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**NIM : 1103204206**

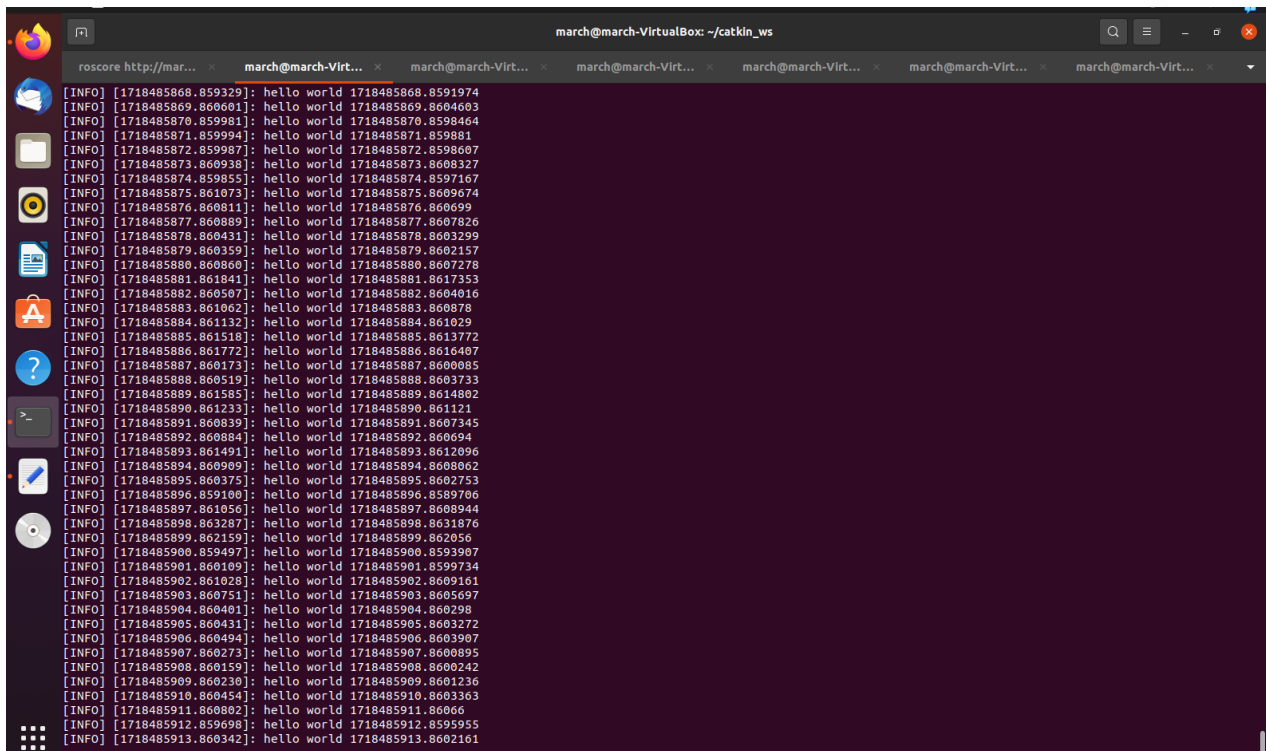
## Bab 1: Introduction to ROS

Bab pertama ini memperkenalkan Robot Operating System (ROS) dan menjelaskan mengapa belajar ROS sangat penting dalam pengembangan robotika. Bab ini membahas tiga tingkatan utama dalam ROS: tingkat filesystem, tingkat grafik komputasi, dan tingkat komunitas. Di tingkat filesystem, pembaca belajar tentang struktur dan manajemen paket ROS, termasuk paket, metapaket, pesan, dan layanan. Di tingkat grafik komputasi, fokusnya adalah pada node ROS, topik, layanan, file bag, serta master ROS dan server parameter. Bab ini juga memperkenalkan berbagai sumber daya komunitas yang tersedia, seperti Wiki ROS, mailing list, dan ROS Answers. Di bagian akhir, bab ini memberikan panduan teknis untuk mempersiapkan sistem, termasuk instalasi Ubuntu 20.04 LTS atau Debian 10 dan ROS Noetic.

## Bab 2: Getting Started with ROS Programming

Bab ini mengajak pembaca untuk memulai pemrograman dengan ROS. Pembaca diajak membuat dan mengorganisir paket ROS, serta memahami cara bekerja dengan topik ROS. Langkah-langkah detail diberikan untuk mengembangkan dan membangun node ROS. Bab ini juga menjelaskan cara menambahkan pesan dan layanan kustom dengan berkas .msg dan .srv. Selain itu, pembaca belajar menggunakan dan mengimplementasikan layanan serta actionlib untuk tugas asinkron. Pembuatan dan penggunaan berkas peluncuran (launch files) juga dibahas untuk membantu memulai beberapa node sekaligus. Bab ini diakhiri dengan contoh-contoh aplikasi praktis untuk topik, layanan, dan actionlib.

Running publisher dan subscriber berjalan dengan baik



The screenshot shows a terminal window titled "march@march-VirtualBox: ~/catkin\_ws". The terminal displays a series of log messages from a ROS publisher and subscriber. The publisher outputs "hello world" followed by a unique identifier in brackets, such as [1718485868.859322]. The subscriber outputs "hello world" followed by a unique identifier in brackets, such as [1718485869.860601]. The messages continue for approximately 30 seconds, with the publisher's ID increasing by 1000 each time and the subscriber's ID increasing by 100 each time. The terminal window has a dark background with a light-colored text area. On the left side of the terminal, there is a vertical sidebar with various icons, including a terminal icon, a file explorer icon, and a search icon. The top of the terminal window shows the title bar with the text "march@march-VirtualBox: ~/catkin\_ws" and standard window control buttons (minimize, maximize, close).

