

2. ROS2 command and tool

1. Package management tool ros2 pkg

1.1 ros2 pkg create

Function: Create a functional package, you need to specify the package name, compilation method, dependencies and so on.

Command Format: `ros2 pkg create --build-type ament_python pkg_name rclpy std_msgs sensor_msgs`

`ros2 pkg create`: the command to create the package

`--build-type`: the newly created package should be `ament_cmake` if it uses C++ or C, or `ament_python` if it uses Python.

`pkg_name`: the name of the package to create.

`rclpy std_msgs sensor_msgs`: these are some compilation dependencies.

1.2 ros2 pkg list

Function: View the list of packages in the system

Command Format: `ros2 pkg list`

```
yahboom@yahboom-virtual-machine:~$ ros2 pkg list
action_msgs
action_tutorials_cpp
action_tutorials_interfaces
action_tutorials_py
actionlib_msgs
ament_cmake
ament_cmake_auto
ament_cmake_copyright
ament_cmake_core
ament_cmake_cppcheck
ament_cmake_cpplint
ament_cmake_export_definitions
ament_cmake_export_dependencies
ament_cmake_export_include_directories
ament_cmake_export_interfaces
ament_cmake_export_libraries
ament_cmake_export_link_flags
ament_cmake_export_targets
ament_cmake_flake8
ament_cmake_gmock
ament_cmake_gtest
ament_cmake_include_directories
ament_cmake_libraries
ament_cmake_lint_cmake
ament_cmake_pep257
ament_cmake_pytest
ament_cmake_python
ament_cmake_ros
ament_cmake_target_dependencies
```

1.3 ros2 pkg executables

Command Format: `ros2 pkg executables pkg_name`

Command Format: `ros2 pkg executables pkg_name`

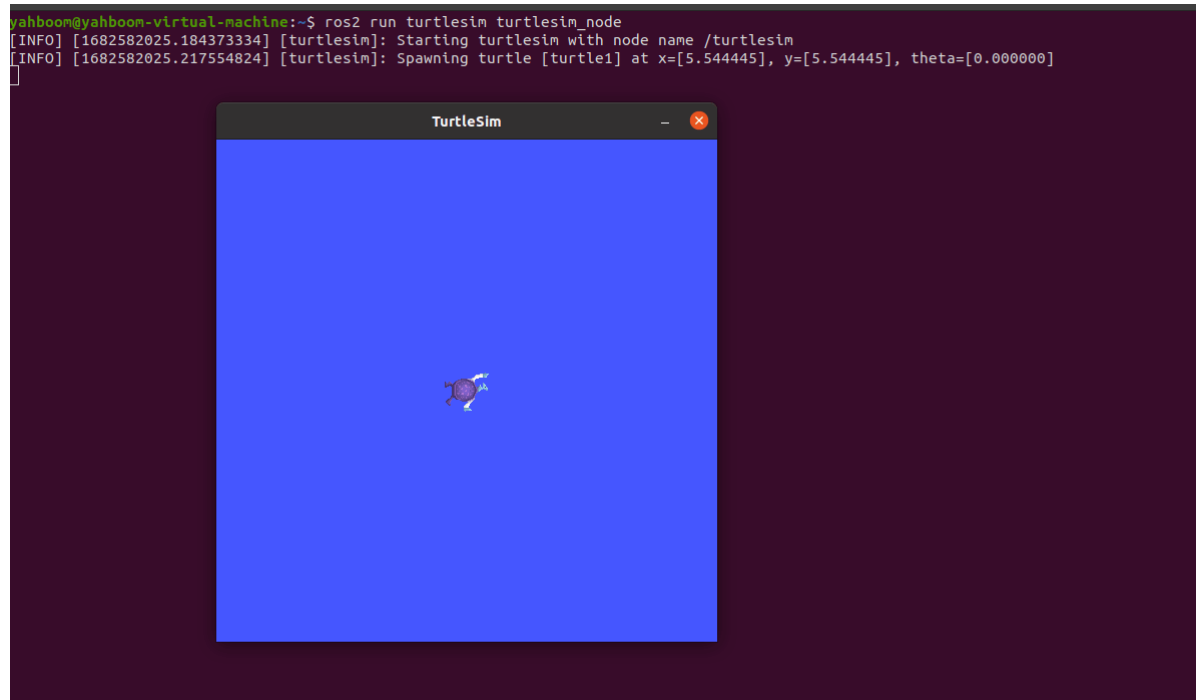
```
yahboom@yahboom-virtual-machine:~$ ros2 pkg executables turtlesim
turtlesim draw_square
turtlesim mimic
turtlesim turtle_teleop_key
turtlesim turtlesim node
```

