

ROS



What is ROS?

The Robot Operating System (ROS) is a set of software libraries and tools that help you build robot applications. From drivers to state-of-the-art algorithms, and with powerful developer tools, ROS has what you need for your next robotics project. And it's all open source.

- Middleware
- Community
- Library

<http://lists.ros.org/mailman/listinfo/ros-users>

ROS

ISEN | école
d'ingénieurs
ALL IS DIGITAL!



ROS





<http://wiki.ros.org/kinetic/Installation/Ubuntu>



1.2 Setup your sources.list

Setup your computer to accept software from packages.ros.org.

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

1.3 Set up your keys

```
sudo apt-key adv --keyserver hkp://ha.pool.sks-keyserver.net:80 --recv-key 421C365BD9FF1F7  
17815A3895523BAEEB01FA116
```

1.4 Installation

First, make sure your Debian package index is up-to-date:

```
sudo apt-get update
```



Desktop-Full Install: (Recommended) : ROS, [rqt](#), [rviz](#), robot-generic libraries, 2D/3D simulators, navigation and 2D/3D perception

```
sudo apt-get install ros-kinetic-desktop-full
```



```
echo "source /opt/ros/kinetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```



Console 1

```
~$ roscore
... logging to /home/santiago/.ros/log/66206fca-11ed-11e9-8a16-080027da3574/roslaunch-Rosie-18936.log
```

Checking log directory for disk usage. This may take awhile.

Press Ctrl-C to interrupt

Done checking log file disk usage. Usage is <1GB.

```
started roslaunch server http://127.0.0.1:39869/
ros_comm version 1.14.3
```

SUMMARY

=====

PARAMETERS

- * /rosdistro: melodic
- * /rosversion: 1.14.3

NODES

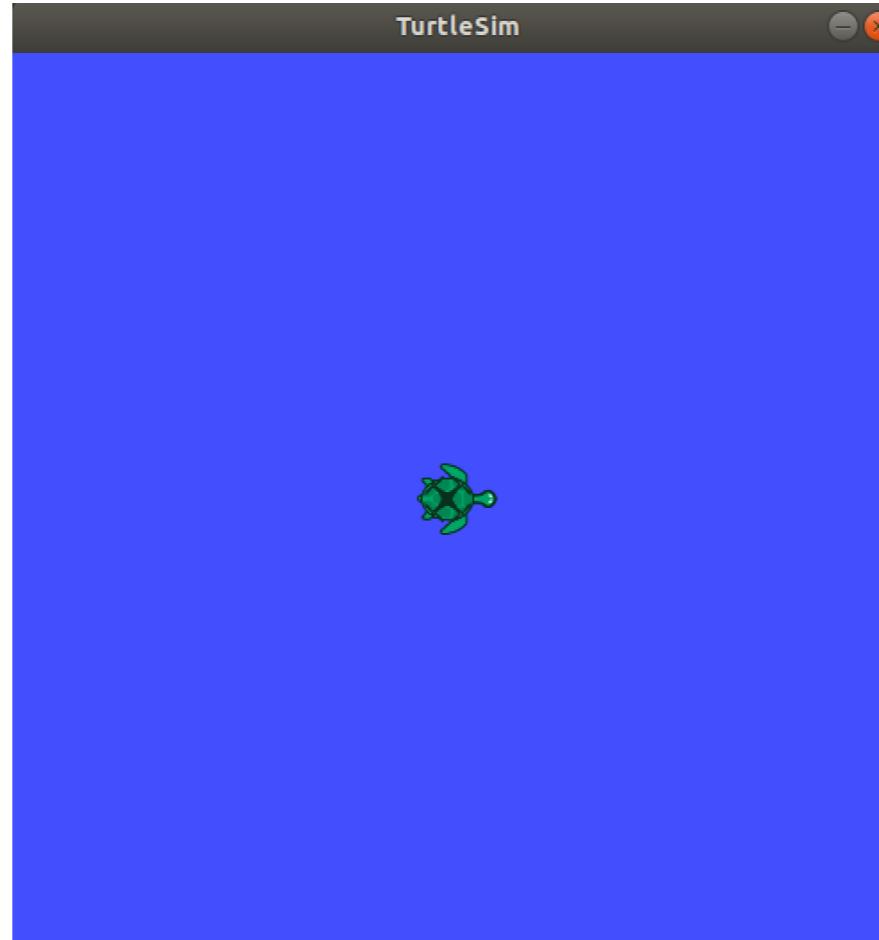
```
auto-starting new master
process[master]: started with pid [19778]
ROS_MASTER_URI=http://127.0.0.1:11311/
```

```
setting /run_id to 66206fca-11ed-11e9-8a16-080027da3574
process[rosout-1]: started with pid [20158]
started core service [/rosout]
```

Console 2

```
~$ rosrun turtlesim turtlesim_node
```

```
[ INFO] [1546804833.137926185]: Starting turtlesim with node name /turtlesim
[ INFO] [1546804833.147558477]: Spawning turtle [turtle1] at x=[5,544445], y=[5,544445], theta=[0,000000]
```



Console 3