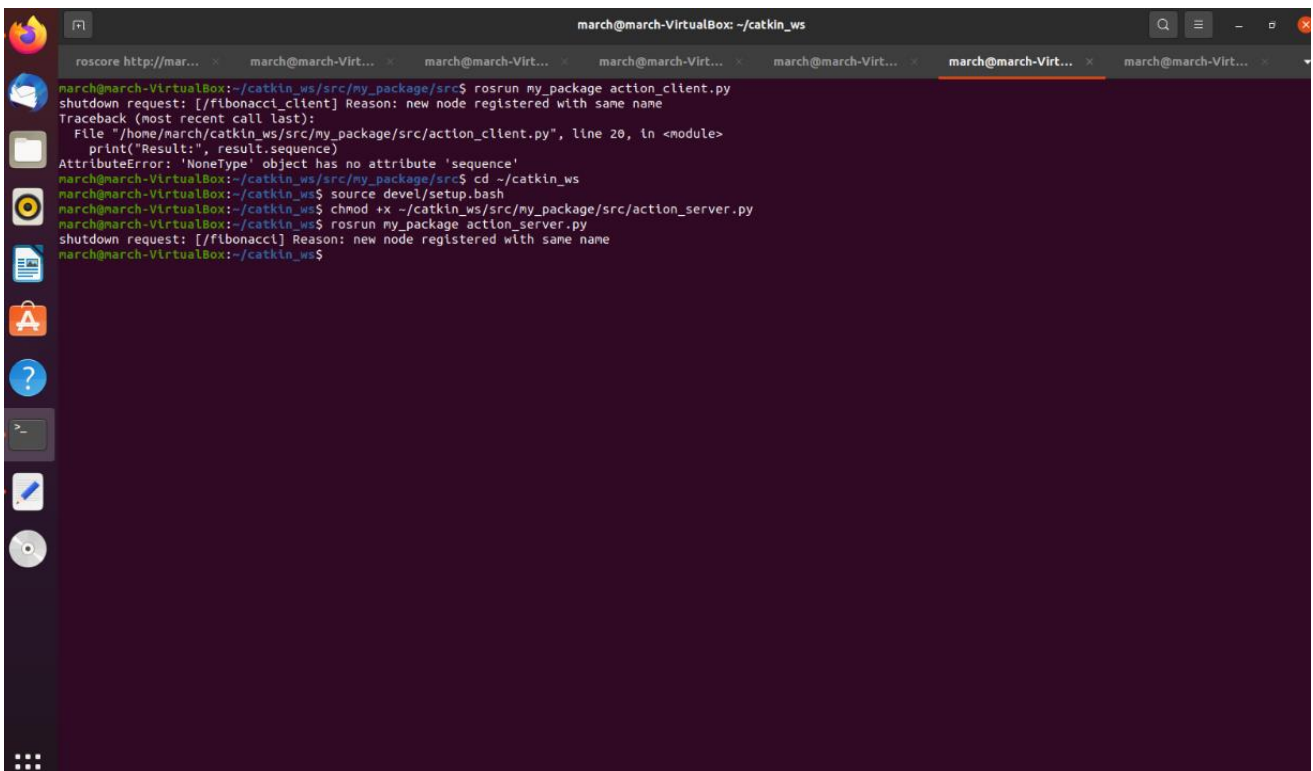
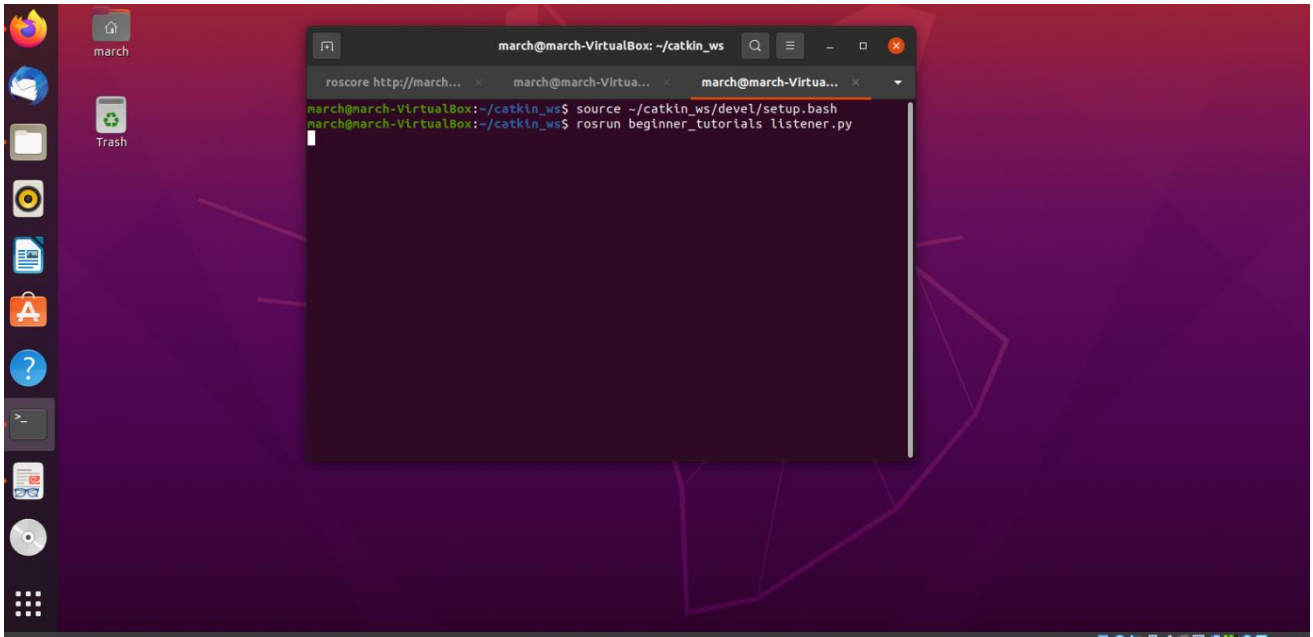
```
march@march-VirtualBox: ~/catkin_ws
roscore http://mar... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt...
[INFO] [1718485868.859322]: hello world 1718485868.8591974
[INFO] [1718485869.860601]: hello world 1718485869.8604603
[INFO] [1718485870.859981]: hello world 1718485870.8598464
[INFO] [1718485871.859994]: hello world 1718485871.859881
[INFO] [1718485872.859987]: hello world 1718485872.8598607
[INFO] [1718485873.860938]: hello world 1718485873.8608327
[INFO] [1718485874.859855]: hello world 1718485874.8597167
[INFO] [1718485875.861073]: hello world 1718485875.8609674
[INFO] [1718485876.860811]: hello world 1718485876.860699
[INFO] [1718485877.860889]: hello world 1718485877.8607826
[INFO] [1718485878.860431]: hello world 1718485878.8603299
[INFO] [1718485879.860359]: hello world 1718485879.8602157
[INFO] [1718485880.860860]: hello world 1718485880.8607278
[INFO] [1718485881.861841]: hello world 1718485881.8617353
[INFO] [1718485882.860507]: hello world 1718485882.8604016
[INFO] [1718485883.861062]: hello world 1718485883.860878
[INFO] [1718485884.861132]: hello world 1718485884.861029
[INFO] [1718485885.861518]: hello world 1718485885.8613772
[INFO] [1718485886.861772]: hello world 1718485886.8616407
[INFO] [1718485887.860173]: hello world 1718485887.8600085
[INFO] [1718485888.860519]: hello world 1718485888.8603733
[INFO] [1718485889.861585]: hello world 1718485889.8614802
[INFO] [1718485890.861233]: hello world 1718485890.861121
[INFO] [1718485891.860839]: hello world 1718485891.8607345
[INFO] [1718485892.860884]: hello world 1718485892.860694
[INFO] [1718485893.861491]: hello world 1718485893.8612096
[INFO] [1718485894.860909]: hello world 1718485894.8608062
[INFO] [1718485895.860375]: hello world 1718485895.8602753
[INFO] [1718485896.859100]: hello world 1718485896.8589706
[INFO] [1718485897.861056]: hello world 1718485897.8608944
[INFO] [1718485898.863287]: hello world 1718485898.8631876
[INFO] [1718485899.862159]: hello world 1718485899.862056
[INFO] [1718485900.859497]: hello world 1718485900.8593907
[INFO] [1718485901.860109]: hello world 1718485901.8599734
[INFO] [1718485902.861028]: hello world 1718485902.8609161
[INFO] [1718485903.860751]: hello world 1718485903.8605697
[INFO] [1718485904.860401]: hello world 1718485904.860298
[INFO] [1718485905.860431]: hello world 1718485905.8603272
[INFO] [1718485906.860494]: hello world 1718485906.8603907
[INFO] [1718485907.860273]: hello world 1718485907.8600895
[INFO] [1718485908.860159]: hello world 1718485908.8600242
[INFO] [1718485909.860230]: hello world 1718485909.8601236
[INFO] [1718485910.860454]: hello world 1718485910.8603363
[INFO] [1718485911.860802]: hello world 1718485911.860606
[INFO] [1718485912.859698]: hello world 1718485912.8595955
[INFO] [1718485913.860342]: hello world 1718485913.8602161
```

```
march@march-VirtualBox: ~/catkin_ws
roscore http://mar... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt...
[INFO] [1718485876.862620]: /listener_50431_1718483299227 I heard hello world 1718485876.860699
[INFO] [1718485877.862813]: /listener_50431_1718483299227 I heard hello world 1718485877.8607826
[INFO] [1718485878.861973]: /listener_50431_1718483299227 I heard hello world 1718485878.8603299
[INFO] [1718485879.862469]: /listener_50431_1718483299227 I heard hello world 1718485879.8602157
[INFO] [1718485880.863030]: /listener_50431_1718483299227 I heard hello world 1718485880.8607278
[INFO] [1718485881.863459]: /listener_50431_1718483299227 I heard hello world 1718485881.8617353
[INFO] [1718485882.862652]: /listener_50431_1718483299227 I heard hello world 1718485882.8604016
