ROS 機器手臂 (small robot arm)

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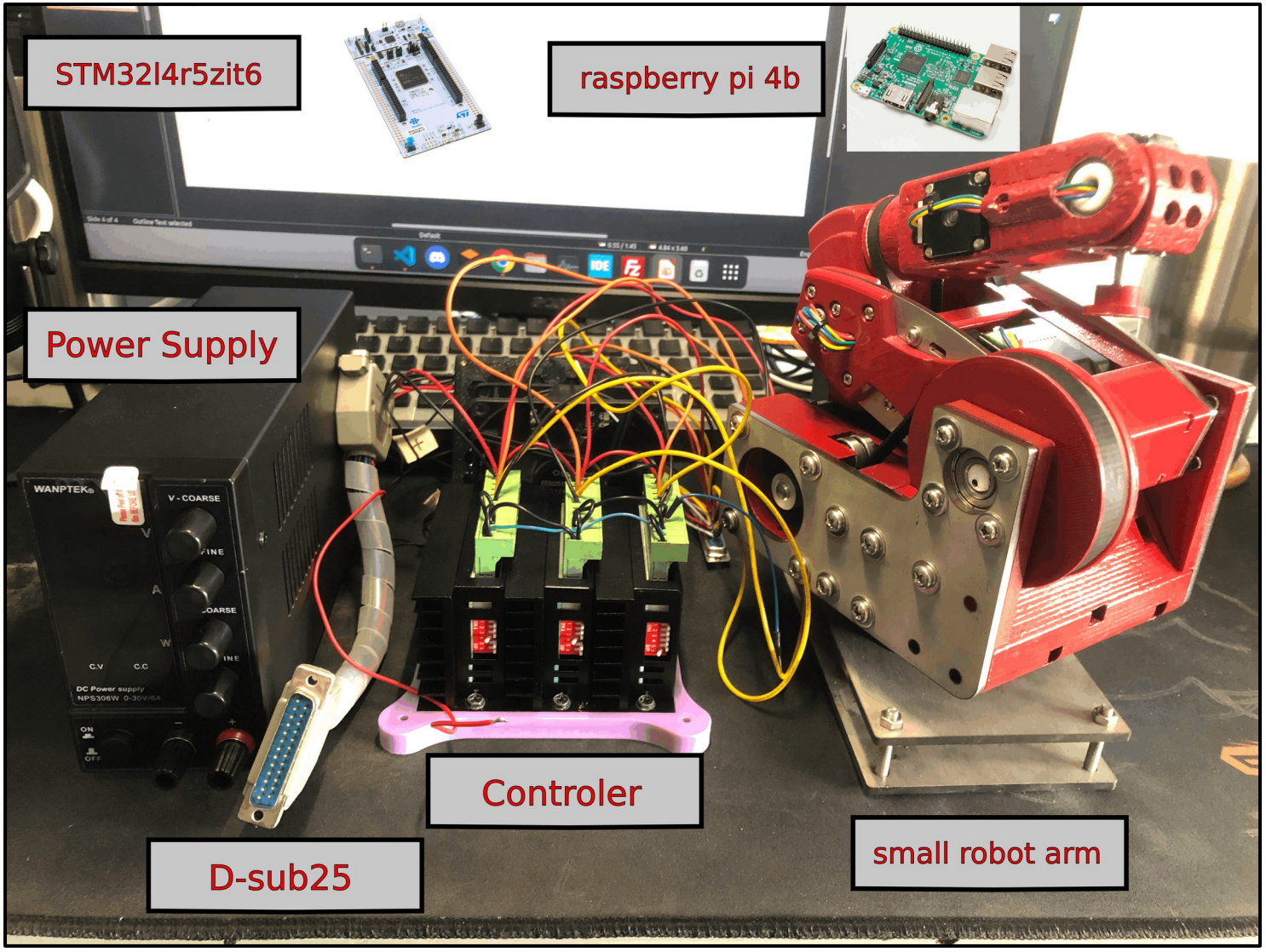
目錄

目前狀況 (Finished)

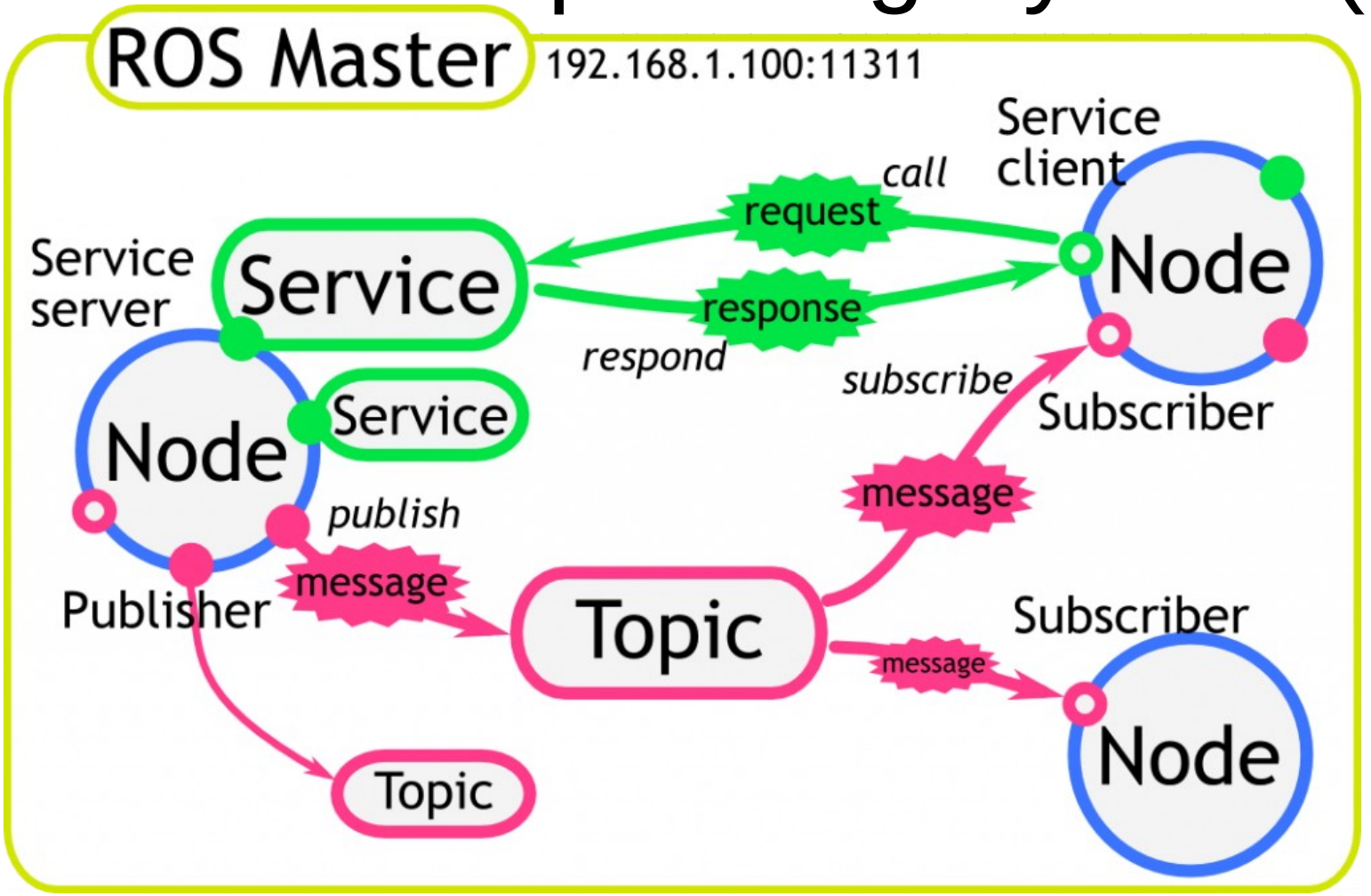
- ros workspace 工作環境建立
- ros aiml 專案 launch
- 安裝雙系統
- stm32cubeide 安裝 (lib5.so)
- Rosserial launch(stm32)
- Docker + Nvidia
- x11 畫面分享（docker -> ubuntu)
- ROS 虛擬教學小車成功啟動
- Docker Rviz 可以啟動
- Dockerfile 撰寫
- c 語言語法入門
- 建立機械手臂 urdf
- 發起 pola6 / panda / small 手臂 urdf
- Moveit Assistant
- 使用程式控制 rviz 手臂

