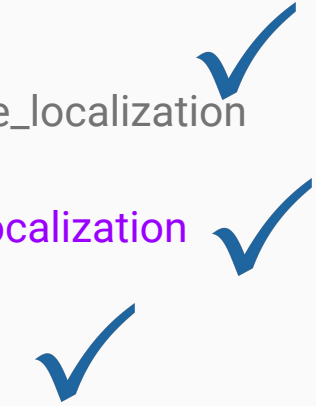
Localization SLAM + GPS

Localization

Rework botanbot_localization so that we have following;

- Absolute localization (utm -> base_link) GNSS + relative_localization = absolute_localization
- Relative localization (map -> base_link) local_localization+ **VSLAM** = relative_localization
- Local localization (odom->base_link) vslam+imu+encoder = local_localization



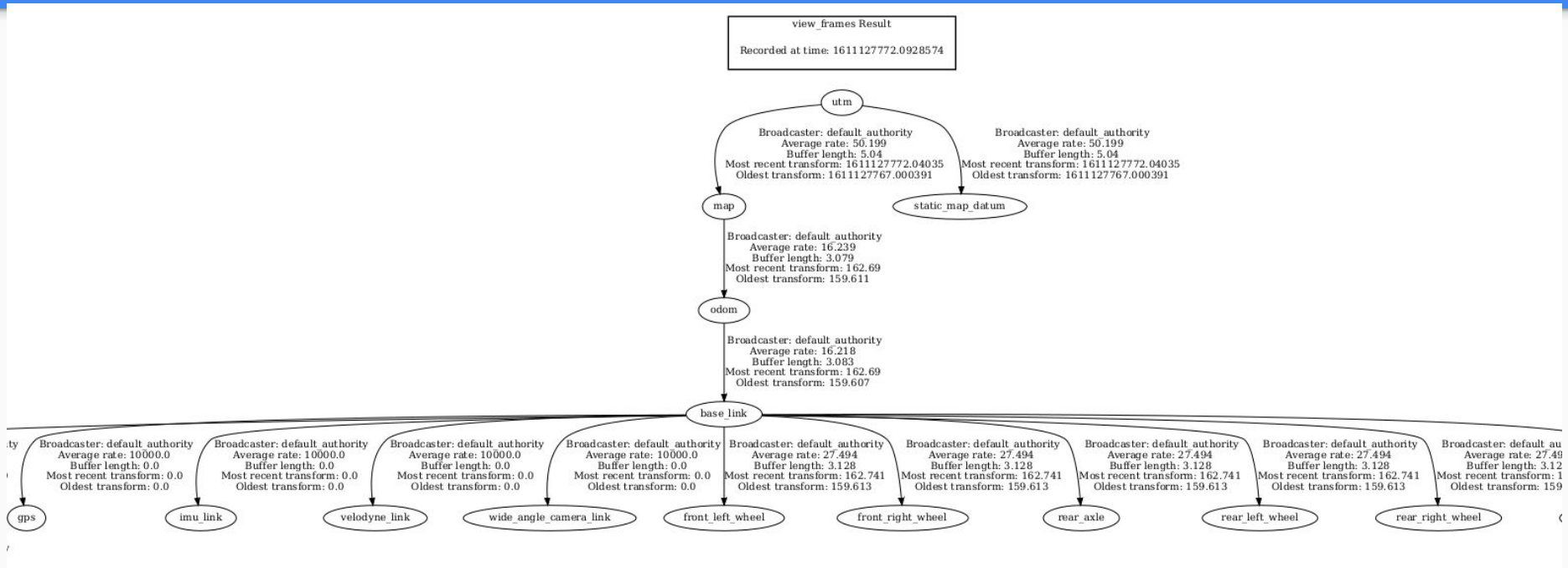
The map is Georeferenced

BotanbotMapManager

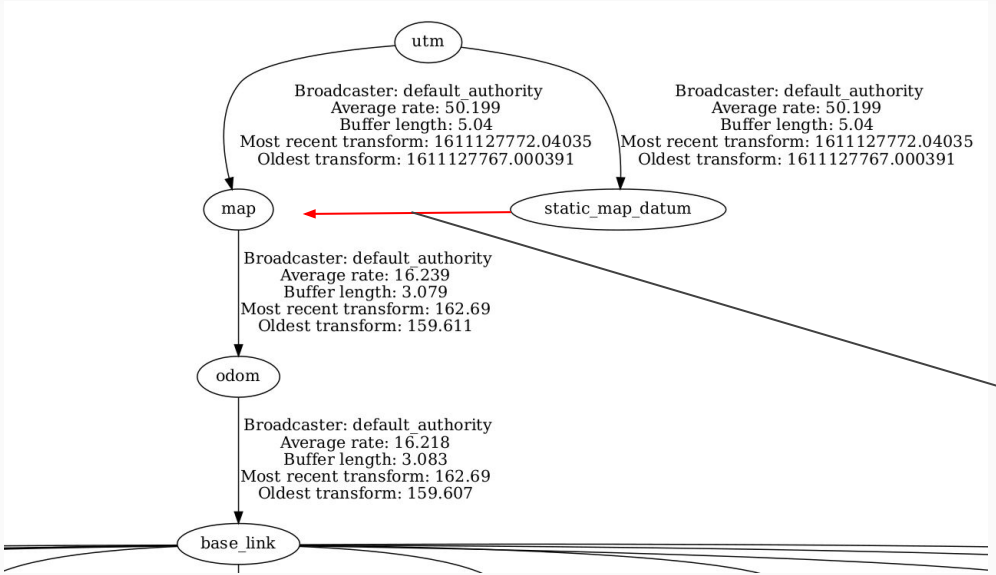
- UTM is global reference system
- Load map with given info
- Align map to robot's initial pose
- Publish utm -> map
- Publish utm -> static_map_datum

```
botanbot_map_manager_rclcpp_node:
  ros__parameters:
    octomap_filename: "/home/ros2-foxy/f.bt"
    octomap_publish_topic_name: "octomap"
    octomap_voxel_size: 0.2
    octomap_publish_frequency: 50
    provide_utm_to_map_transform: true
    publish_octomap_as_pointcloud: true
    octomap_point_cloud_publish_topic: "octomap_pointcloud"
    octomap_frame_id: "map"
    map_coordinates:
      latitude: 49.89998651126992
      longitude: 8.90004175541922
      altitude: 0.6342219080730283
      quaternion:
        x: -0.0002674302377596963
        y: -7.804134265664371e-05
        z: 0.7068408908205831
        w: 0.7073725167509558
```