[INFO] [1718485883.863755]: /listener_50431_1718483299227 I heard hello world 1718485883.860078
[INFO] [1718485884.862592]: /listener_50431_1718483299227 I heard hello world 1718485884.861029
[INFO] [1718485885.863750]: /listener_50431_1718483299227 I heard hello world 1718485885.8613772
[INFO] [1718485886.863712]: /listener_50431_1718483299227 I heard hello world 1718485886.8616407
[INFO] [1718485887.862819]: /listener_50431_1718483299227 I heard hello world 1718485887.8600085
[INFO] [1718485888.862715]: /listener_50431_1718483299227 I heard hello world 1718485888.8603733
[INFO] [1718485889.863303]: /listener_50431_1718483299227 I heard hello world 1718485889.8614802
[INFO] [1718485890.863231]: /listener_50431_1718483299227 I heard hello world 1718485890.861121
[INFO] [1718485891.862331]: /listener_50431_1718483299227 I heard hello world 1718485891.8607345
[INFO] [1718485892.864242]: /listener_50431_1718483299227 I heard hello world 1718485892.860694
[INFO] [1718485893.864400]: /listener_50431_1718483299227 I heard hello world 1718485893.8612096
[INFO] [1718485894.863029]: /listener_50431_1718483299227 I heard hello world 1718485894.8608062
[INFO] [1718485895.862144]: /listener_50431_1718483299227 I heard hello world 1718485895.8602753
[INFO] [1718485896.860666]: /listener_50431_1718483299227 I heard hello world 1718485896.8598706
[INFO] [1718485897.863121]: /listener_50431_1718483299227 I heard hello world 1718485897.8608944
[INFO] [1718485898.864452]: /listener_50431_1718483299227 I heard hello world 1718485898.8631876
[INFO] [1718485899.863720]: /listener_50431_1718483299227 I heard hello world 1718485899.862056
[INFO] [1718485900.861094]: /listener_50431_1718483299227 I heard hello world 1718485900.8593907
[INFO] [1718485901.861009]: /listener_50431_1718483299227 I heard hello world 1718485901.8599734
[INFO] [1718485902.863307]: /listener_50431_1718483299227 I heard hello world 1718485902.8609161
[INFO] [1718485903.863965]: /listener_50431_1718483299227 I heard hello world 1718485903.8605697
[INFO] [1718485904.862085]: /listener_50431_1718483299227 I heard hello world 1718485904.860298
[INFO] [1718485905.862033]: /listener_50431_1718483299227 I heard hello world 1718485905.8603272
[INFO] [1718485906.862096]: /listener_50431_1718483299227 I heard hello world 1718485906.8603907
[INFO] [1718485907.862567]: /listener_50431_1718483299227 I heard hello world 1718485907.8600895
[INFO] [1718485908.862078]: /listener_50431_1718483299227 I heard hello world 1718485908.8600242
[INFO] [1718485909.861620]: /listener_50431_1718483299227 I heard hello world 1718485909.8601236
[INFO] [1718485910.861877]: /listener_50431_1718483299227 I heard hello world 1718485910.8603303
[INFO] [1718485911.862654]: /listener_50431_1718483299227 I heard hello world 1718485911.86066
[INFO] [1718485912.860976]: /listener_50431_1718483299227 I heard hello world 1718485912.8595955
[INFO] [1718485913.861945]: /listener_50431_1718483299227 I heard hello world 1718485913.8602161
[INFO] [1718485914.863479]: /listener_50431_1718483299227 I heard hello world 1718485914.8619633
[INFO] [1718485915.861973]: /listener_50431_1718483299227 I heard hello world 1718485915.8602762
[INFO] [1718485916.863799]: /listener_50431_1718483299227 I heard hello world 1718485916.8614962
[INFO] [1718485917.862174]: /listener_50431_1718483299227 I heard hello world 1718485917.8598726
[INFO] [1718485918.862759]: /listener_50431_1718483299227 I heard hello world 1718485918.8604774
[INFO] [1718485919.863388]: /listener_50431_1718483299227 I heard hello world 1718485919.8612285
[INFO] [1718485920.862558]: /listener_50431_1718483299227 I heard hello world 1718485920.8609502
[INFO] [1718485921.863112]: /listener_50431_1718483299227 I heard hello world 1718485921.8612394
```

