ROS - Robot Operating System

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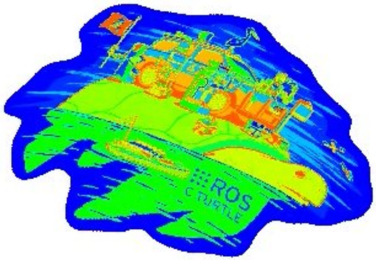
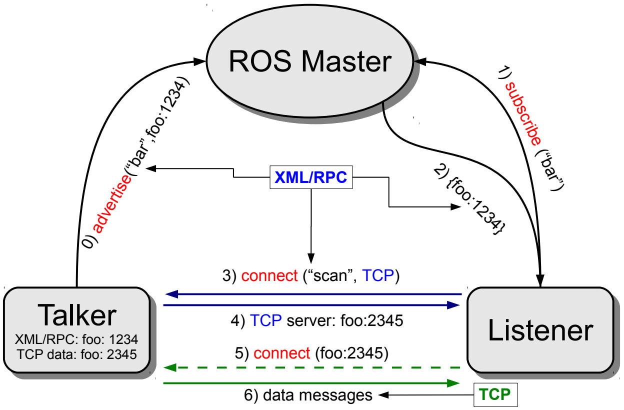
ROS Tutorial



ROS Tutorial

Topics

- nodes connect via topics
- the discovery of who publishes on what topic is done via a ROS master



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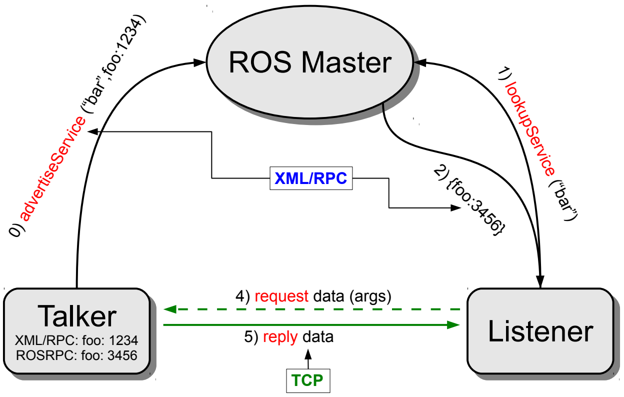
Services

- synchronous services



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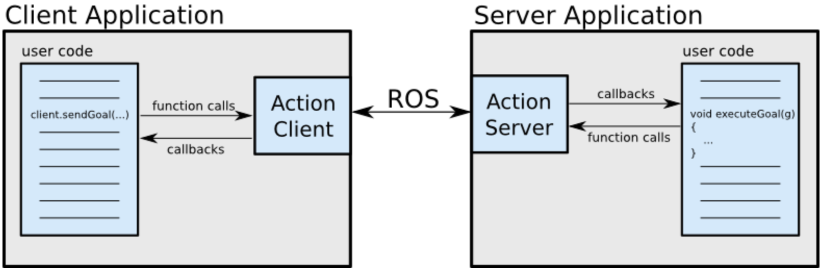
Actions (1/2)

Using function calls and callbacks

- request goals (client side)
- execute goals (server side)



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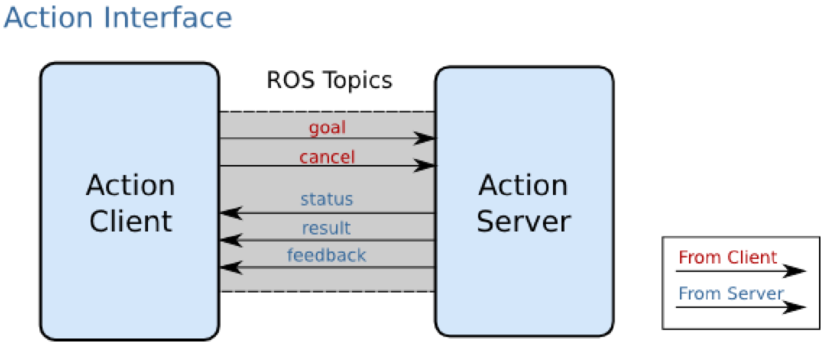
Actions (2/2)

- action protocol relies on ROS topics to transport messages



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Messages

- defined in package-name/msg/*.msg files, sent over topics
- basic data types:
  - int{8,16,32,64}
  - float{32,64}
  - string
  - time
  - duration
  - array[]
- Example: *Point.msg*

```
float64 x
float64 y
float64 z
```

- used in ROS services, defined in package-name/srv/*.srv
  Service = Request msg + Response msg

