



 ROS

# Development Tools in ROS

Session 05

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# Session Plan



## Session 01

Robotics and ROS

- Introduction to basic concepts of Robotics
- Introduction to ROS
- When and How to use ROS in robotics



## Session 02

Communication infrastructure in ROS

- Getting started with ROS
- Publisher Subscriber (C++)
- Publisher Subscriber (Python)

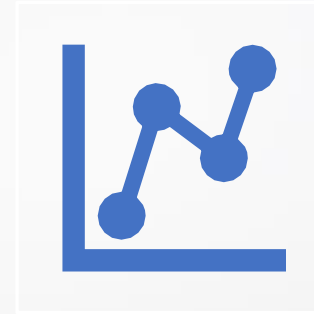
# Session Plan (cont..)



## Session 03

Communication infrastructure in ROS (Part 2)

- Standard and Custom message, service and action definitions
- Client Server(C++)
- Client Server (Python)



## Session 04

Robot specific infrastructure of ROS

- Action client Action server (C++)
- Action client Action server (Python)
- Introduction to Gazebo
- Introduction to Robot Description language
- Introduction to Robot Geometry library

# Session Plan (cont..)



## Session 05

Development tools available in ROS

- rosrun, roslaunch
- rostopic, rosservice
- rqt\_graph
- rqt\_tf\_tree
- Catkin build system

# Development Tools available in ROS

ROSRUN

# Running the nodes

- Open a terminal and run  
`roscore`
- Open a 2<sup>nd</sup> terminal in the workspace root and run  
`source devel/setup.bash`  
`roslaunch session3_pubsub publisher`
- Open a 3<sup>rd</sup> terminal in the workspace root and run  
`source devel/setup.bash`  
`roslaunch session3_pubsub subscriber`
- Open a 4<sup>th</sup> terminal in the workspace root and run  
`source devel/setup.bash`  
`roslaunch session3_pubsub publisher`

# Renaming

- Nodes with the same name cannot be alive at the same time. Default Name is given at,

```
ros::init(argc, argv, "publisher");
```

- We can do renaming on the terminal itself

```
__name:=publisher1
```

# Running the nodes

- Open a terminal and run  
`roscore`
- Open a 2<sup>nd</sup> terminal in the workspace root and run  
`source devel/setup.bash`  
`roslaunch session3_pubsub publisher __name:=publisher1`
- Open a 3<sup>rd</sup> terminal in the workspace root and run  
`source devel/setup.bash`  
`roslaunch session3_pubsub subscriber`
- Open a 4<sup>th</sup> terminal in the workspace root and run  
`source devel/setup.bash`  
`roslaunch session3_pubsub publisher __name:=publisher2`



# Development Tools available in ROS

ROSLAUNCH

# ROSLAUNCH

- Writing terminal commands for each node in separate terminals can be confusing.
- Can use roslaunch files instead
  - Xml file
  - `<launch> </launch>`
  - `<node> </node>`

## Creating launch file

- Inside a package create a new folder named "launch"
- Create a new file name "test.launch"
- Copy the content

## Running the Launch file

- Open a terminal in the workspace root and run

```
source devel/setup.bash
```

```
roslaunch session3_pubsub test.launch
```

# Development Tools available in ROS

RQT\_GRAPH

# RQT\_GRAPH

- Open a terminal and run  
`rqt_graph`
- This is a QT based window
- Shows live nodes and their topic subscriptions.
- Very useful when debugging

# Development Tools available in ROS

ROSTOPIC

# ROSTOPIC

- Open a terminal and run `rostopic`
- This enables to view the details about topics
- Msg definition, rate, subscribe and publish info, and messages them selves



