

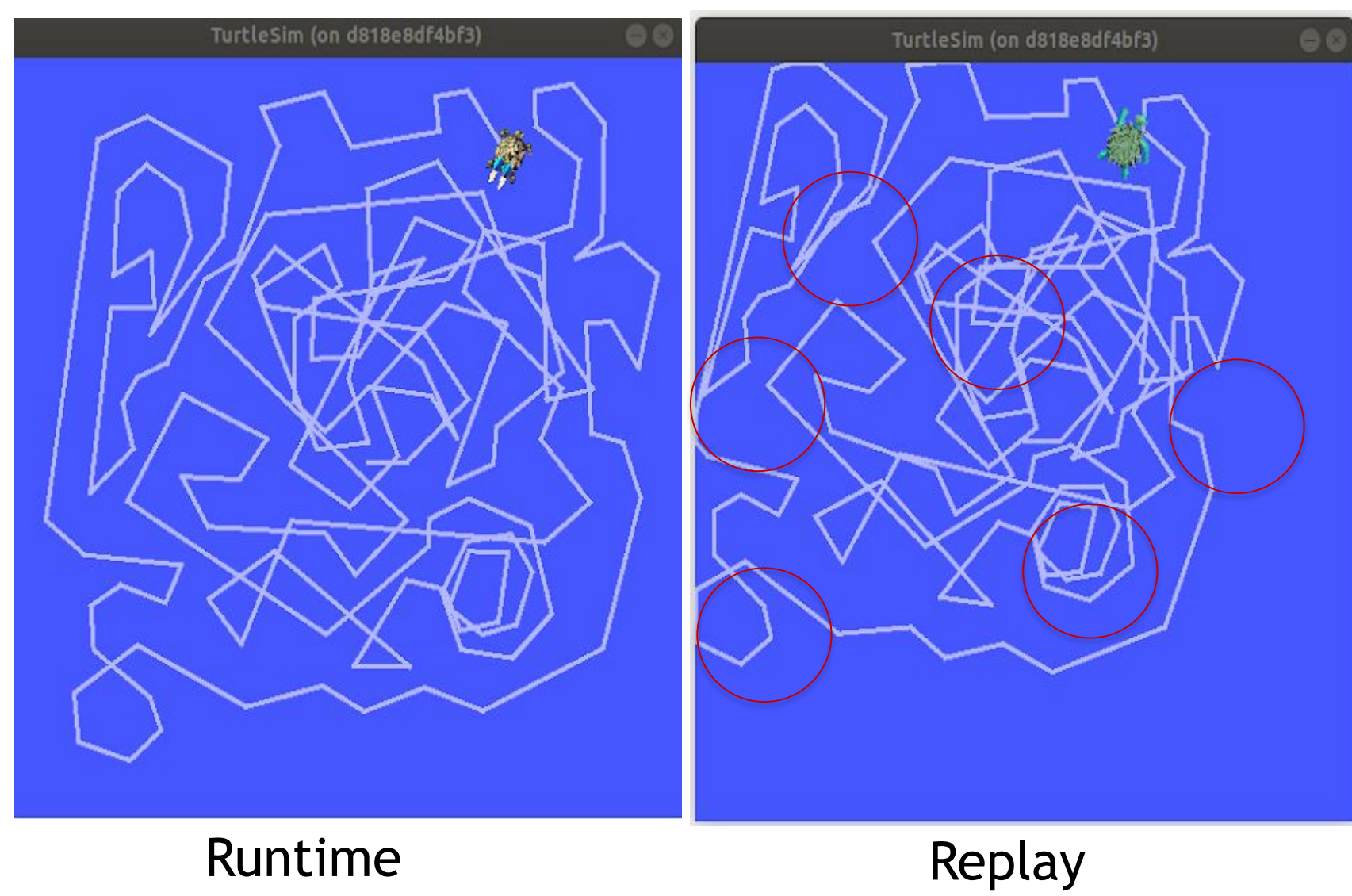
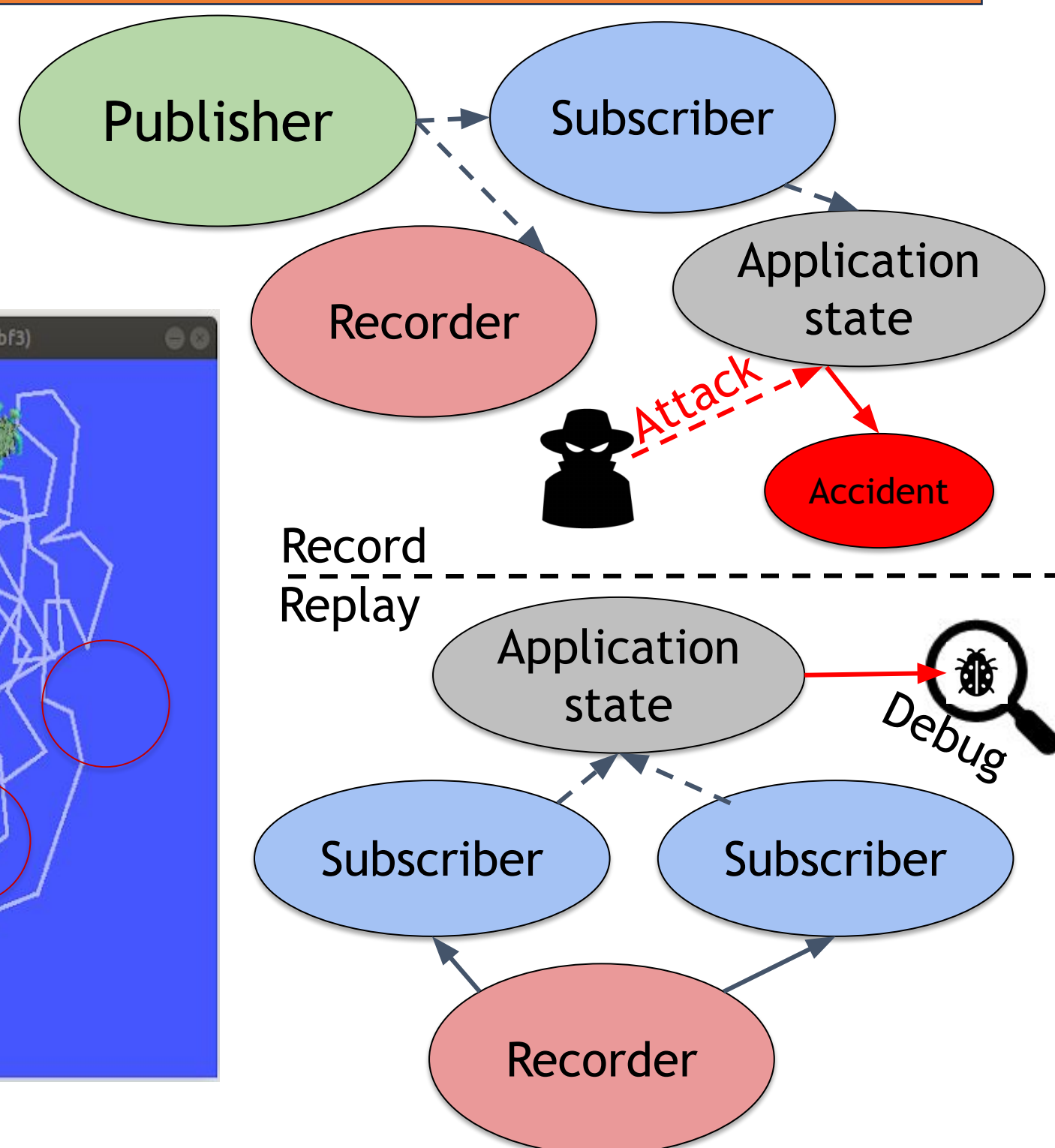
Deterministic Replay and Debugging for Robotic Systems

