ROS Tutorial

Software version 1.86

Training Center

Nov 2022

達明機器人股份有限公司
TECHMAN ROBOT INC.

ROS教學

TECHMAN ROBOT-TRAINING CENTER

目錄

01.

ROS介紹

- ROS基本介紹
- ROS版本
- ROS常用Library

ROS 基本介紹

ROS

1. Robot operating system的縮寫
2. 主要在Linux上 (最新版的support Windows)
3. 優點 : 很多第三方的library
4. 缺點 : 因為第一版在2007年就開發完成
   因此有一些過時的技術包袱

2

1. Robot operating system 2 (ROS2)
2. 主要在Linux上，也有支援Windows 和 Mac
3. 優點: 改善ROS的過時技術
4. 缺點: 第三方的library還不完善

ROS 版本

ROS 1 Distribution Releases [52]

Distribution	Release date	Poster	EOL date	Support duration
Noetic Ninjemys (last ROS 1 release)	23 May 2020		May 2025	5 years
Melodic Morenia	23 May 2018		2023-05-30	5 years
Lunar Loggerhead	23 May 2017		2019-05-30	2 years
Kinetic Kame	23 May 2016		2021-05-30	5 years

ROS 2 Distribution Releases [65][91]

Distribution	Release date	Poster	EOL date	Support duration
Rolling Ridley[92][93] (rolling release with latest features)	progressing since June 2020	(unknown)	N/A	N/A
(J Turtle)	May 2024	t.b.d.	EST. May 2029	5 years
(I Turtle)	May 2023	t.b.d.	EST. November 2024	1.5 years
Humble Hawksbill	May 2022	t.b.d.	EST. May 2027	5 years
Galactic Geochelone	23 May 2021[94]		November 2022	1.5 years
Foxy Fitzroy	5 June 2020[95]		May 2023	2 years
Eloquent Elusor	22 November 2019		November 2020	1 year
Dashing Diademata	31 May 2019		May 2021	2 years

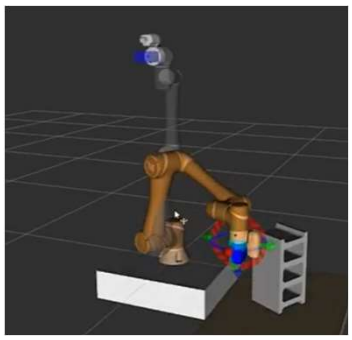
有圈起來的是我們目前有支援(2022)

ROS 版本

ROS和Linux版本對應的關係

Ubuntu版本	ROS1	ROS2
18.04	Melodic	Dashing
20.04	Noetic	Foxy
22.04	ROS1不再支援	Humble

ROS 常用Library



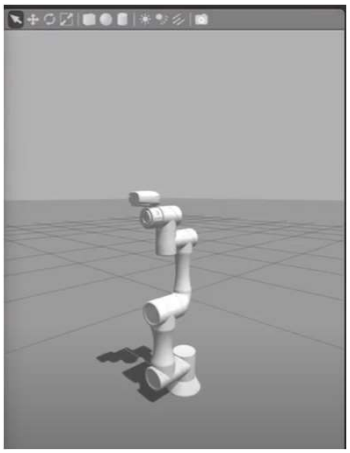
Moveit 是一個軌跡規劃和避障的軟體
最近有越來越多的使用者在使用

	Moveit1	Moveit2
特點	普通的模型	可以撈手臂的資料 讓模型跟實際相同
製作時間	早	晚
主要位置	ROS1(已經下架)	ROS1(剛上架)ROS2

ROS 常用Library

GAZEBO

Gazebo是一個有物理引擎的模擬器
預計明年初之前會開始支援

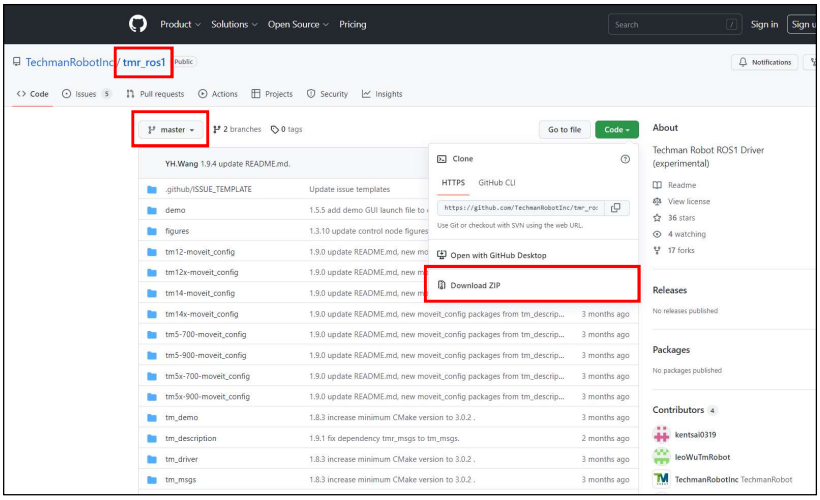


02.

TM ROS Driver 環境建置

- TM ROS Driver 環境建置(Melodic)
- TM ROS Driver 環境建置(Dashing)

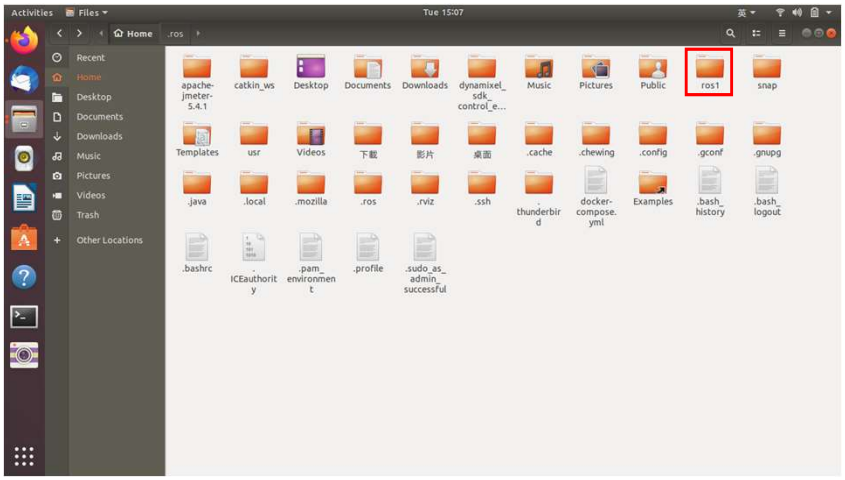
TM ROS Driver (Melodic)



Step1
到 TechmanRobotInc的Github
上下載正確版本的TM Ros Driver

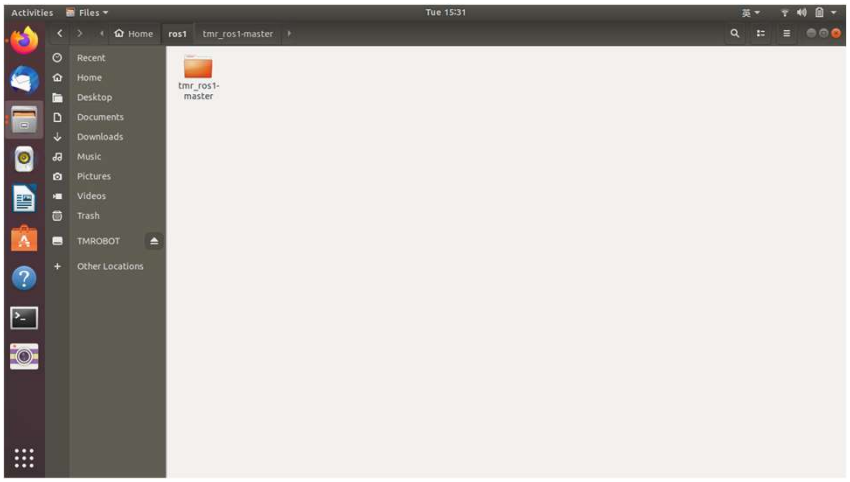
https://github.com/TechmanRobotInc

TM ROS Driver (Melodic)