Tetapi untuk service client dan server node terjadi error pada beberapa line

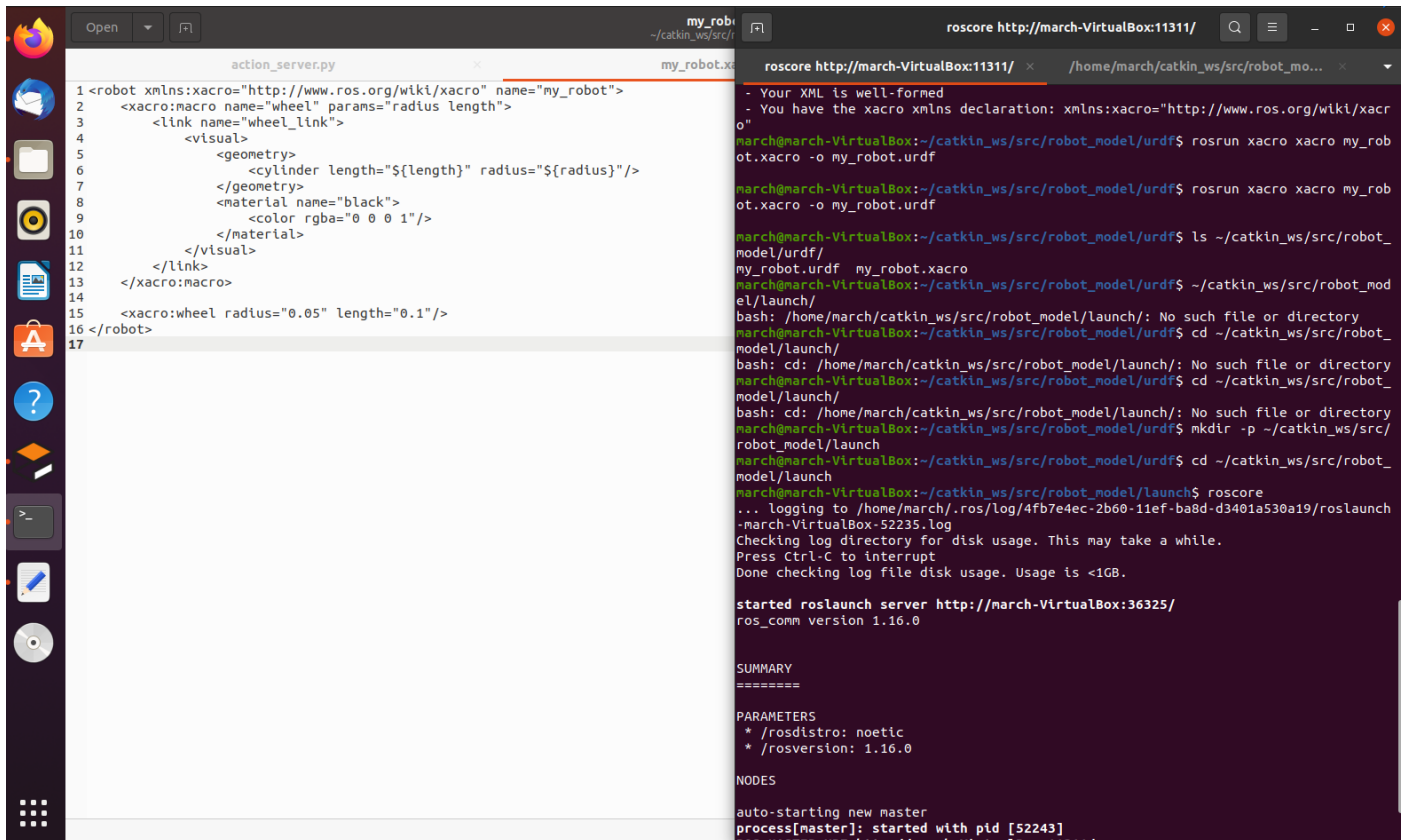
```
march@march-VirtualBox: ~/catkin_ws/src/my_package/src
roscore http://mar... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt... march@march-Virt...
march@march-VirtualBox:~/catkin_ws/src/my_package/src$ rosrn my_package action_server.py
Traceback (most recent call last):
  File "/home/march/catkin_ws/src/my_package/src/action_server.py", line 40, in <module>
    server = FibonacciAction(rospy.get_name())
  File "/home/march/catkin_ws/src/my_package/src/action_server.py", line 12, in __init__
    self.as = actionlib.SimpleActionServer(self._action_name, FibonacciAction, execute_cb=self.execute_cb, auto_start = False)
  File "/opt/ros/noetic/lib/python3/dist-packages/actionlib/simple_action_server.py", line 93, in __init__
    self.action_server = ActionServer(name, ActionSpec, self.internal_goal_callback, self.internal_preempt_callback, auto_start)
  File "/opt/ros/noetic/lib/python3/dist-packages/actionlib/action_server.py", line 68, in __init__
    a = ActionSpec(Q)
TypeError: __init__() missing 1 required positional argument: 'name'
shutdown request: [/fibonacci] Reason: new node registered with same name
march@march-VirtualBox:~/catkin_ws/src/my_package/src$
```

Setelah saya perbaiki dan run lagi tidak ada yang terjadi dan command tidak berjalan



### Bab 3: Working with ROS for 3D Modeling

Di bab ini, pembaca dikenalkan dengan konsep dasar pemodelan 3D dalam ROS. Bab ini memberikan pengenalan tentang Unified Robot Description Format (URDF) dan XML Macros (Xacro), yang digunakan untuk pemodelan robot. Langkah-langkah praktis diberikan untuk membuat, mengedit, dan memvisualisasikan model 3D dari robot, membantu pembaca memahami cara membuat representasi digital yang akurat dari robot mereka.



