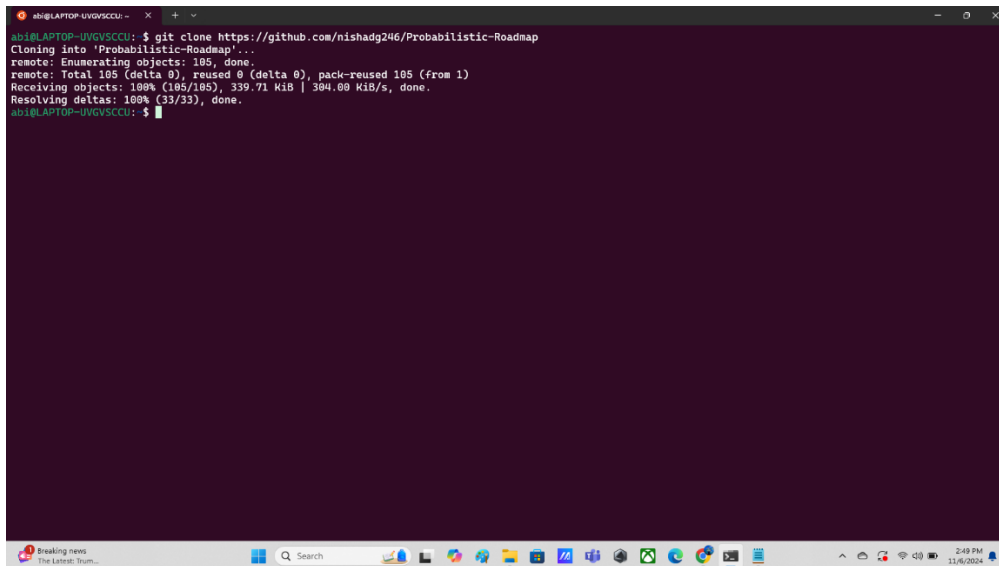


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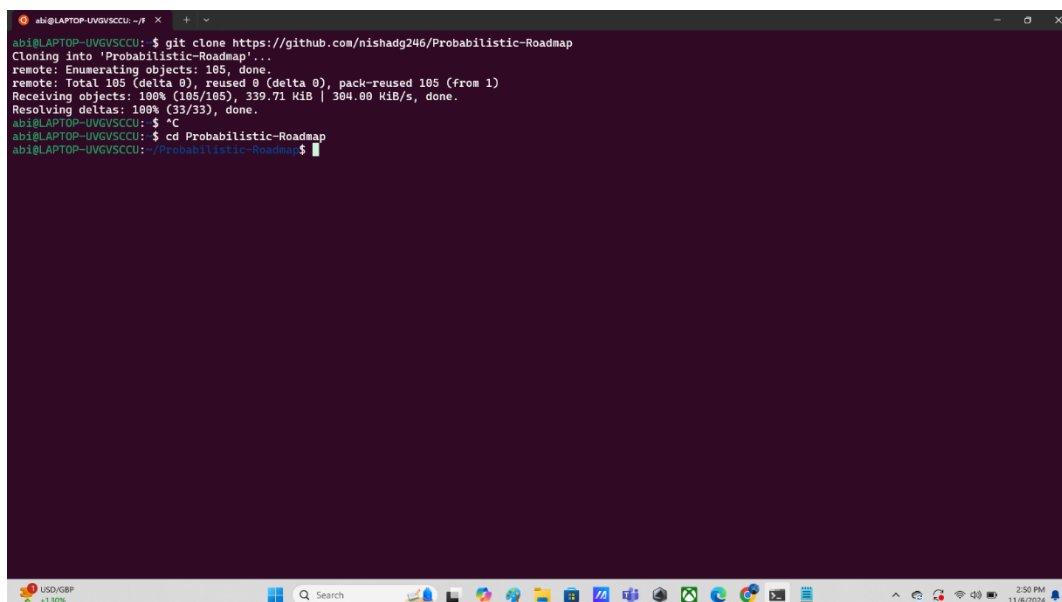
Implementasi dan Simulasi Probabilistic Roadmap (PRM) dengan Rviz

