

EVALUATION OF ROS2 COMMUNICATION LAYER

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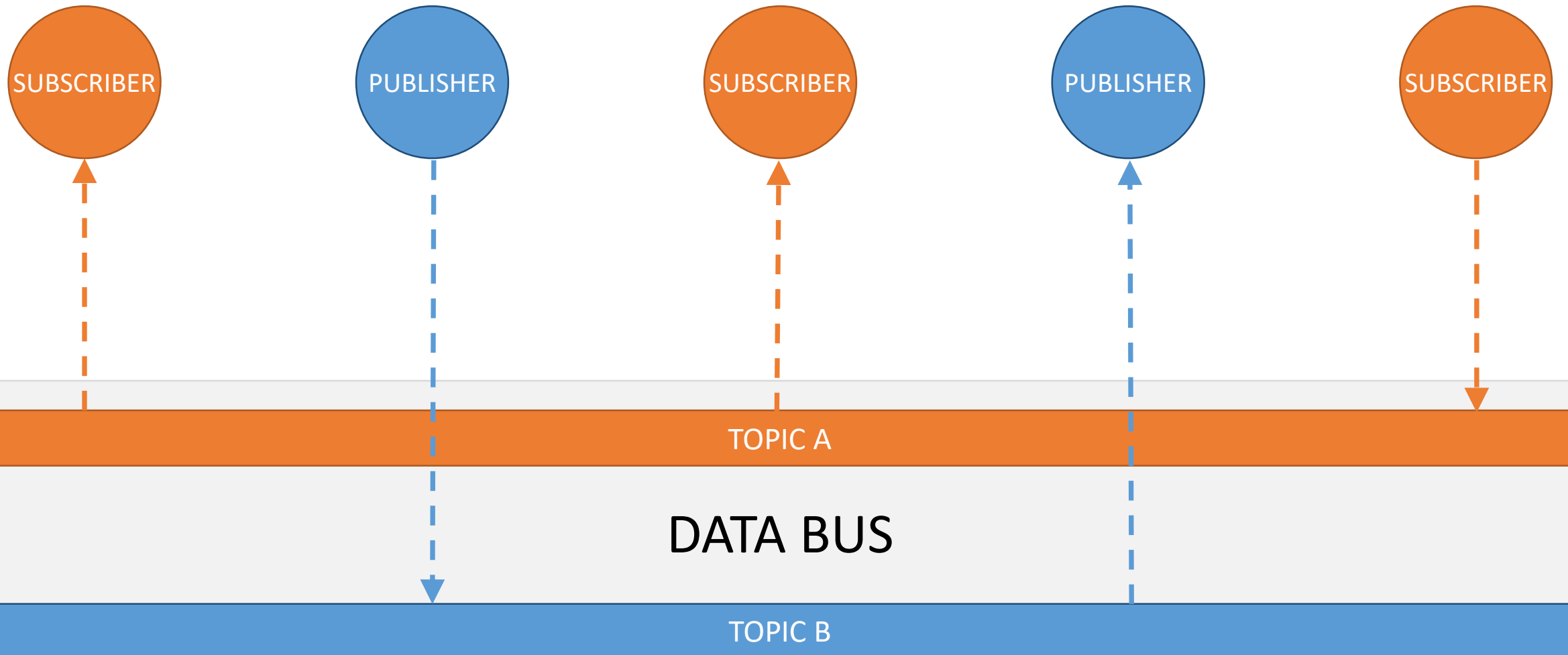


