Background Information

The NovAtel OEM7 is a high-precision Global Navigation Satellite System (GNSS) receiver developed by NovAtel Inc., a leading provider of GNSS positioning and navigation technology.

The OEM7 is the latest generation of NovAtel's OEM family of GNSS receivers and is designed to provide high accuracy, reliability, and flexibility for a wide range of applications. It supports multiple GNSS constellations, including GPS, GLONASS, Galileo, BeiDou, and QZSS, and is capable of receiving signals on multiple frequency bands, including L1, L2, L5, E1, E5a, E5b, and B1.

The receiver features advanced signal processing algorithms, such as RTK and PPP, to provide centimeter-level positioning accuracy in real-time. It also includes a wide range of communication and interface options, including Ethernet, CAN bus, and serial ports, allowing for easy integration into a variety of systems.

The OEM7 is used in a wide range of industries, including surveying, mapping, precision agriculture, construction, mining, marine, and aerospace. It has been designed to meet the requirements of high-performance applications that demand precise and reliable positioning, navigation, and timing solutions.

For our purposes at WATonomous, the NovAtel OEM7 will be used to provide data for ego vehicle localization such as IMU and GPS coordinate data. With regard to our wato_monorepo_v2, we expect to integrate the OEM7 into our ROS2 infrastructure such that the IMU data is published to the ***/imu*** topic and the gps coordinates are published to the ***/gps*** topic.

Interfacing With ROS2

The ***novatel-oem7-driver*** is a ROS2 package that provides a driver for NovAtel OEM7 series receivers. This driver allows you to interface with the OEM7 receiver and receive GNSS data through ROS2 topics.

Installation and Setup:

To install the package, we can use the following command:

```
sudo apt install ros-${ROS_DISTRO}-novatel-oem7-driver
```

Once the package is installed, we can launch the driver by running the following command:

```
ros2 launch novatel_oem7_driver oem7_driver.launch.py
```

This will start the NovAtel OEM7 ROS2 node and begin publishing GNSS data on ROS2 topics.

Topics:

The NovAtel OEM7 ROS2 driver provides several topics for accessing GNSS data, including:

- ***/novatel/oem7/gps/time***: provides the current GNSS time in the form of a TimeReference message.
- ***/novatel/oem7/gps/pos***: provides the current GNSS position in the form of a NavSatFix message.
- **/novatel/oem7/gps/vel**: provides the current GNSS velocity in the form of a TwistWithCovarianceStamped message.
- ***/novatel/oem7/gps/imu***: provides the current IMU data in the form of an Imu message.
- ***/novatel/oem7/gps/inspvax***: provides the GNSS/INS position, velocity, and attitude solution in the form of an InertialSense message.

- ***/novatel/oem7/gps/bestpos***: provides the best position solution in the form of a Bestpos message.

Running the `ros2 topic list` command will list all the active topics. For our purposes, we can choose a few or multiple topics from this list such as the ***/novatel/oem7/gps/pos*** and ***/novatel/oem7/gps/imu*** topics to listen to the GPS and IMU data being published by the sensor.

Implementation In WATO Monorepo

In our monorepo, we can then create a custom ROS2 publisher node that subscribes to one or more of these topics to receive the IMU and GPS data as specific ROS2 messages as defined in the ***novatel-oem7-driver*** package.

Then, this node can publish this data either as the same ROS2 message type it was received as, or as a custom ROS2 message to the ***/imu*** and ***/gps*** topics as necessary.