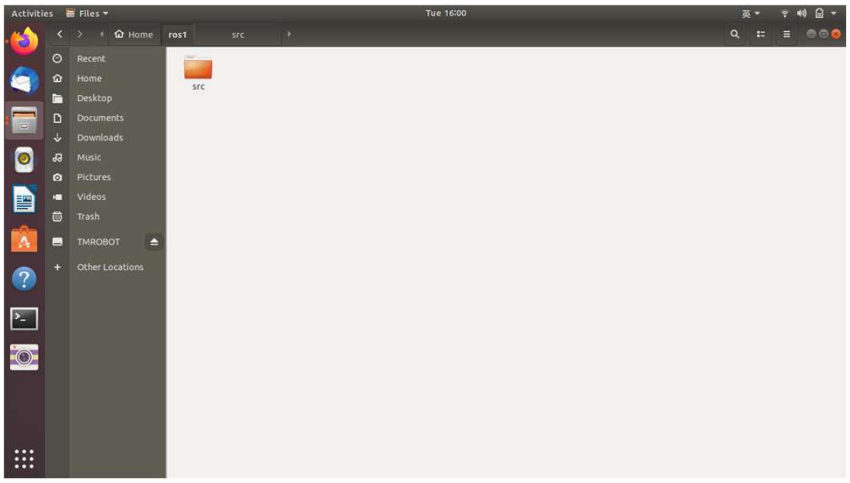
Step2
在Linux系統的Home下面新增一個新資料夾

TM ROS Driver (Melodic)



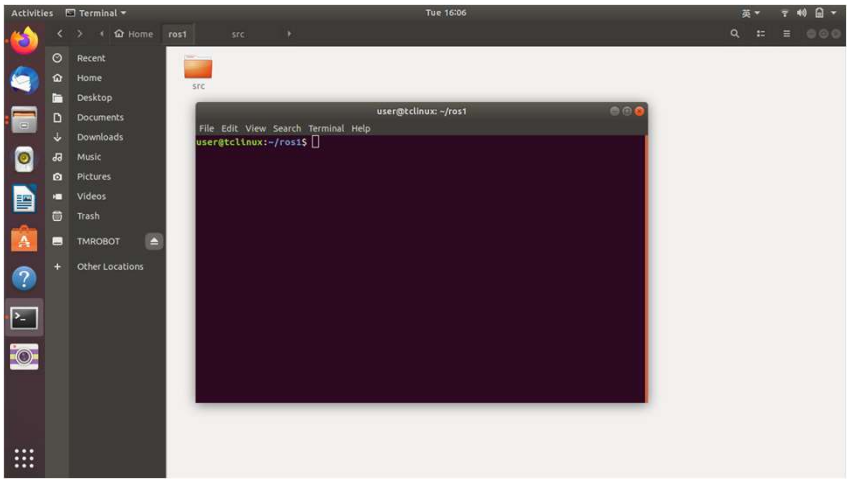
Step3
將下載下來的ROS Driver解壓縮並放置在Step2建立好的資料夾內

TM ROS Driver (Melodic)



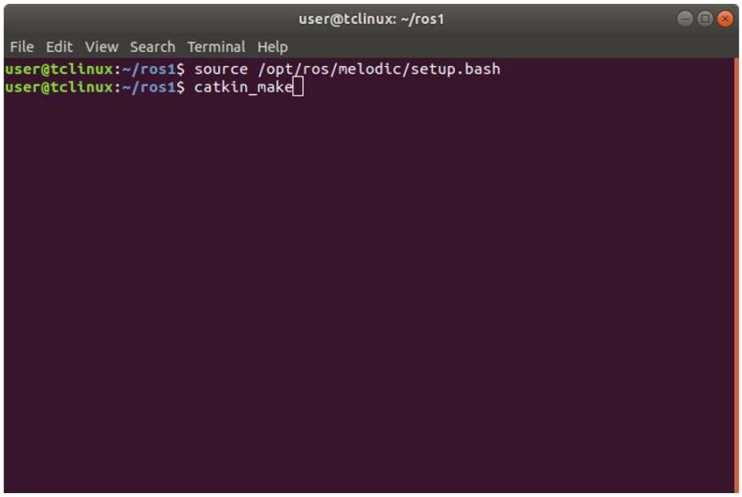
Step4
將資料夾更改為 src

TM ROS Driver (Melodic)



Step5
在資料夾內按下滑鼠右鍵，選擇
Open in Terminal

TM ROS Driver (Melodic)

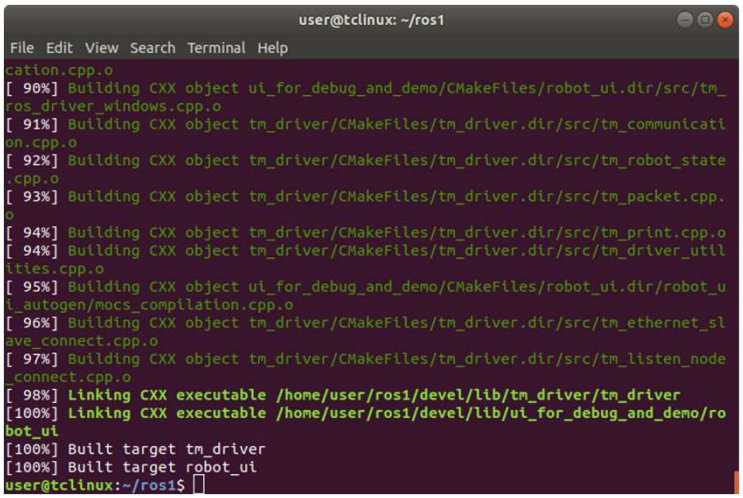


Step6
在Terminal內輸入

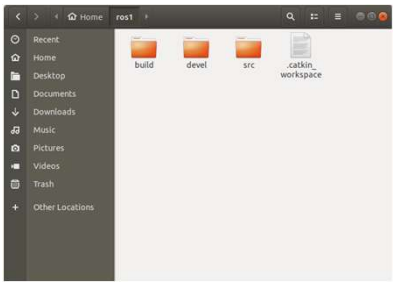
source /opt/ros/melodic/setup.bash

catkin_make

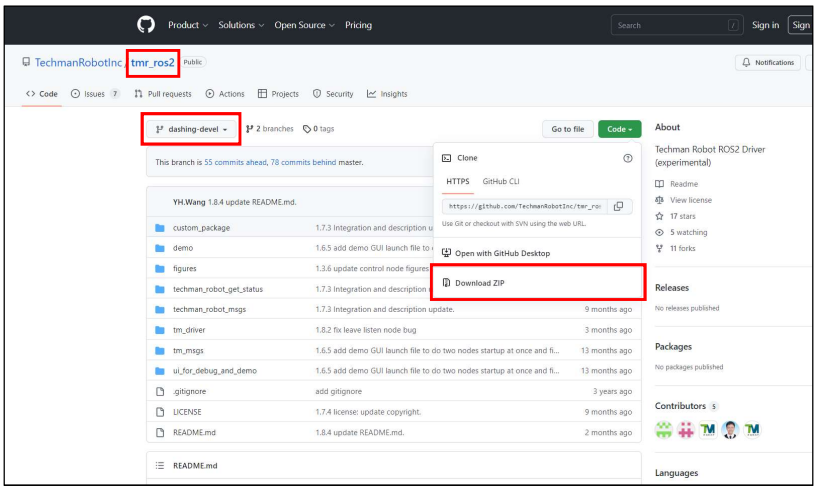
TM ROS Driver (Melodic)