目前方向（缺少軟體）


STM32l4r5zit6
raspberry pi 4b
Power Supply
Controler
D-sub25
small robot arm

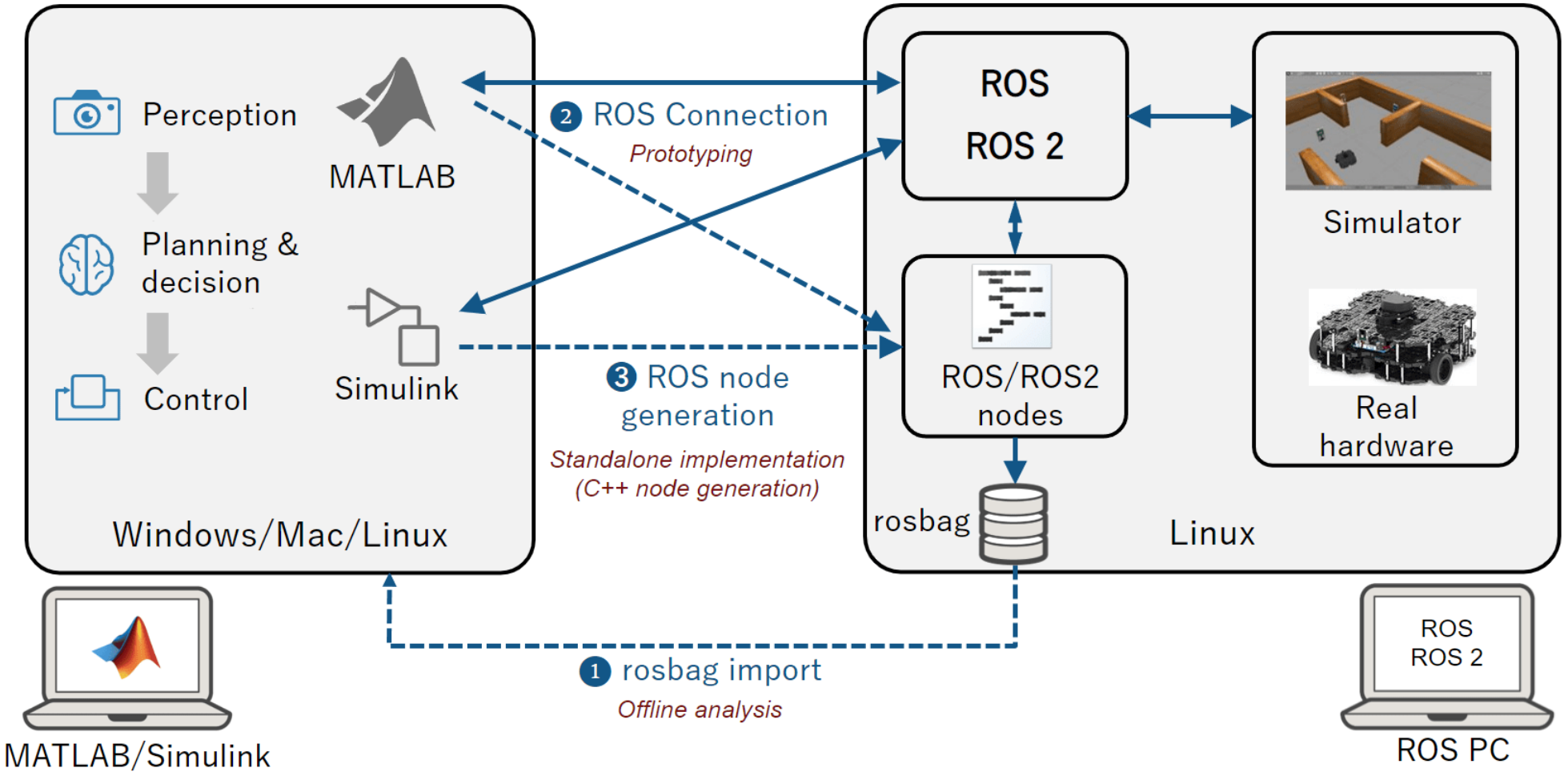
硬體

Robot Operating System (ROS)



使用原因

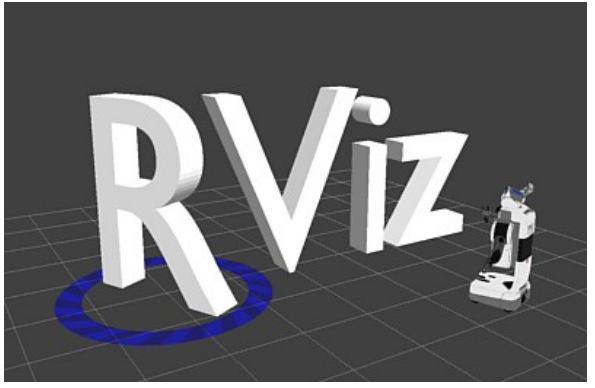
Example:


Perception
Planning & decision
Control
MATLAB
Simulink
Windows/Mac/Linux
2 ROS Connection
Prototyping
3 ROS node generation
Standalone implementation
(C++ node generation)
ROS
ROS 2
ROS/ROS2 nodes
rosbag
Linux
Simulator
Real hardware
1 rosbag import
Offline analysis
MATLAB/Simulink
ROS
ROS 2
ROS PC

介紹工具

ROS1 melodic

機器人系統

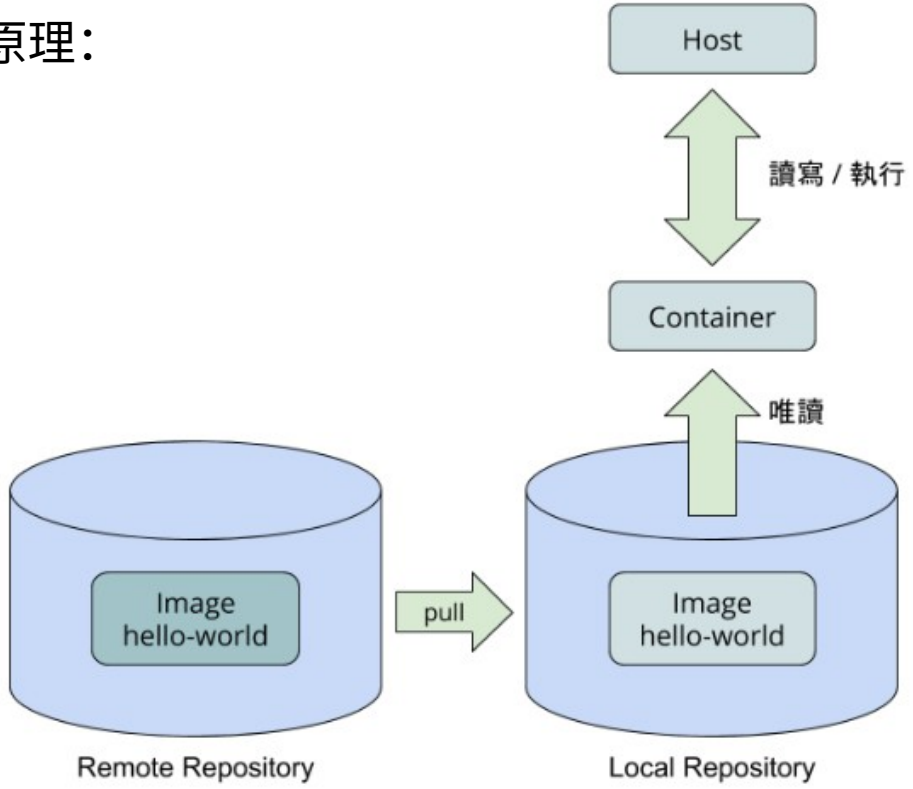


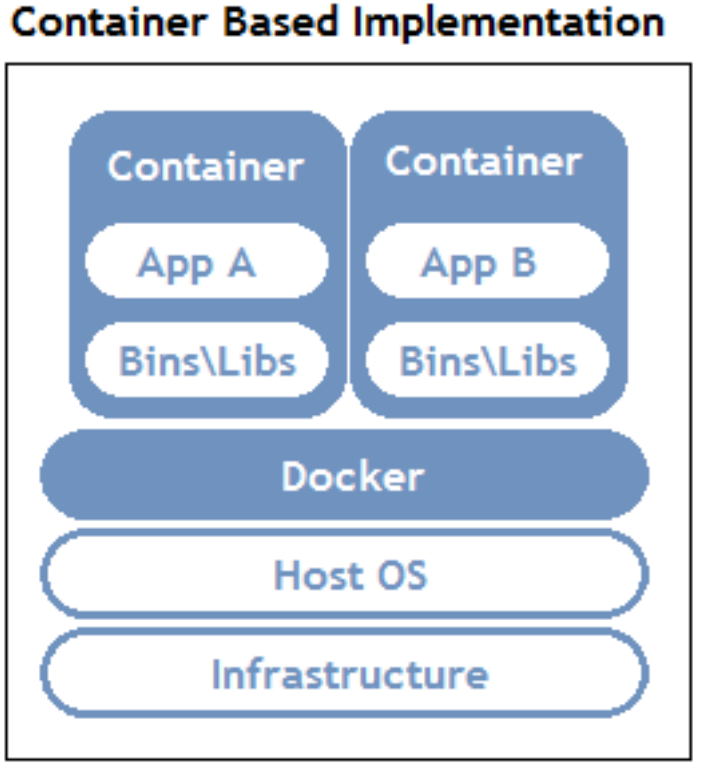
模型檢視軟體

彷真環境軟體

如何做版本控制

原理：


Host
讀寫 / 執行
Container
唯讀
Image
hello-world
pull
Image
hello-world
Remote Repository
Local Repository