```
~$ rosrun turtlesim turtle_teleop_key
```

Reading from keyboard

Use arrow keys to move the turtle.



ROS is not only code, but a
community, an Ecosystem

- ROS Ecosystem
- Distributed Processing
- Nodes and Messages
- Topics
- Publisher / Subscriber
- What is a Robotic system?

ROS is not only code, but a community, an Ecosystem

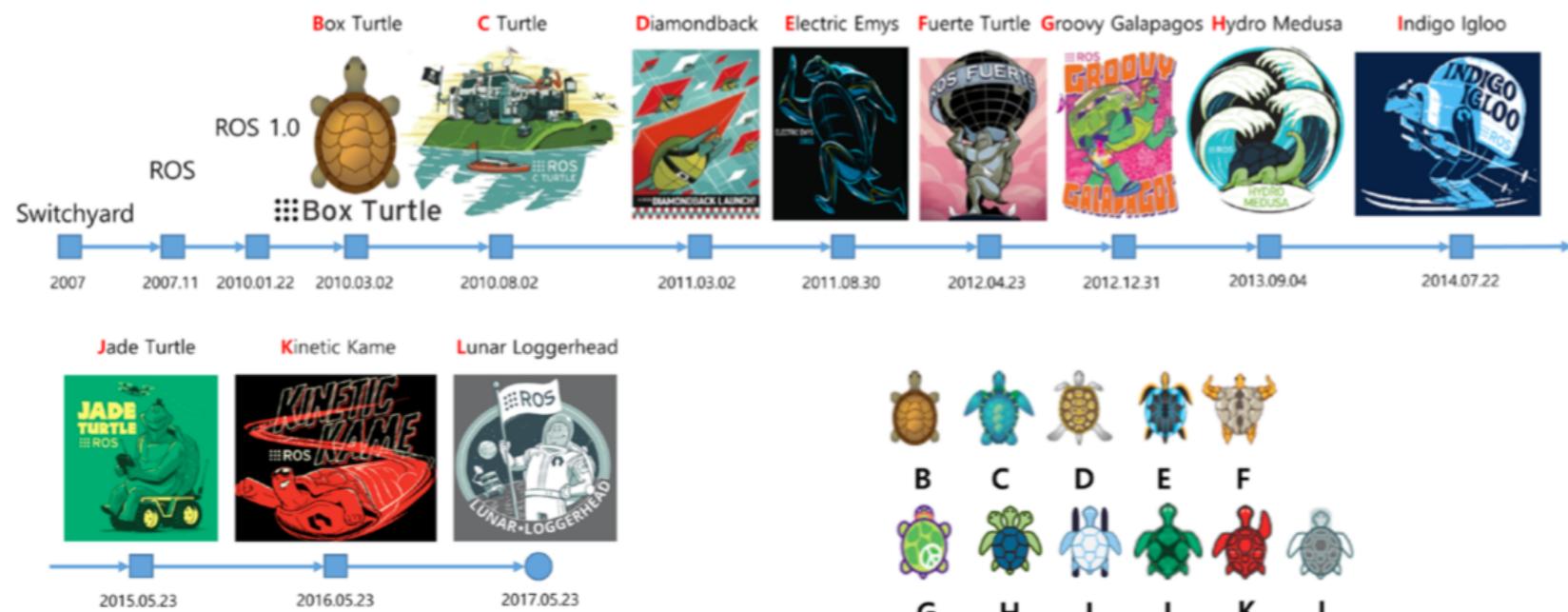


FIGURE 2-7 ROS Versions(<http://wiki.ros.org/>)

- ROS Ecosystem
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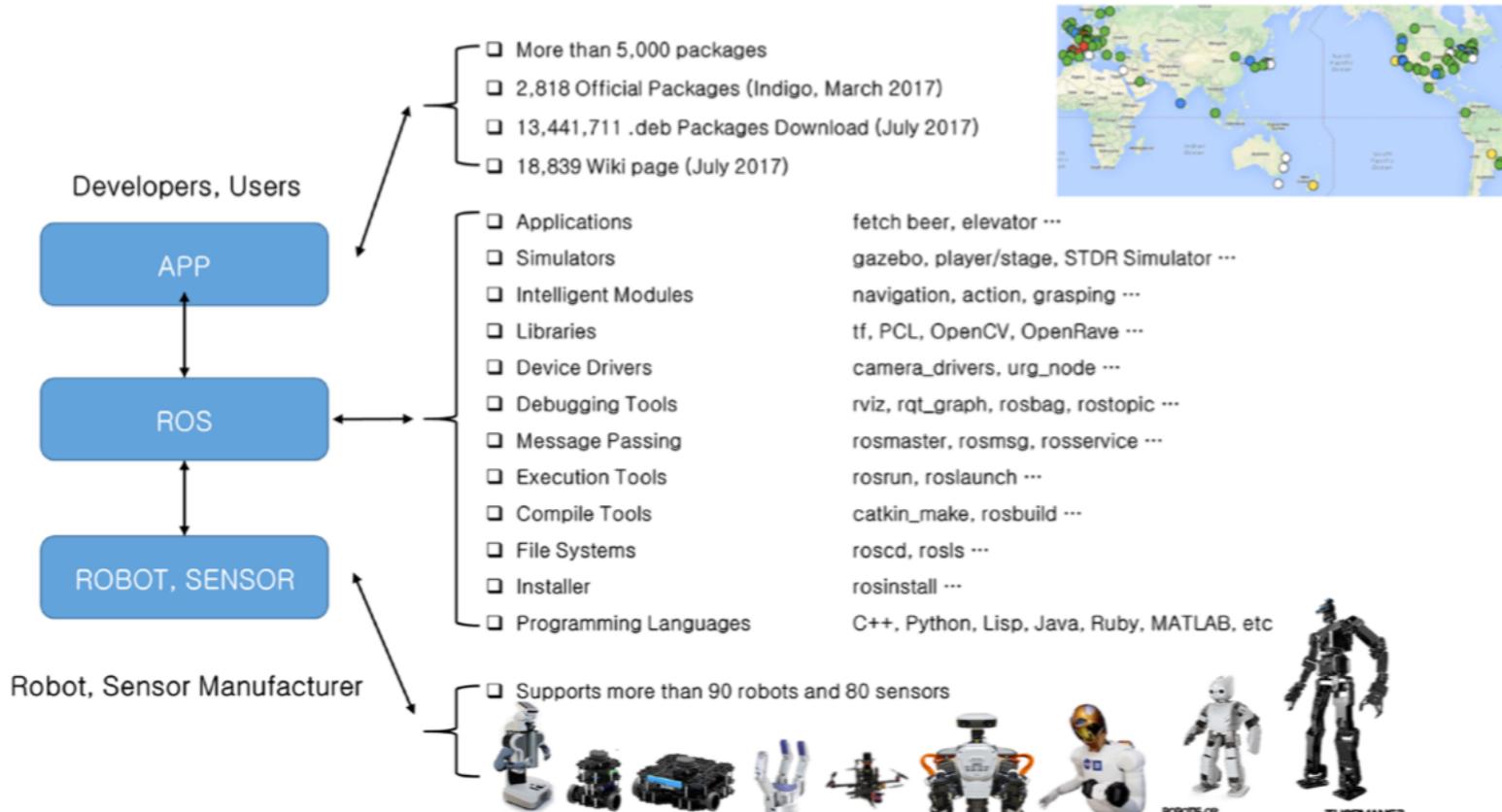


FIGURE 2-4 ROS Ecosystem

- ROS Ecosystem
- Distributed Processing
- Nodes and Messages
- Topics
- Publisher / Subscriber
- What is a Robotic system?

ROS is not only code, but a community, an Ecosystem



FIGURE 2-3 Components of ROS³

- ROS Ecosystem
- Distributed Processing
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- What is a Robotic system?

ROS is not only code, but a community, an Ecosystem

<https://wiki.ros.org/Events>

1.2 Regular Regional Meetups

- Barcelona Learn/Teach ROS Meetup
 - <https://www.meetup.com/meetup-group-GLGBcAgn/>
- Chicago EDT ROS Meetup
 - <http://www.meetup.com/ROS-Robot-Operating-System-in-Chicago/>
 - <http://www.chicagoedt.org/>
- ROS India Users Group Meetup
 - <http://www.meetup.com/rosindia>