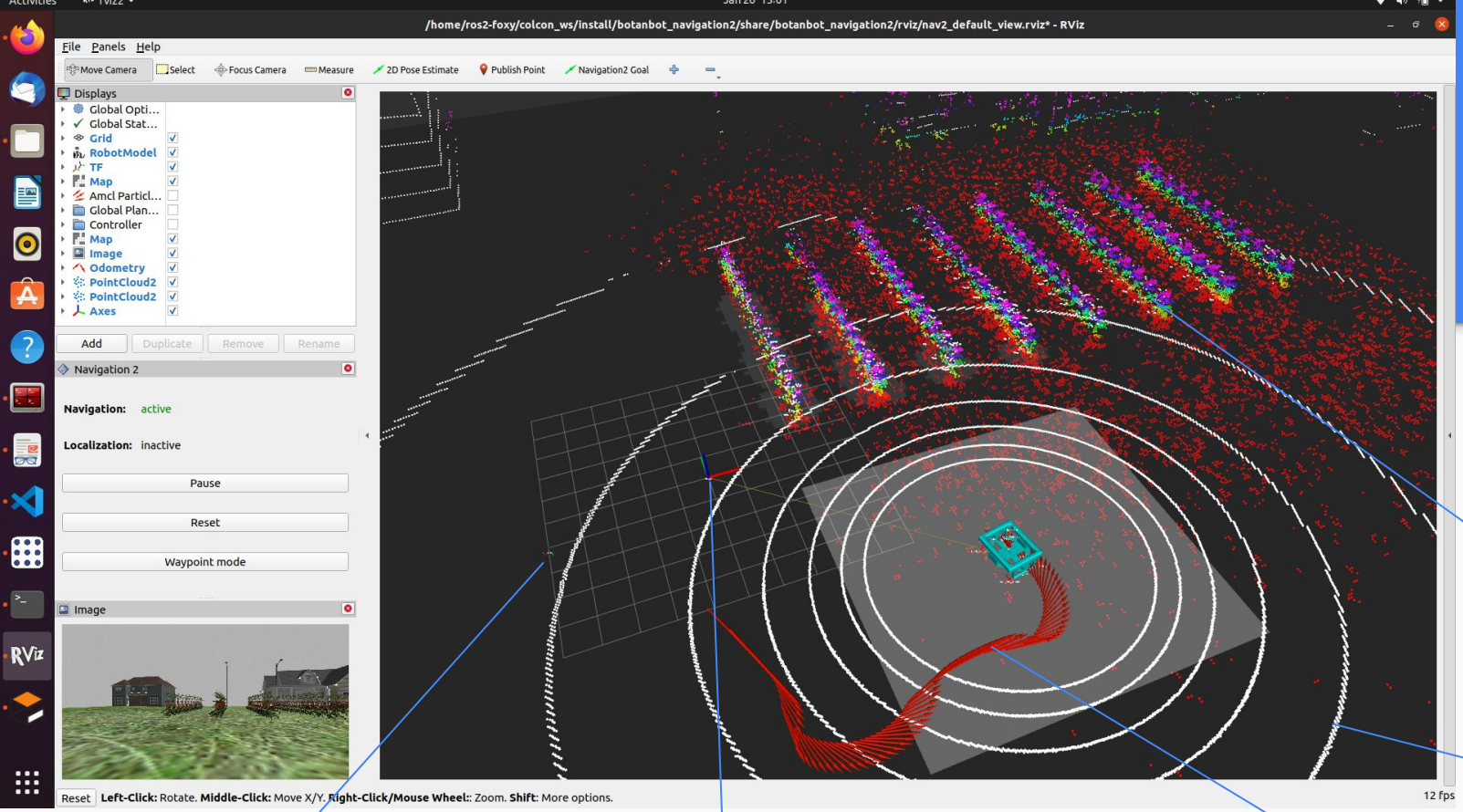
Current Frames



Current Frames



This transform aligns map with start pose of GPS.