Container Based Implementation
Container
Container
App A
App B
Bins\Libs
Bins\Libs
Docker
Host OS
Infrastructure

Docker

Image(映像)

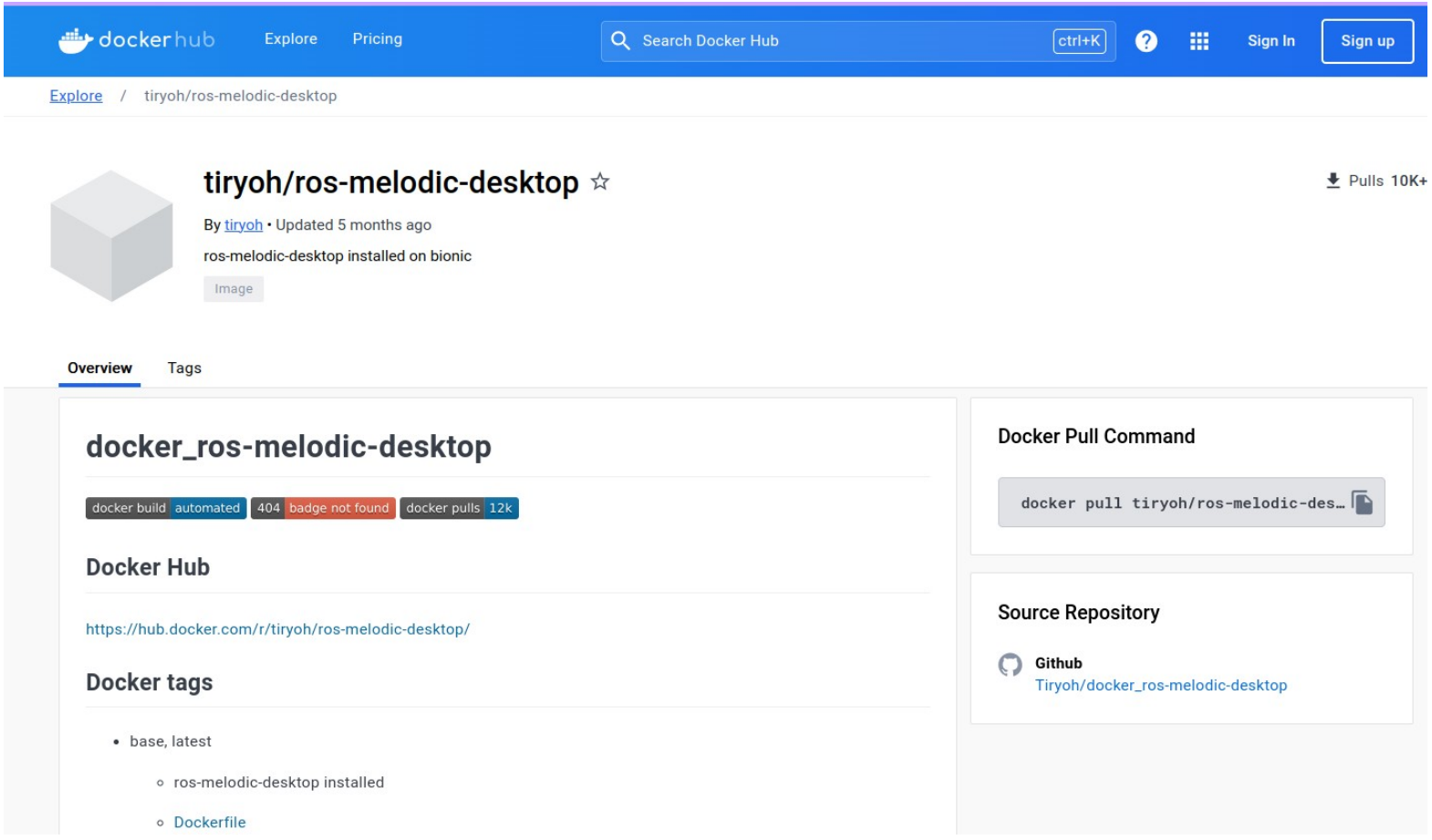
```
fxrbindi@fxrbindi:~$ docker images
REPOSITORY            TAG               IMAGE ID       CREATED         SIZE
<none>                <none>            14a866a572bb   3 weeks ago     2.81GB
ros_aiml              1.1.3             dabd7bddf83b   7 weeks ago     3.52GB
ros_aiml              1.1.2             ef0e045f21b4   8 weeks ago     3.51GB
ros_aiml              1.1.1             df550ae1c5b6   8 weeks ago     3.51GB
osrf/ros              noetic-desktop    e5e4243f66b4   8 weeks ago     2.31GB
ros                   noetic            5f5174885589   2 months ago    1.21GB
<none>                <none>            dda2e223a6ff   2 months ago    3.85GB
ros-test              1.1.2             ce014c9a21c3   2 months ago    3.82GB
ros_test              1.1.2             8c8552493ebc   2 months ago    3.54GB
1.1.0                 ros_develop       aae9a4c59057   2 months ago    3.54GB
ubuntu                latest            e4c58958181a   2 months ago    77.8MB
aiml-ros              1.1.0             3ab105b7a95d   2 months ago    3.22GB
image                 new_ros_test      3ab105b7a95d   2 months ago    3.22GB
ros                   melodic           b7ad30224b51   5 months ago    2.75GB
portainer/portainer   latest            5f11582196a4   12 months ago   287MB
```

Container(容器)

已啟用容器

```
fxrbindi@fxrbindi:~$ docker ps -a
CONTAINER ID   IMAGE                     COMMAND                  CREATED         STATUS
              PORTS                                                                NAMES
0132c32d55ff   14                        "/ros_entrypoint.sh …"   3 weeks ago     Up 5 hours
                                                                                  ros_melodic_1.0
8320d50f7a3e   b7                        "/ros_entrypoint.sh …"   4 weeks ago     Exited (255)
2 weeks ago                                                                       ros-melodice
54bfa9931c92   osrf/ros:noetic-desktop   "/ros_entrypoint.sh …"   5 weeks ago     Exited (255)
2 weeks ago                                                                       cranky_hodgkin
9121173c213a   portainer/portainer       "/portainer"             5 weeks ago     Up 7 hours
              8000/tcp, 9443/tcp, 0.0.0.0:9000->9000/tcp, :::9000->9000/tcp       prtainer
7cb06032990a   ros:noetic                "/ros_entrypoint.sh …"   5 weeks ago     Exited (139)
5 weeks ago                                                                       ros-noetic-conta
iner
d35fae61fcaa   da                        "/ros_entrypoint.sh …"   7 weeks ago     Exited (0) 7
weeks ago                                                                         amazing_taussig
9117956adb31   da                        "/ros_entrypoint.sh …"   7 weeks ago     Exited (1) 7
weeks ago                                                                         beautiful_pasteu
r
0bcef6c9668a   ef                        "/ros_entrypoint.sh …"   8 weeks ago     Exited (0) 7
weeks ago                                                                         ros_aiml2
```