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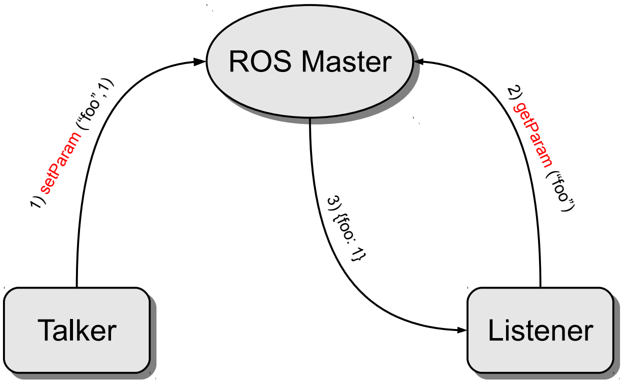
Parameters (1/2)

- nodes can set parameters on the server
- any other nodes can read them



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Parameters (2/2)

- have unique names
- can represent primitive data types:
  - integers
  - floats
  - boolean
  - dictionaries
  - maps, etc
- can be set and remapped at runtime
- stored on the parameter server

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Packages and Stacks

- Packages : directories with a certain structure, can contain anything: nodes, messages, tools
- in their most basic form:
  - *package_name*
  - *package_name/Makefile*
  - *package_name/CMakeLists.txt*
  - *package_name/manifest.xml*
- ROS core = small, but ROS universe = many packages !!!
- Stacks : collection of packages
- in their most basic form:
  - *stack_name/*
  - *stack_name/package_name_1*
  - *stack_name/package_name_N*
  - *stack_name/stack.xml*

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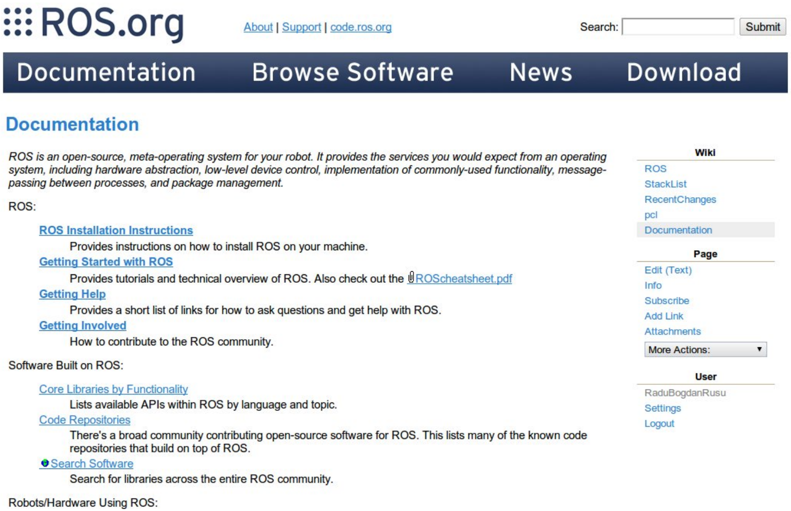
ros.org

Documentation, tutorials, wiki:



Documentation

ROS is an open-source, meta-operating system for your robot. It provides the services you would expect from an operating system, including hardware abstraction, low-level device control, implementation of commonly-used functionality, message-passing between processes, and package management.

ROS:

ROS Installation Instructions
Provides instructions on how to install ROS on your machine.

Getting Started with ROS
Provides tutorials and technical overview of ROS. Also check out the ROScheatsheet.pdf

Getting Help
Provides a short list of links for how to ask questions and get help with ROS.

Getting Involved
How to contribute to the ROS community.

Software Built on ROS:

Core Libraries by Functionality
Lists available APIs within ROS by language and topic.

Code Repositories
There's a broad community contributing open-source software for ROS. This lists many of the known code repositories that build on top of ROS.

Search Software
Search for libraries across the entire ROS community.

Robots/Hardware Using ROS:

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Example

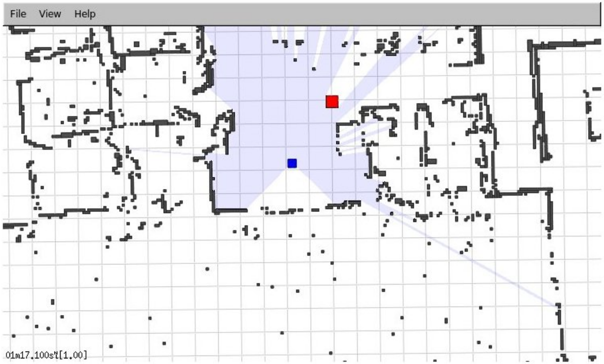
- simulator_stage demo

4. Run stageros with an existing world file

The stage package ships with some example world files, including one that puts an Erratic-like robot in a Willow Garage-like environment. To run it:

```
roscd stage
./bin/stageros world/willow-erratic.world
```

You should see a Stage window pop up that looks something like this:


File
View
Help
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