1. Jalankan syntax **git clone** <https://github.com/nishadg246/Probabilistic-Roadmap> untuk mengunduh repositori PRM dari GitHub.



```
abi@LAPTOP-UVGVSCCU: ~$ git clone https://github.com/nishadg246/Probabilistic-Roadmap
Cloning into 'Probabilistic-Roadmap'...
remote: Enumerating objects: 105, done.
remote: Total 105 (delta 0), reused 0 (delta 0), pack-reused 105 (from 1)
Receiving objects: 100% (105/105), 339.71 KiB | 384.00 KiB/s, done.
Resolving deltas: 100% (33/33), done.
abi@LAPTOP-UVGVSCCU: ~$
```

2. Jalankan syntax **cd Probabilistic-Roadmap** untuk memasuki direktori repositori yang telah di clone.



```
abi@LAPTOP-UVGVSCCU: ~$ git clone https://github.com/nishadg246/Probabilistic-Roadmap
Cloning into 'Probabilistic-Roadmap'...
remote: Enumerating objects: 105, done.
remote: Total 105 (delta 0), reused 0 (delta 0), pack-reused 105 (from 1)
Receiving objects: 100% (105/105), 339.71 KiB | 384.00 KiB/s, done.
Resolving deltas: 100% (33/33), done.
abi@LAPTOP-UVGVSCCU: ~$ *C
abi@LAPTOP-UVGVSCCU: ~$ cd Probabilistic-Roadmap
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$
```

3. Jalankan syntax **catkin_make** untuk membangun workspace dengan package PRM.

```
abi@LAPTOP-UVGVSCCU: ~/$ ^C
abi@LAPTOP-UVGVSCCU: ~/$ cd Probabilistic-Roadmap
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$ catkin_make
Base path: /home/abi/Probabilistic-Roadmap
Source space: /home/abi/Probabilistic-Roadmap/src
Build space: /home/abi/Probabilistic-Roadmap/build
Devel space: /home/abi/Probabilistic-Roadmap/devel
Install space: /home/abi/Probabilistic-Roadmap/install
Removing symlink "/home/abi/Probabilistic-Roadmap/src/CMakeLists.txt" which points to non-existing file
Creating symlink "/home/abi/Probabilistic-Roadmap/src/CMakeLists.txt" pointing to "/opt/ros/noetic/share/catkin/cmake/toplevel.cmake"
####
#### Running command: "cmake /home/abi/Probabilistic-Roadmap/src -DCATKIN_DEVEL_PREFIX=/home/abi/Probabilistic-Roadmap/devel -DCMAKE_INSTALL_PREFIX=/home/abi/Probabilistic-Roadmap/install -G Unix Makefiles" in "/home/abi/Probabilistic-Roadmap/build"
####
-- The C compiler identification is GNU 9.4.0
-- The CXX compiler identification is GNU 9.4.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Using CATKIN_DEVEL_PREFIX: /home/abi/Probabilistic-Roadmap/devel
-- Using CMAKE_PREFIX_PATH: /home/abi/ws_moveit/devel;/opt/ros/noetic
-- This workspace overlays: /home/abi/ws_moveit/devel;/opt/ros/noetic
-- Found PythonInterp: /usr/bin/python3 (found suitable version "3.8.10", minimum required is "3")
-- Using PYTHON_EXECUTABLE: /usr/bin/python3
-- Using Debian Python package layout
-- Found PY_em: /usr/lib/python3/dist-packages/em.py
-- Using empy: /usr/lib/python3/dist-packages/em.py
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/abi/Probabilistic-Roadmap/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.
```