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Kyu Hyung Lee⁺, Heejo Lee[§], Chung Hwan Kim

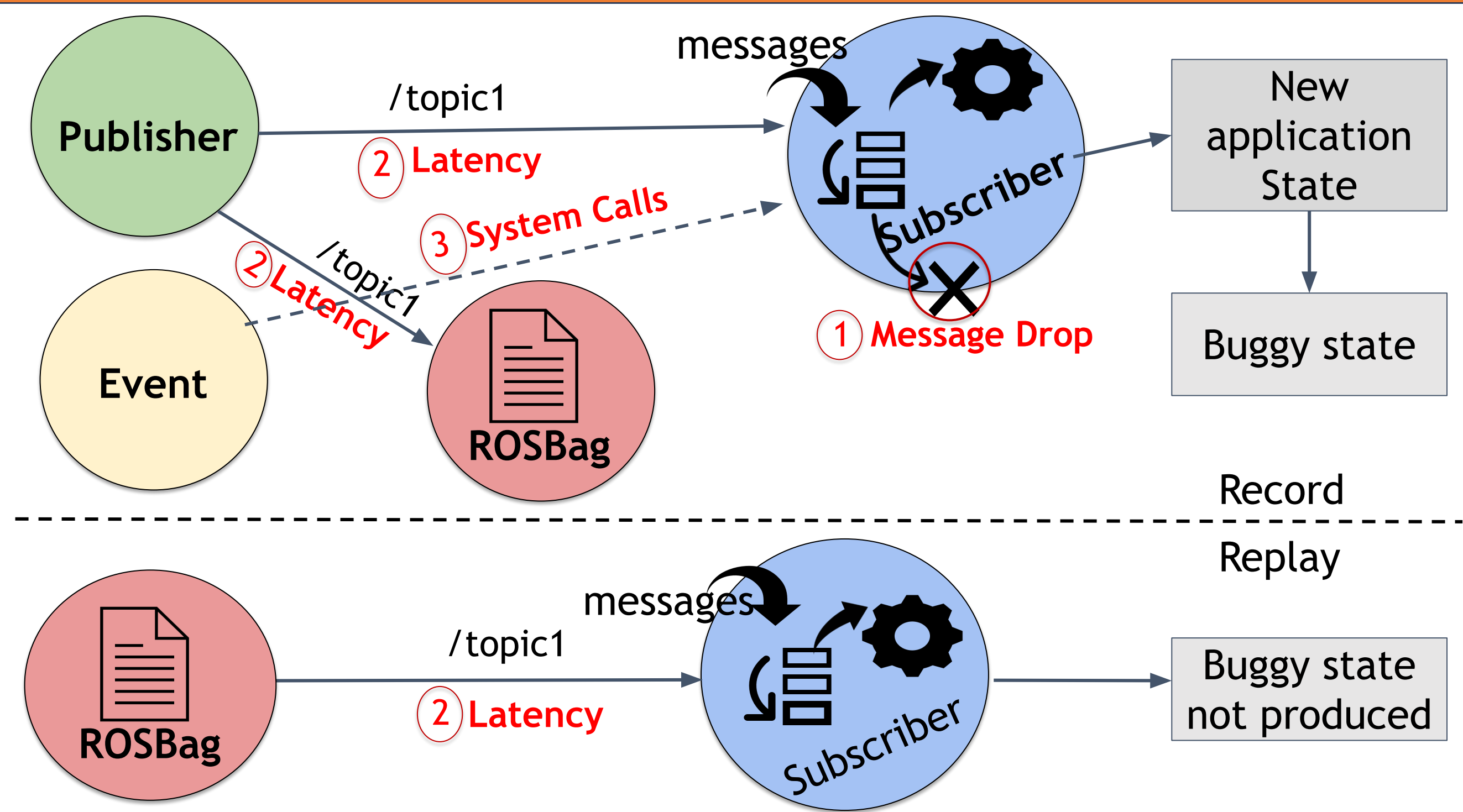
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Non-determinism in robotic applications