如何快速抓取 (pull) 一個 ROS 環境



從 docker pub 抓取 Image

作者　　版本　　包含軟體

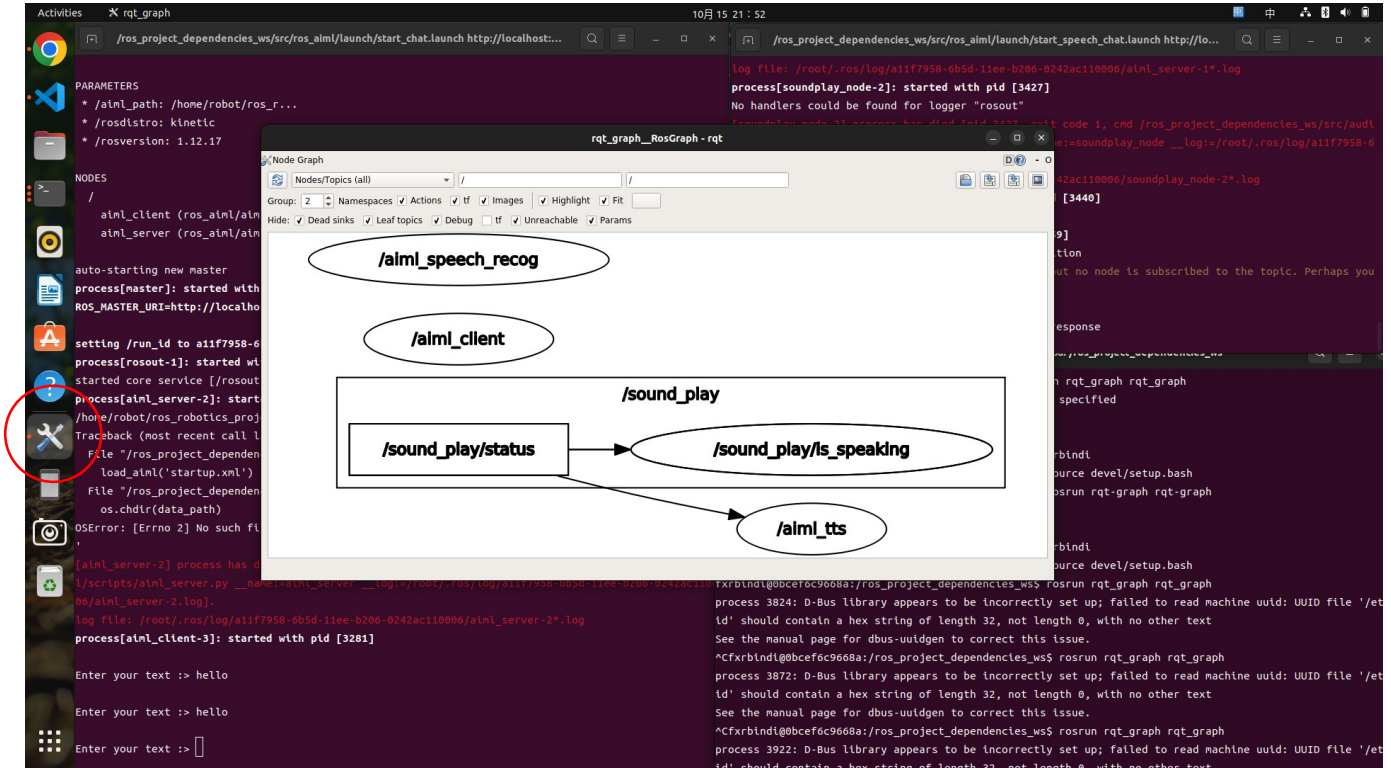
```
fxrbindi@fxrbindi:~$ docker pull tiryoh/ros-melodic-desktop
Using default tag: latest
latest: Pulling from tiryoh/ros-melodic-desktop
72d9f18d70f3: Pull complete
45c02df2982c: Pull complete
8d5bba7ab2bc: Downloading [==============>                                    ]  43.71MB/158.9MB
011b2bb0a498: Download complete
f8eba62bb434: Download complete
cd66ff22b117: Downloading [===>                                               ]   61.5MB/829.1MB
4738d93309f2: Download complete
a28a73afd3d4: Download complete
b647212f1bac: Download complete
dda2462bbf04: Download complete
```

docker 掛載畫面 / 資料夾

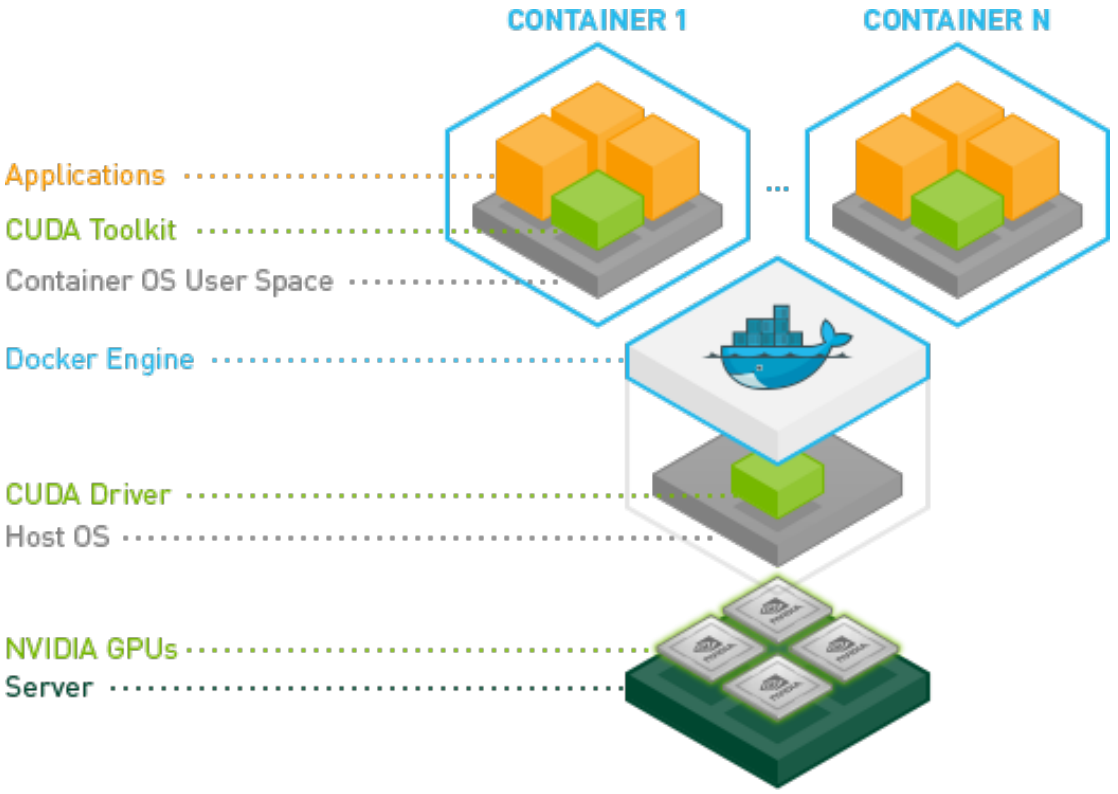
docker run -it -e DISPLAY=$DISPLAY -v /tmp/.X11-unix:/tmp/.X11-unix -v /home/ckhung/data:/tmp/exdata 01 bin/bash