4. Jalankan syntax **source devel/setup.bash** untuk mengaktifkan workspace yang telah dibangun.

```
abi@LAPTOP-UVGVSCCU: ~/$ ^C
abi@LAPTOP-UVGVSCCU: ~/$ cd Probabilistic-Roadmap
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$ catkin_make
Base path: /home/abi/Probabilistic-Roadmap
Source space: /home/abi/Probabilistic-Roadmap/src
Build space: /home/abi/Probabilistic-Roadmap/build
Devel space: /home/abi/Probabilistic-Roadmap/devel
Install space: /home/abi/Probabilistic-Roadmap/install
Removing symlink "/home/abi/Probabilistic-Roadmap/src/CMakeLists.txt" which points to non-existing file
Creating symlink "/home/abi/Probabilistic-Roadmap/src/CMakeLists.txt" pointing to "/opt/ros/noetic/share/catkin/cmake/toplevel.cmake"
####
#### Running command: "cmake /home/abi/Probabilistic-Roadmap/src -DCATKIN_DEVEL_PREFIX=/home/abi/Probabilistic-Roadmap/devel -DCMAKE_INSTALL_PREFIX=/home/abi/Probabilistic-Roadmap/install -G Unix Makefiles" in "/home/abi/Probabilistic-Roadmap/build"
####
-- The C compiler identification is GNU 9.4.0
-- The CXX compiler identification is GNU 9.4.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Using CATKIN_DEVEL_PREFIX: /home/abi/Probabilistic-Roadmap/devel
-- Using CMAKE_PREFIX_PATH: /home/abi/ws_moveit/devel;/opt/ros/noetic
-- This workspace overlays: /home/abi/ws_moveit/devel;/opt/ros/noetic
-- Found PythonInterp: /usr/bin/python3 (found suitable version "3.8.10", minimum required is "3")
-- Using PYTHON_EXECUTABLE: /usr/bin/python3
-- Using Debian Python package layout
-- Found PY_em: /usr/lib/python3/dist-packages/em.py
-- Using empy: /usr/lib/python3/dist-packages/em.py
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/abi/Probabilistic-Roadmap/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.

-- Found gtest sources under '/usr/src/gtest': gtests will be built
-- Found gmock sources under '/usr/src/gmock': gmock will be built
-- Found PythonInterp: /usr/bin/python3 (found version "3.8.10")
-- Found Threads: TRUE
-- Using Python nosetests: /usr/bin/nosetests3
-- catkin 0.8.10
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on

-- traversing 1 packages in topological order:
--   - rrt-planning
-- processing catkin package: 'rrt-planning'
--> add_subdirectory(rrt-planning)
-- Configuring done
CMake Warning (dev) at rrt-planning/CMakeLists.txt:204 (add_dependencies):
  Policy CMP0046 is not set: Error on non-existent dependency in
  add_dependencies. Run "cmake --help-policy CMP0046" for policy details.
  Use the cmake_policy command to set the policy and suppress this warning.

  The dependency target "ros_rrt_generate_messages_cpp" of target "prm" does
  not exist.
This warning is for project developers. Use -Wno-dev to suppress it.

-- Generating done
-- Build files have been written to: /home/abi/Probabilistic-Roadmap/build
####
#### Running command: "make -j12 -l12" in "/home/abi/Probabilistic-Roadmap/build"
####
Scanning dependencies of target prm
[ 50%] Building CXX object rrt-planning/CMakeFiles/prm.dir/src/prm.cpp.o
In file included from /home/abi/Probabilistic-Roadmap/src/rrt-planning/src/prm.cpp:8:
/home/abi/Probabilistic-Roadmap/src/rrt-planning/src/prmImpl.h: In member function 'Node PRM::getById(int)':
/home/abi/Probabilistic-Roadmap/src/rrt-planning/src/prmImpl.h:232:5: warning: control reaches end of non-void function [-Wreturn-type]
    232 |     }
        |     ^
[100%] Linking CXX executable /home/abi/Probabilistic-Roadmap/devel/lib/rrt-planning/prm
[100%] Built target prm
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$ source devel/setup.bash
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$
```

5. Jalankan syntax **roscore** di terminal lain untuk memulai master ROS.

```
abi@LAPTOP-UVGVSCCU: ~/P X roscore http://LAPTOP-UVGVSCCU:35491/ X + -
abi@LAPTOP-UVGVSCCU: $ roscore
... logging to /home/abi/.ros/log/fa947b40-9c13-11ef-ae9-d78db18dae75/roslaunch-LAPTOP-UVGVSCCU-4658.log
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://LAPTOP-UVGVSCCU:35491/
ros_comm version 1.17.0

SUMMARY
=====

PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.17.0

NODES

auto-starting new master
process[master]: started with pid [4666]
ROS_MASTER_URI=http://LAPTOP-UVGVSCCU:11311/

setting /run_id to fa947b40-9c13-11ef-ae9-d78db18dae75
process[rosout-1]: started with pid [4676]
started core service [/rosout]
```