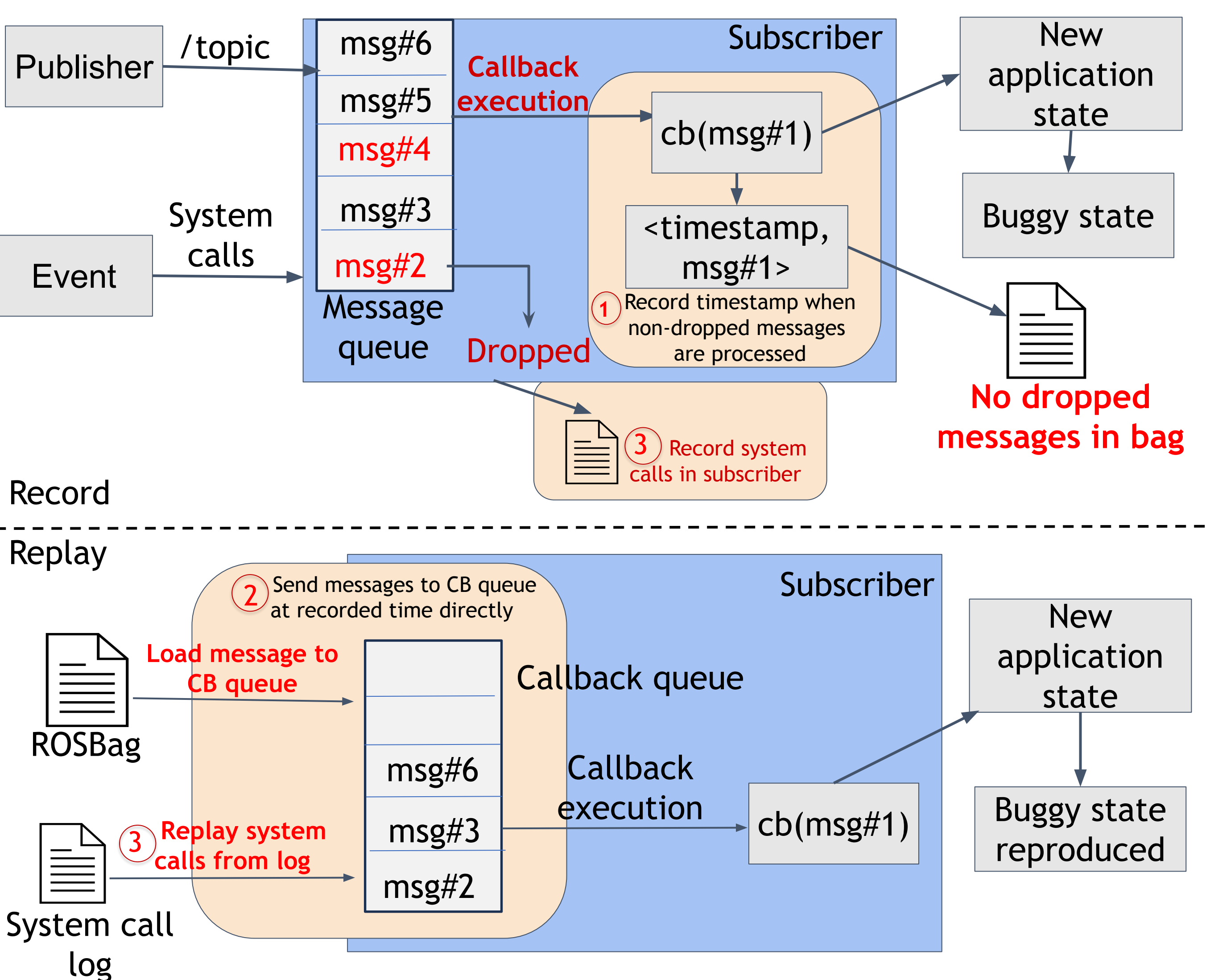
- Robotic Operating System (ROS)
- Autonomous vehicle accidents
- ROSBAG replay