- Edmonton Users Meetup
 - <http://rosedmonton.org>
- Japan Users Meetup
 - <https://groups.google.com/group/ros-japan-users>
- ROS on the Rocks:
 - Boulder Colorado Meetup
 - <http://www.meetup.com/ROS-on-the-Rocks/>
- Silicon Valley ROS Meetup
 - <http://www.meetup.com/SV-ROS-users/>
- London Robotics Network ROS Drinks
 - https://connect.innovateuk.org/web/london-robotics-network/events-view/-/events/14013278?p_p_auth=xGU0Fyax
 - <https://connect.innovateuk.org/documents/7384482/0/LRN.ROSdrinks.pdf>
- Korea ROS Users Meetup
 - <http://www.ros.org/news/2015/01/notes-from-the-first-korean-ros-users-meetup.html>
 - <http://www.ros.org/news/2015/06/2nd-ros-meetup-in-korea.html>
 - <http://www.ros.org/news/2015/08/3rd-ros-meetup-in-korea.html>
 - <http://www.ros.org/news/2015/11/4th-ros-meetup-in-korea.html>
- Seattle ROS Users Meetup
 - <http://www.meetup.com/ROS-Seattle>

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<http://lists.ros.org/mailman/listinfo/ros-users>

ros-users -- User discussions

About ros-users

This is the historical location of the ROS users mailing list. Please use <http://discourse.ros.org/> to continue discussions.

Posts there will be archived here as well, but direct posting to this list has been turned off.