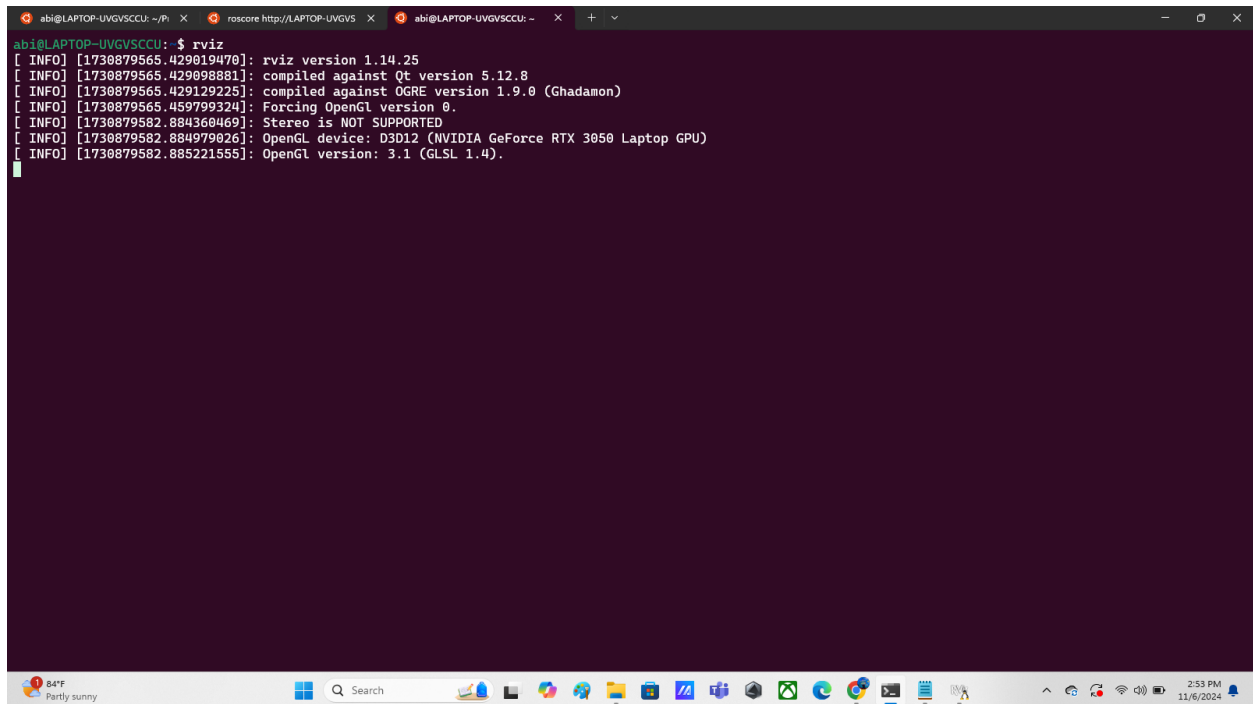
6. Jalankan syntax **roslaunch rrt-planning prm** di terminal sebelumnya untuk menjalankan algoritma PRM.

```
abi@LAPTOP-UVGVSCCU: ~/P X roscore http://LAPTOP-UVGVSCCU:35491/ X + -
-- Using Python nosetests: /usr/bin/nosetests3
-- catkin 0.8.10
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- traversing 1 packages in topological order:
--   - rrt-planning
-- processing catkin package: 'rrt-planning'
--> add_subdirectory(rrt-planning)
-- Configuring done
CMake Warning (dev) at rrt-planning/CMakeLists.txt:204 (add_dependencies):
  Policy CMP0046 is not set: Error on non-existent dependency in
  add_dependencies. Run "cmake --help-policy CMP0046" for policy details.
  Use the cmake_policy command to set the policy and suppress this warning.

  The dependency target "ros_rrt_generate_messages_cpp" of target "prm" does
  not exist.
  This warning is for project developers. Use -Wno-dev to suppress it.

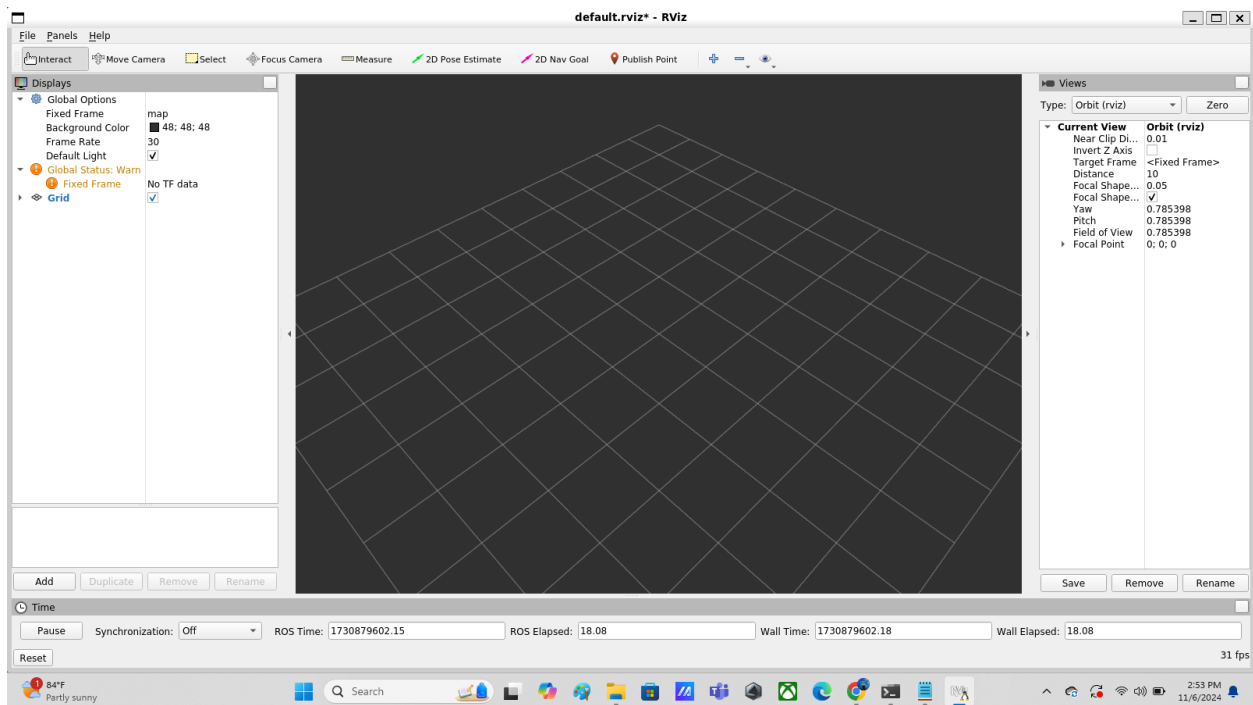
-- Generating done
-- Build files have been written to: /home/abi/Probabilistic-Roadmap/build
#### Running command: "make -j12 -l12" in "/home/abi/Probabilistic-Roadmap/build"
####
Scanning dependencies of target prm
[ 50%] Building CXX object rrt-planning/CMakeFiles/prm.dir/src/prm.cpp.o
In file included from /home/abi/Probabilistic-Roadmap/src/rrt-planning/src/prm.cpp:8:
/home/abi/Probabilistic-Roadmap/src/rrt-planning/src/prmImpl.h: In member function 'Node PRM::getById(int)':
/home/abi/Probabilistic-Roadmap/src/rrt-planning/src/prmImpl.h:232:5: warning: control reaches end of non-void function [-Wreturn-type]
   232 |     }
       |     ^
[100%] Linking CXX executable /home/abi/Probabilistic-Roadmap/dev/lib/rrt-planning/prm
[100%] Built target prm
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$ source devel/setup.bash
abi@LAPTOP-UVGVSCCU: ~/Probabilistic-Roadmap$ roslaunch rrt-planning prm
[ INFO] [1730879532.098568122]: Size: 202
[ INFO] [1730879532.208714621]: Frame: 0
[ WARN] [1730879532.208866470]: Please run Rviz in another terminal.
```