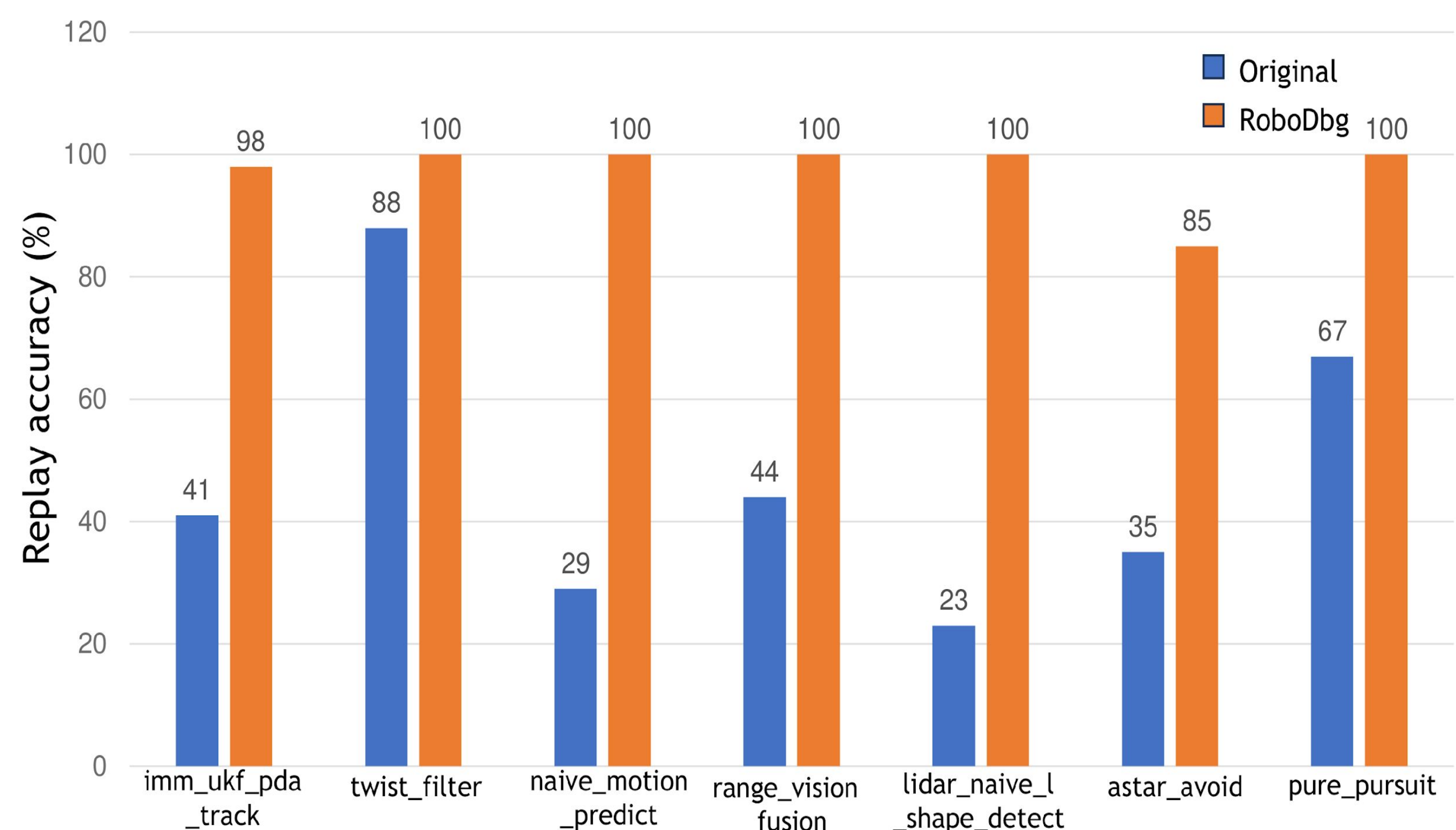
Challenges of deterministic replay



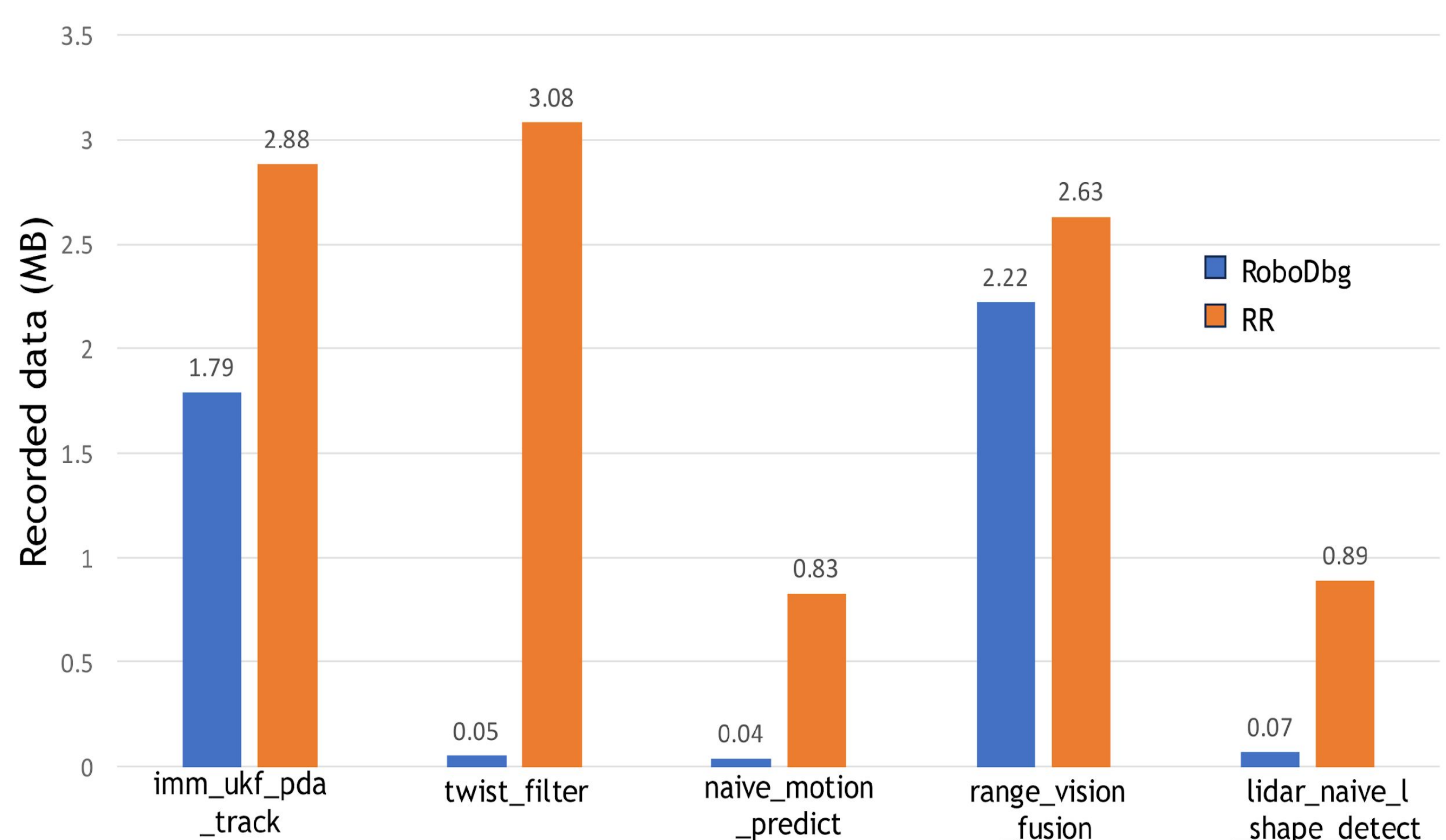
RoboDbg Architecture



Preliminary evaluation



Replay accuracy of RoboDbg compared to the ROS replayer



Size of recorded data required for deterministic replay with RoboDbg and RR

Takeaway

Subscriber-centric recording in publisher-subscriber based robotic application middleware can lead to deterministic replay

RoboDbg allows for replayability of ROS nodes with and average of **95%** accuracy when compared with the default ROS player.