The screenshot displays a virtual machine environment with a Linux desktop. On the left, a file manager window shows the contents of a file named `action_server.py`. The code defines a robot model using Xacro macros, including a cylinder for the body and a link for the wheel. The right side of the image shows a terminal window with the following commands and output:

```
roscore http://march-VirtualBox:11311/
- Your XML is well-formed
- You have the xacro xmlns declaration: xmlns:xacro="http://www.ros.org/wiki/xacro"
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ rosrunc xacro xacro my_robot.xacro -o my_robot.urdf
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ rosrunc xacro xacro my_robot.xacro -o my_robot.urdf
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ ls ~/catkin_ws/src/robot_model/urdf/
my_robot.urdf  my_robot.xacro
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ cd ~/catkin_ws/src/robot_model/launch/
bash: cd: /home/march/catkin_ws/src/robot_model/launch/: No such file or directory
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ cd ~/catkin_ws/src/robot_model/launch/
bash: cd: /home/march/catkin_ws/src/robot_model/launch/: No such file or directory
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ mkdir -p ~/catkin_ws/src/robot_model/launch
march@march-VirtualBox:~/catkin_ws/src/robot_model/urdf$ cd ~/catkin_ws/src/robot_model/launch
march@march-VirtualBox:~/catkin_ws/src/robot_model/launch$ roscore
... logging to /home/march/.ros/log/4fb7e4ec-2b60-11ef-ba8d-d3401a530a19/roslaunch
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://march-VirtualBox:36325/
ros_comm version 1.16.0

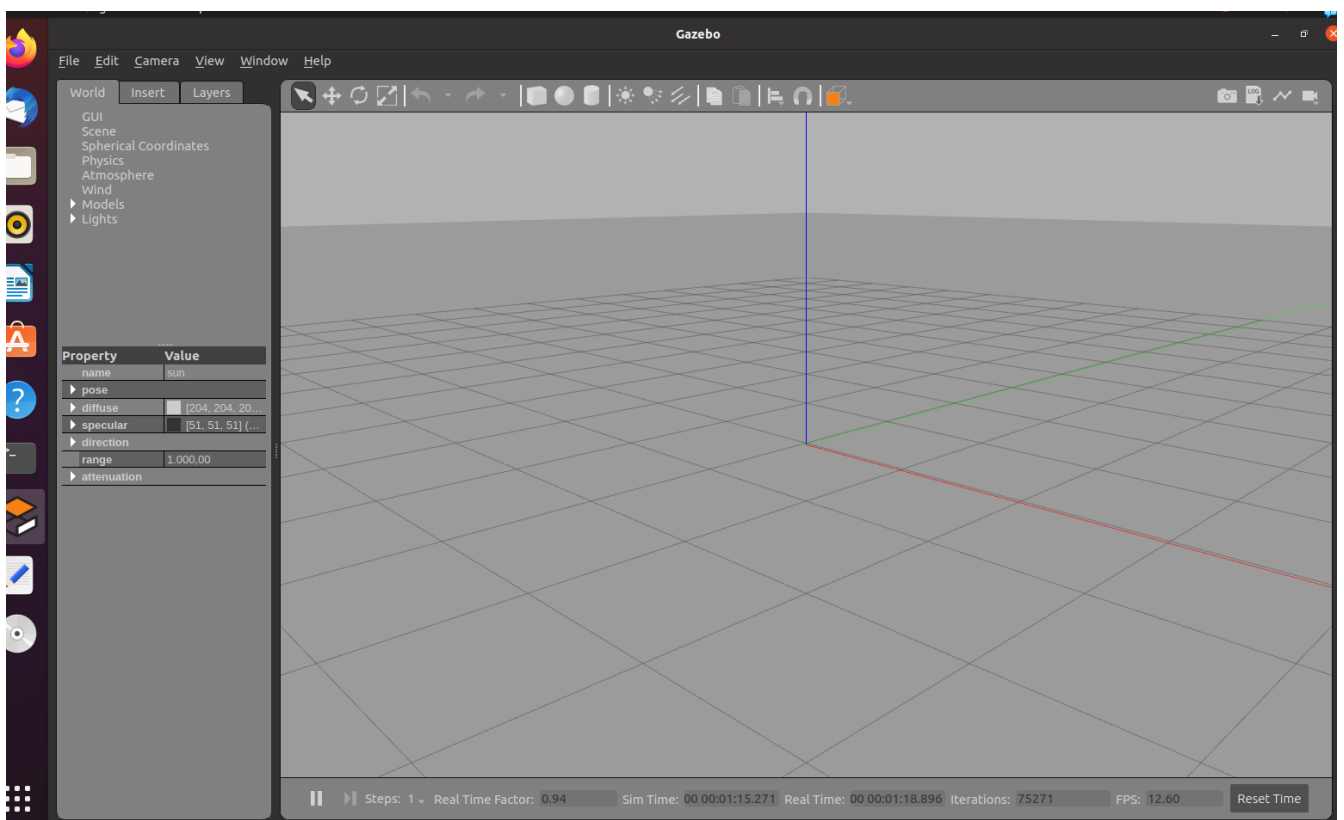
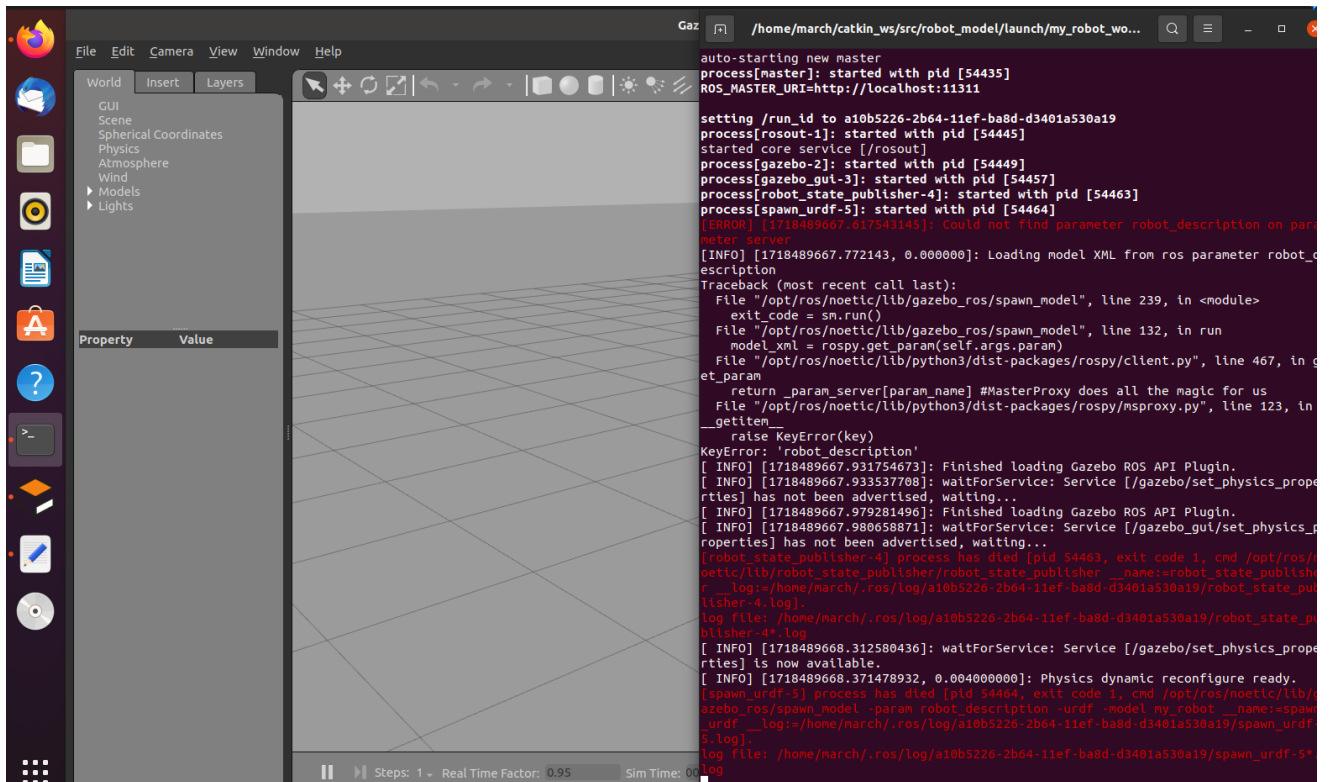
SUMMARY
=====
PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.16.0

NODES
auto-starting new master
process[master]: started with pid [52243]
```

## Bab 4: Simulating Robots Using ROS and Gazebo

Bab ini fokus pada penggunaan Gazebo sebagai simulator untuk ROS. Pembaca mendapatkan gambaran umum tentang Gazebo dan cara mengintegrasikannya dengan ROS. Langkah-langkah rinci diberikan untuk membangun dan menjalankan simulasi robot di Gazebo. Selain itu, bab ini mengajarkan teknik-teknik untuk berinteraksi dan mengontrol robot yang disimulasikan menggunakan node dan alat ROS, memungkinkan pembaca untuk mensimulasikan perilaku robot dalam lingkungan yang terkendali.

Saat saya mengrun gazebo terdapat error yangdimana saya tidak dapat menjalankan gazebo tersebut dan hanya menampilkan visual seperti gambar dibawah