Step7
建置完成後，環境內會出現其他的資料夾

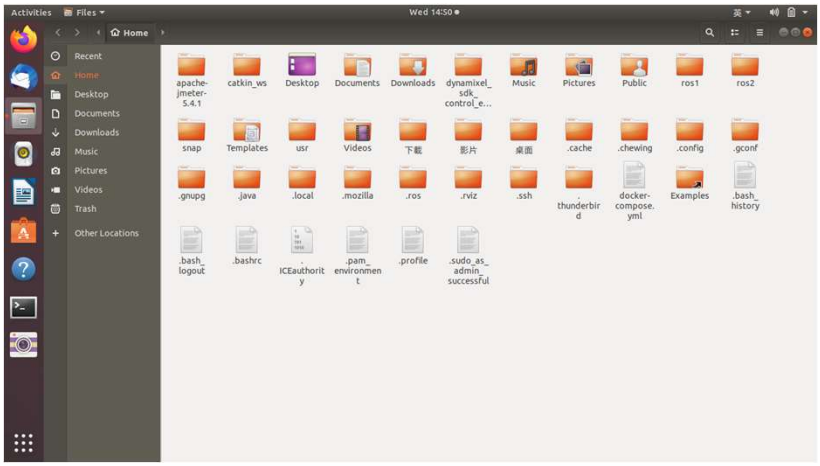


TM ROS Driver (Dashing)



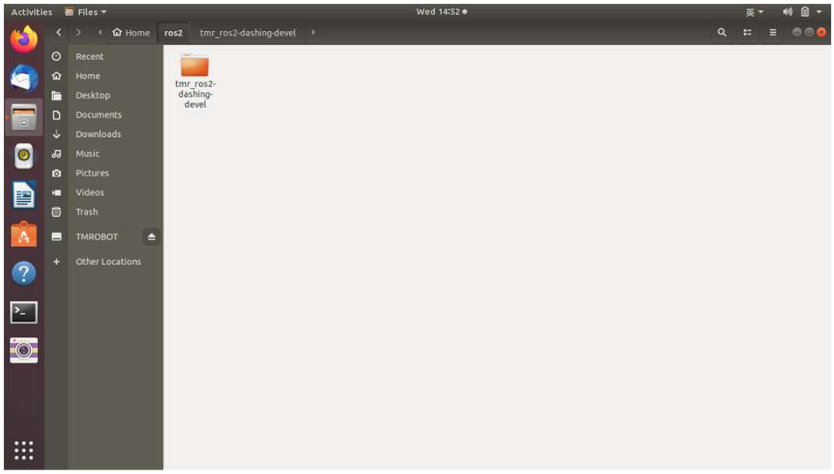
Step1
到 TechmanRobotInc的Github
上下載正確版本的TM Ros Driver

TM ROS Driver (Dashing)



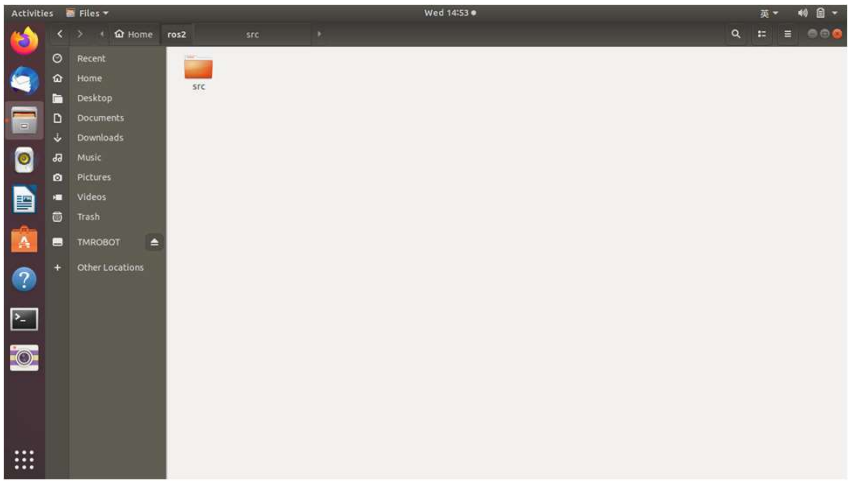
Step2
在Linux系統的Home下面新增一
個新資料夾

TM ROS Driver (Dashing)



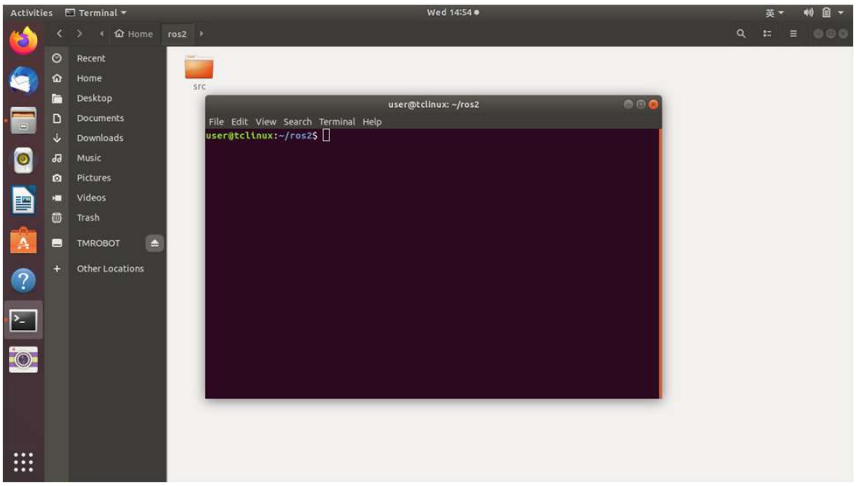
Step3
將下載下來的ROS Driver解壓縮
並放置在Step2建立好的資料夾內

TM ROS Driver (Dashing)



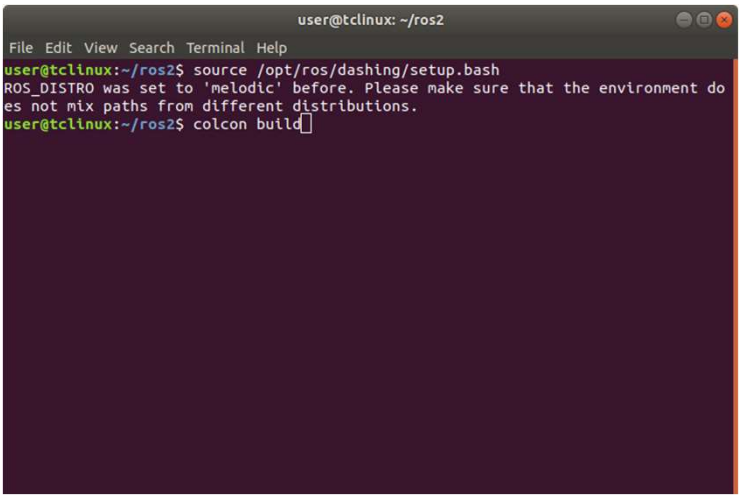
Step4
將其名稱更改為 src

TM ROS Driver (Dashing)



Step5
在資料夾內按下滑鼠右鍵，選擇
Open in Terminal

TM ROS Driver (Dashing)



Step6
在Terminal內輸入

source /opt/ros/dashing/setup.bash

colcon build

TM ROS Driver (Dashing)

```
user@tclinux: ~/ros2
File  Edit  View  Search  Terminal  Help
/home/user/.local/lib/python3.6/site-packages/setuptools/dist.py:726: UserWarnin
g: Usage of dash-separated 'install-scripts' will not be supported in future ver
sions. Please use the underscore name 'install_scripts' instead
  % (opt, underscore_opt)
/home/user/.local/lib/python3.6/site-packages/setuptools/command/install.py:37:
SetuptoolsDeprecationWarning: setup.py install is deprecated. Use build and pip
and other standards-based tools.
  setuptools.SetuptoolsDeprecationWarning,
---
Finished <<< tm_get_status [1.77s]
Finished <<< techman_robot_msgs [19.6s]
Starting >>> custom_package
Finished <<< custom_package [12.6s]
Finished <<< tm_msgs [37.6s]
Starting >>> demo
Starting >>> tm_driver
Starting >>> ui_for_debug_and_demo
Finished <<< ui_for_debug_and_demo [27.8s]
Finished <<< tm_driver [35.9s]
Finished <<< demo [38.2s]

Summary: 7 packages finished [1min 17s]
  1 package had stderr output: tm_get_status
user@tclinux:~/ros2$
```

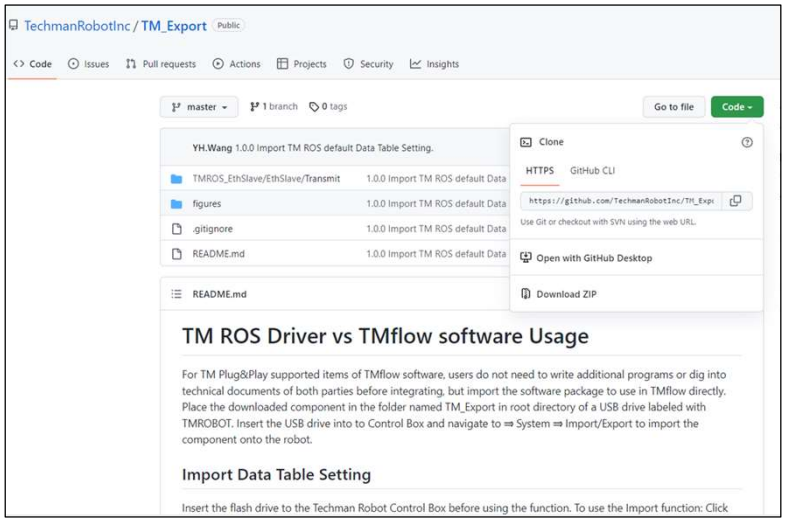
Step7
建置完成後，環境內會出現其他的資料夾

03.