Agenda

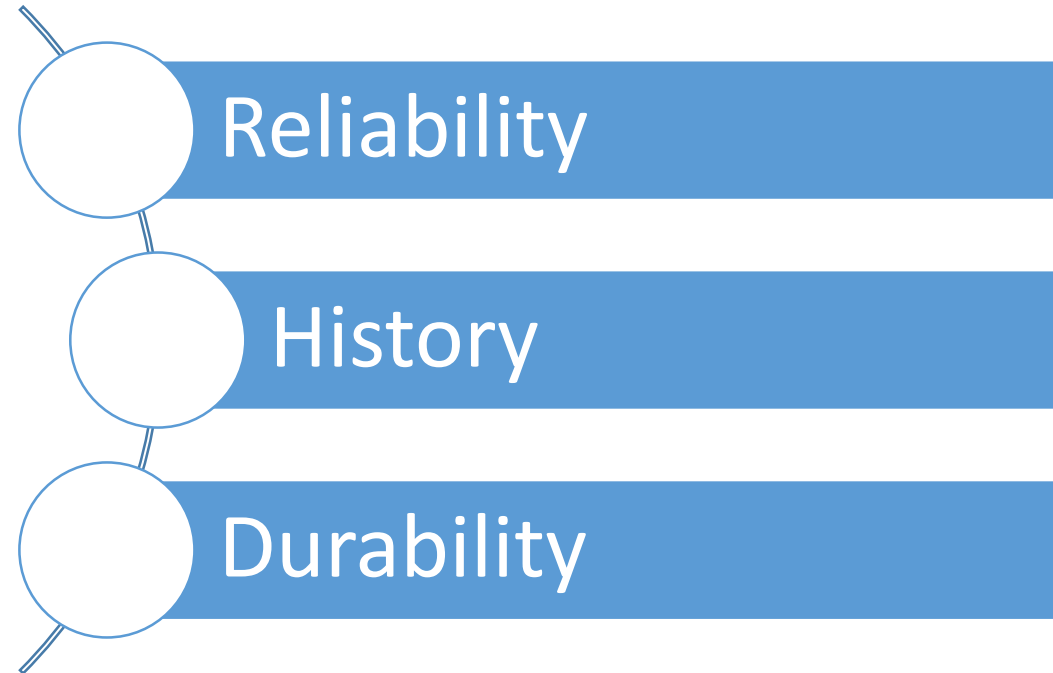
- Why we need robustness and resilience in ROS
- Introduction to ROS2 and DDS
- Evaluation methodology
- Results
- Conclusions

Why do we need **robust and resilient** ROS?

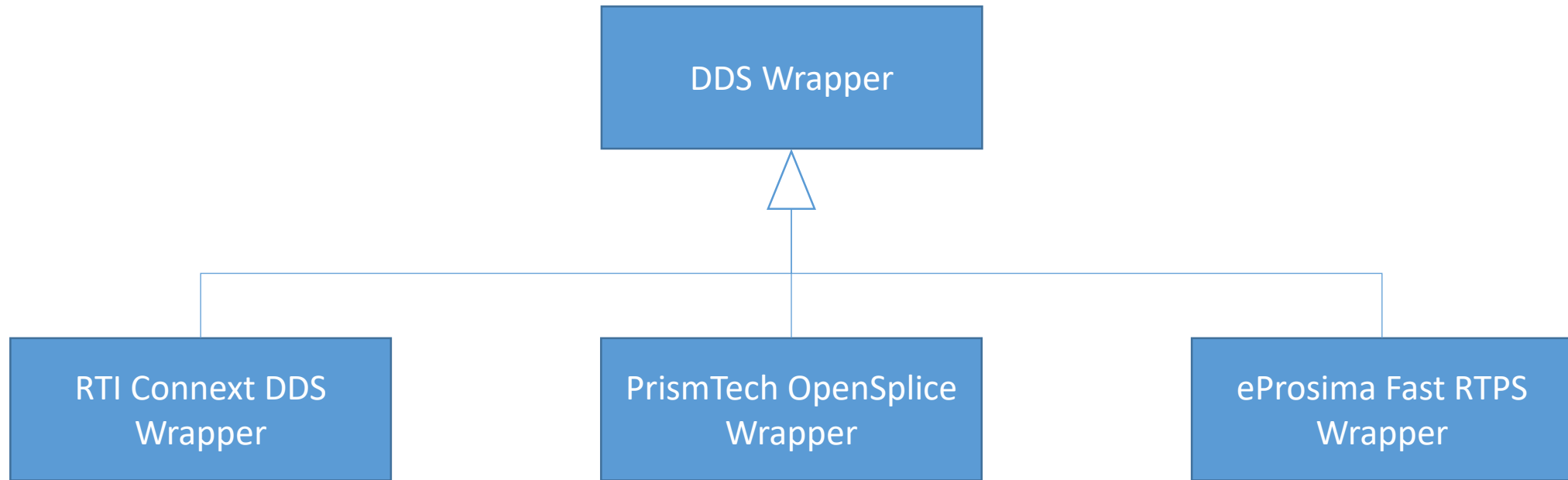
Data Distribution Service (DDS)



