How to Lanelet2 Map And Use in autoware

This document provides you the information to create a Lanelet2 map and pcd map which will be used in the AutowareAuto avp demo after modification done in below steps.

Pre-requisite for creating the Lanelet2 map for AutowareAuto-

* JOSM
* OpenStreetMap
* Unity

**Lanelet2 map for AutowareAuto can be created by the below following steps-**

1. Go to <https://openstreetmap.org> and find/search the target place which you want to create the lanelet2 map for AutowareAuto. Make sure the entire track is in view in your browser.
2. Go to the Export tab at the top and click the Export button, it will download the selected map in .osm format, for example taltech.osm .
3. Install [JOSM](https://josm.openstreetmap.de/). In ubuntu, you can install this with sudo apt install josm.
4. Open the OSM file that was downloaded with JOSM.
5. Remove all of the parts of the map that aren't the track (external roads, ground features, etc.). Below is the reference link for the same

<https://gitlab.com/autowarefoundation/autoware.auto/AutowareAuto/-/issues/676>

1. Once it is done. You have to create the parking in map like in the Autonomous Stuff map using the JOSM tool.
2. Definition and information of adding the parking slot in map are provided in the below link

<https://answers.ros.org/question/376880/cannot-plan-trajectory-by-lanelet2_global_planner-with-own-map/?answer=377358#post-id-377358>

Lanelet2 Primitives: -

<https://github.com/fzi-forschungszentrum-informatik/Lanelet2/blob/master/lanelet2_core/doc/LaneletPrimitives.md#lanelet>

As the AutowareAuto AVP demo works with only parking slot as goal position, user must need to add parking in the lanelet2 map.

1. To validate the lanelet2 map you can use the vector map builder tool of TierIV, below is the link-

<https://tools.tier4.jp/vector_map_builder_ll2/>

1. You can import the created lanelet2 map on vector map builder and check if it is giving any error also check manually that the points are at connected and at same level.
2. Also you need to create the pcd map from the scene of the taltech map. For that you can use the simulator project in unity and and open the scene in the project and export the pcd map and saved it to any location named taltech.pcd.

**How to use the lanelet2 map in AutowareAuto avp demo-**

To use the lanelet2 map in avp demo, user need to modify the avp demo, below are the steps to add the lanelet2 map and build-

* Goto the **avp\_demo** in adehome/avp\_demo.
* Put **taltech.osm** file in the adehome/avp\_demo/data path.
* Put generated **taltech.pcd** file in the adehome/avp\_demp/data path.
* Now open the adehome/avp\_demo/param/lanelet2\_map\_provider.param.yaml file and change map\_osm\_file parameter path to **taltech.osm** file.
* Now open the adehome/avp\_demo/param/map\_publisher.param.yaml file and change map\_pcd\_file parameter path to **taltech.pcd**.
* Open the adehome/avp\_demo/param/map\_publisher\_vehicle.param.yaml file and change map\_pcd\_file parameter path to **taltech.pcd**.
* Once all the changes made successfully, build the **avp\_demo** using **colcon build** command.
* Now run the **avp\_demo** and check if the generated lanelet2 map and pcd map are reflected on the rviz2.
* If you are not able to find the changes in rviz, please go through the below links for the references.

**Reference link-**

* <https://answers.ros.org/question/376240/how-to-build-correct-lanelet2-map-for-autowareauto/>
* <https://gitlab.com/autowarefoundation/autoware.auto/AutowareAuto/-/issues/676>
* <https://answers.ros.org/question/376880/cannot-plan-trajectory-by-lanelet2_global_planner-with-own-map/?answer=377358#post-id-377358>
* <https://tools.tier4.jp/vector_map_builder_ll2/>
* <https://autowarefoundation.gitlab.io/autoware.auto/AutowareAuto/avpdemo.html>