2. Node run ros2 run

Command Function: Run the function package node program.

Command Format: `ros2 run pkg_name node_name`

- `pkg_name`: name of the function package
- `node_name`: the name of the executable programme.

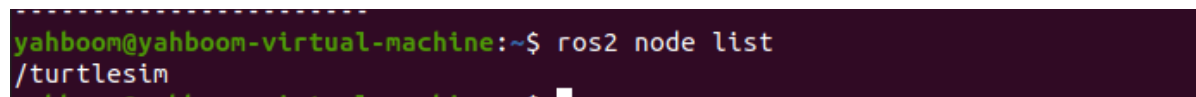


3. Node-related tools ros2 node

3.1 ros2 node list

Command Function: List all the nodes in the current domain.

Command Format: `ros2 node list`



3.2 ros2 node info

Command Function: View node details, including subscriptions, published messages, opened services and actions, etc.

Command Format: `ros2 node info node_name`

- `node_name`: name of the node to be viewed.

```

yahboom@yahboom-virtual-machine:~$ ros2 node info /turtlesim
/turtlesim
Subscribers:
  /parameter_events: rcl_interfaces/msg/ParameterEvent
  /turtle1/cmd_vel: geometry_msgs/msg/Twist
Publishers:
  /parameter_events: rcl_interfaces/msg/ParameterEvent
  /rosout: rcl_interfaces/msg/Log
  /turtle1/color_sensor: turtlesim/msg/Color
  /turtle1/pose: turtlesim/msg/Pose
Service Servers:
  /clear: std_srvs/srv/Empty
  /kill: turtlesim/srv/Kill
  /reset: std_srvs/srv/Empty
  /spawn: turtlesim/srv/Spawn
  /turtle1/set_pen: turtlesim/srv/SetPen
  /turtle1/teleport_absolute: turtlesim/srv/TeleportAbsolute
  /turtle1/teleport_relative: turtlesim/srv/TeleportRelative
  /turtlesim/describe_parameters: rcl_interfaces/srv/DescribeParameters
  /turtlesim/get_parameter_types: rcl_interfaces/srv/GetParameterTypes
  /turtlesim/get_parameters: rcl_interfaces/srv/GetParameters
  /turtlesim/list_parameters: rcl_interfaces/srv/ListParameters
  /turtlesim/set_parameters: rcl_interfaces/srv/SetParameters
  /turtlesim/set_parameters_atomically: rcl_interfaces/srv/SetParametersAtomically
Service Clients:

Action Servers:
  /turtle1/rotate_absolute: turtlesim/action/RotateAbsolute
Action Clients:

```

4. Topic-related tools ros2 topic

4.1 ros2 topic list

Command Function: List all topics in the current domain.

Command Format: ros2 topic list

```

yahboom@yahboom-virtual-machine:~$ ros2 topic list
/parameter_events
/rosout
/turtle1/cmd_vel
/turtle1/color_sensor
/turtle1/pose

```

4.2 ros2 topic info

Command Function: Display topic message type and number of subscribers/publishers.

Command Format: ros2 topic info topic_name

- topic_name: the name of the topic to be queried.

```

yahboom@yahboom-virtual-machine:~$ ros2 topic info /turtle1/cmd_vel
Type: geometry_msgs/msg/Twist
Publisher count: 0
Subscription count: 1

```

4.3 ros2 topic type

Command Function: Check the message type of a topic.