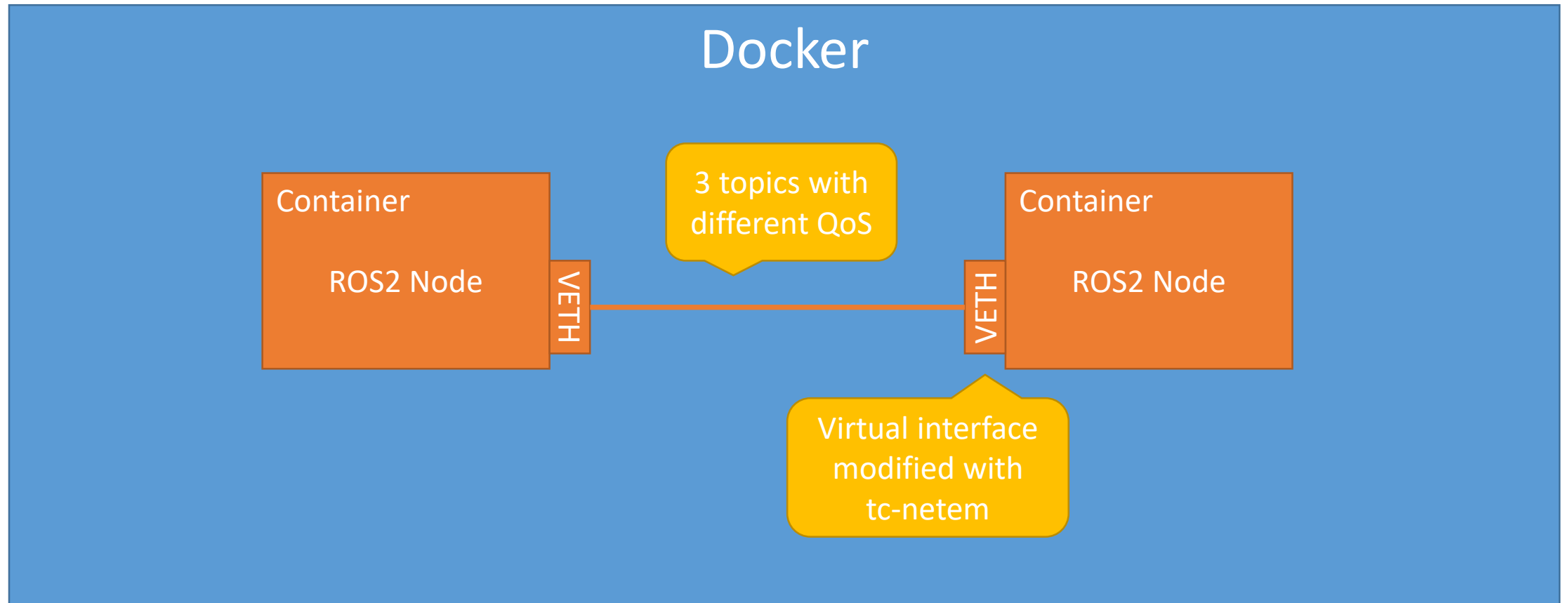
Quality of Service (QoS)