To see the collection of prior postings to the list, visit the [ros-users Archives](#).

To browse and search the list archives, visit the [lists.ros.org Lurker archives](#).

Using ros-users

To post a message to all the list members, send email to ros-users@lists.ros.org.

You can subscribe to the list, or change your existing subscription, in the sections below.

Subscribing to ros-users

Subscribe to ros-users by filling out the following form. You will be sent email requesting confirmation, to prevent others from gratuitously subscribing you. This form is available only to the list administrator.

- ROS Ecosystem
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ROS is not only code, but a
community, an Ecosystem:
Participate

- Ask!
- Respond!
- Share!
- ROS Ecosystem
- Distributed Processing
- Nodes and Messages
- Topics
- Publisher / Subscriber
- What is a Robotic system?

ROS

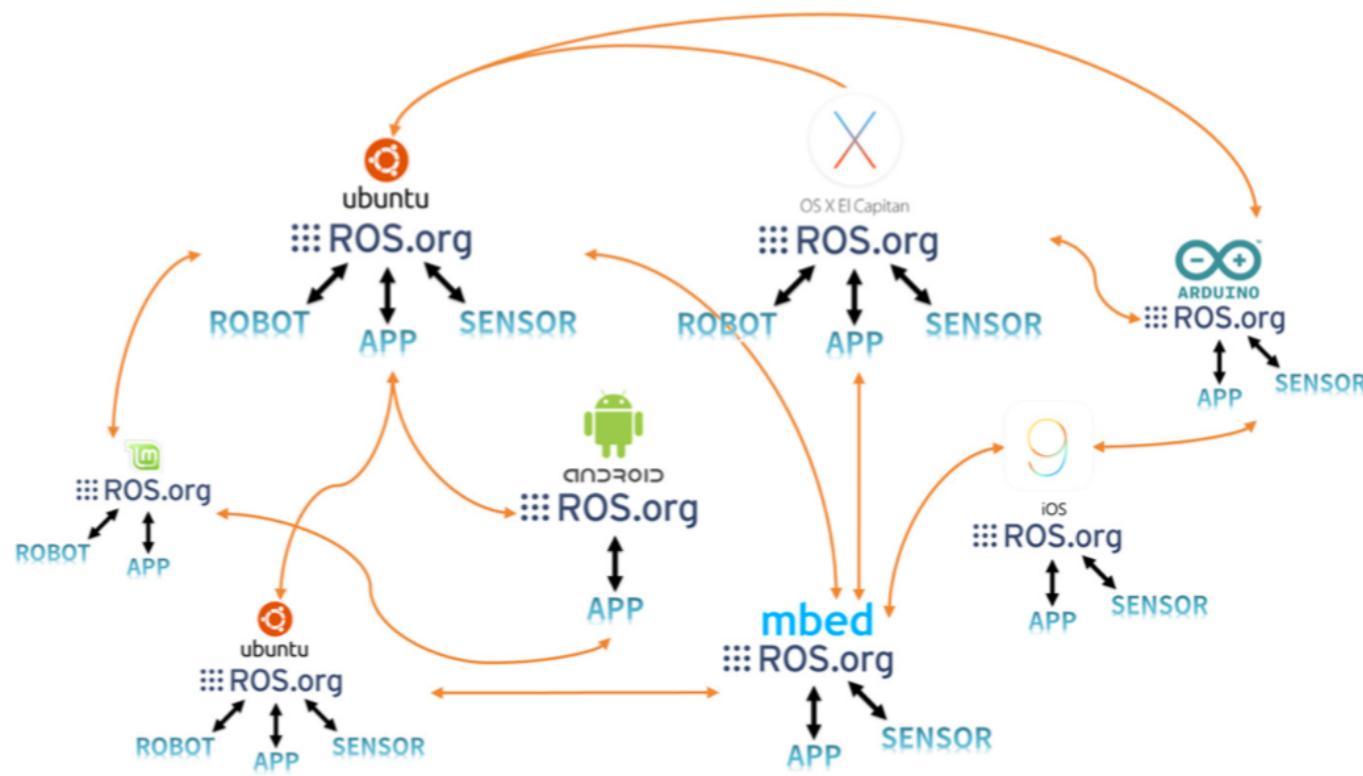
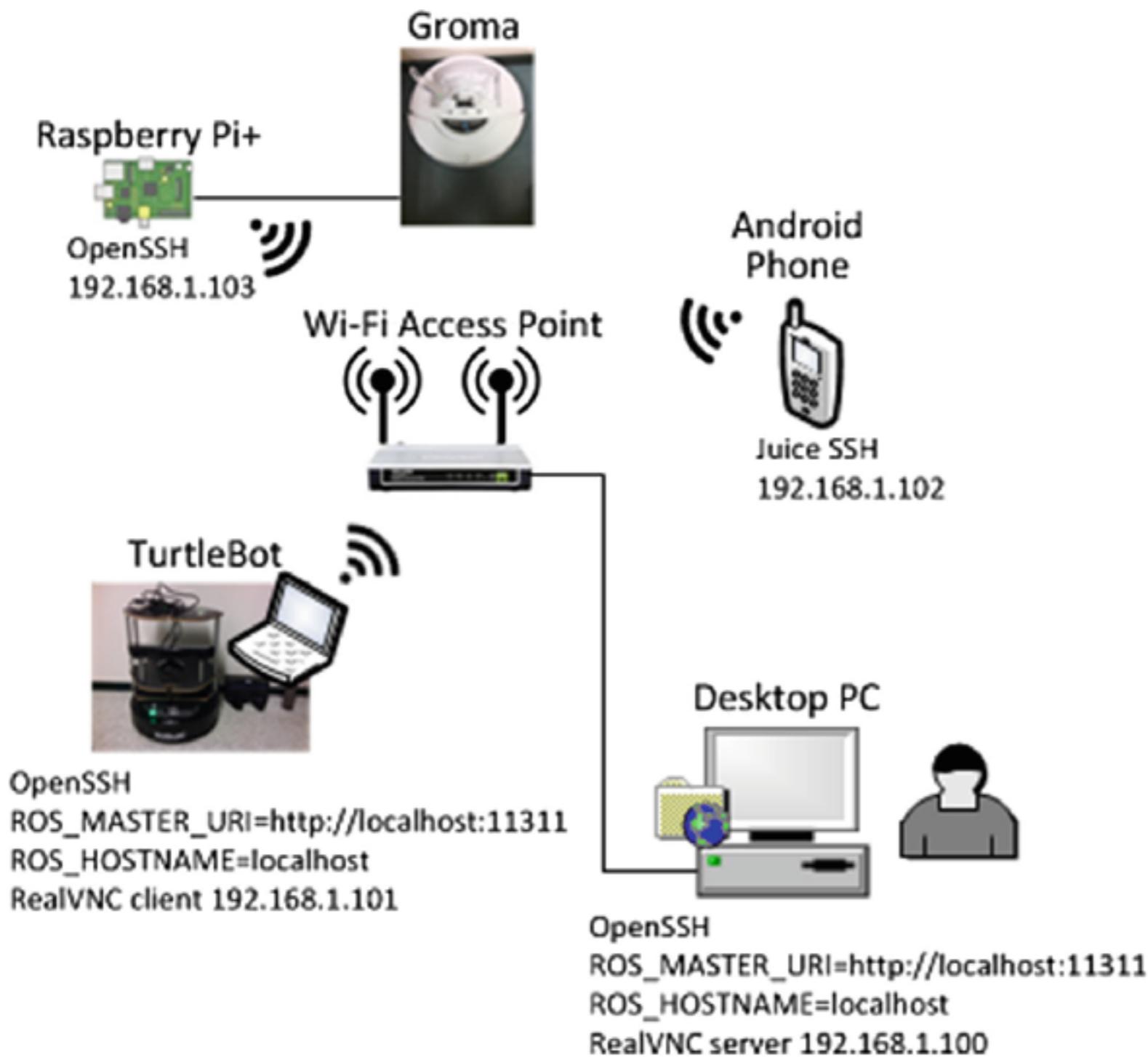


FIGURE 2-2 ROS Multi-Communication

- ROS Ecosystem
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- Topics
- Publisher / Subscriber
- What is a Robotic system?

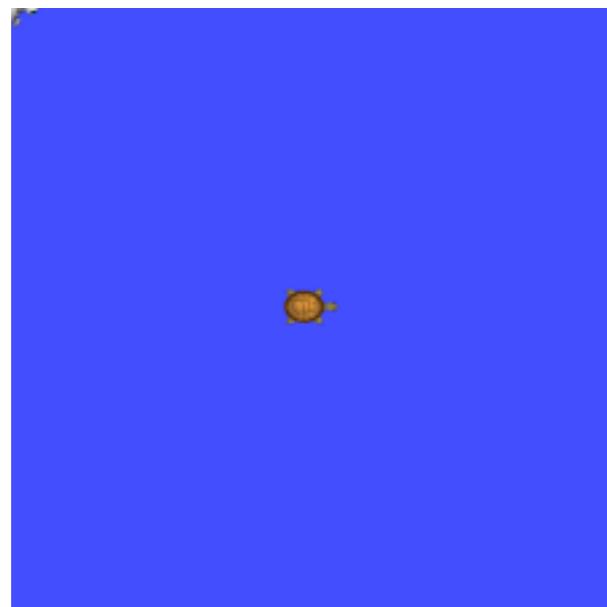
ROS



- ROS Ecosystem
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Run the turtlesim example in more than
two machines