Command Format: ros2 topic type topic_name

- topic_name: the name of the topic to be queried.

```

yahboom@yahboom-virtual-machine:~$ ros2 topic type /turtle1/cmd_vel
geometry_msgs/msg/Twist

```

4.4 ros2 topic hz

Command Function: Display the average posting frequency of topics.

Command Format: `ros2 topic hz topic_name`

- `topic_name`: the name of the topic to be queried.

```
yahboom@yahboom-virtual-machine:~$ ros2 topic hz /turtle1/cmd_vel
average rate: 2.532
  min: 0.002s max: 6.513s std dev: 1.44588s window: 19
average rate: 4.026
  min: 0.002s max: 6.513s std dev: 1.06690s window: 36
average rate: 4.613
  min: 0.002s max: 6.513s std dev: 0.93960s window: 47
average rate: 5.803
  min: 0.002s max: 6.513s std dev: 0.80420s window: 65
average rate: 5.961
  min: 0.002s max: 6.513s std dev: 0.75605s window: 74
average rate: 5.991
  min: 0.002s max: 6.513s std dev: 0.72046s window: 82
average rate: 5.755
  min: 0.002s max: 6.513s std dev: 0.70435s window: 86
average rate: 5.568
  min: 0.002s max: 6.513s std dev: 0.68547s window: 91
average rate: 5.419
  min: 0.002s max: 6.513s std dev: 0.67609s window: 94
```

4.5 ros2 topic echo

Command Function: Print the topic message in the terminal, similar to a subscriber.

Command Format: `ros2 topic echo topic_name`

- `topic_name`: the name of the topic to be printed.

```
yahboom@yahboom-virtual-machine:~$ ros2 topic echo /turtle1/cmd_vel
linear:
  x: 2.0
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: 0.0
---
linear:
  x: 2.0
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: 0.0
```

4.5 ros2 topic pub

Command Function: Publish the specified topic message in the terminal.

Command Format: `ros2 topic pub topic_name message_type message_content`

- `topic_name`: name of the topic to be published.
- `message_type`: the data type of the topic.
- `message_content`: content of the message

By default, the topic is published cyclically at a frequency of 1Hz, and the following parameters can be set.

- Parameter `-1` publish only once, `ros2 topic pub -1 topic_name message_type message_content`

- Parameter -t count The end of count times, ros2 topic pub -t count topic_name message_type message_content
- The -r count parameter publishes at a frequency of count Hz, ros2 topic pub -r count topic_name message_type message_content

```
ros2 topic pub turtle1/cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.5, y: 0.0, z: 0.0}, angular: {x: 0.0, y: 0.0, z: 0.2}}"
```

The important thing to note here is that there is a space after the colon.

```
yahboom@yahboom-virtual-machine:~$ ros2 topic pub turtle1/cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.5, y: 0.0, z: 0.0}, angular: {x: 0.0, y: 0.0, z: 0.2}}"
```

publisher: beginning loop

publishing #1: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

publishing #2: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

publishing #3: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

publishing #4: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

5. Interface-related tools ros2 interface

5.1. ros2 interface list

Command Function: lists all the interfaces of the current system, including topics, services and actions.

Command Format: ros2 interface list

```
yahboom@yahboom-virtual-machine:~$ ros2 interface list
```

Messages:

- action_msgs/msg/GoalInfo
- action_msgs/msg/GoalStatus
- action_msgs/msg/GoalStatusArray
- actionlib_msgs/msg/GoalID
- actionlib_msgs/msg/GoalStatus
- actionlib_msgs/msg/GoalStatusArray
- builtin_interfaces/msg/Duration
- builtin_interfaces/msg/Time
- diagnostic_msgs/msg/DiagnosticArray
- diagnostic_msgs/msg/DiagnosticStatus
- diagnostic_msgs/msg/KeyValue
- example_interfaces/msg/Bool
- example_interfaces/msg/Byte
- example_interfaces/msg/ByteMultiArray
- example_interfaces/msg/Char
- example_interfaces/msg/Empty
- example_interfaces/msg/Float32
- example_interfaces/msg/Float32MultiArray
- example_interfaces/msg/Float64
- example_interfaces/msg/Float64MultiArray
- example_interfaces/msg/Int16
- example_interfaces/msg/Int16MultiArray
- example_interfaces/msg/Int32
- example_interfaces/msg/Int32MultiArray
- example_interfaces/msg/Int64
- example_interfaces/msg/Int64MultiArray
- example_interfaces/msg/Int8
- example_interfaces/msg/Int8MultiArray
- example_interfaces/msg/MultiArrayDimension
- example_interfaces/msg/MultiArrayLayout
- example_interfaces/msg/String
- example_interfaces/msg/UInt16

5.2 ros2 interface show

Command Function: Display the details of the specified interface.

Command Format: ros2 interface show interface_name

- interface_name: the name of the interface to be shown.

```

yahboom@yahboom-virtual-machine:~$ ros2 interface show sensor_msgs/msg/LaserScan
# Single scan from a planar laser range-finder
#
# If you have another ranging device with different behavior (e.g. a sonar
# array), please find or create a different message, since applications
# will make fairly laser-specific assumptions about this data

std_msgs/Header header # timestamp in the header is the acquisition time of
                        # the first ray in the scan.
                        #
                        # in frame frame_id, angles are measured around
                        # the positive Z axis (counterclockwise, if Z is up)
                        # with zero angle being forward along the x axis

float32 angle_min       # start angle of the scan [rad]
float32 angle_max       # end angle of the scan [rad]
float32 angle_increment  # angular distance between measurements [rad]

float32 time_increment  # time between measurements [seconds] - if your scanner
                        # is moving, this will be used in interpolating position
                        # of 3d points
float32 scan_time       # time between scans [seconds]

float32 range_min       # minimum range value [m]
float32 range_max       # maximum range value [m]

float32[] ranges         # range data [m]
                        # (Note: values < range_min or > range_max should be discarded)
float32[] intensities    # intensity data [device-specific units]. If your
                        # device does not provide intensities, please leave
                        # the array empty

```

6. Service-related tools ros2 service

6.1 ros2 service list

Command Format: `ros2 interface show interface_name`

Command Format: `ros2 interface show interface_name`

```

yahboom@yahboom-virtual-machine:~$ ros2 service list
/clear
/kill
/reset
/spawn
/teleop_turtle/describe_parameters
/teleop_turtle/get_parameter_types
/teleop_turtle/get_parameters
/teleop_turtle/list_parameters
/teleop_turtle/set_parameters
/teleop_turtle/set_parameters_atomically
/turtle1/set_pen
/turtle1/teleport_absolute
/turtle1/teleport_relative
/turtlesim/describe_parameters
/turtlesim/get_parameter_types
/turtlesim/get_parameters
/turtlesim/list_parameters
/turtlesim/set_parameters
/turtlesim/set_parameters_atomically
yahboom@yahboom-virtual-machine:~$

```

6.2 ros2 service call

Command Function: Call the specified service.