Supported DDS implementations



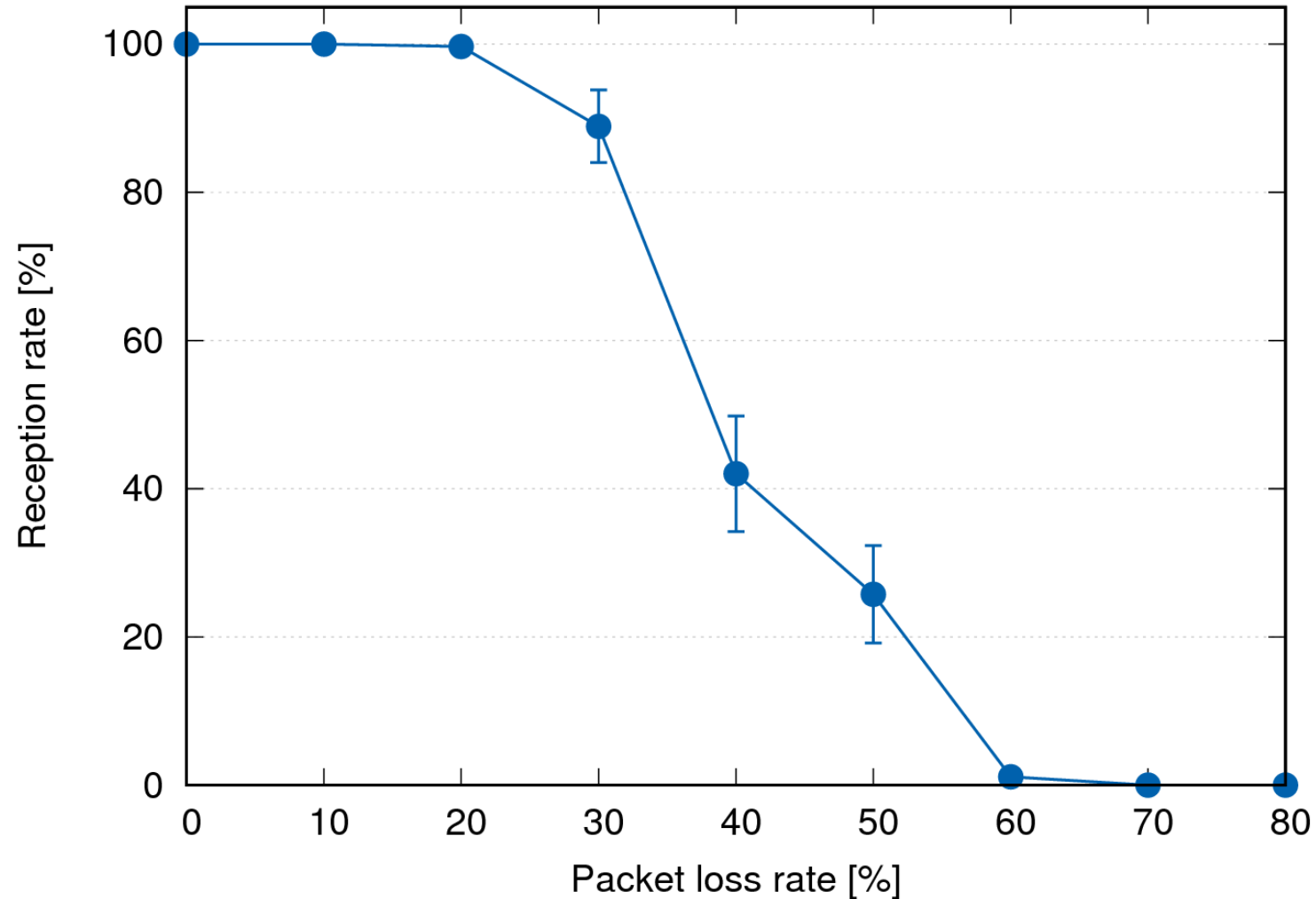
Evaluation environment



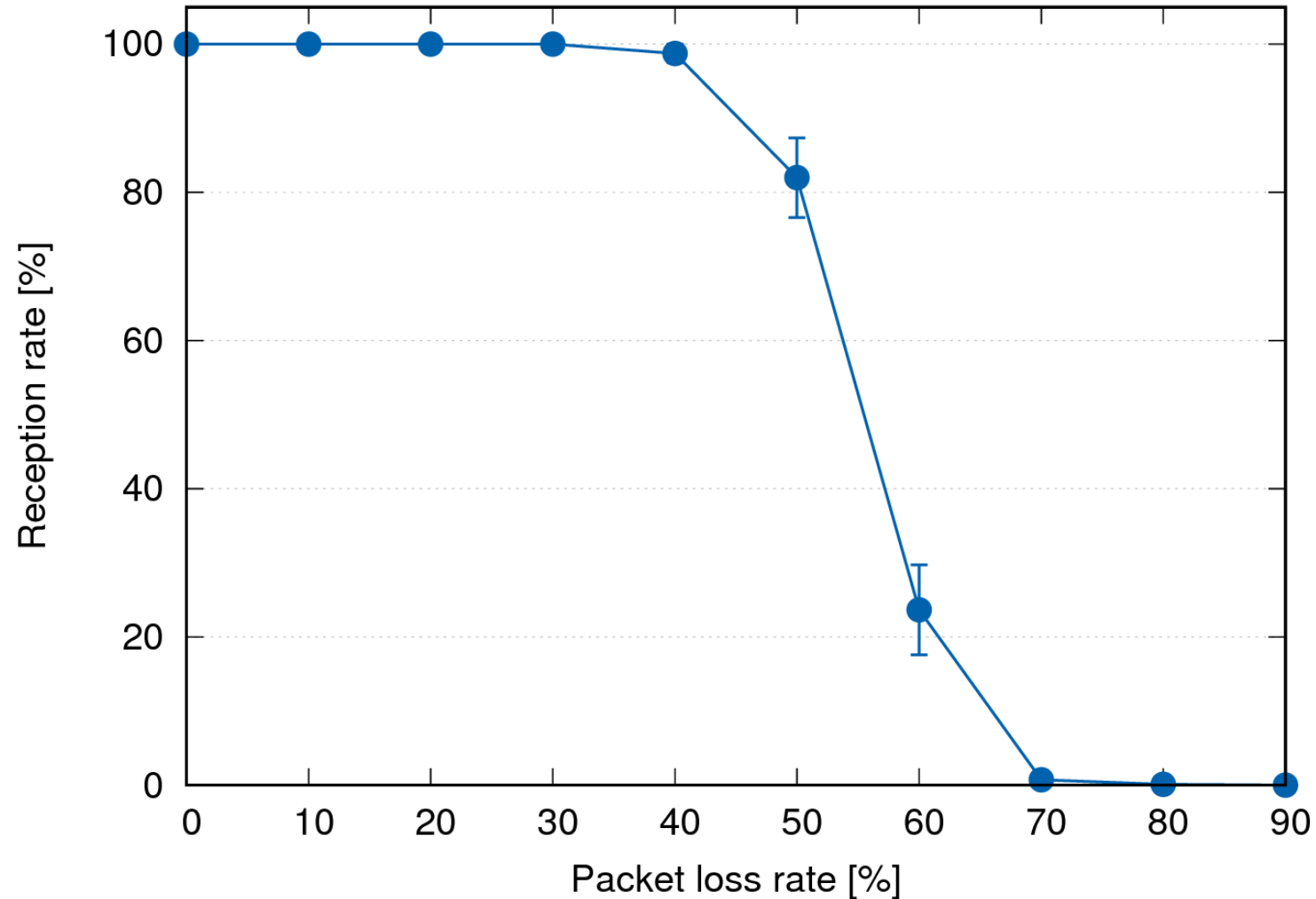
Scenario 1

- Random packets are being dropped
- Presented results are for RTI Connex DDS
- Graphs show mean values from 28 runs