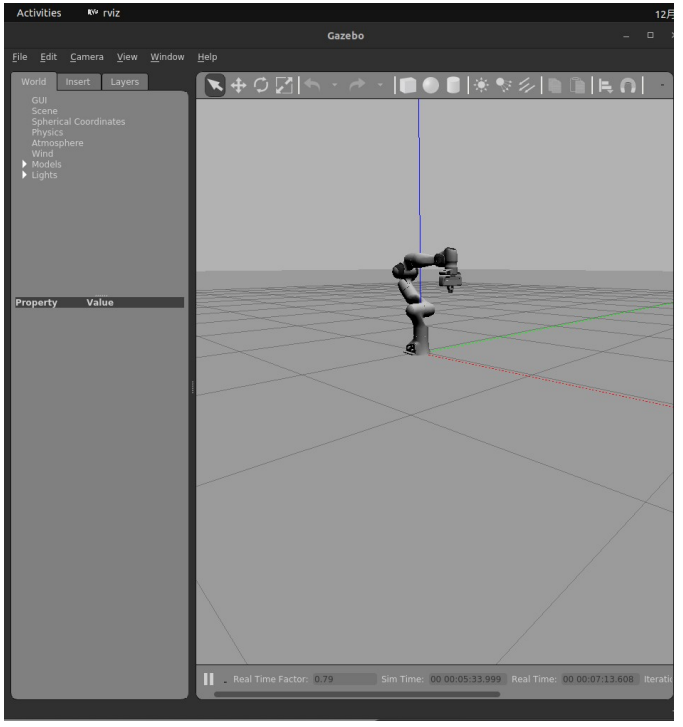
畫面　　x11 服務器　　host 到 container 資料夾路徑

直接將畫面傳回本機



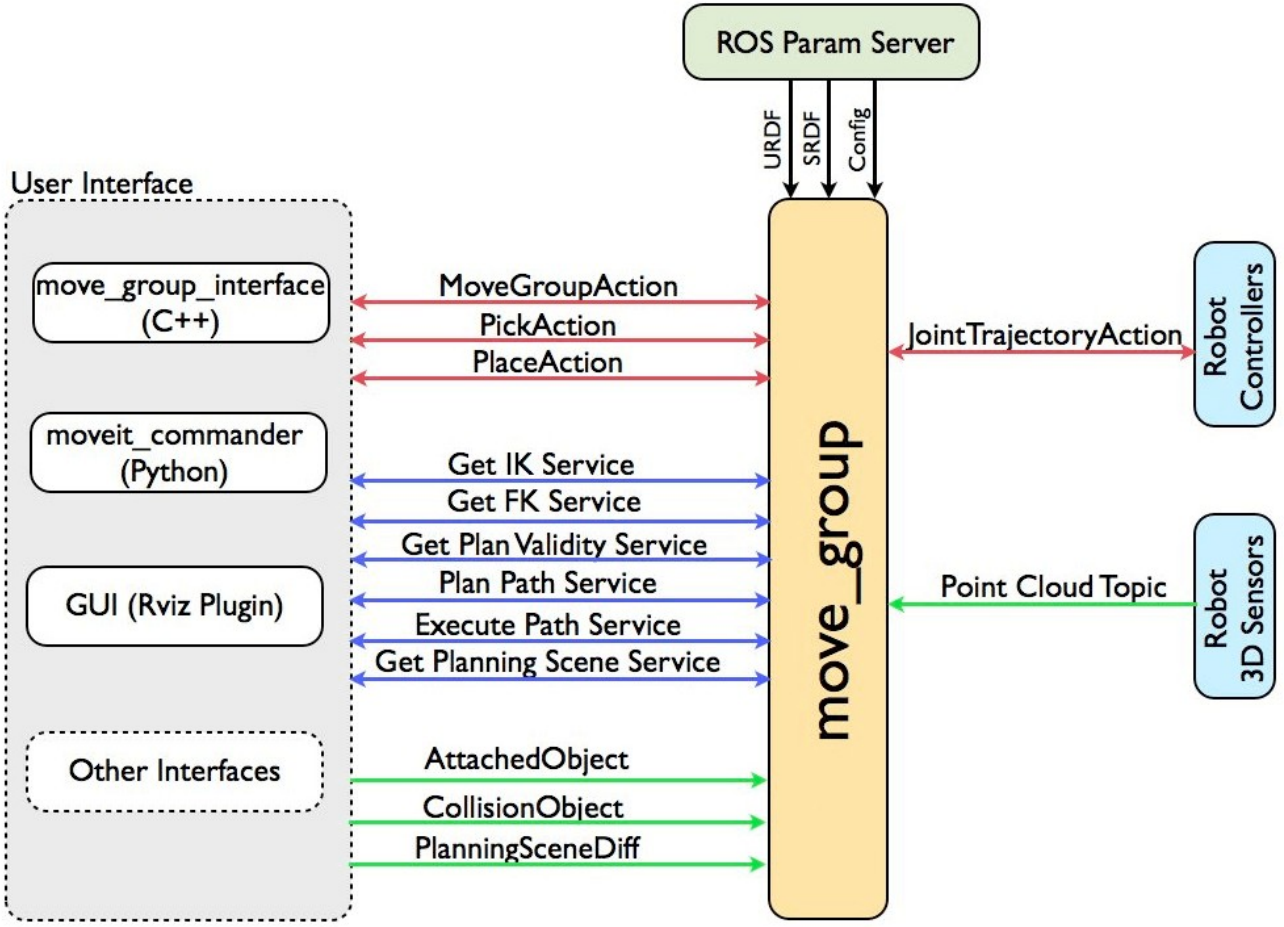
Docker-nvidia



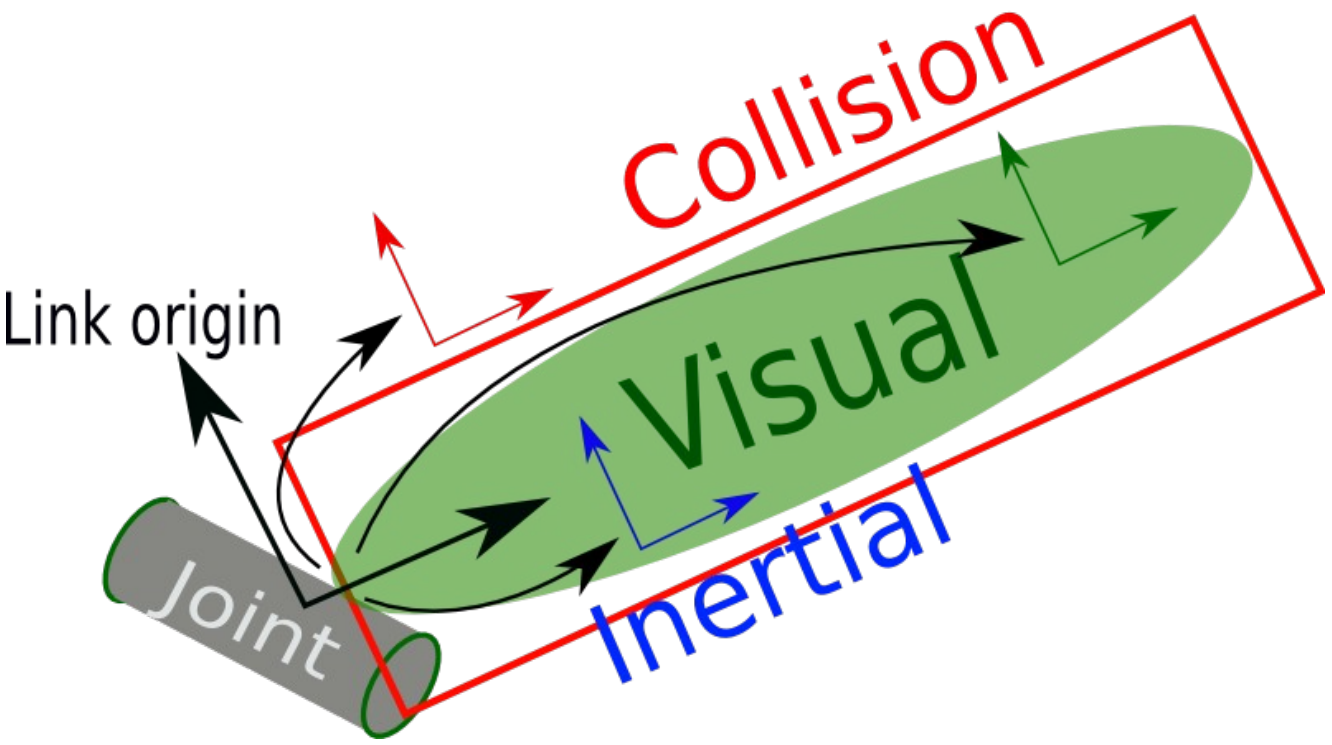


Gazebo 沒有 GPU 只有 10fps

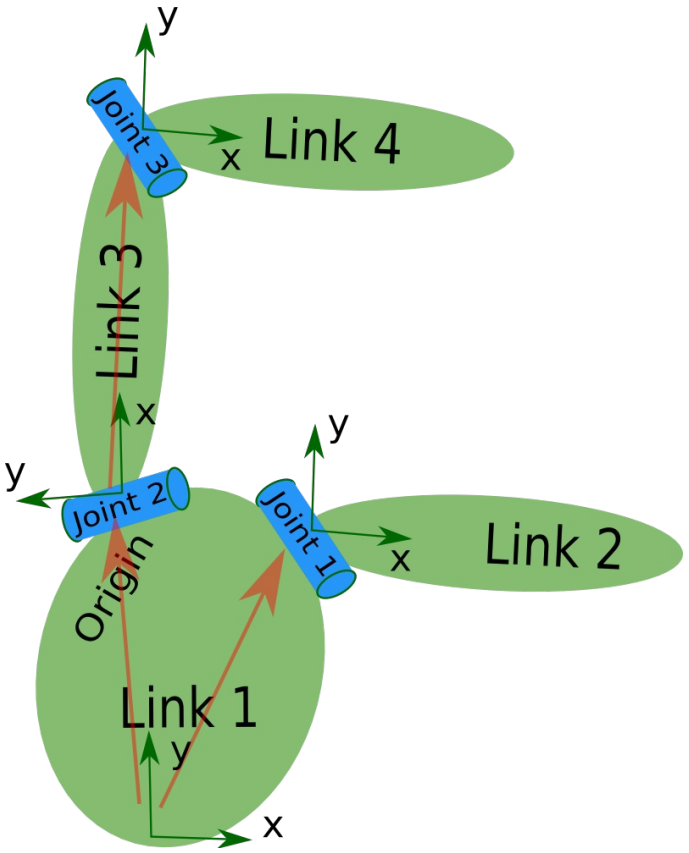
Moveit

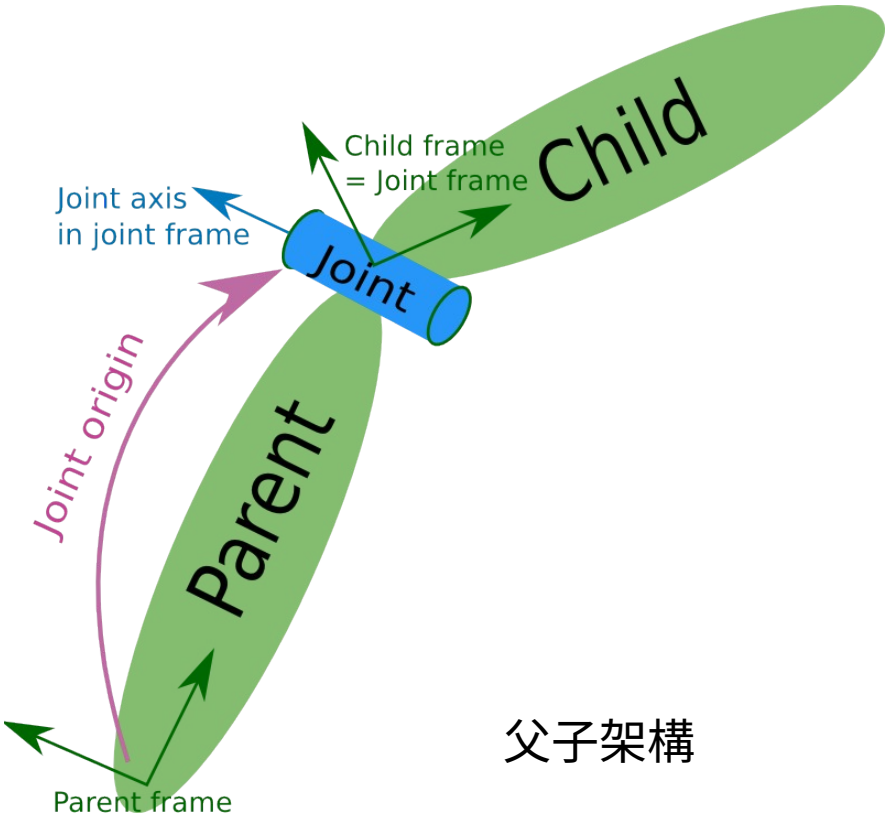

ROS Param Server
URDF
SRDF
Config
User Interface
move_group_interface (C++)
moveit_commander (Python)
GUI (Rviz Plugin)
Other Interfaces
MoveGroupAction
PickAction
PlaceAction
Get IK Service
Get FK Service
Get Plan Validity Service
Plan Path Service
Execute Path Service
Get Planning Scene Service
AttachedObject
CollisionObject
PlanningSceneDiff
move_group
JointTrajectoryAction
Point Cloud Topic
Robot Controllers
Robot 3D Sensors