TM ROS Driver 連線

- Ethernet slave setting
- Network setting
- Listen Node
- ROS1 連線(Melodic)
- ROS2 連線(Dashing)

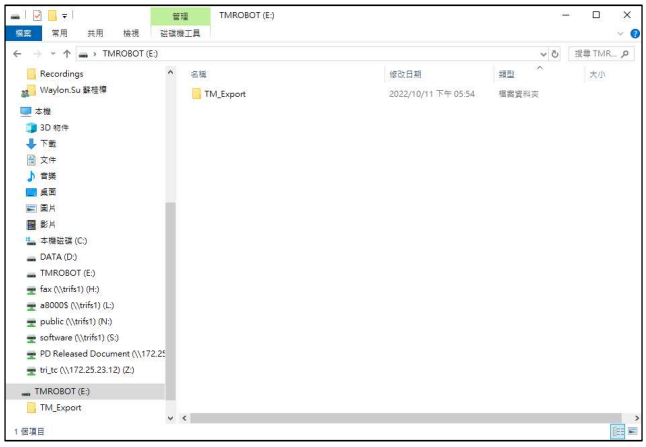
Ethernet Slave setting



Step1

到Github上下載TM_Export
(此為Ethernet slave設定檔)

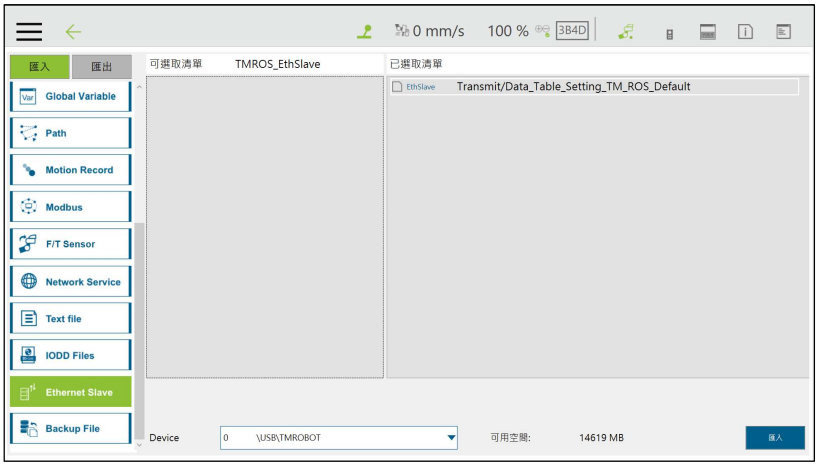
Ethernet Slave setting



Step2

解壓縮後，將TM_Export放置於
TMROBOT隨身碟內

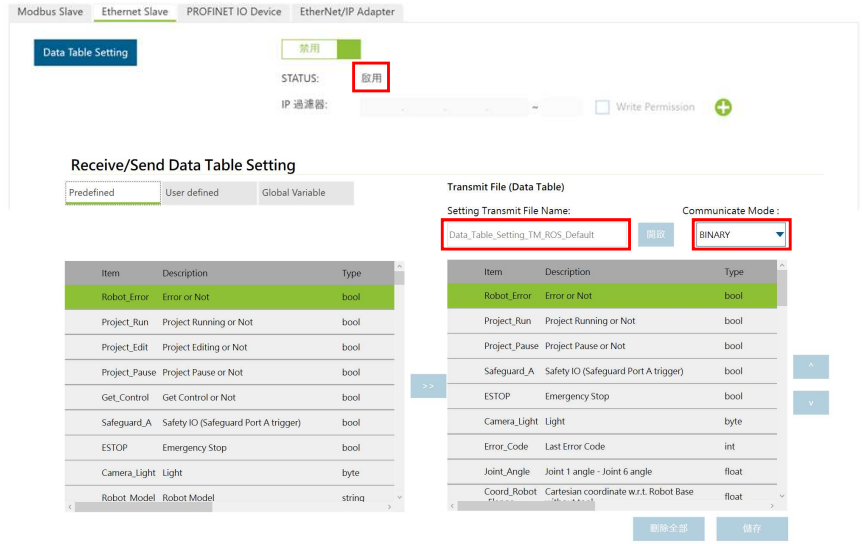
Ethernet Slave setting



Step3

將下載下來的Ethernet slave設定檔匯入手臂中

Ethernet Slave setting



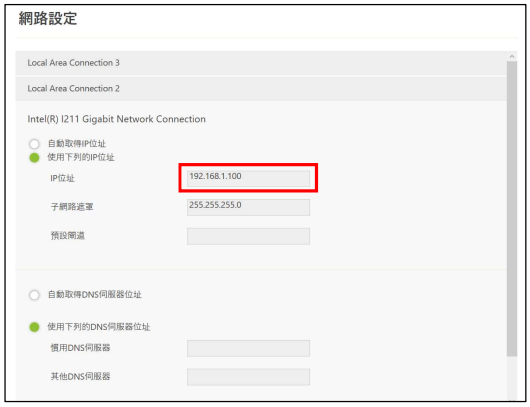
Step4

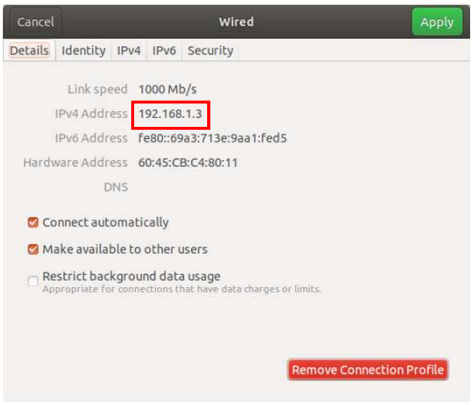
到connection中設定正確的Ethernet Slave setting

通訊模式要選擇Binary

並確定Status為啟用

Network setting

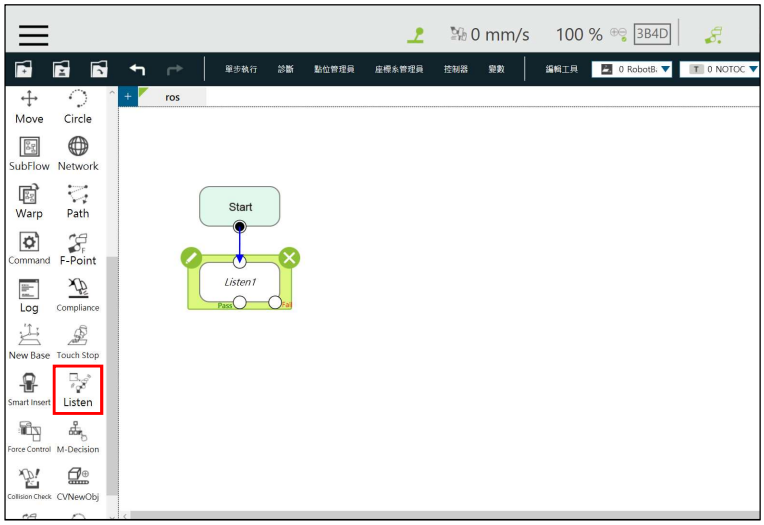




Step5

使用網路線連接電控箱與Linux主機
並確定他們的IP位置在同一個網域下

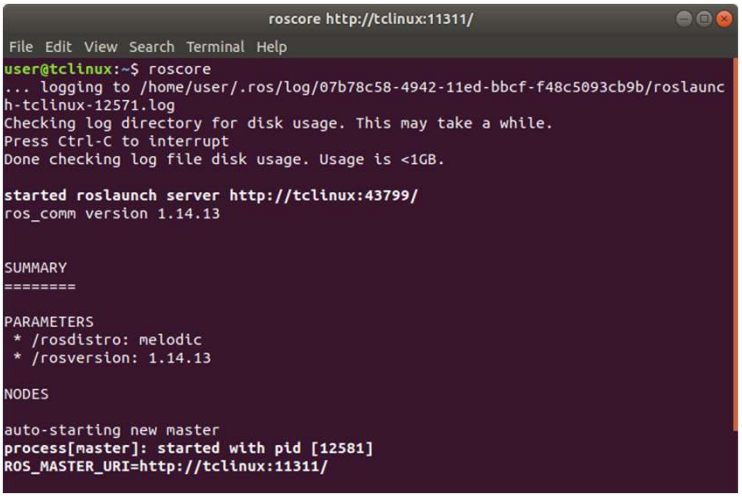
Listen node



Step6

建立新專案並拉出一個Listen node
然後執行專案

ROS1 連線(Melodic)

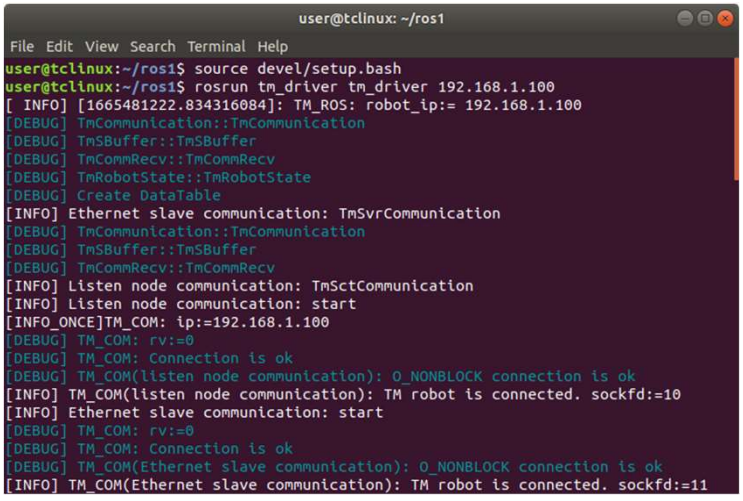