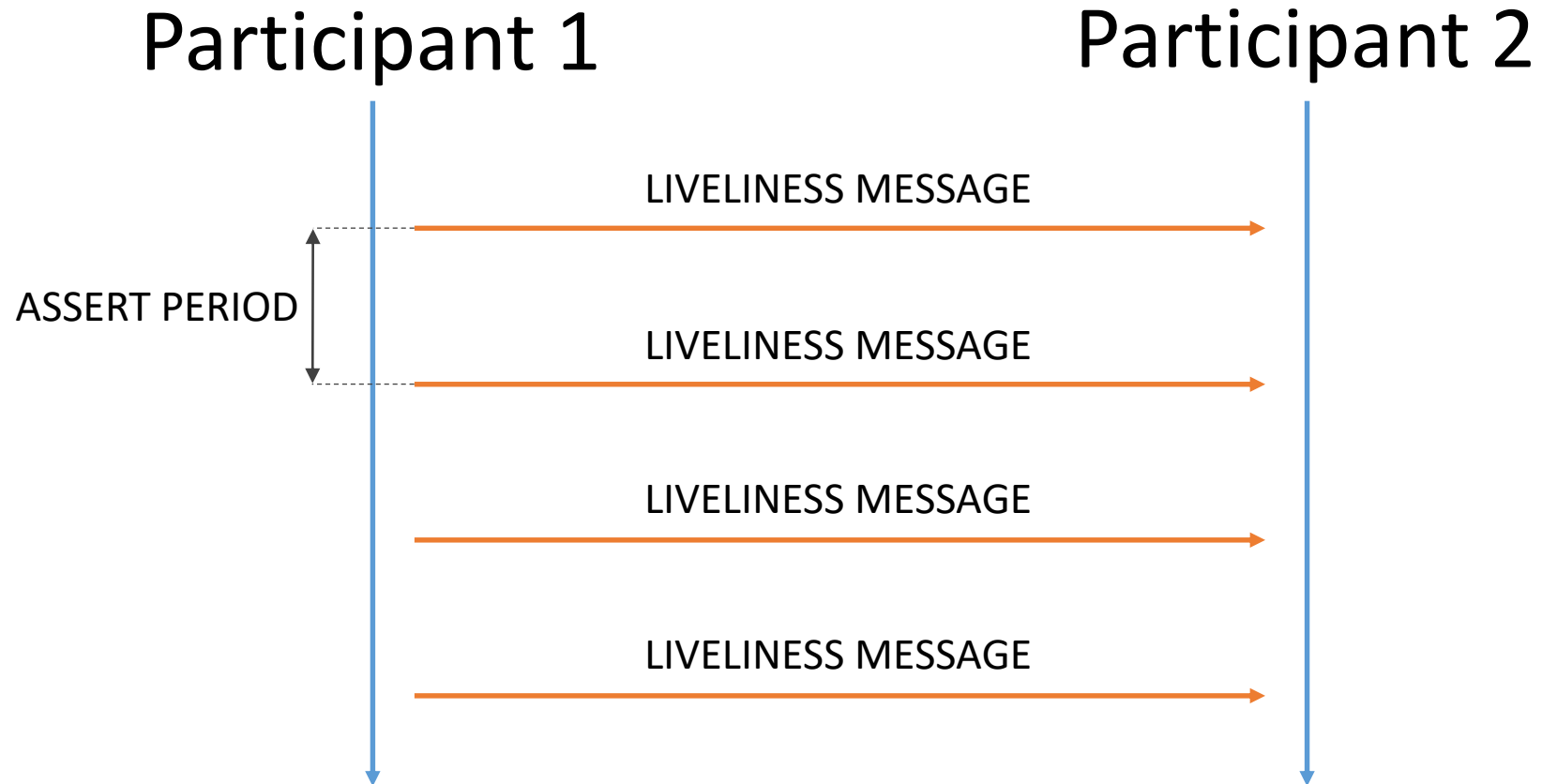
ROS reception rate in lossy networks