```
export ROS_MASTER_URI=http://192.168.0.108:11311  
export ROS_HOSTNAME=<YOUR.IP>
```



- ROS Ecosystem
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- What is a Robotic system?

- Nodes
 - Processing entities
 - Mono or multi thread
 - Written in whatever language
 - Responds to an unified protocol
 - ROS Ecosystem
 - Distributed Processing
 - Nodes and Messages
 - Topics
 - Publisher / Subscriber
 - What is a Robotic system?

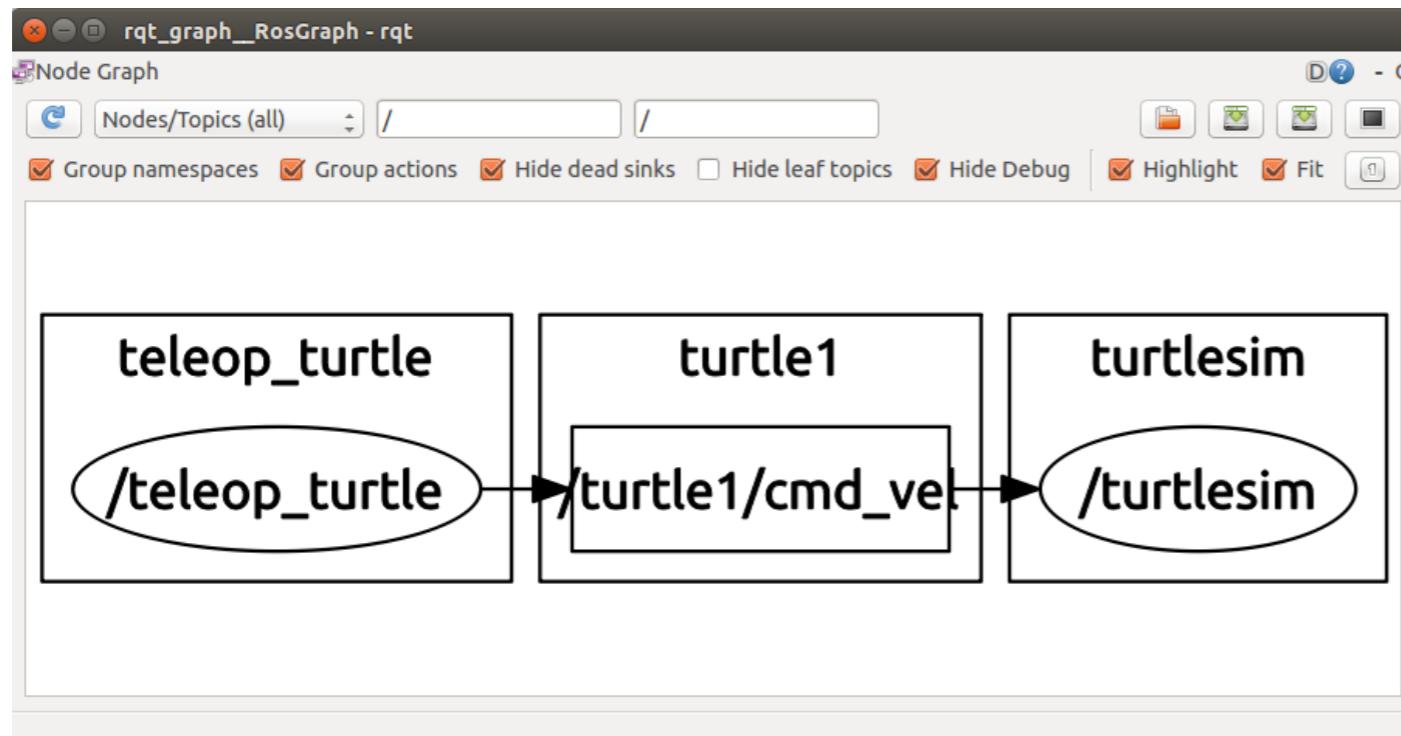
- rosnode command
 - ping test connectivity to node
 - list list active nodes
 - machine list nodes running on a particular machine or list machines
 - info print information about node
 - kill kill a running node
 - cleanup purge registration information of unreachable nodes
- ROS Ecosystem
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- Publisher / Subscriber
- What is a Robotic system?

- Messages
 - A message is a unit of communication