Step1

Terminal 1 :
輸入
roscore

ROS1需要一個roscore來進行溝通

ROS1 連線(Melodic)

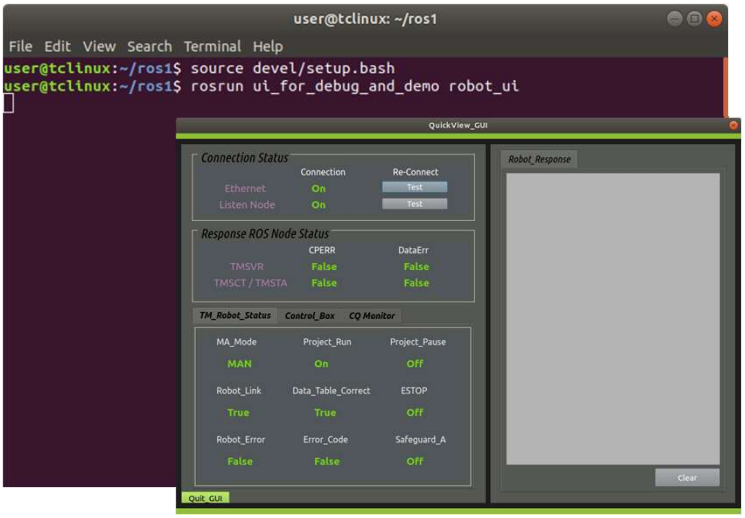


Step2

Terminal 2 :
輸入
source devel/setup.bash

rosrun tm_driver tm_driver <ip>

ROS1 連線(Melodic)



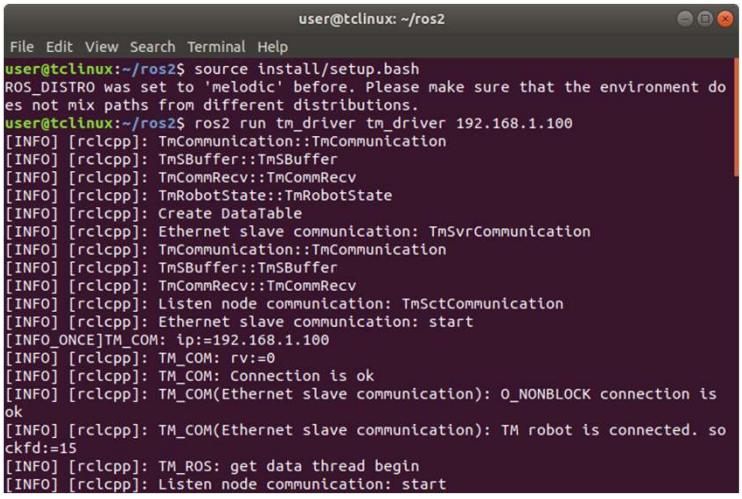
Step3

Terminal 3:
輸入
source devel/setup.bash

rosrun ui_for_debug_and_demo robot_ui

此UI可以幫助使用者判斷連線是否成功

ROS2 連線(Dashing)

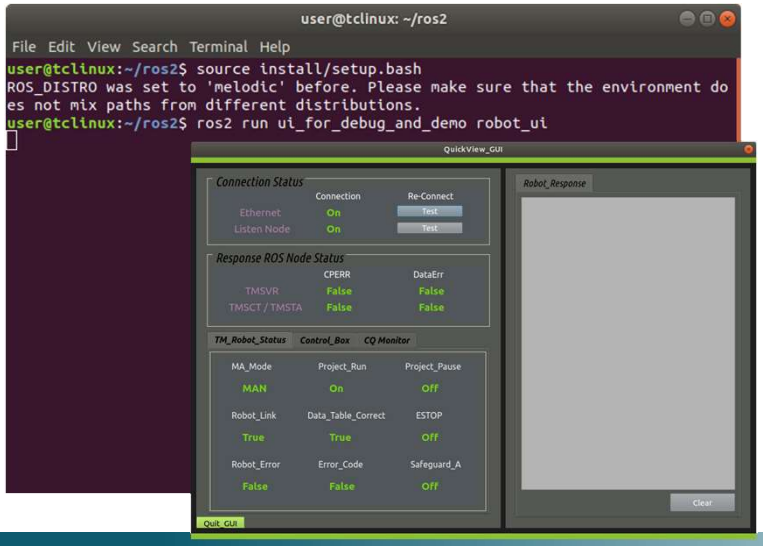


Step1

Terminal 1 :
輸入
source install/setup.bash

ros2 run tm_driver tm_driver <ip>

ROS2 連線(Dashing)



Step2

Terminal 2:
輸入
source install/setup.bash

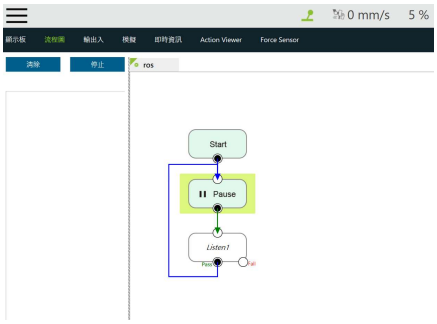
ros2 run ui_for_debug_and_demo robot_ui

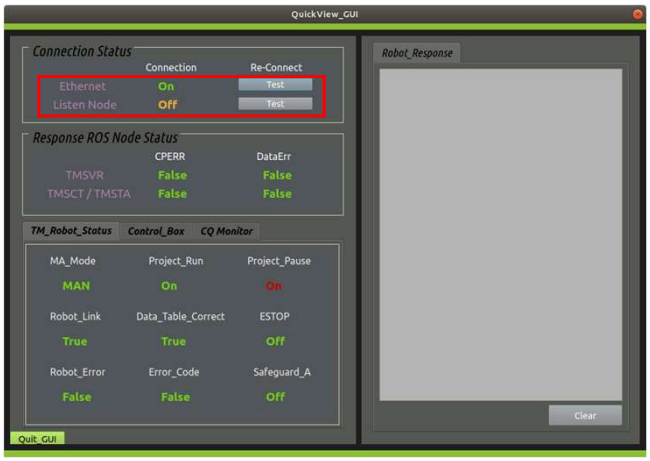
此UI可以幫助使用者判斷連線是否成功

連線常見問題

只要執行專案

就算沒有進入
listen node還是可以連線





連線常見問題

連線失敗時

Listen node Reconnect
Ethernet slave Recoonect

這兩個會一直跳

連線常見問題

當連線失敗要怎麼辦?