Command Format: `ros2 interface call service_name service_Type arguments`

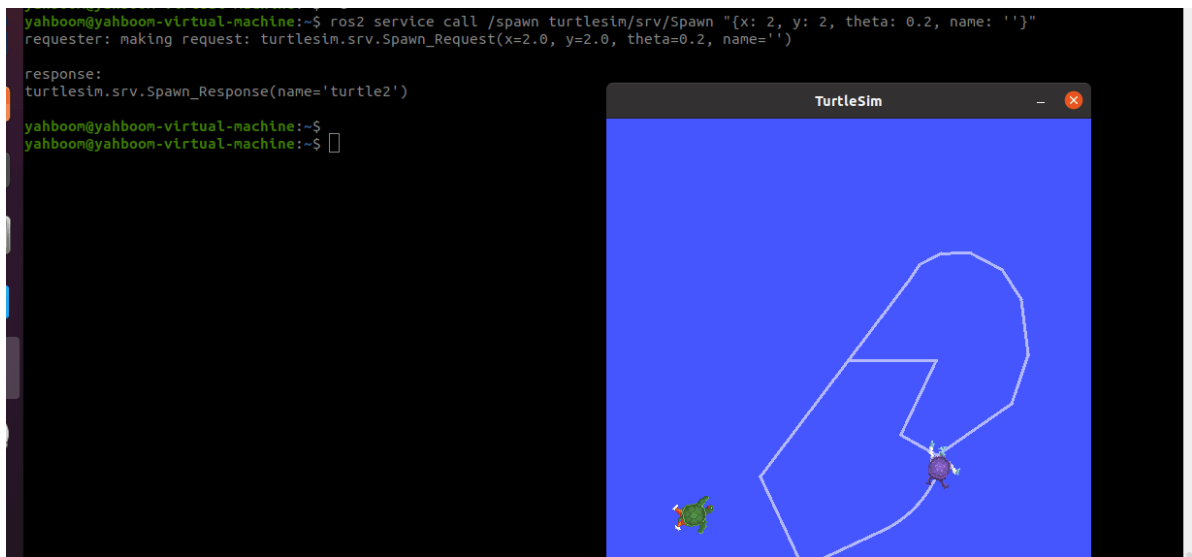
- `service_name`: the service to be called.
- `service_Type`: data type of the service.
- `arguments`: arguments needed to provide the service

For example, to call the turtle generation service

```

ros2 service call /spawn turtlesim/srv/Spawn "{x: 2, y: 2, theta: 0.2, name:
''}"
requester: making request: turtlesim.srv.Spawn_Request(x=2.0, y=2.0, theta=0.2,
name='turtle2')