URDF(Unified Robot Description Format)



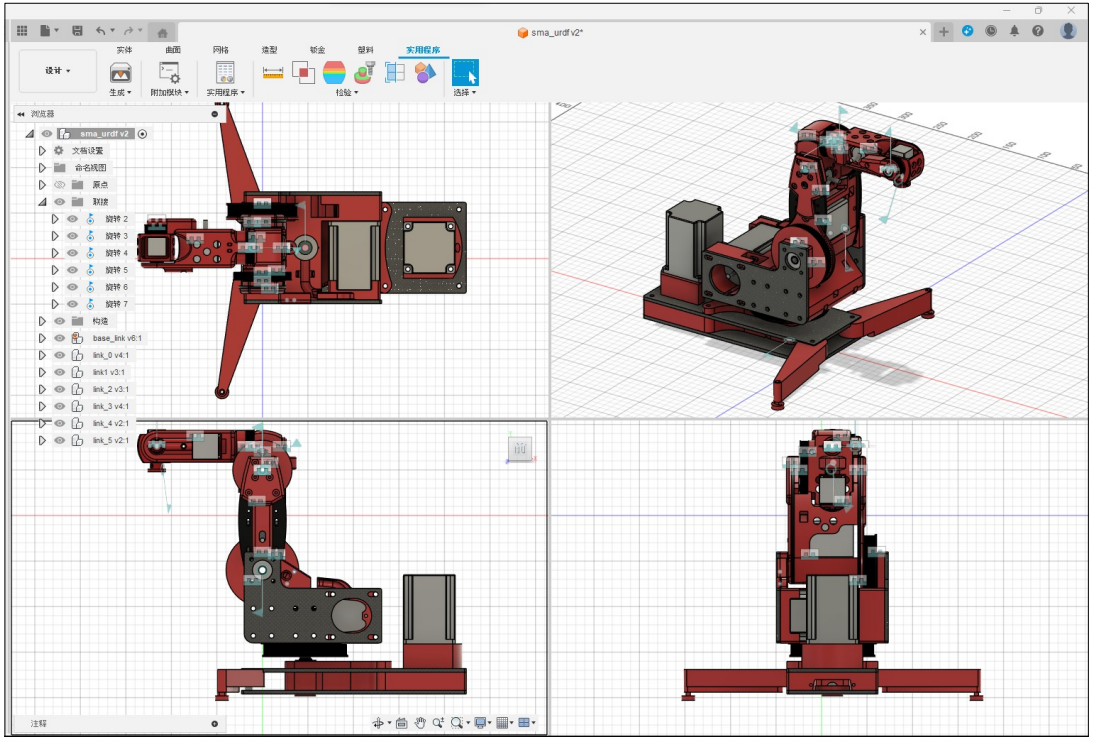
Joint & Link

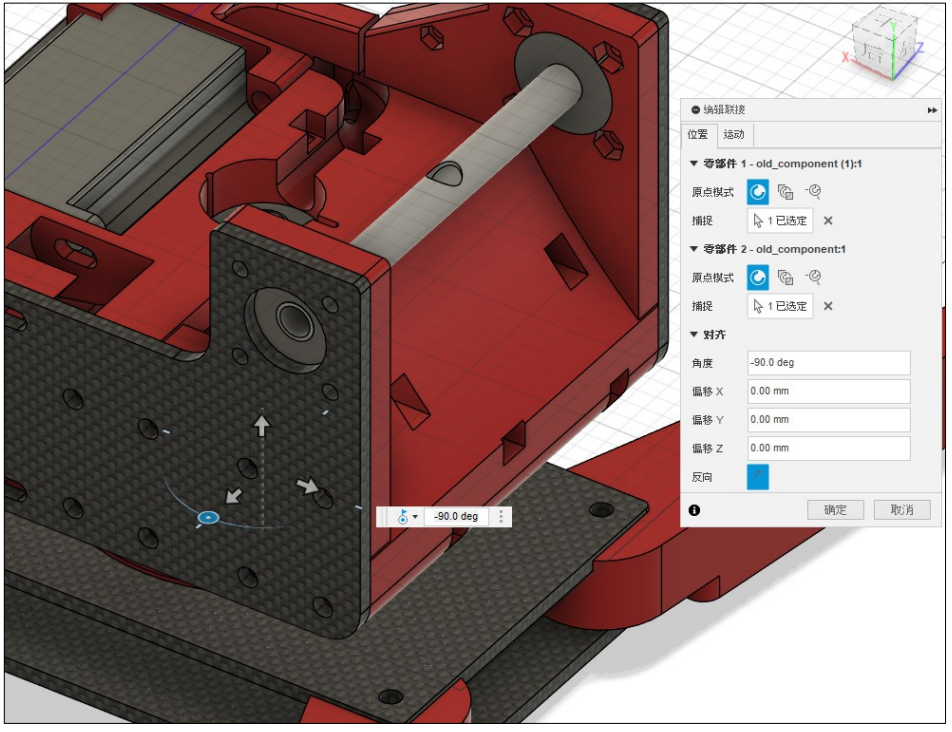




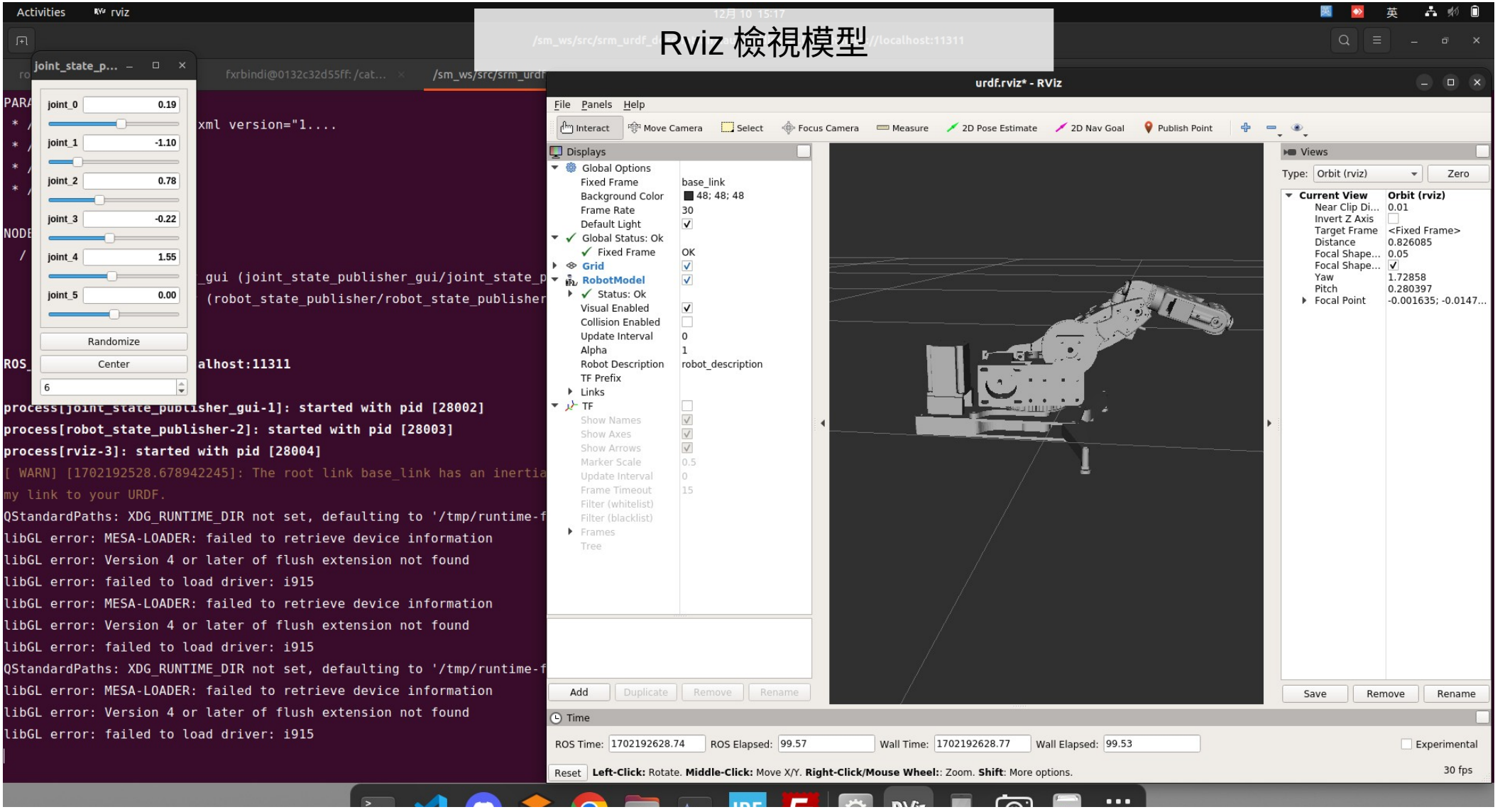
父子架構

FUSION360 to URDF

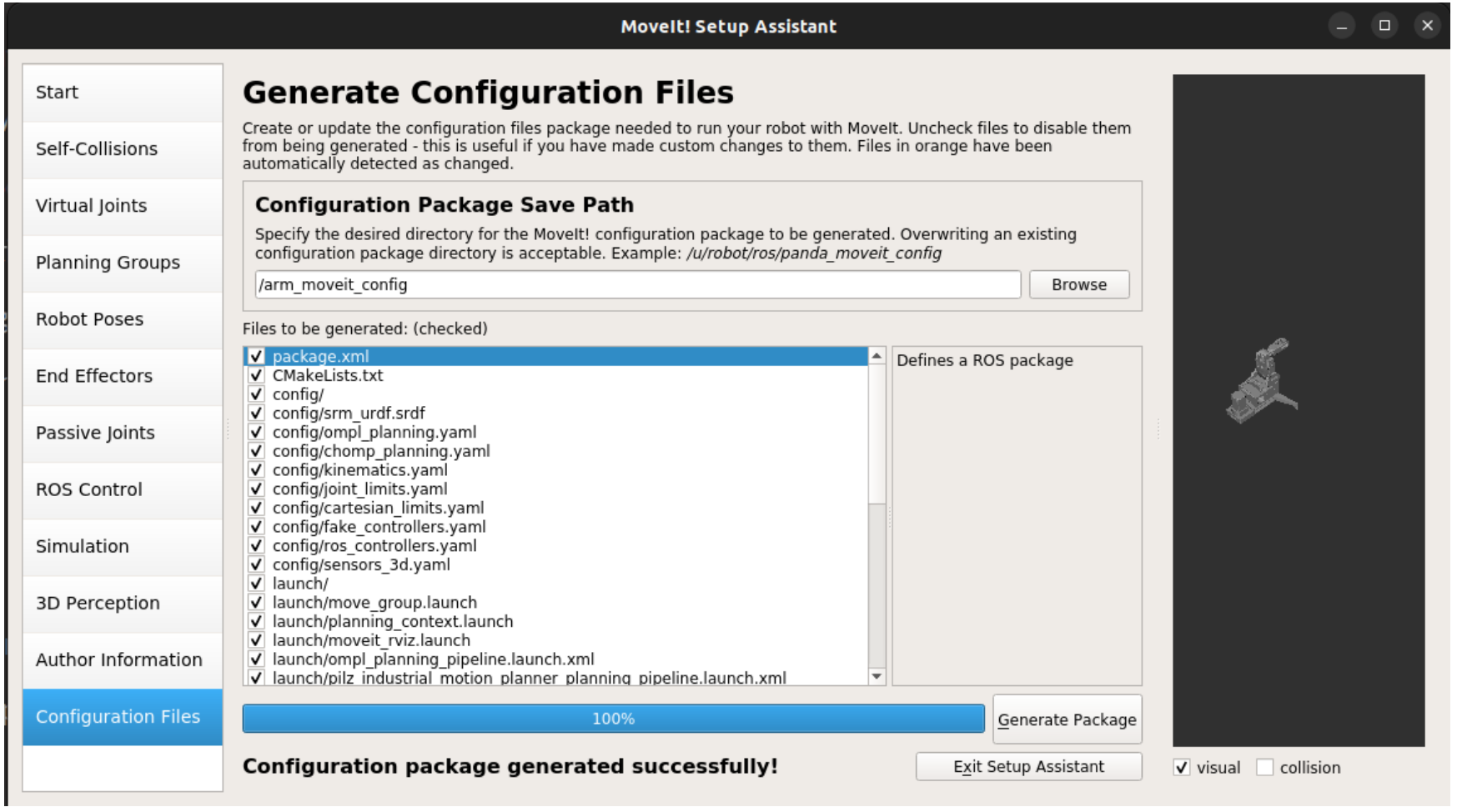




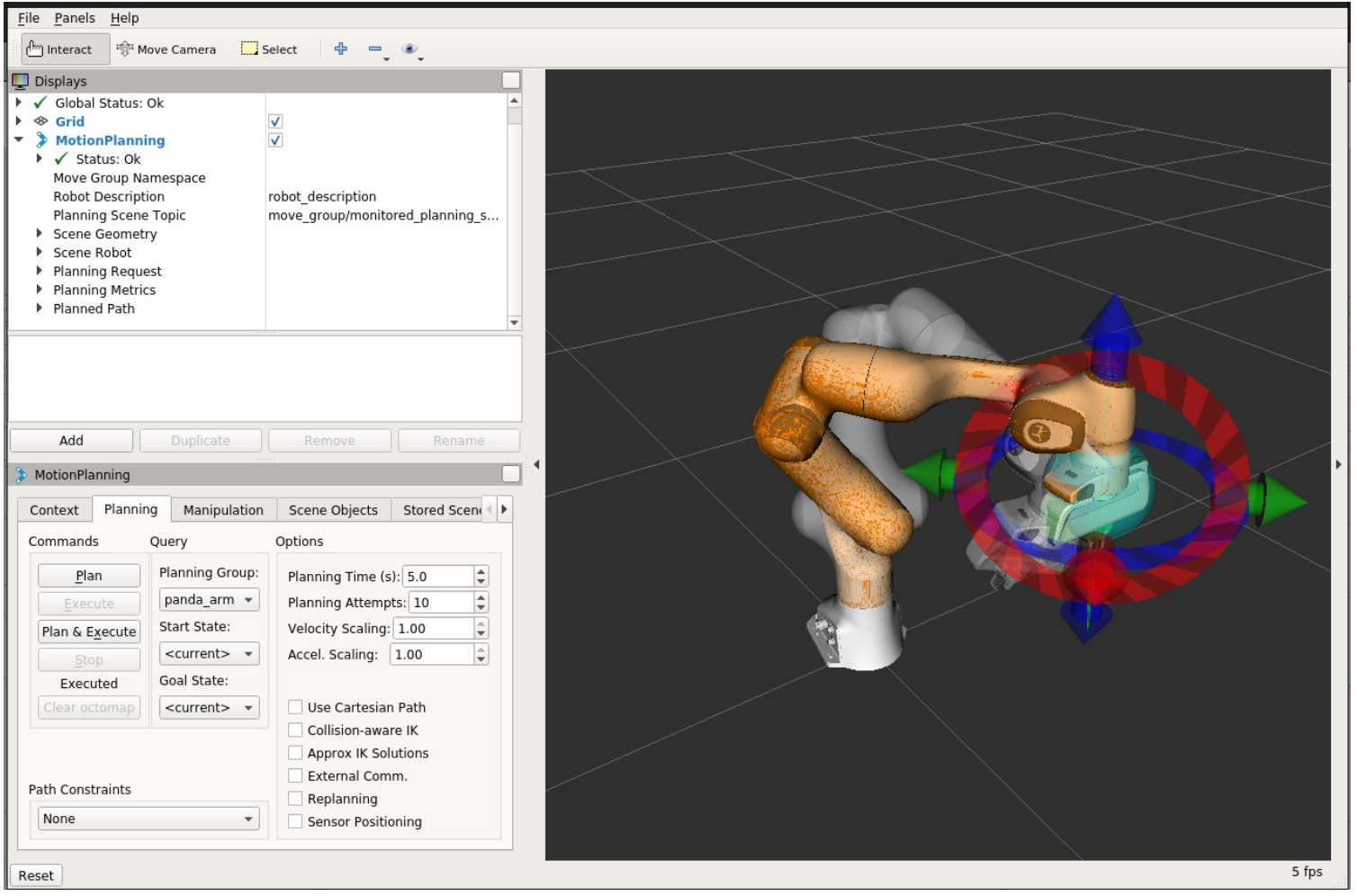
Rviz 檢視模型


Activities
rviz
joint_state_p...
joint_0 0.19
joint_1 -1.10
joint_2 0.78
joint_3 -0.22
joint_4 1.55
joint_5 0.00
Randomize
Center
6
process[joint_state_publisher_gui-1]: started with pid [28002]
process[robot_state_publisher-2]: started with pid [28003]
process[rviz-3]: started with pid [28004]
[WARN] [1702192528.678942245]: The root link base_link has an inertia
my link to your URDF.
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-f
libGL error: MESA-LOADER: failed to retrieve device information
libGL error: Version 4 or later of flush extension not found
libGL error: failed to load driver: i915