1. Ping IP 是否有通
2. Mask和IP是否一致
3. Ethernet slave是否設定完成並打開
4. 專案是否執行中
5. 換網路孔

04.

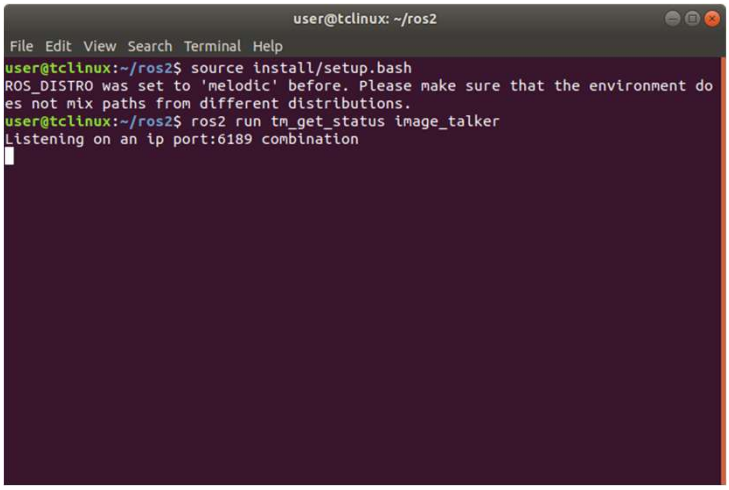
ROS Vision

- ROS Vision Dependencies
- ROS Vision 使用說明

ROS Vision Dependencies

- ROS2 Dashing (這邊以此版本進行示範)
- Python packages：
  - flask
  - waitress
  - opencv-python==3.4.13.47(minimum)
  - numpy
  - datetime
- For example：
  - pip3 install flask
  - pip3 install waitress
  - pip3 install opencv-python
  - pip3 install datetime