7. Jalankan syntax **rviz** pada terminal baru lagi untuk membuka Rviz sebagai visualisasi.

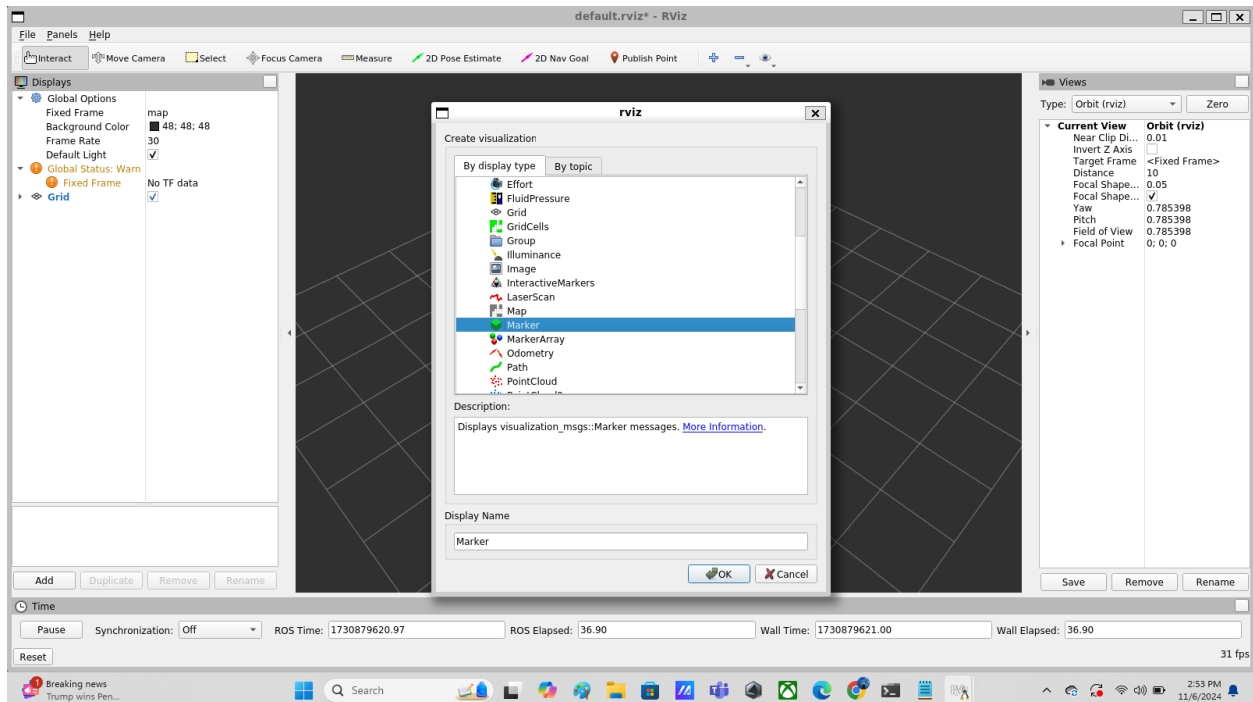


```
abi@LAPTOP-UVGVSCCU: ~/P x  roscore http://LAPTOP-UVGVSCCU: ~ x  abi@LAPTOP-UVGVSCCU: ~ x  + v
abi@LAPTOP-UVGVSCCU: $ rviz
[ INFO ] [1730879565.429019470]: rviz version 1.14.25
[ INFO ] [1730879565.429098881]: compiled against Qt version 5.12.8
[ INFO ] [1730879565.429129225]: compiled against OGRE version 1.9.0 (Ghadamon)
[ INFO ] [1730879565.459799324]: Forcing OpenGL version 0.
[ INFO ] [1730879582.884360469]: Stereo is NOT SUPPORTED
[ INFO ] [1730879582.884979026]: OpenGL device: D3D12 (NVIDIA GeForce RTX 3050 Laptop GPU)
[ INFO ] [1730879582.885221555]: OpenGL version: 3.1 (GLSL 1.4).
```

8. Akan memunculkan tampilan Rviz.



9. Tambahkan **Marker** untuk menampilkan node dan edges yang dibuat oleh PRM.



10. Akan muncul visualisasi PRM di Rviz, dimana akan menampilkan roadmap dan jalur yang ditemukan.