```

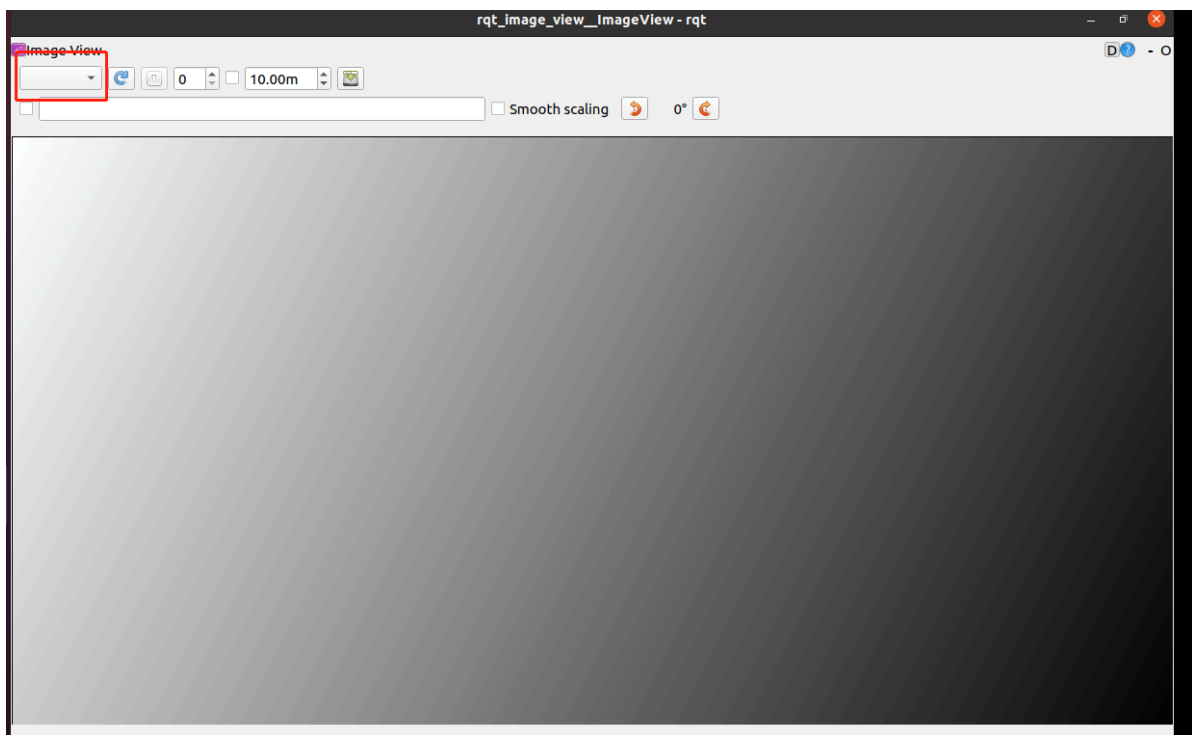


7. rqt_image_view

`roslaunch rqt_image_view rqt_image_view`

`rqt_image_view` can be used to view an image, if there is a published image topic data in the current domain, you can use this tool to view the image.

```
ros2 run rqt_image_view rqt_image_view
```

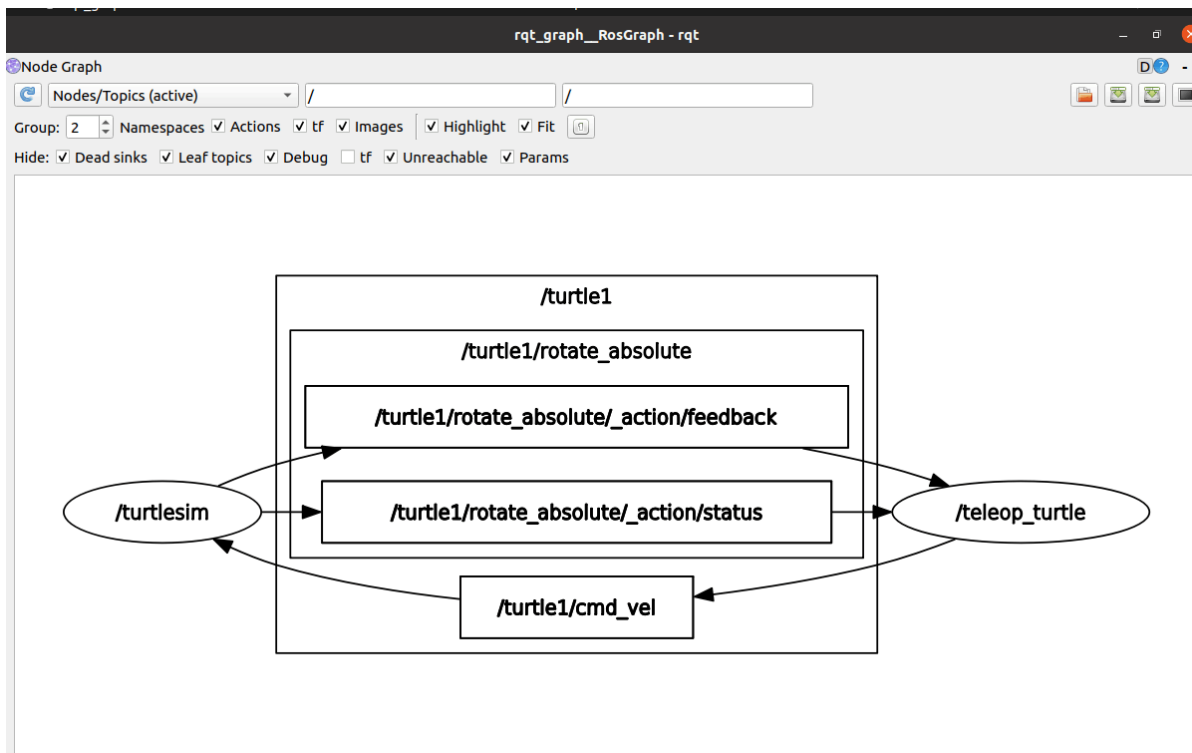


Displays image data via the image topic selected in the upper left corner.