ROS Vision 使用說明



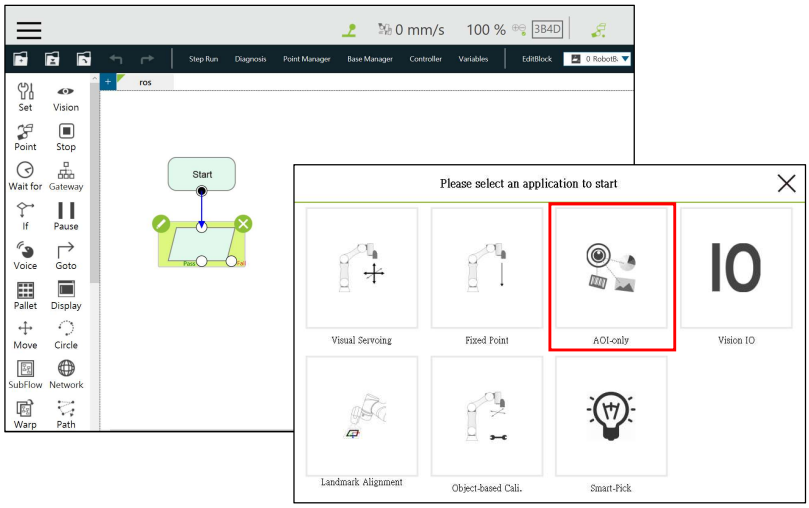
Step1

在Terminal輸入：

source install/setup.bash

ros2 run tm_get_status image_ talker

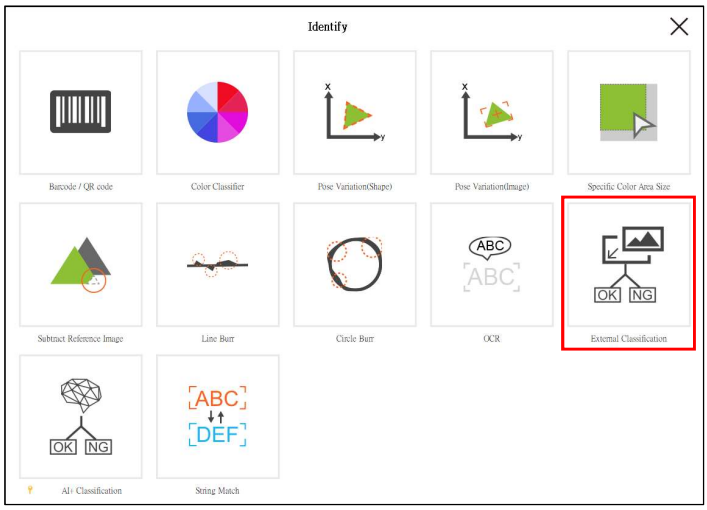
ROS Vision 使用說明



Step2

在TMFlow新增一個視覺任務，
並選擇僅AOI辨識

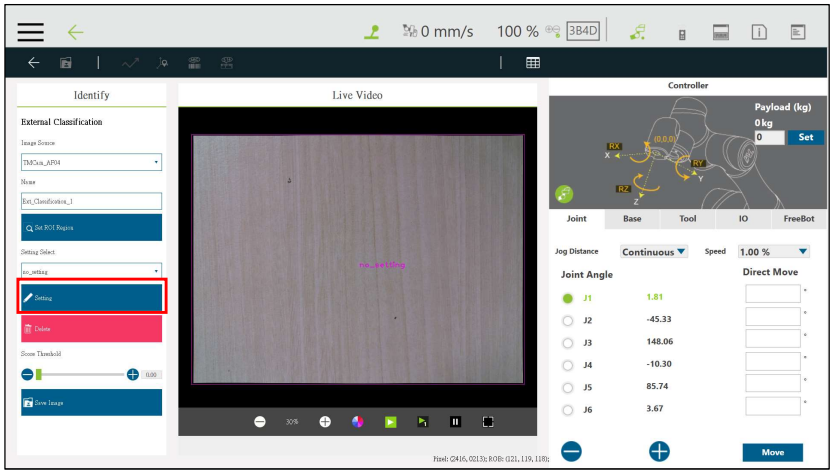
ROS Vision 使用說明



Step3

選擇辨識模組，並選擇External Classification

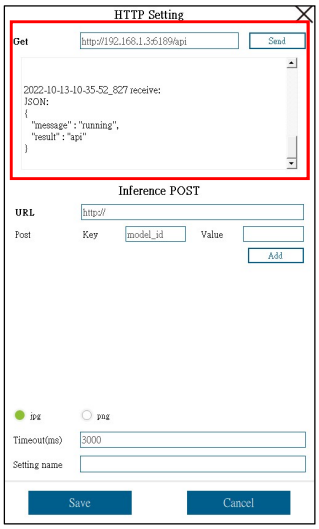
ROS Vision 使用說明

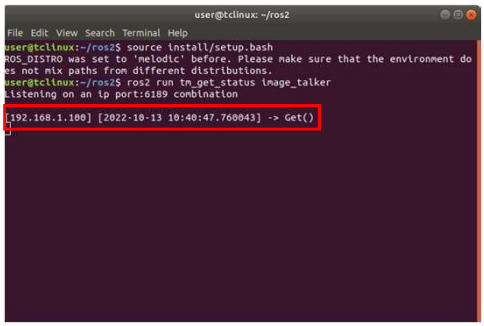


Step4

點選Setting

ROS Vision 使用說明

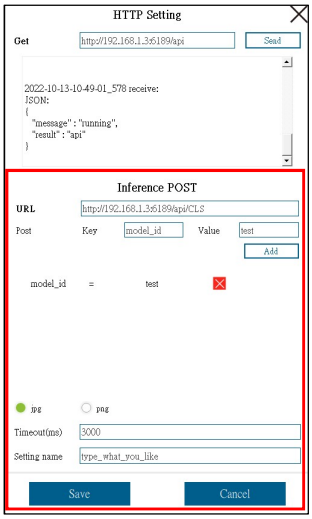




Step5

在Get中輸入 http://[IP]:6189/api ，
可以測試連線是否成功

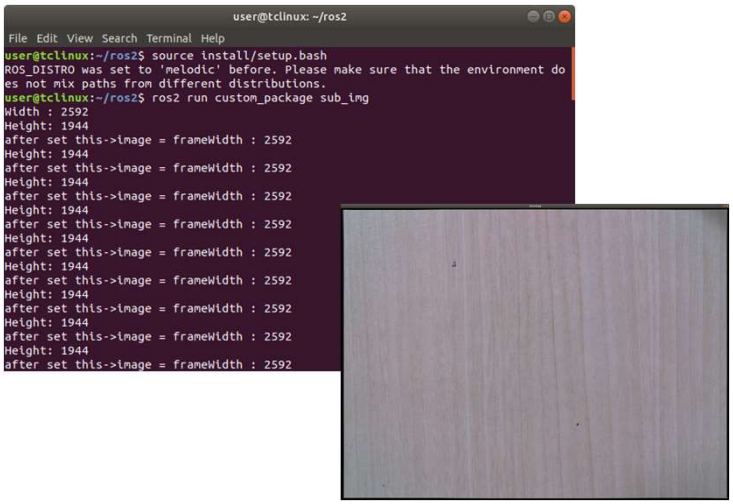
ROS Vision 使用說明



Step6

確認連線沒有問題後，在下面的
URL輸入http://[IP]:6189/api/CLS，
在Value中輸入test並按下Add ，
最後再輸入一個setting name，
即可儲存本設定

ROS Vision 使用說明



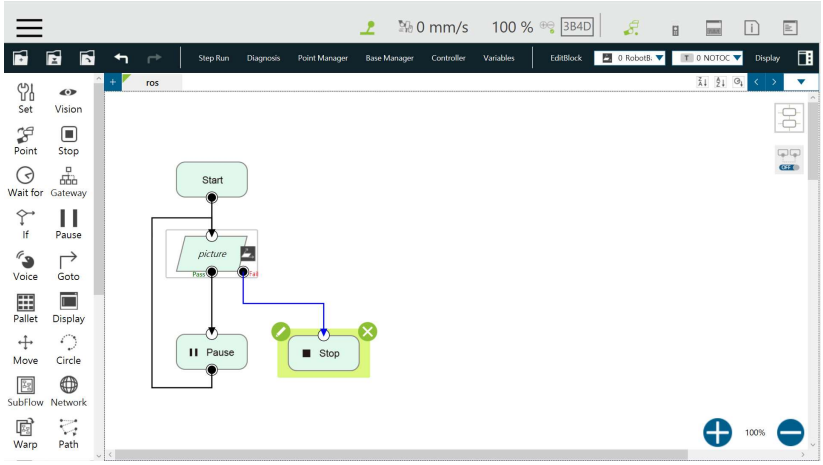
Step7

設定完成後，
在Terminal輸入：
source install/setup.bash

ros2 run custom_package sub_img

可以讀取到傳送出來的圖片

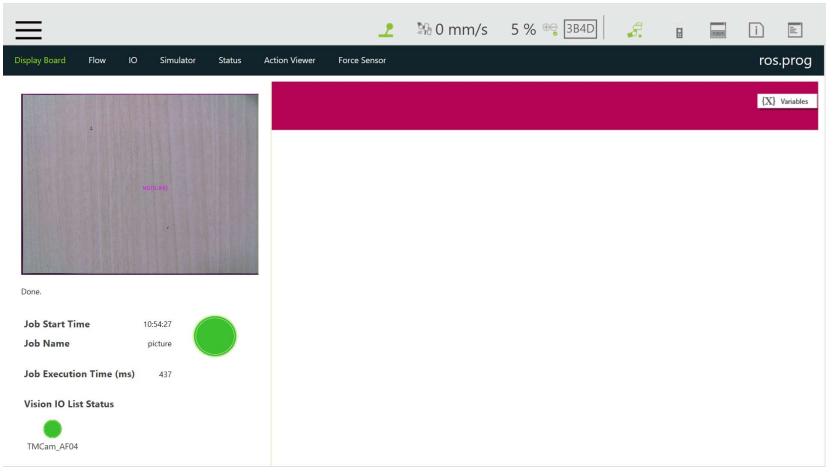
ROS Vision 使用說明



Step8

在專案中設定
每按一下Play/Pause鍵取一張圖

ROS Vision 使用說明



Step9

執行專案

05.

Moveit

- Moveit介紹
- Moveit使用說明

Moveit介紹

目前moveit的支援程度:

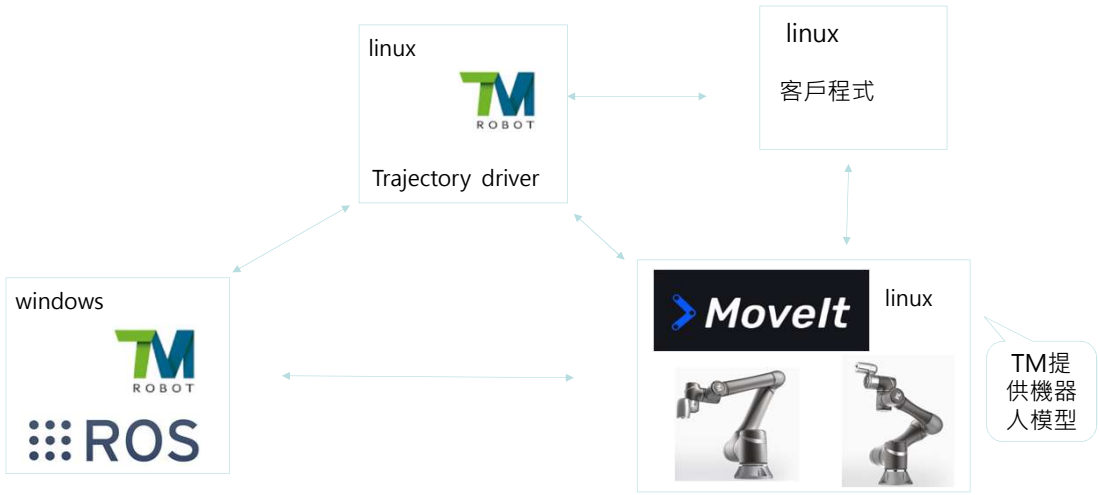
ROS2 : foxy (簡易顯示)和簡易demo

ROS1: melodic noetic(完整)

ROS2本身
Moveit還沒完善

ROS1
Moveit系統完整

Moveit介紹



Moveit使用說明

請參考Moveit的官方網站
並安裝好所有需要用到的Package

http://docs.ros.org/en/melodic/api/moveit_tutorials/html/doc/getting_started/getting_started.html