# Development Tools available in ROS

ROSSERVICE

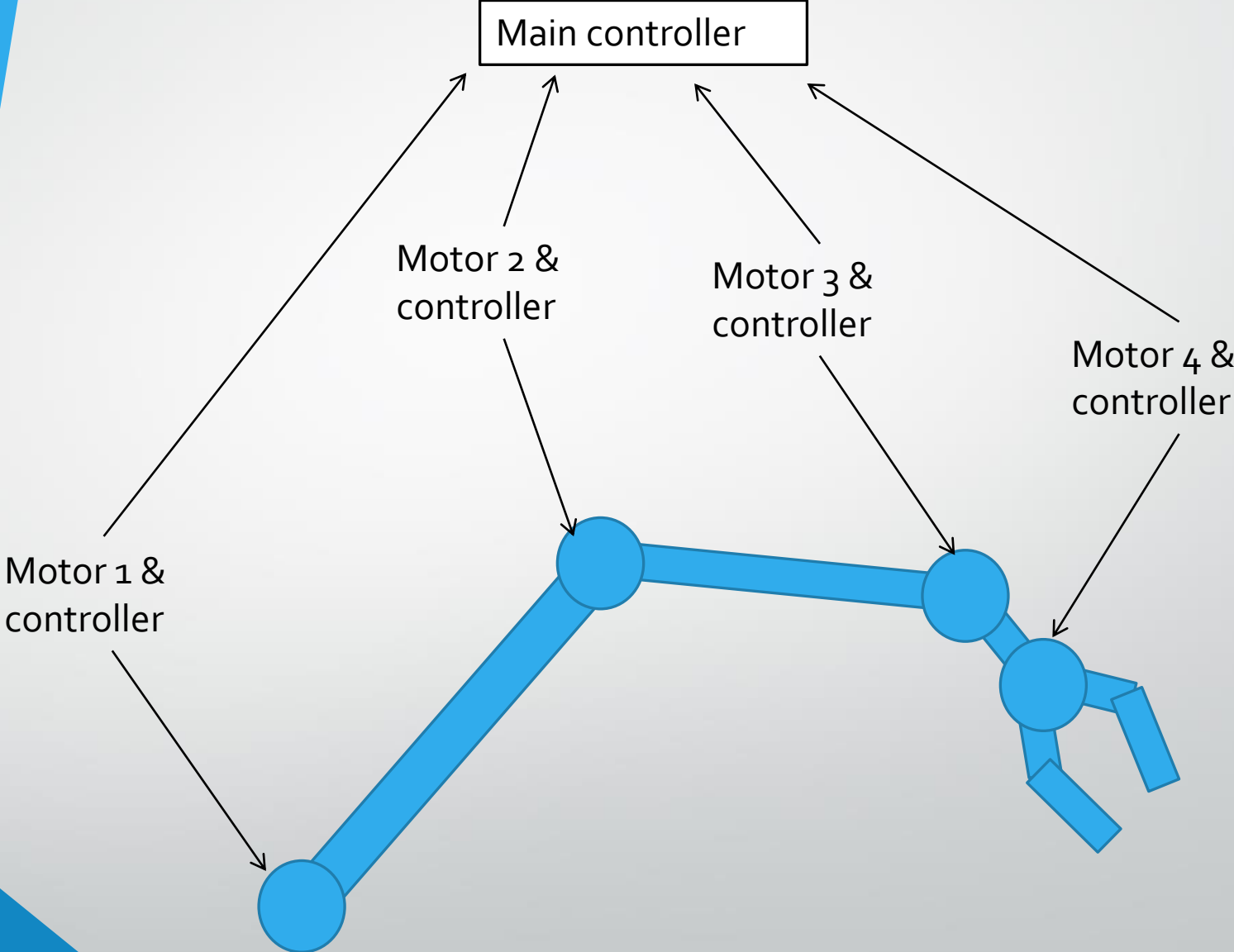
# ROSSERVICE

- Open a terminal and run `rosservice`
- This enables to view the details about services
- srv definition, rate, subscribe and publish info, and messages them selves