 - It has an arbitrary, yet static and predefined structure
 - In ROS 1 is transmitted under TCP/IP protocol.
- ROS Ecosystem
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- What is a Robotic system?

- rosmsg command
 - show Show message description
 - info Alias for rosmsg show
 - list List all messages
 - md5 Display message md5sum
 - package List messages in a package
 - packages List packages that contain message

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- rqt_graph command



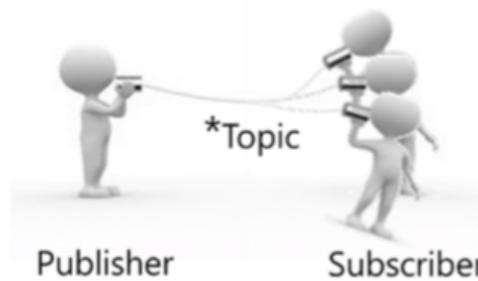
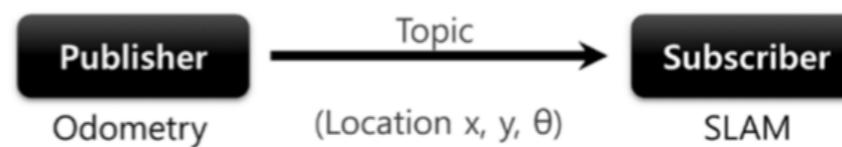
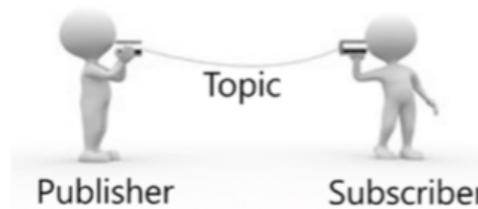
- ROS Ecosystem
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ROS

- Asynchronous
- Unidirectional
- N2N
- Used for streaming information

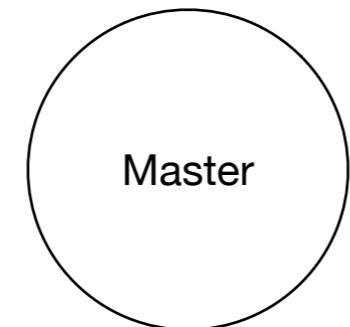
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ROS

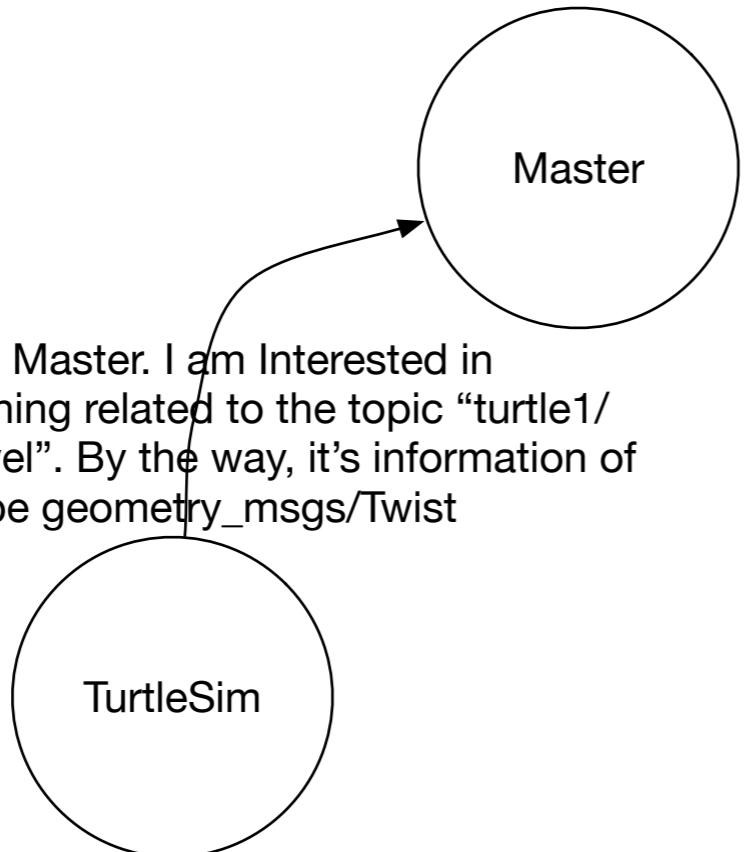


