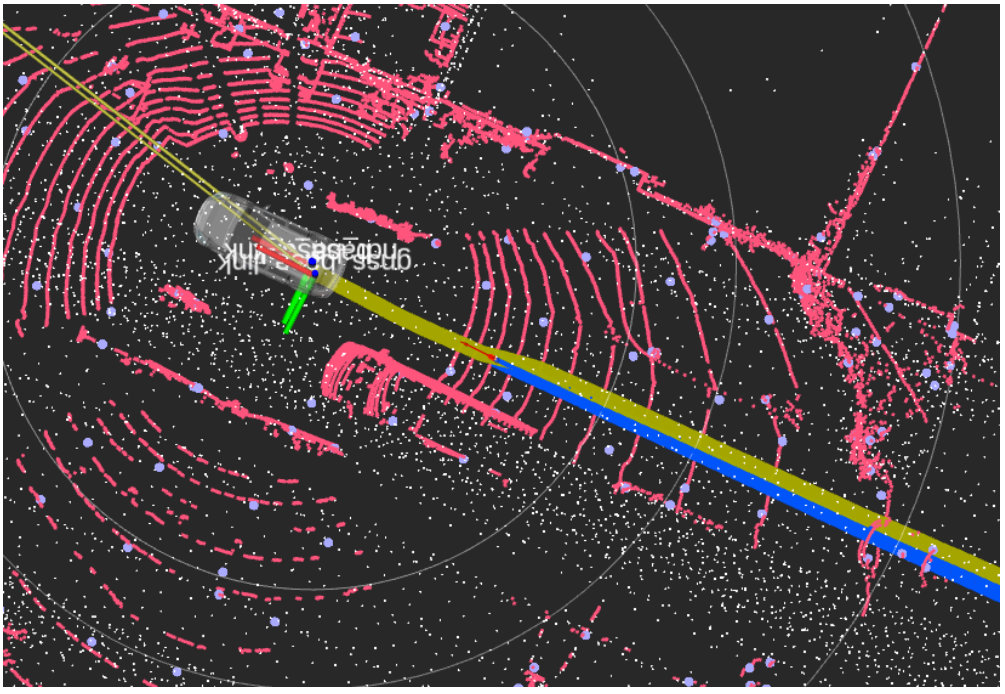
ROS2 Synchronization Issue: Pose and GNSS Data Out of Sync with Different Update Rates (200 - 100) #5246

Unanswered **cavadibrahimli1** asked this question in **Q&A**

cavadibrahimli1 on Sep 16 edited



Body:

I am working with ROS2 Humble and trying to synchronize the data from two topics in my system: one from a GNSS sensor and another from a pose estimation node. However, I am experiencing synchronization issues, where one data stream (GNSS) seems to lag behind the other (pose) by around 2-3 meters during playback.

Setup:

- **ROS2 version**: Humble
- **Topic 1** (`/ros_pospac_bridge/pose_stamped`): Pose data from a pose estimation node, publishing at an average rate of **200 Hz**.
- **Topic 2** (`/applanix/lvx_client/gnss/fix`): GNSS data from a GNSS sensor, publishing at an average rate of **100 Hz**.
- **GitHub Repository for GNSS Publisher**: gps_publisher_ros2humble

Problem:

- The pose data updates more frequently than the GNSS data, and this causes synchronization problems. Specifically, the GNSS data often

Category

🙏 Q&A

Labels

None yet

2 participants

seems to stop earlier or lag behind by about 2-3 meters, even when both streams are supposed to be synchronized (around the same timestamp).

- Both topics should cover the same path, but due to the difference in update rates, the pose data seems to advance ahead of the GNSS fix at certain points.

What I've Tried:

- I've checked the publishing frequencies of both topics using `ros2 topic hz`:
  - Pose data (`/ros_pospac_bridge/pose_stamped`) is updating at ~200 Hz.
  - GNSS data (`/applanix/lvx_client/gnss/fix`) is updating at ~100 Hz.
- The mismatch in rates seems to be causing one stream to move faster than the other, leading to desynchronization.

My Questions:

1. How can I ensure that both the pose and GNSS data streams remain synchronized, despite the difference in update rates?
2. Is there a way to interpolate or align the slower GNSS data with the more frequent pose updates?
3. Would adjusting the GNSS update rate to match the pose rate help resolve this, or is there a better approach in ROS2 to synchronize topics with different frequencies?
4. Are there existing ROS2 packages or tools to synchronize data streams from multiple topics efficiently?

Additional Information:

- I am using the `rosbag2` for playback, but the same issue happens during live processing.
- I've considered resampling or time synchronization but am unsure of the best approach in ROS2.

I run this via 3 terminals:
`ros2 launch ros_pospac_bridge ros_pospac_bridge.launch.xml`
`ros2 launch autoware_launch logging_simulator.launch.xml map_path:=/home/javadibrahimli/autoware_map/test_route2 vehicle_model:=sample_vehicle sensor_model:=sample_sensor_kit`
`ros2 bag play  rosbag2_2024_09_12-14_40_52/`

Any guidance or suggestions on how to properly synchronize these two data streams would be greatly appreciated!

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1 comment · 4 replies

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maxime-clem on Sep 16 Collaborator

> Are there existing ROS2 packages or tools to synchronize data streams from multiple topics efficiently?

I think this is what you want
https://github.com/ros2/message_filters/blob/rolling/doc/index.rst#3-time-synchronizer

> Topic 2 (/applanix/lvx_client/gnss/fix): GNSS data from a GNSS sensor, publishing at an average rate of 100 Hz.
> GitHub Repository for GNSS Publisher: gps_publisher_ros2humble

Could the issue simply come from this `gps_publisher_ros2humble` ? Are you sure that it outputs an accurate pose ?

↑ 1 4 replies

cavadibrahimli1 on Sep 17 Author edited

@maxime-clem thanks for your attention!
There is a very narrow tunnel through which the system passes successfully, so the path should not be an issue. My problem arises when I run the rosbag and this ROS package—initially, one moves faster, then the other overtakes it. I also split the rosbag to only include the first 3 minutes of the data due to storage limitations. Could this truncation be the cause of the desynchronization?

Moreover, in my test i saw that, when they stop one of them stop a meter back from another one

maxime-clem on Sep 17 Collaborator

> Moreover, in my test i saw that, when they stop one of them stop a meter back from another one

With a synchronization issue we would expect the late signal to catch up once the other signals stops. If both signals stops together, then this is not a synchronization issue but an offset issue.
I can imagine 2 causes for the offset:

- ~~the signal originally has an offset~~. It seems to not be the case.
- some transforms are wrong (`vehicle_model:=sample_vehicle sensor_model:=sample_sensor_kit` , do these models match your test vehicle ?).

cavadibrahimli1 on Sep 17 Author

I want to describe it like from 0 to 100 X coordinate. When I run both packet and bag, bag goes forward and stops on 23, and after it the packet comes and stops with same reaction on 20. I hope I could explain the problem. I tested the transforms and I think they are correctly setted up.
@maxime-clem

maxime-clem on Sep 17 Collaborator

It's not easy to understand the issue without seeing the data. Can you share a bag ?
Since the issue does not seem specific to Autoware, you may want to ask on ROS 2 forums.

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