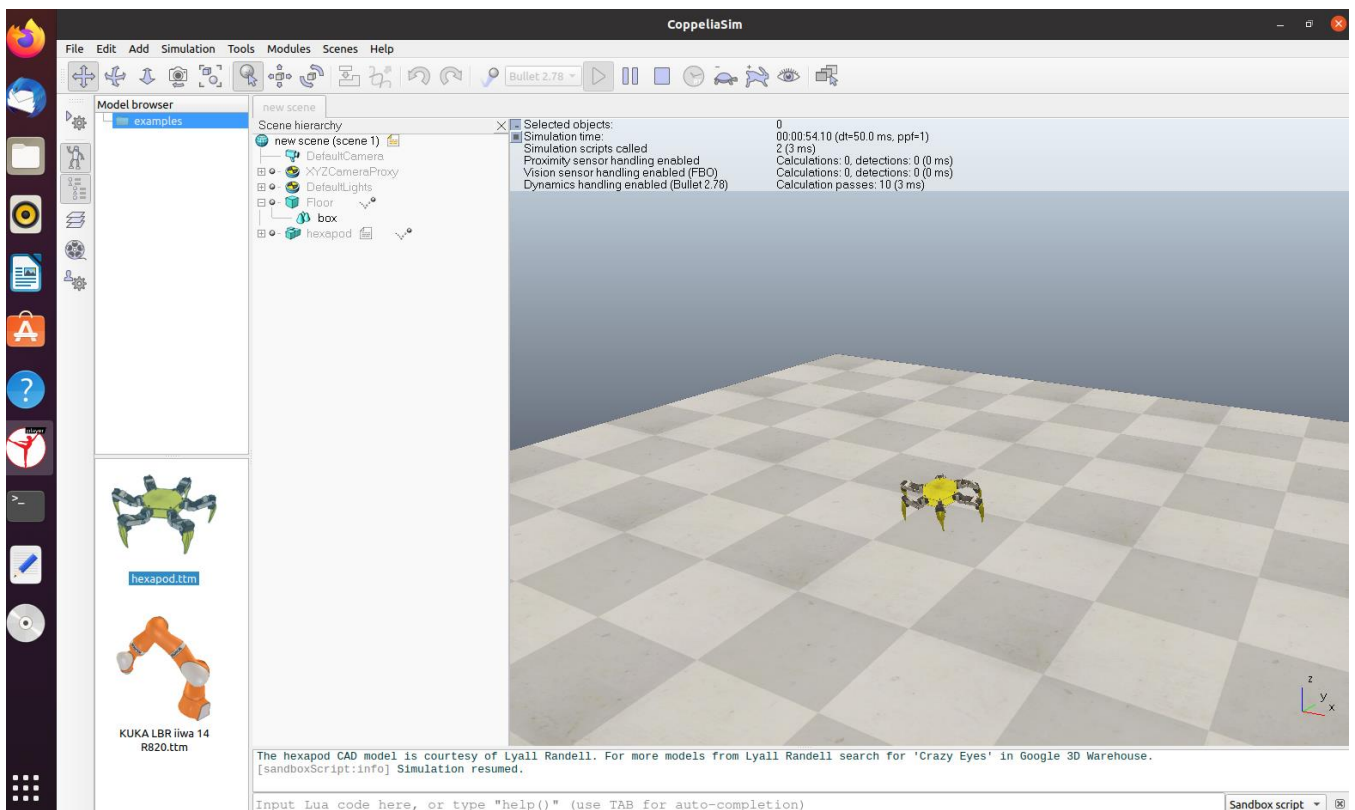
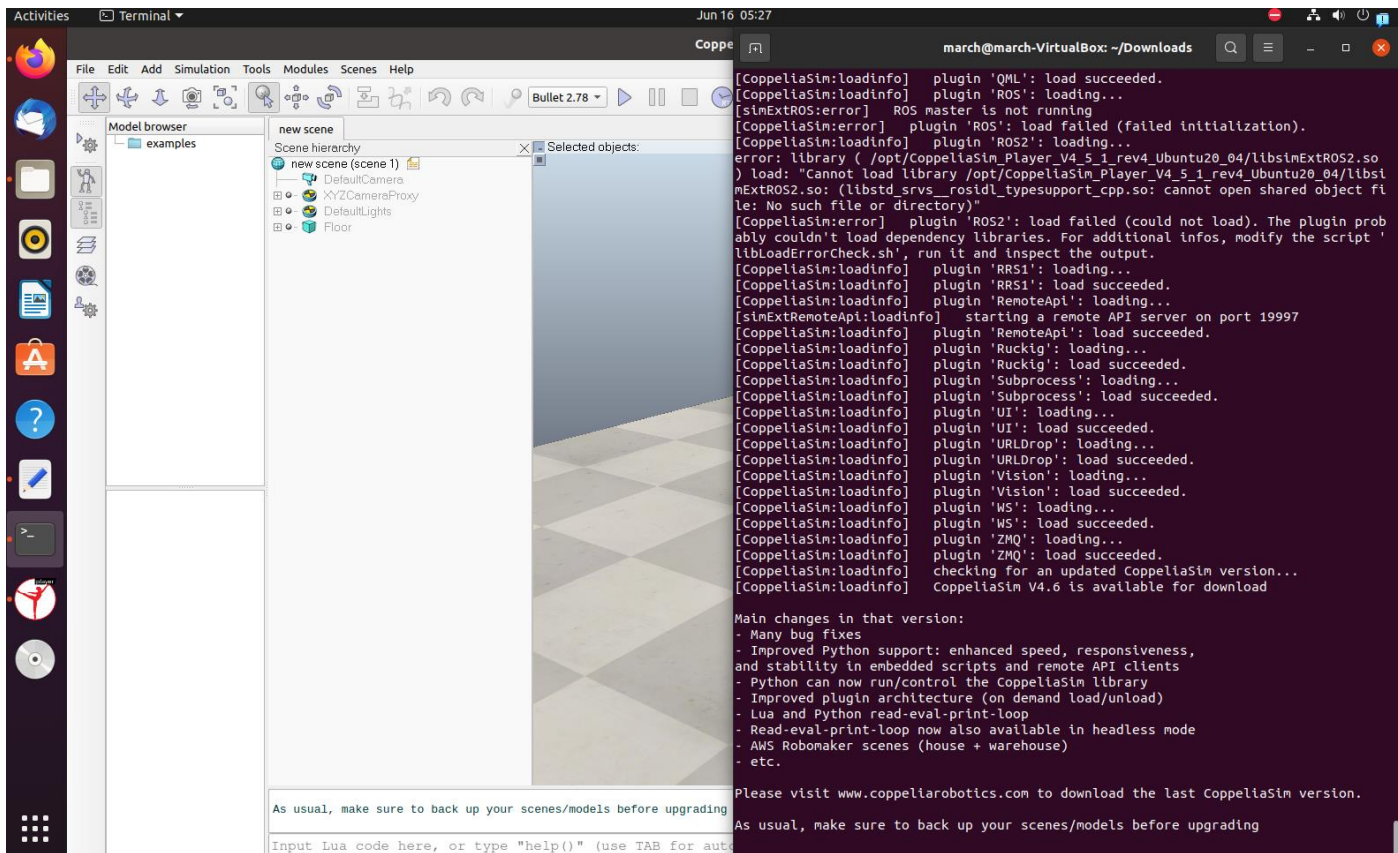