Moveit使用說明

這邊以Melodic進行示範

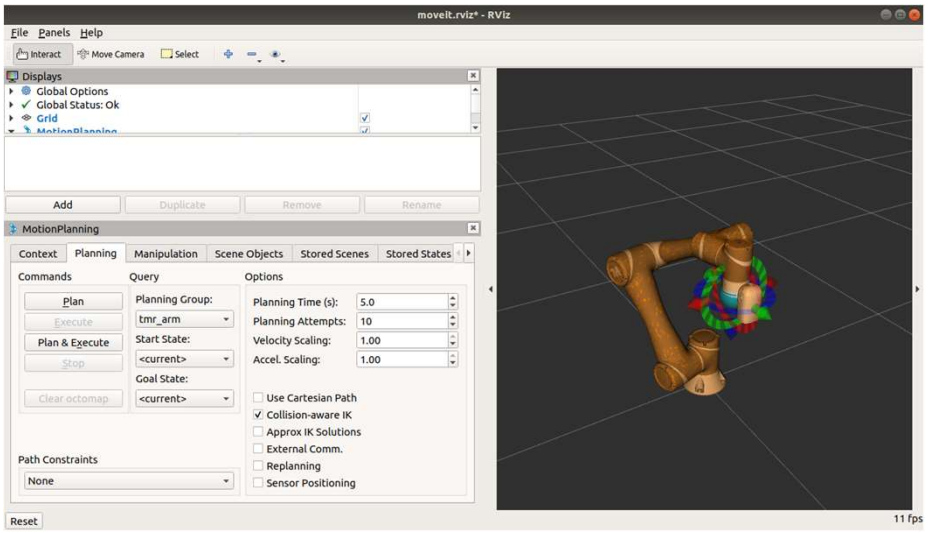
啟動虛擬的手臂

roslaunch tm5-900-moveit_config tm5-900_moveit_planning_execution.launch sim:= True

啟動真實的手臂

roslaunch tm5-900-moveit_config tm5-900_moveit_planning_execution.launch sim:=False robot_ip:=<robot_ip_address>

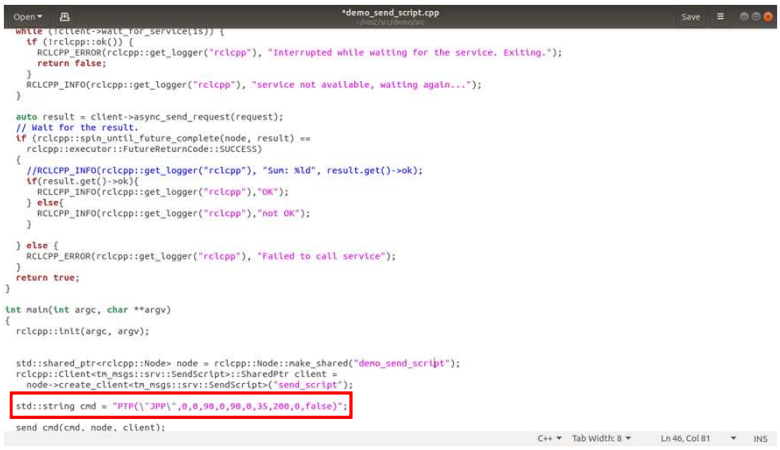
Moveit使用說明



06.

Demo code 使用

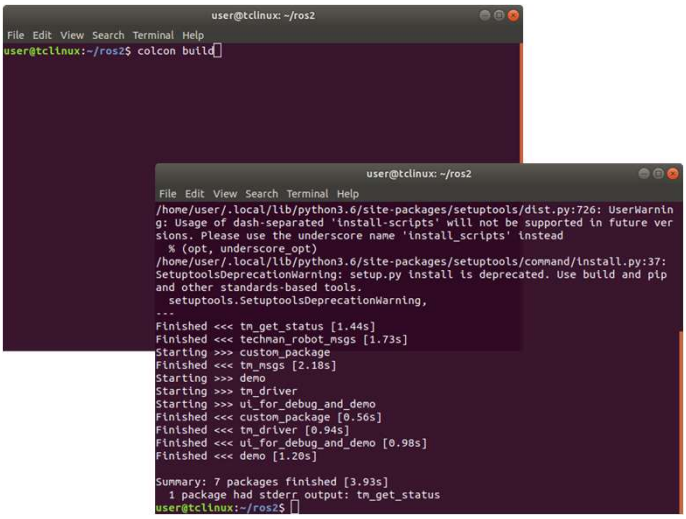
Demo code 使用



這邊使用Ros2作為範例

編輯src裡面的demo_send_script

Demo code 使用



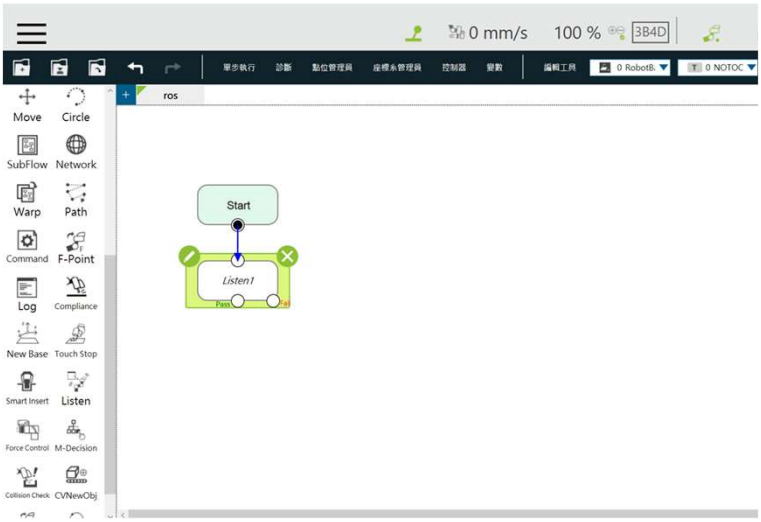
Step 1

編輯完專案後在Terminal輸入：

colcon build
進行建置

建置完成

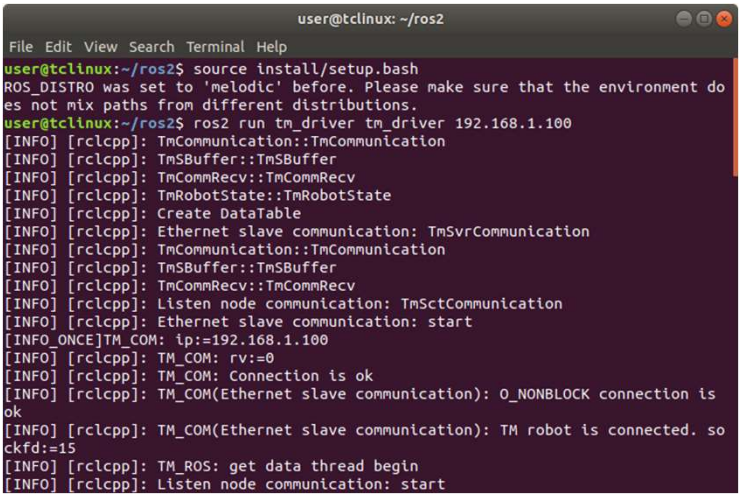
Demo code 使用



Step 2

到TMFlow拉出一個Listen node
並執行專案

Demo code 使用



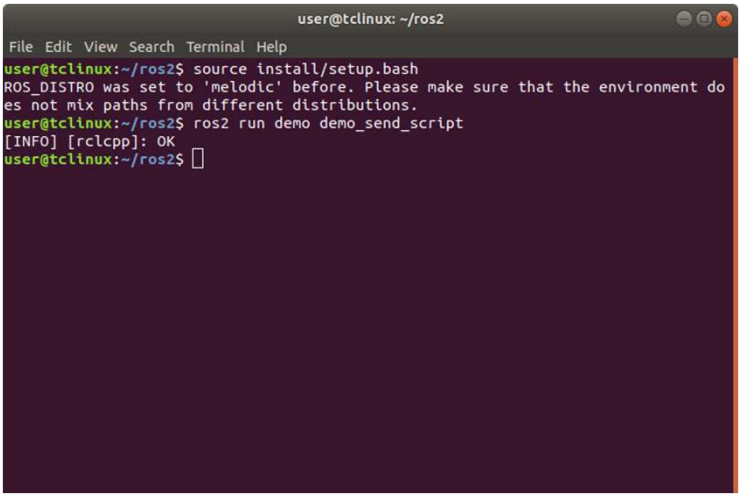
Step3

使用TM ROS driver進行連線

Terminal 1 :
輸入
source install/setup.bash

ros2 run tm_driver tm_driver <ip>

Demo code 使用



Step4

執行demo_send_script

Terminal 2 :
輸入
source install/setup.bash

ros2 run demo demo_send_script

TECHMAN
ROBOT

THANK YOU

TECHMAN
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www.tm-robot.com