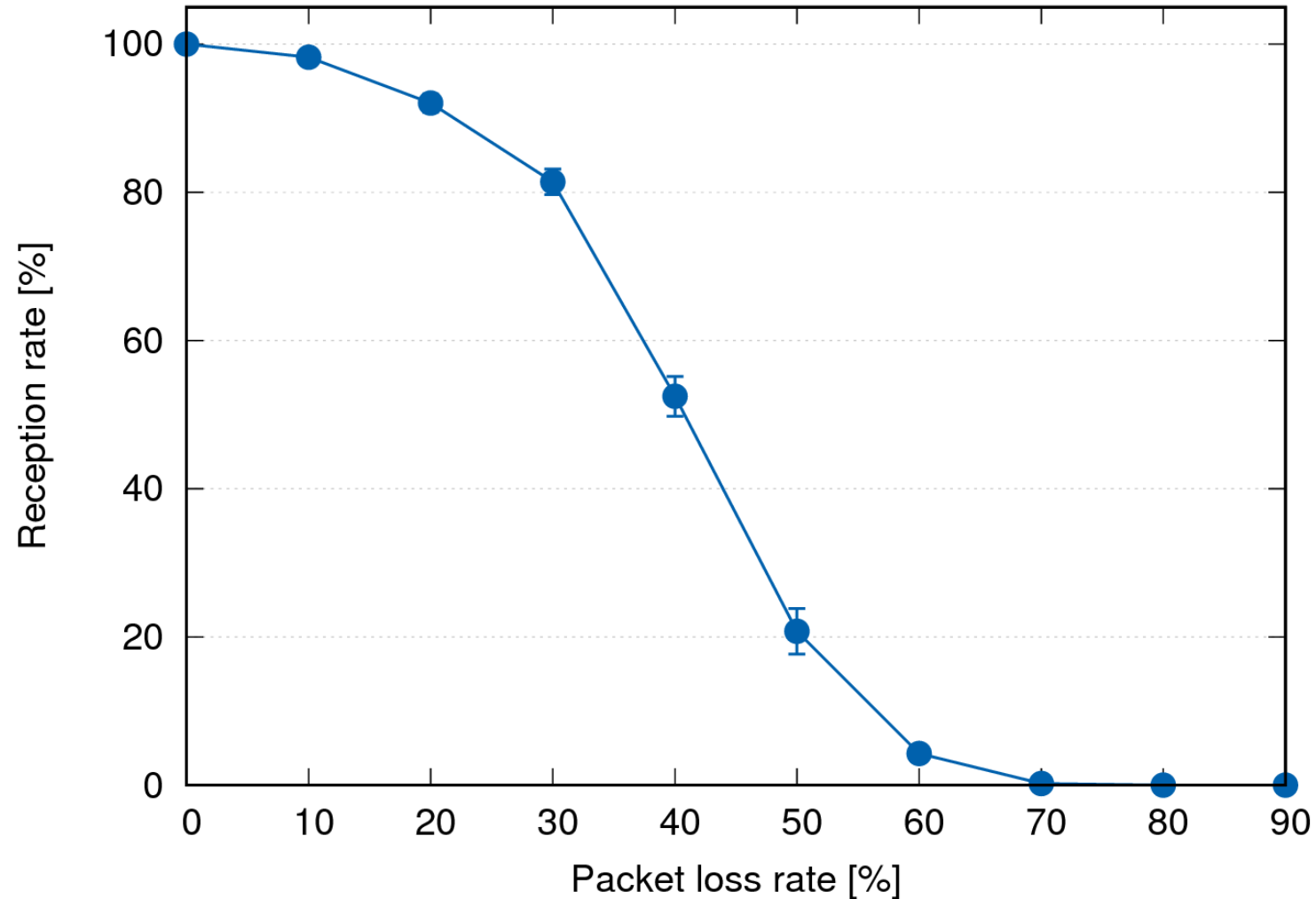
ROS2: reception rate for critical messages