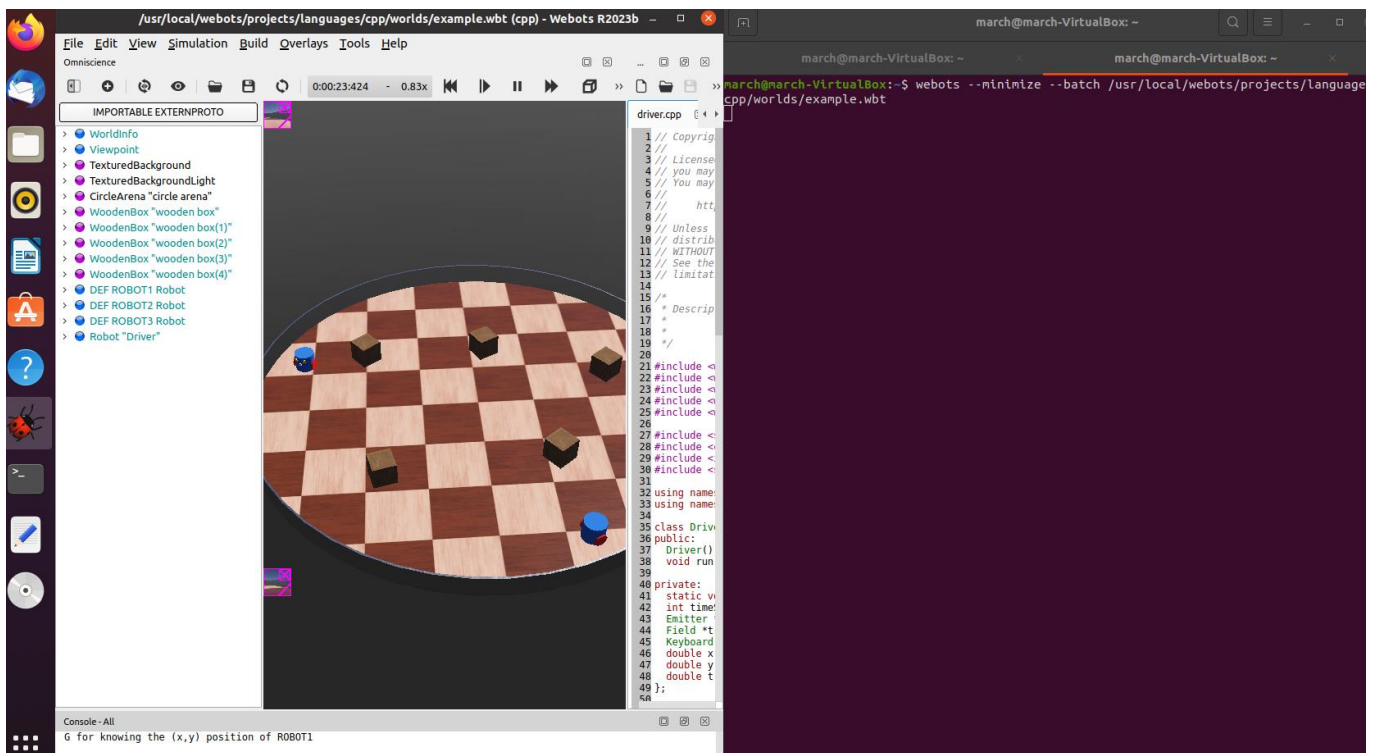
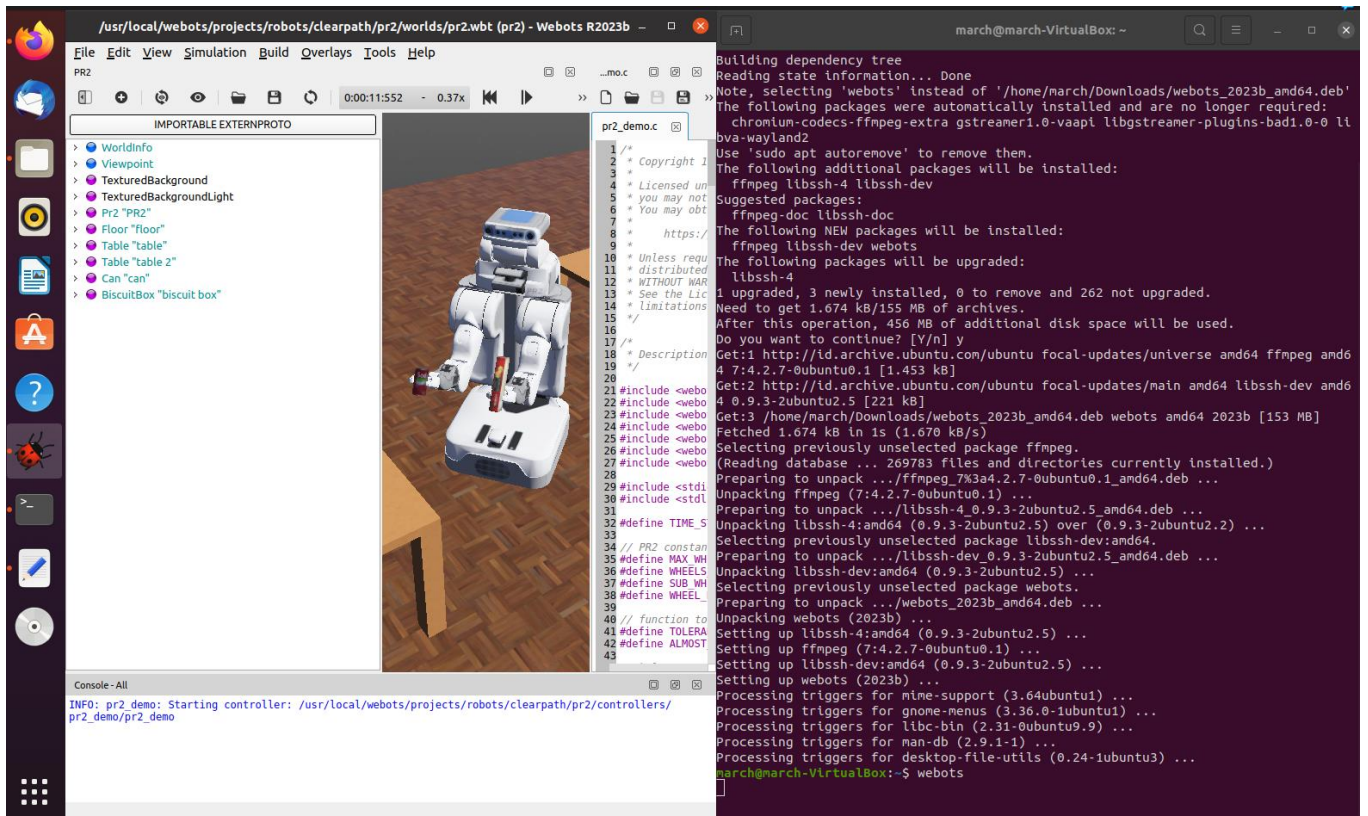
## Bab 5: Simulating Robots Using ROS, CoppeliaSim, and Webots

Bab ini membandingkan dan mengkontraskan simulator CoppeliaSim dan Webots dengan Gazebo. Pembaca diperkenalkan dengan kedua simulator ini dan perbedaan utama mereka dari Gazebo dijelaskan. Langkah-langkah rinci disediakan untuk menyiapkan simulasi robot di CoppeliaSim dan Webots. Bab ini juga menjelaskan cara menghubungkan dan mengontrol simulasi menggunakan ROS, memberi pembaca berbagai pilihan alat untuk mensimulasikan robot.



Pengampilikan di coppeliasim dan webots berjalan lancar saya bisa membukan,mengedit command,dll lewat terminal