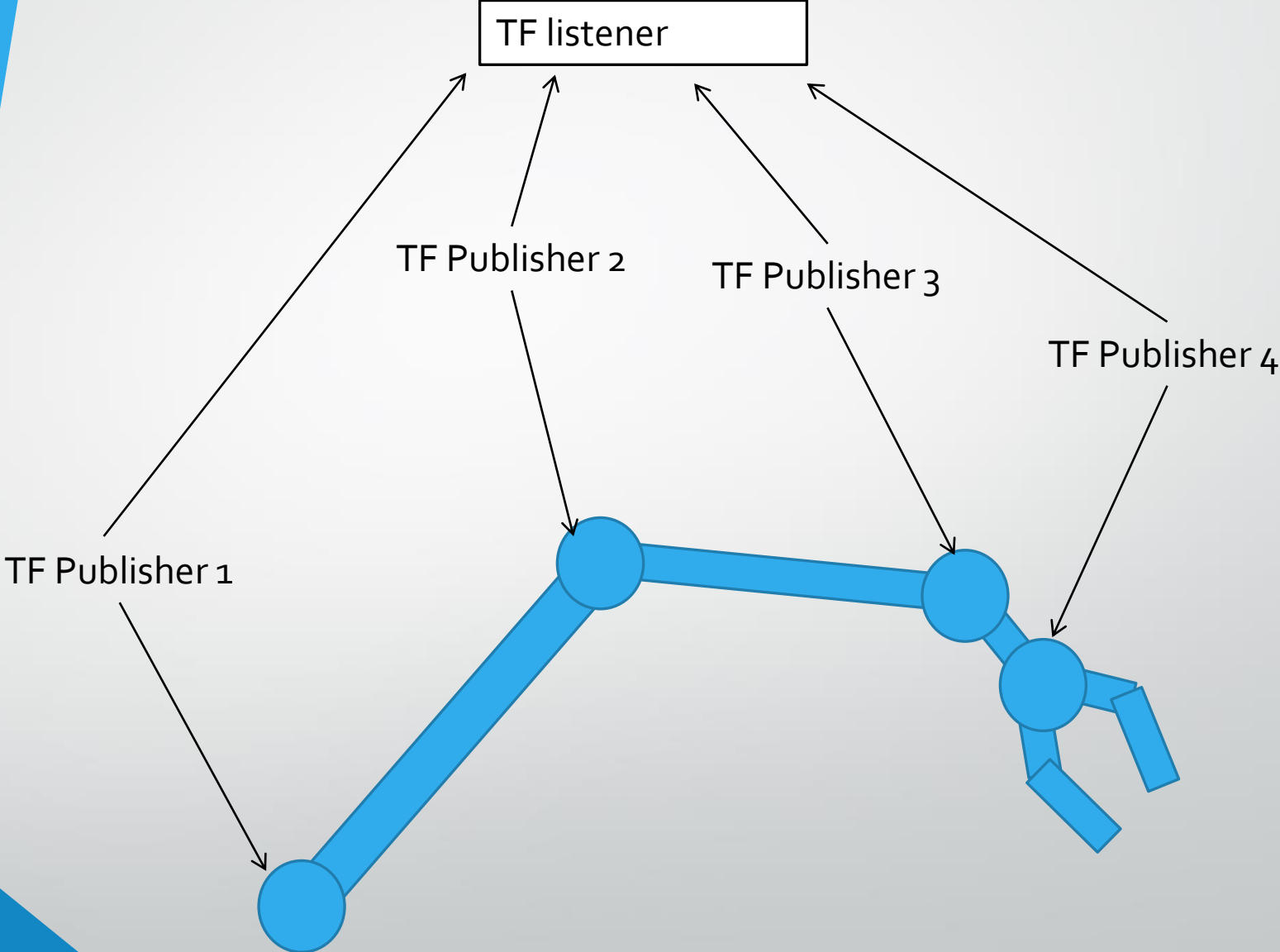
# Development Tools available in ROS

RQT\_TF\_TREE

# Basic Structure



# Using TF broadcasters



# Gazebo

- Open a terminal and run  

```
roslaunch rqt_tf_tree rqt_tf_tree
```
- This is a QT based window
- Shows the Tf transformations between Tf frames

# Development Tools available in ROS

CATKIN Build system

# Catkin build system

- Open and evaluate CMakeLists.txt



# Catkin build system

- `catkin_make`
  - When there are only pure ros packages
- `catkin_make -j 4`
  - When there are only pure ros packages and needs multi threading
- `catkin_make_isolated`
  - When there are non ros libraries as well
- `catkin_make_isolated -j 4`
  - When there are non ros libraries as well and need multi threading
- `catkin build`



Thank you