*Topic not only allows 1:1 Publisher and Subscriber communication, but also supports 1:N, N:1 and N:N depending on the purpose.

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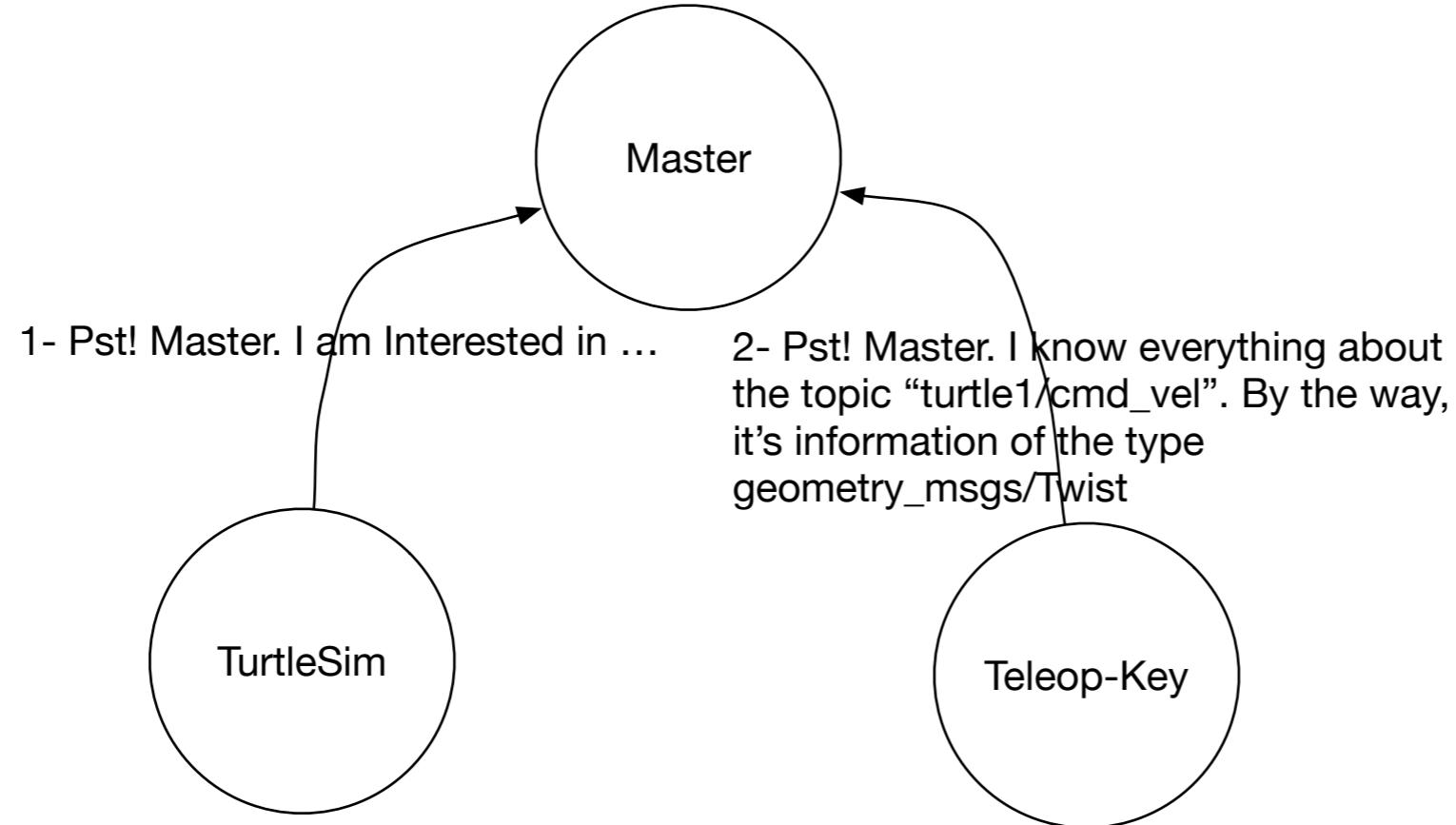


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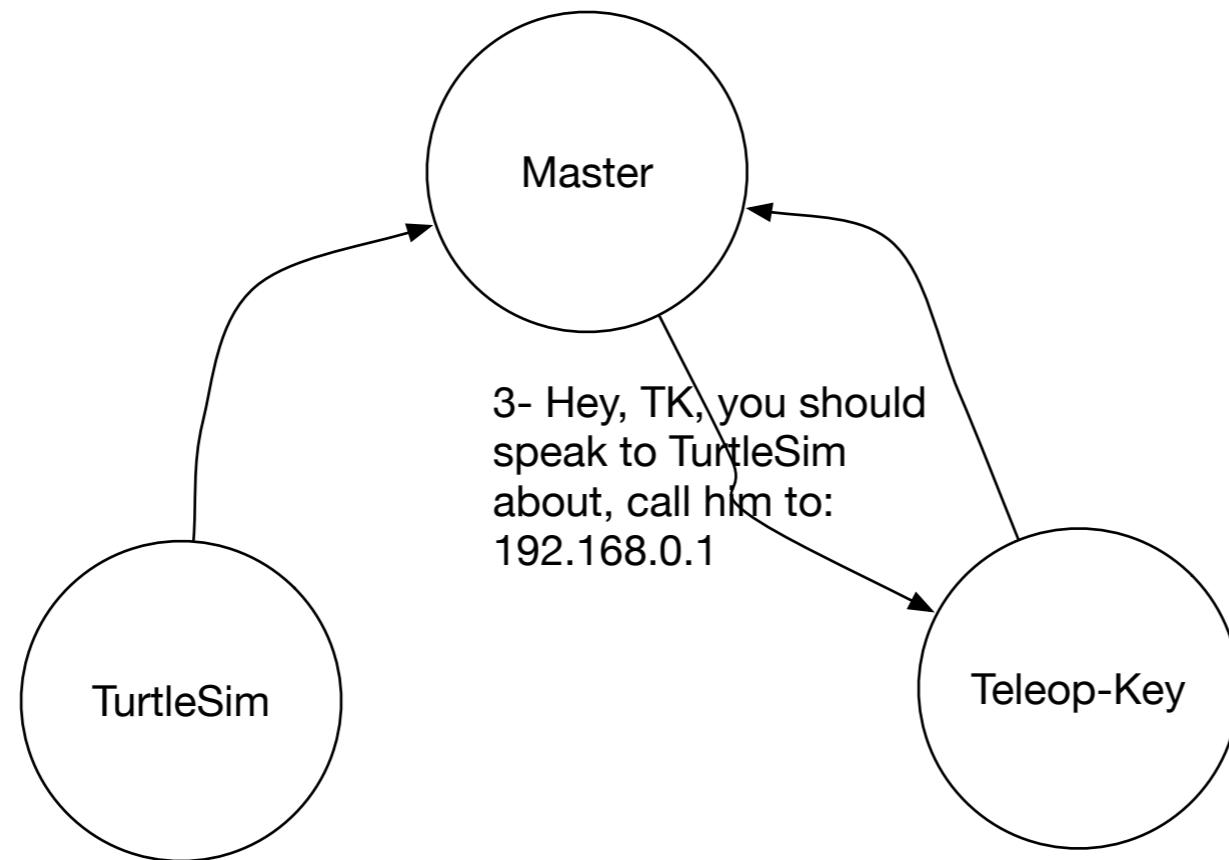


1- Pst! Master. I am Interested in everything related to the topic “turtle1/cmd_vel”. By the way, it's information of the type geometry_msgs/Twist

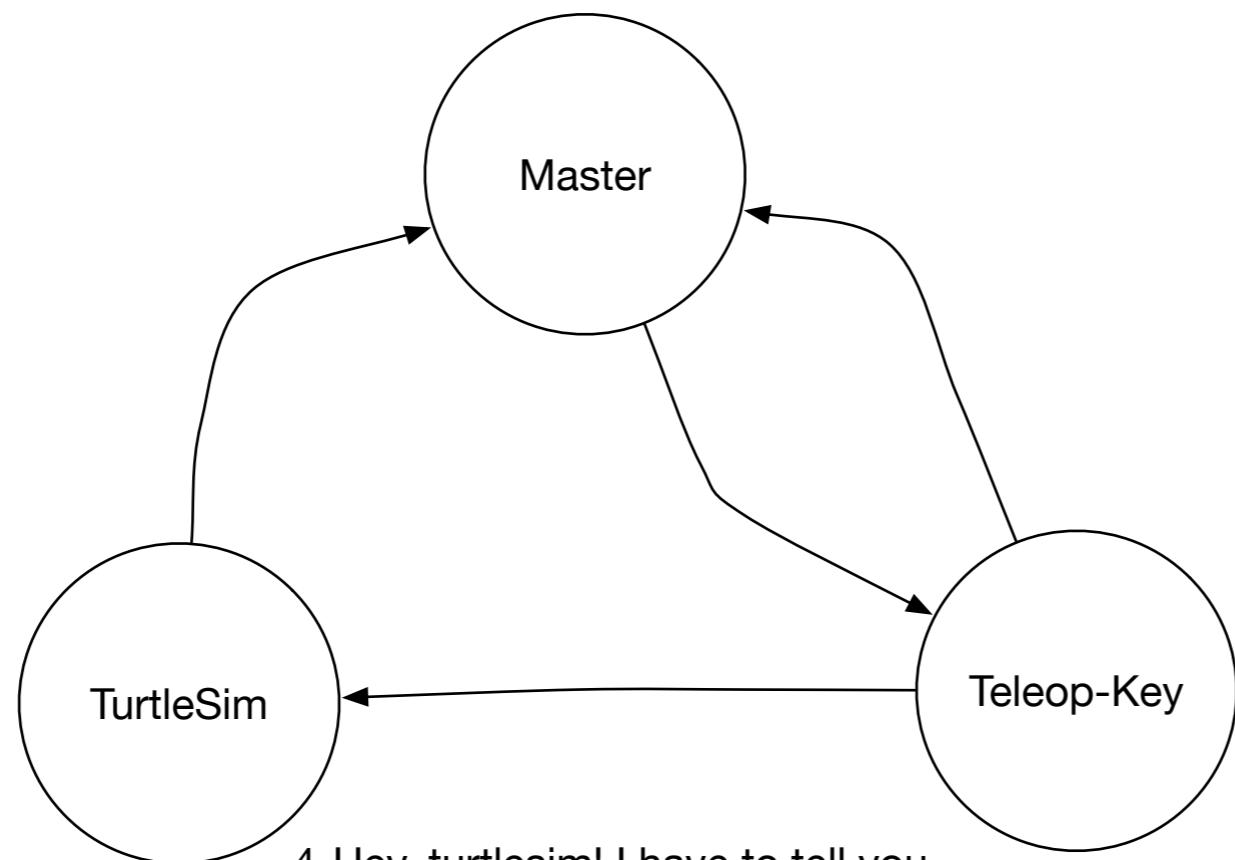
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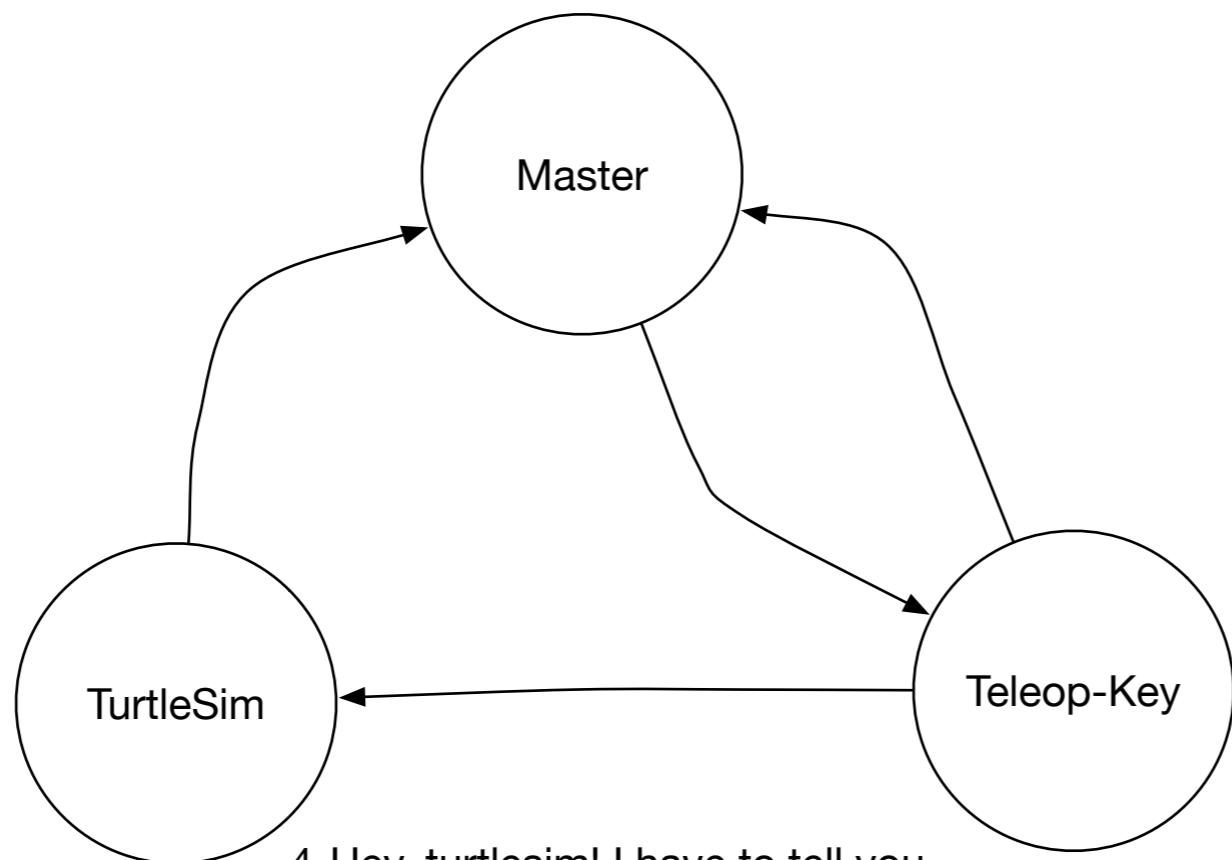


- ROS Ecosystem
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4-Hey, turtlesim! I have to tell you something about “turtle1/cmd_vel” type geometry_msgs/Twist

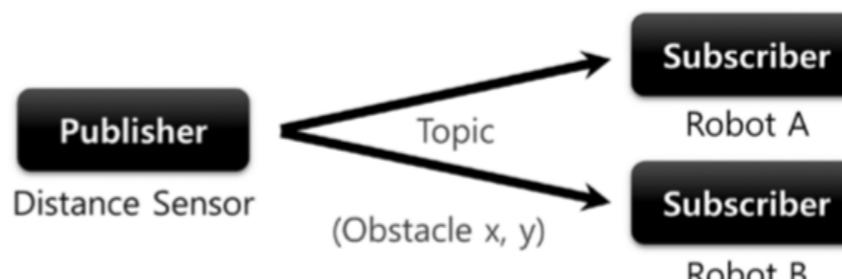
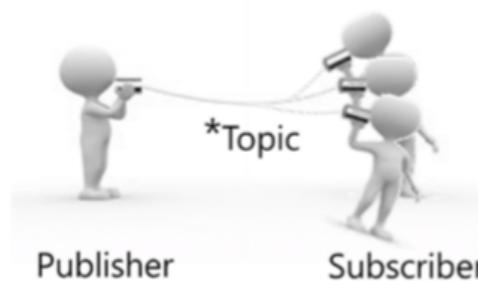
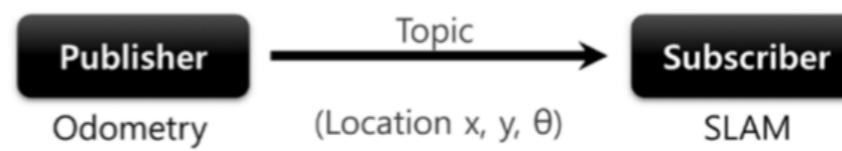
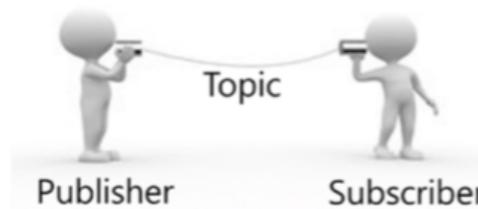