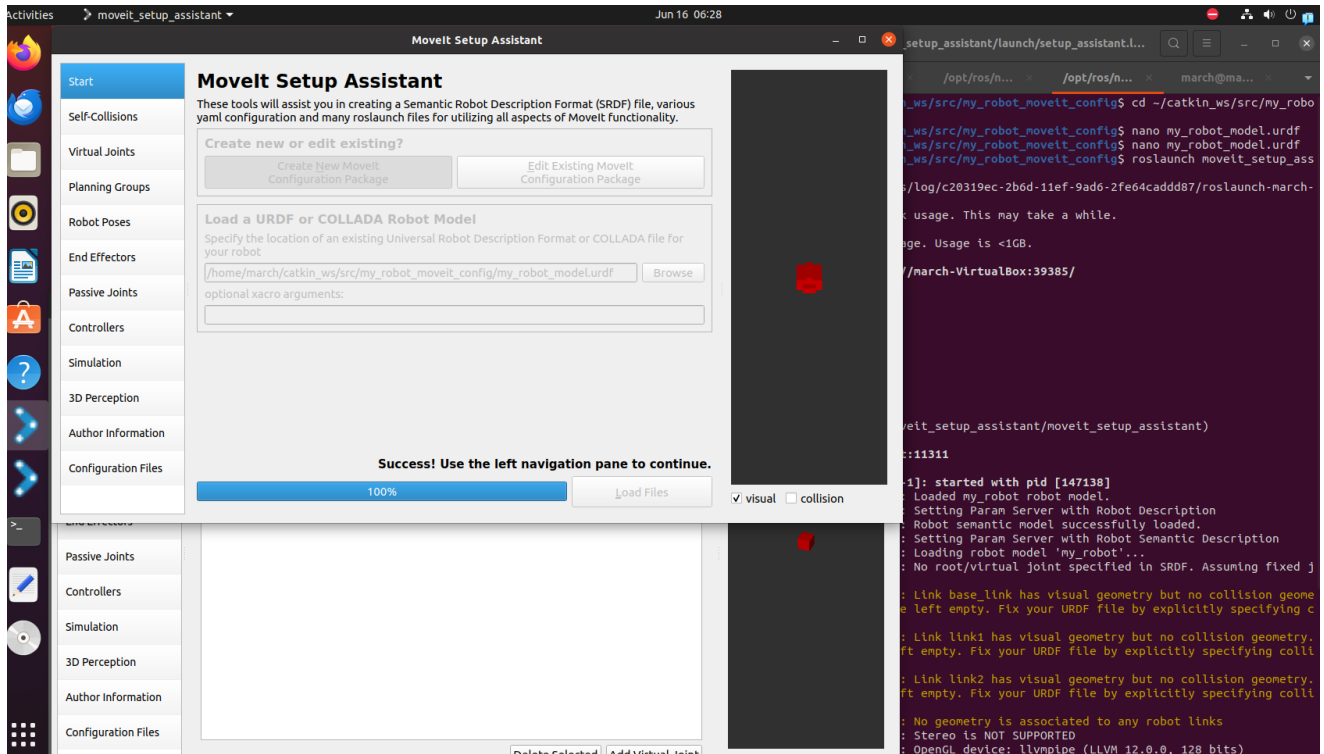




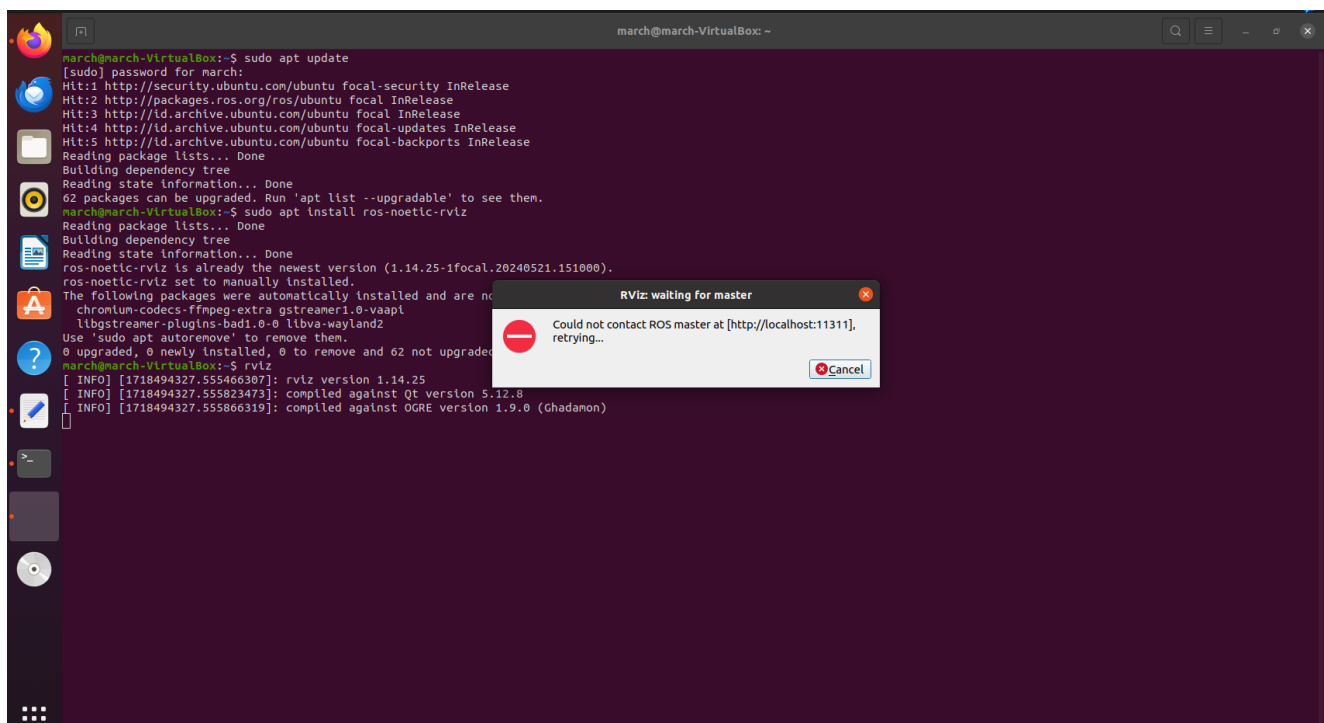
## Bab 6: Using the ROS MoveIt! and Navigation Stack

Bab terakhir yang dirangkum ini membahas MoveIt! dan tumpukan navigasi ROS. MoveIt! diperkenalkan sebagai kerangka kerja untuk perencanaan gerakan robot. Pembaca belajar tentang komponen utama dari tumpukan navigasi ROS dan bagaimana mereka bekerja bersama untuk mencapai navigasi otonom. Langkah-langkah praktis diberikan untuk mengonfigurasi dan menggunakan MoveIt! untuk manipulasi robot. Bab ini juga memberikan panduan untuk menyiapkan dan memanfaatkan tumpukan navigasi untuk membantu robot bergerak secara otonom dalam berbagai lingkungan.

Saya mencoba membuat setup sederhana



Saya mencoba membuka RVIZ tapi terjadi error



Untuk navigation stacknya terjadi error



Activities Terminal Jun 16 06:12

march@march-VirtualBox: ~/catkin\_ws/src/my\_robot\_navigation/launch

```

/opt/ros/noetic/share/moveit_setup_assist... march@march-VirtualBox: ~/catkin_ws/src/...

march@march-VirtualBox:~$ cd ~/catkin_ws/src/my_robot_navigation
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ mkdir -p launch
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ mv ~/catkin_ws/src/my_robot_n
avigation/navigation.launch ~/catkin_ws/src/my_robot_navigation/launch/
mv: cannot stat '/home/march/catkin_ws/src/my_robot_navigation/navigation.launch': No suc
h file or directory
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ roslaunch my_robot_navigation
navigation.launch
RException: [navigation.launch] is neither a launch file in package [my_robot_navigation
] nor is [my_robot_navigation] a launch file name
The traceback for the exception was written to the log file
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ cd ~/catkin_ws/src/my_robot_n
avigation
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ ls launch
navigation.launch
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ source ~/catkin_ws/devel/setu
p.bash
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ roslaunch my_robot_navigation
navigation.launch
RException: [navigation.launch] is neither a launch file in package [my_robot_navigation
] nor is [my_robot_navigation] a launch file name
The traceback for the exception was written to the log file
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ source ~/catkin_ws/devel/setu
p.bash
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ roslaunch my_robot_navigation
navigation.launch
RException: [navigation.launch] is neither a launch file in package [my_robot_navigation
] nor is [my_robot_navigation] a launch file name
The traceback for the exception was written to the log file
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ roslaunch my_robot_navigation
navigation.launch
RException: [navigation.launch] is neither a launch file in package [my_robot_navigation
] nor is [my_robot_navigation] a launch file name
The traceback for the exception was written to the log file
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation$ cd ~/catkin_ws/src/my_robot_n
avigation/launch
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation/launch$ ls
navigation.launch
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation/launch$ nano navigation.launch
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation/launch$ source ~/catkin_ws/dev
el/setup.bash
march@march-VirtualBox:~/catkin_ws/src/my_robot_navigation/launch$ roslaunch my_robot_nav
igation navigation.launch
RException: [navigation.launch] is neither a launch file in package [my_robot_navigation
] nor is [my_robot_navigation] a launch file name

```