libGL error: MESA-LOADER: failed to retrieve device information
libGL error: Version 4 or later of flush extension not found
libGL error: failed to load driver: i915
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-f
libGL error: MESA-LOADER: failed to retrieve device information
libGL error: Version 4 or later of flush extension not found
libGL error: failed to load driver: i915
urdf.rviz* - RViz
File Panels Help
Interact Move Camera Select Focus Camera Measure 2D Pose Estimate 2D Nav Goal Publish Point
Displays
Global Options
Fixed Frame base_link
Background Color 48; 48; 48
Frame Rate 30
Default Light
Global Status: Ok
Fixed Frame OK
Grid
RobotModel
Status: Ok
Visual Enabled
Collision Enabled
Update Interval 0
Alpha 1
Robot Description robot_description
TF Prefix
Links
TF
Show Names
Show Axes
Show Arrows
Marker Scale 0.5
Update Interval 0
Frame Timeout 15
Filter (whitelist)
Filter (blacklist)
Frames
Tree
Add Duplicate Remove Rename
Views
Type: Orbit (rviz) Zero
Current View Orbit (rviz)
Near Clip Di... 0.01
Invert Z Axis
Target Frame <Fixed Frame>
Distance 0.826085
Focal Shape... 0.05
Focal Shape...
Yaw 1.72858
Pitch 0.280397
Focal Point -0.001635; -0.0147...
Save Remove Rename
Time
ROS Time: 1702192628.74 ROS Elapsed: 99.57 Wall Time: 1702192628.77 Wall Elapsed: 99.53
Experimental
Reset Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click/Mouse Wheel:: Zoom. Shift: More options.
30 fps

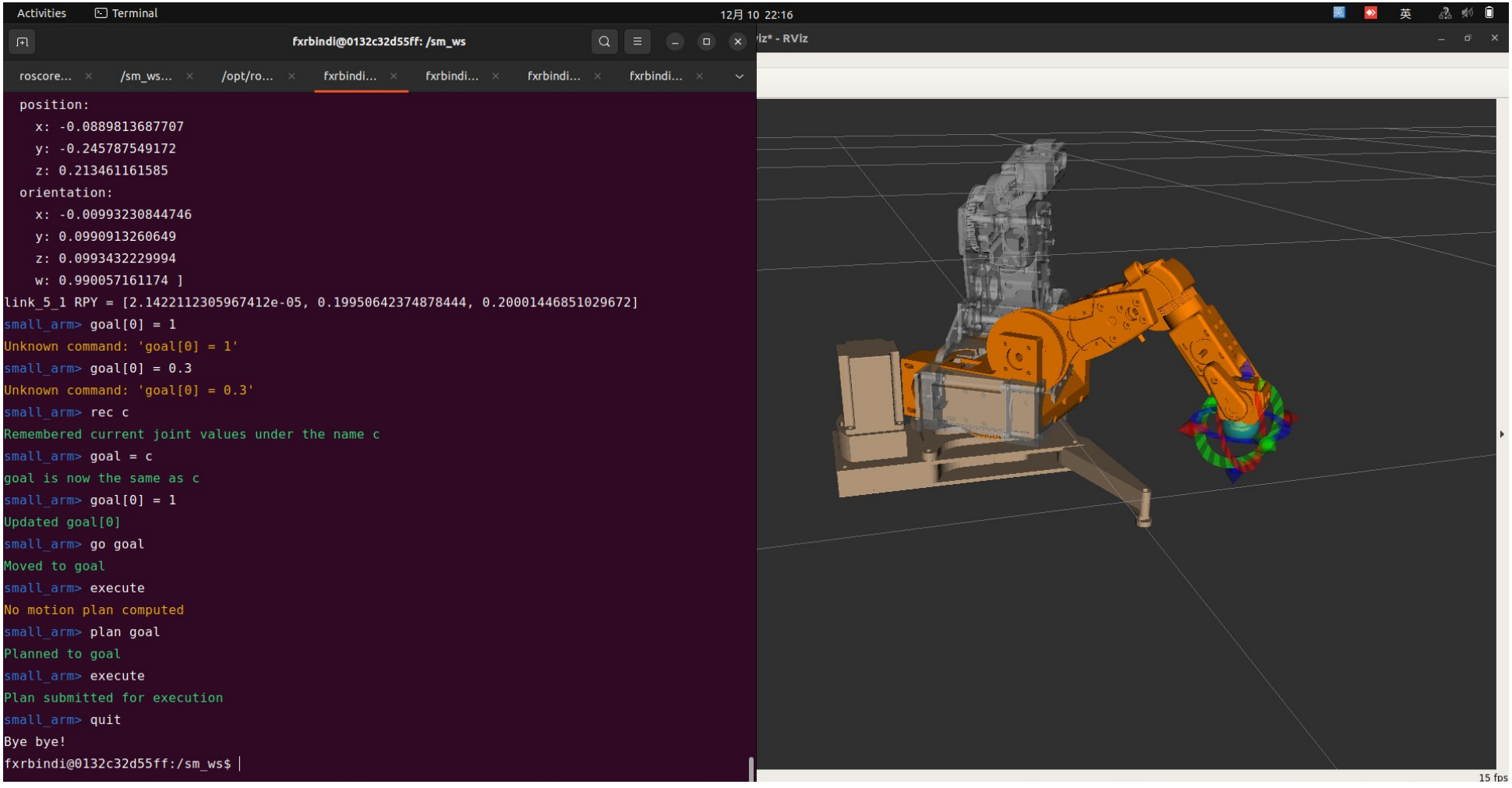
Moveit Setup Assistant



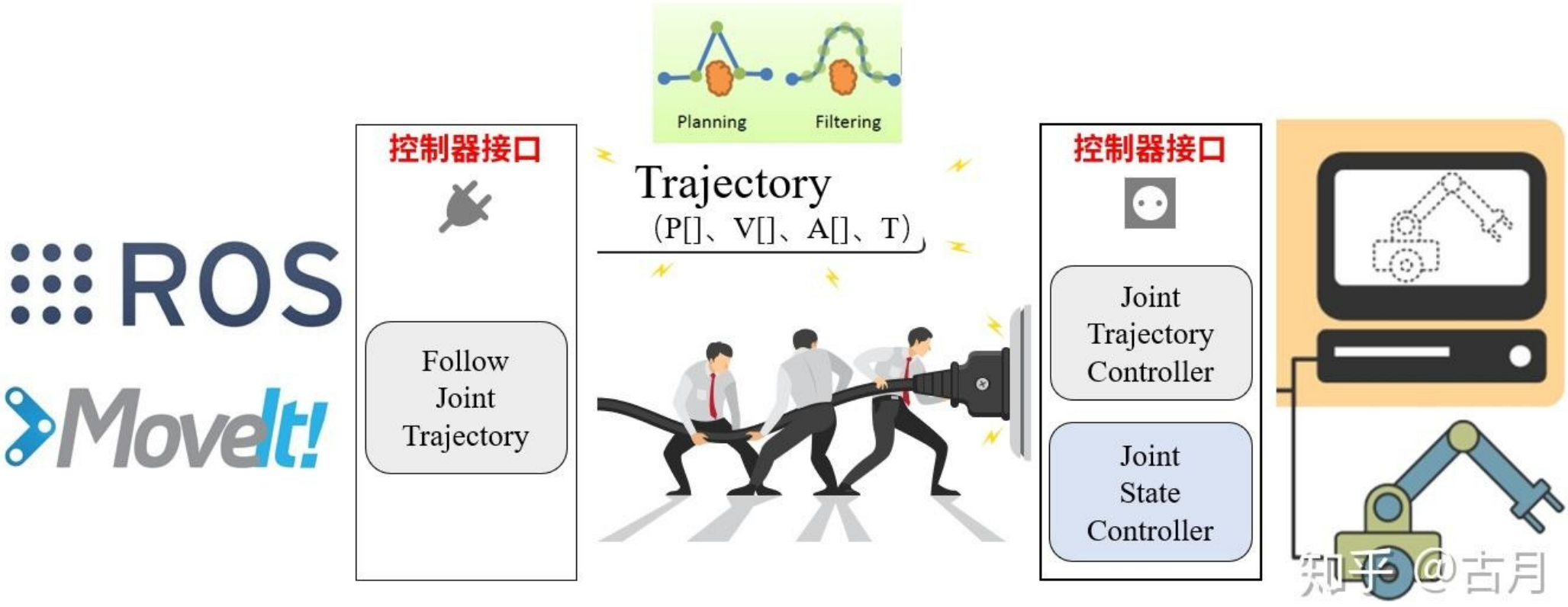
rviz-plugin(panda-moveit-config)



python command(只能控制 Rviz)



節點說明


ROS
MoveIt!
控制器接口
Follow
Joint
Trajectory
Planning
Filtering
Trajectory
(P[]、V[]、A[]、T)
控制器接口
Joint
Trajectory
Controller
Joint
State
Controller
知乎 @古月

目前問題

- arm gazebo 原點錯誤

接下來目標

- c++ interface
- add object
- ardiuno code 轉成 Hal
- 末端校正
- object 2D 抓取