8. rqt_graph

`rqt_graph` can be used to view which nodes are running in the current domain and the topic communication between nodes, use the following command to turn it on.

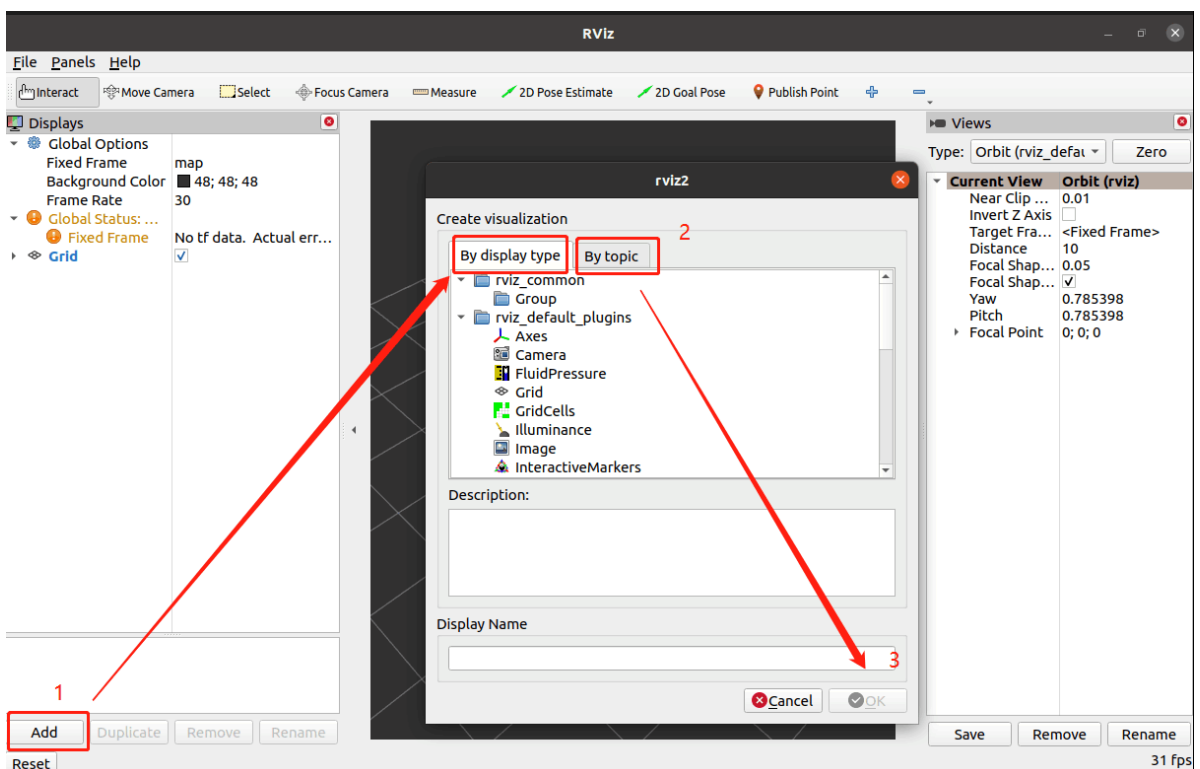
```
ros2 run rqt_graph rqt_graph
```



9. rviz2

The core framework of Rviz is an open platform built on Qt visualisation tools. Follow the messages in ROS to publish the corresponding topics and you can see the graphical results. In ROS2, use rviz2 to launch the rviz tool.

rviz2



Through the above steps you can add visualisation data through plugins or through topics, the general choice is to add through topics.

10. tf2_tools

tf2_tools can view the current TF tree, will enter the command under the terminal to generate frame.pdf file.

```
ros2 run tf2_tools view_frames.py
```