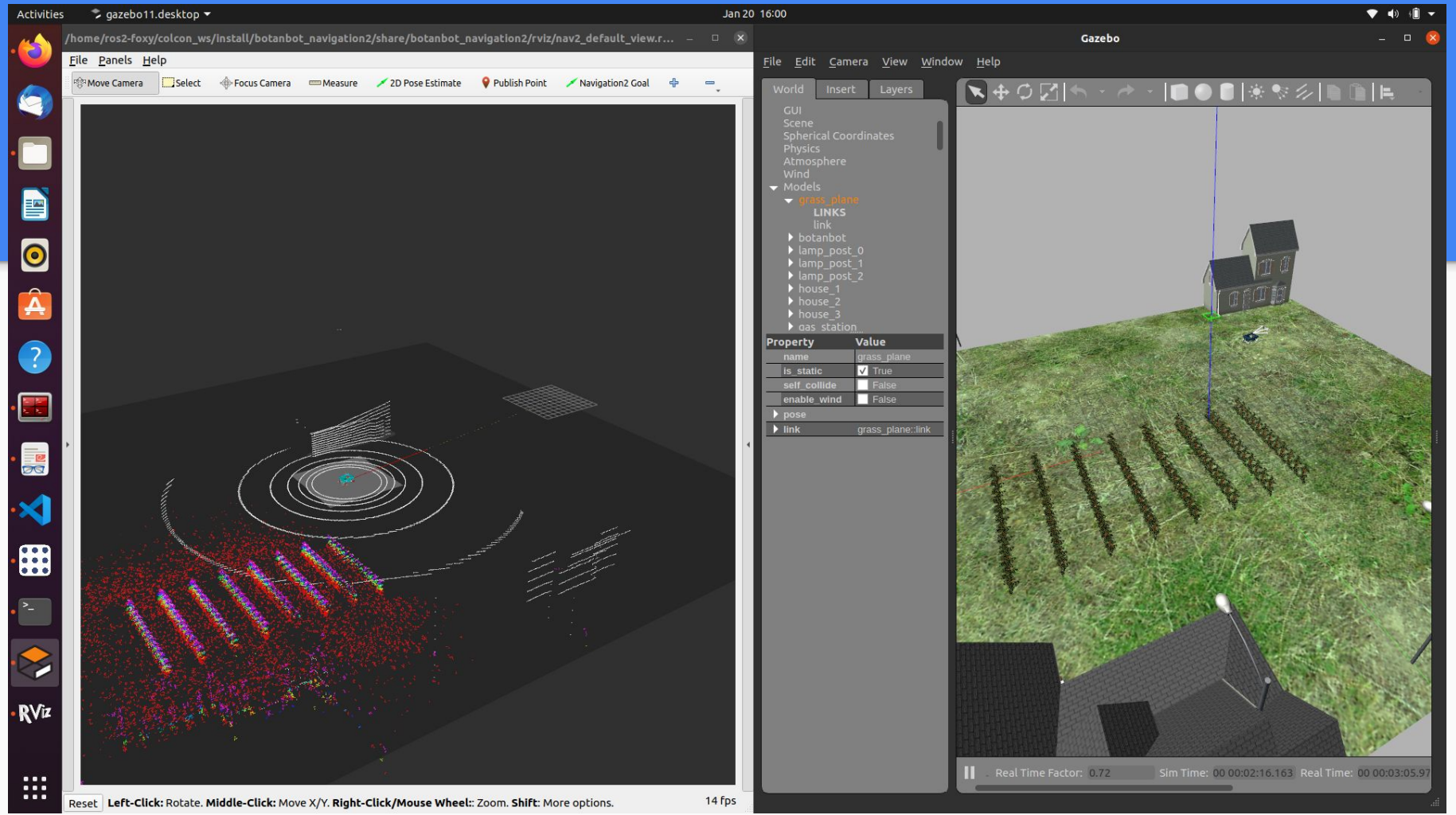
Static map

Live PointCloud

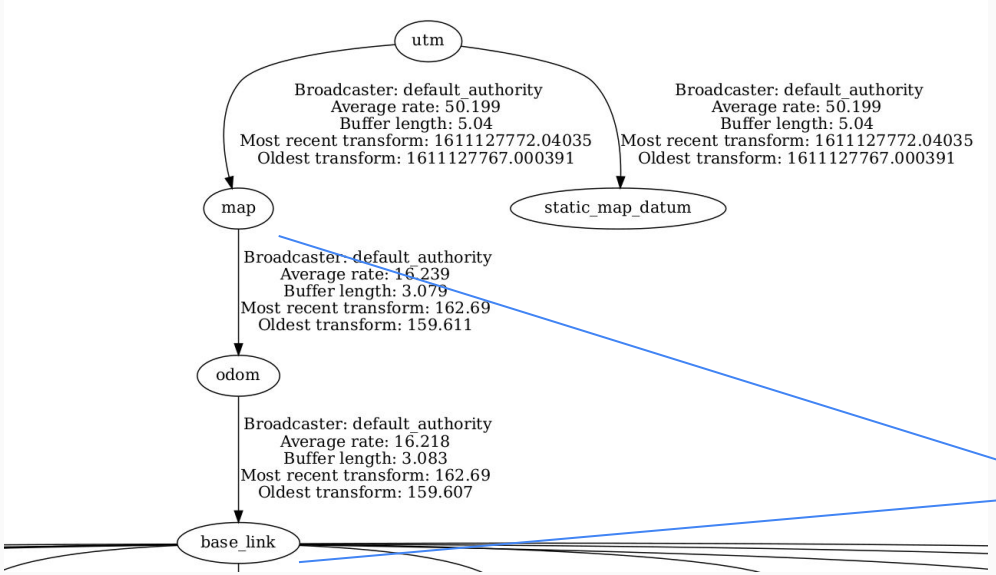
static_map_datum

map(robot's initial pose in UTM)

