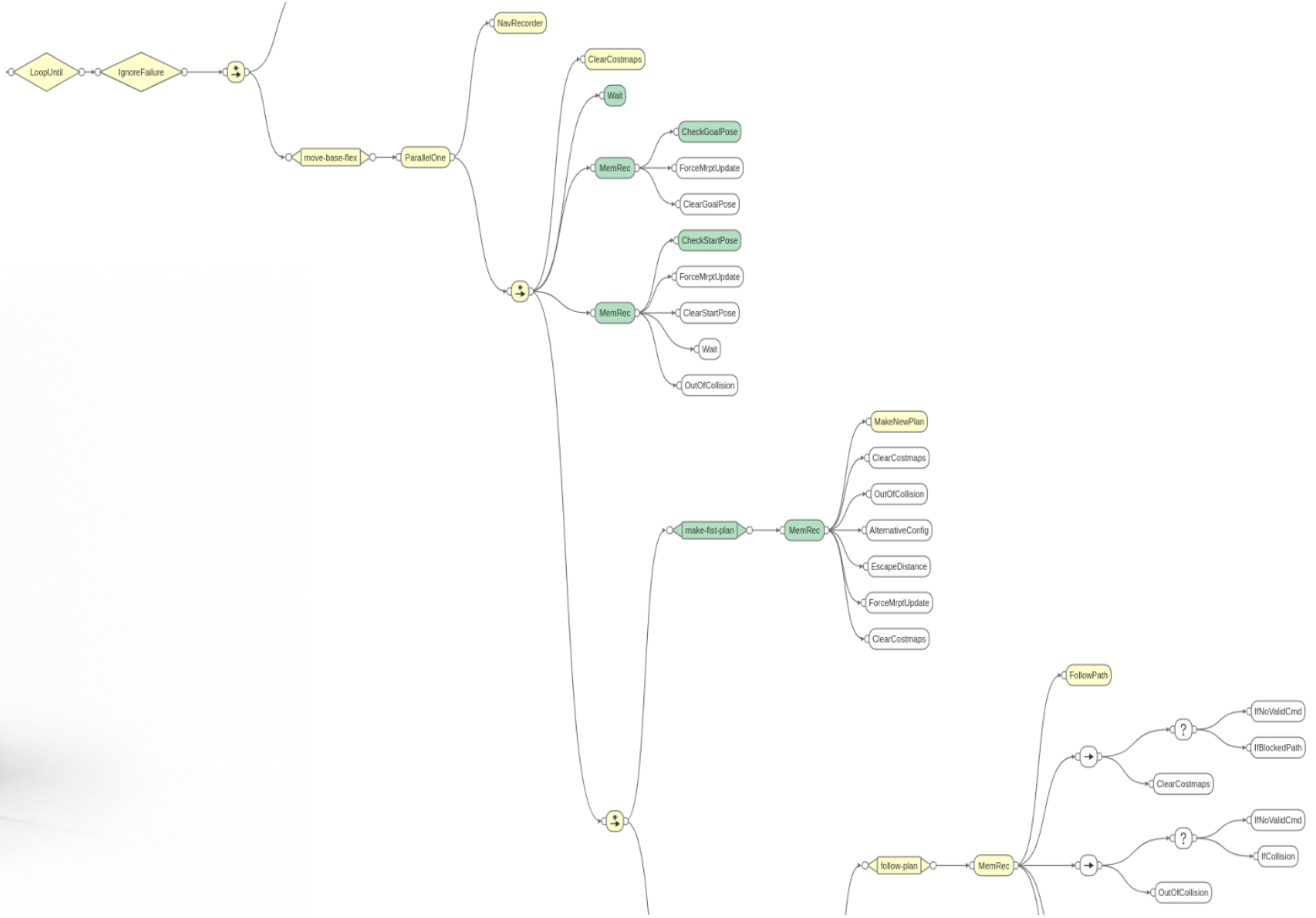
- Check start/goal poses before planning
- Replan only if strictly needed
- Exploit anytime planners
- Use the right recovery behavior for each error
- Introspection in the navigation decision-making
- Monitor progress and log data
- …



Move Base Flex at Magazino

Some examples…

- avoid replanning
- check start/goal poses
- escape from collision



Avoid replanning

Future Work

- First release on October
- Grid Map (ETH Zürich, ASL: https://github.com/ethz-asl/grid_map)
- Allow multiple planners and controllers
- Select applicable plugins at runtime
- Add pause/resume interface for the controller
- Plans with waypoints
- … `<your ideas here>`

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Magazino GmbH
Landsberger Str. 234
80687 München
T +49-89-21552415-0
F +49-89-21552415-9
info@magazino.eu
www.magazino.eu

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- Trainee Robotics - 18 months (m/f)
- Software QA and Testing Engineer (m/f)
- Al Research Engineer (m/f)
- Al Software Architect (m/f)
- Cloud DevOps Engineer (m/f)
- Multi-Robot Coordination Specialist (m/f)
- Robot UX and Frontend Developer (m/f)
- Robots Application Engineer (m/f)
- Senior Navigation Engineer (m/f)
- Senior Software Developer (m/f)