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ROS



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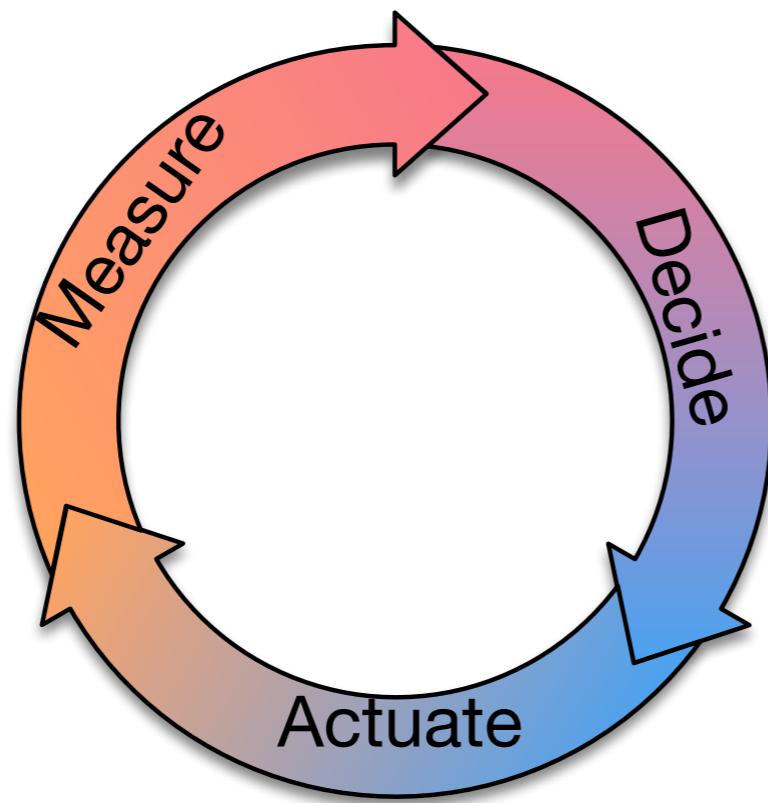
Writing a publisher and a subscriber: Chat exercise.

- ROS Ecosystem
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- What is a Robotic system?

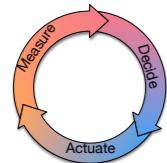
- Robot

A mechanical device capable of performing a variety tasks interacting with the environment

- ROS Ecosystem
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- ROS Ecosystem
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- Measure specific environmental properties
 - Analyse and model specific aspects of reality
 - Act over the environment for transforming the reality
-
- ROS Ecosystem
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Then, what is a program in ROS?

- ROS Ecosystem
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