Global pose estimation of robot


Activities
gazebo11.desktop
Jan 20 16:00
/home/ros2-foxy/colcon_ws/install/botanbot_navigation2/share/botanbot_navigation2/rviz/nav2_default_view.r...
File Panels Help
Move Camera
Select
Focus Camera
Measure
2D Pose Estimate
Publish Point
Navigation2 Goal
Reset
Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click/Mouse Wheel:: Zoom. Shift: More options.
14 fps
Gazebo
File Edit Camera View Window Help
World
Insert
Layers
GUI
Scene
Spherical Coordinates
Physics
Atmosphere
Wind
Models
grass_plane
LINKS
link
botanbot
lamp_post_0
lamp_post_1
lamp_post_2
house_1
house_2
house_3
gas_station
Property
Value
name
grass_plane
is_static
True
self_collide
False
enable_wind
False
pose
link
grass_plane::link
Real Time Factor: 0.72
Sim Time: 00 00:02:16.163
Real Time: 00 00:03:05.97

Relative Localization



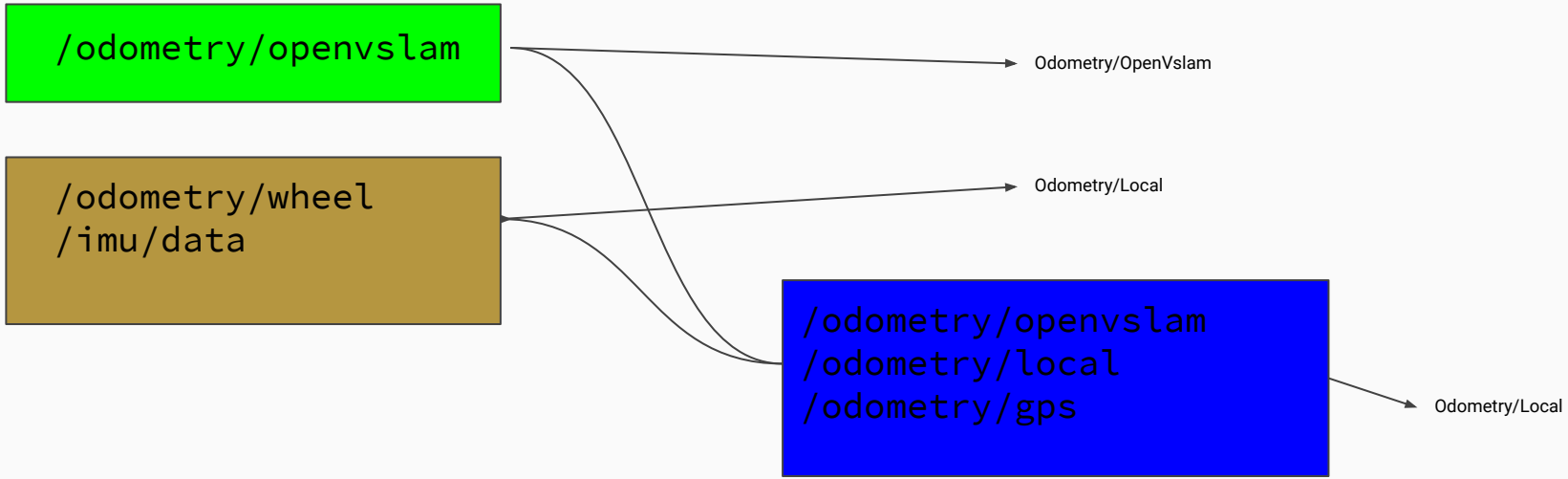
OpenVSLAM,
Run in pure localization
get map->base_link and fuse with existing GPS,IMU,WHEEL ODOM

A complete Localization is acquired

- Run OpenVslam in Pure localiztion mode.
- Fuse output of pure localization into EKF global node

```
/odometry/openvslam
/odometry/gps
/odometry/wheel
/imu/data
```

FINAL LOCALIZATION



Static map(rgb cloud)

Live PointCloud
(flat white cloud)

Robot Start Pose

Estimated poses
arrows(Actual
LOcalization)

Odometry/OpenVslam

Odometry/Local

Odometry/Global