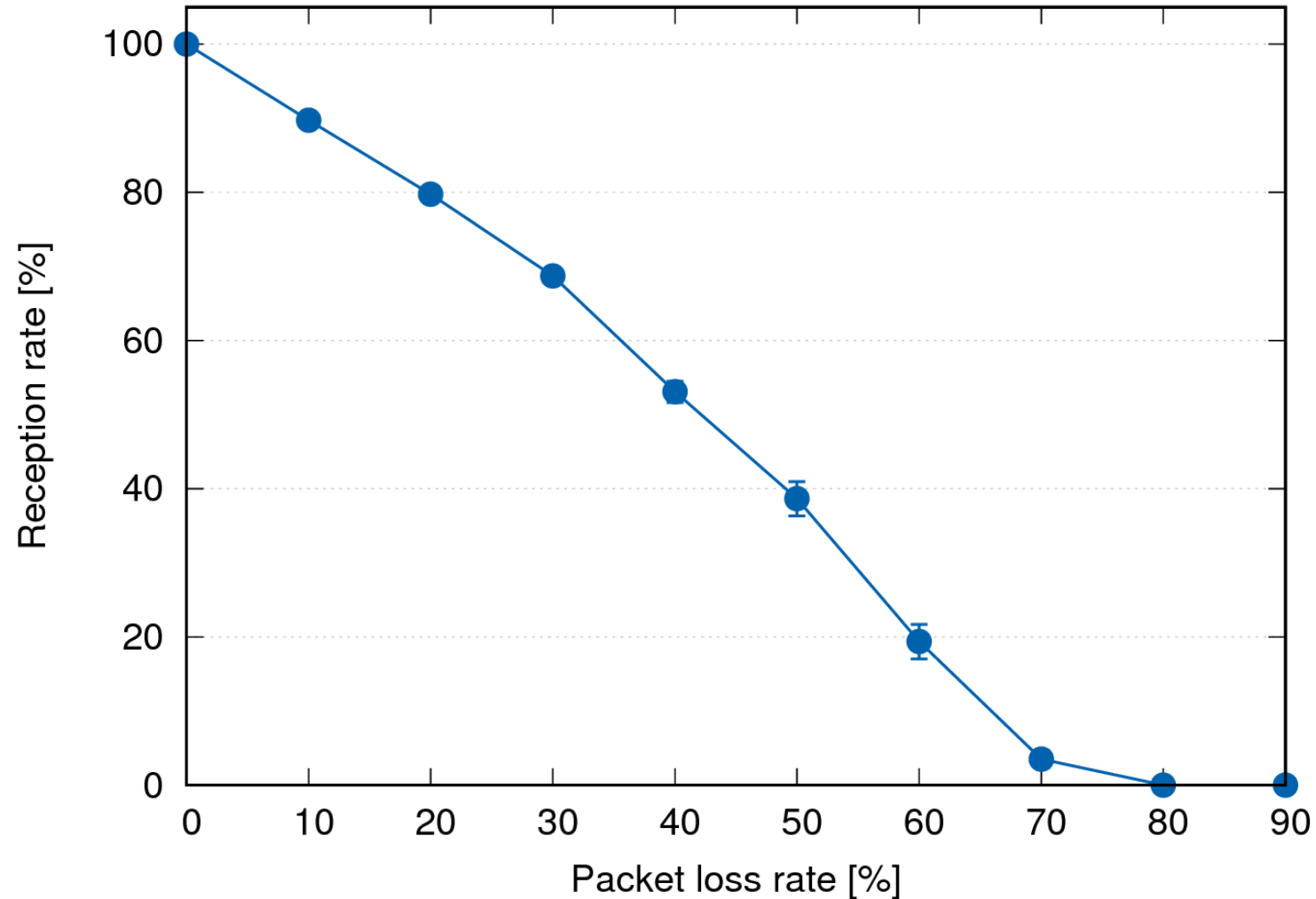
Participant liveness



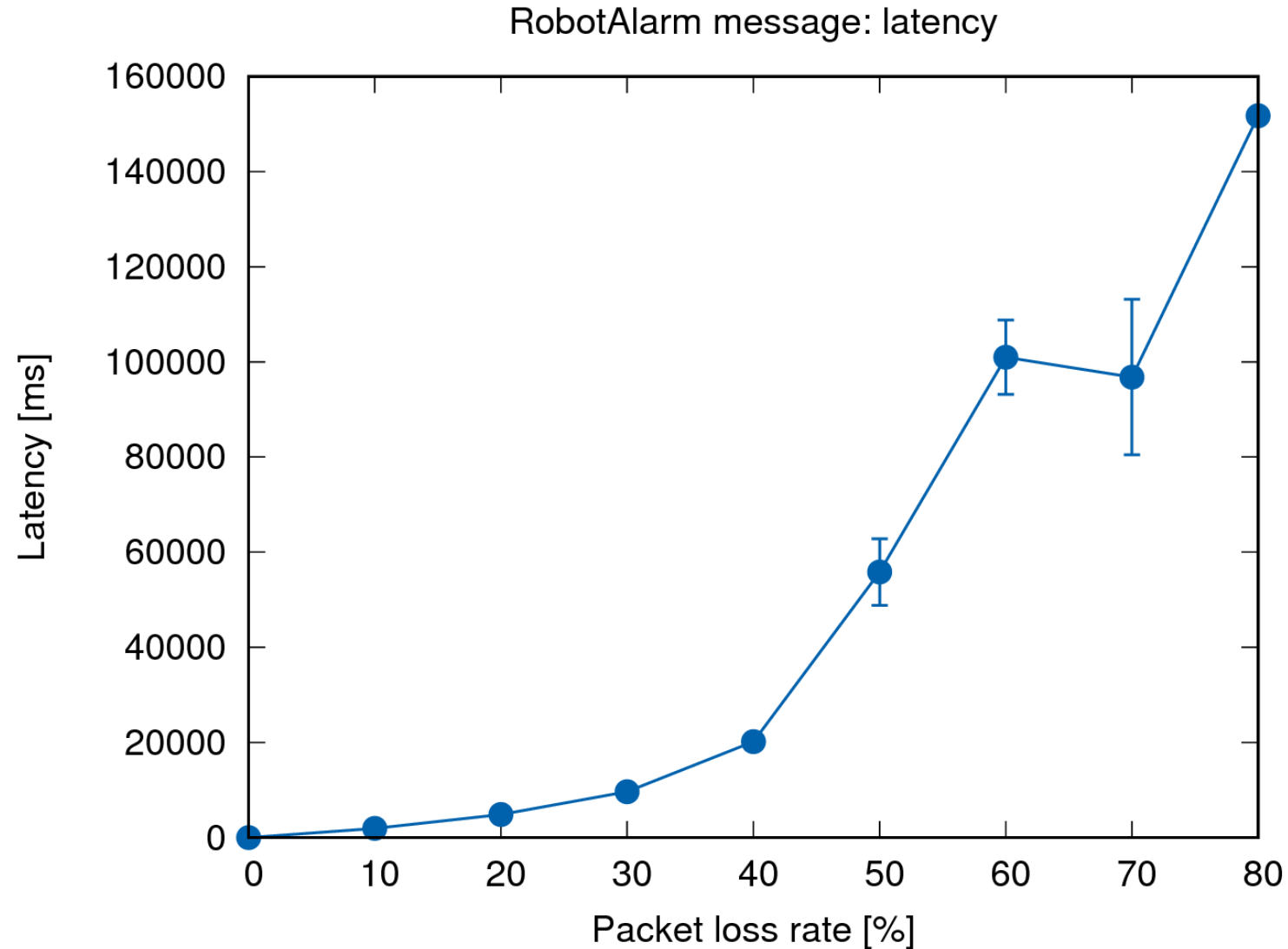
ROS2: reception rate for control messages



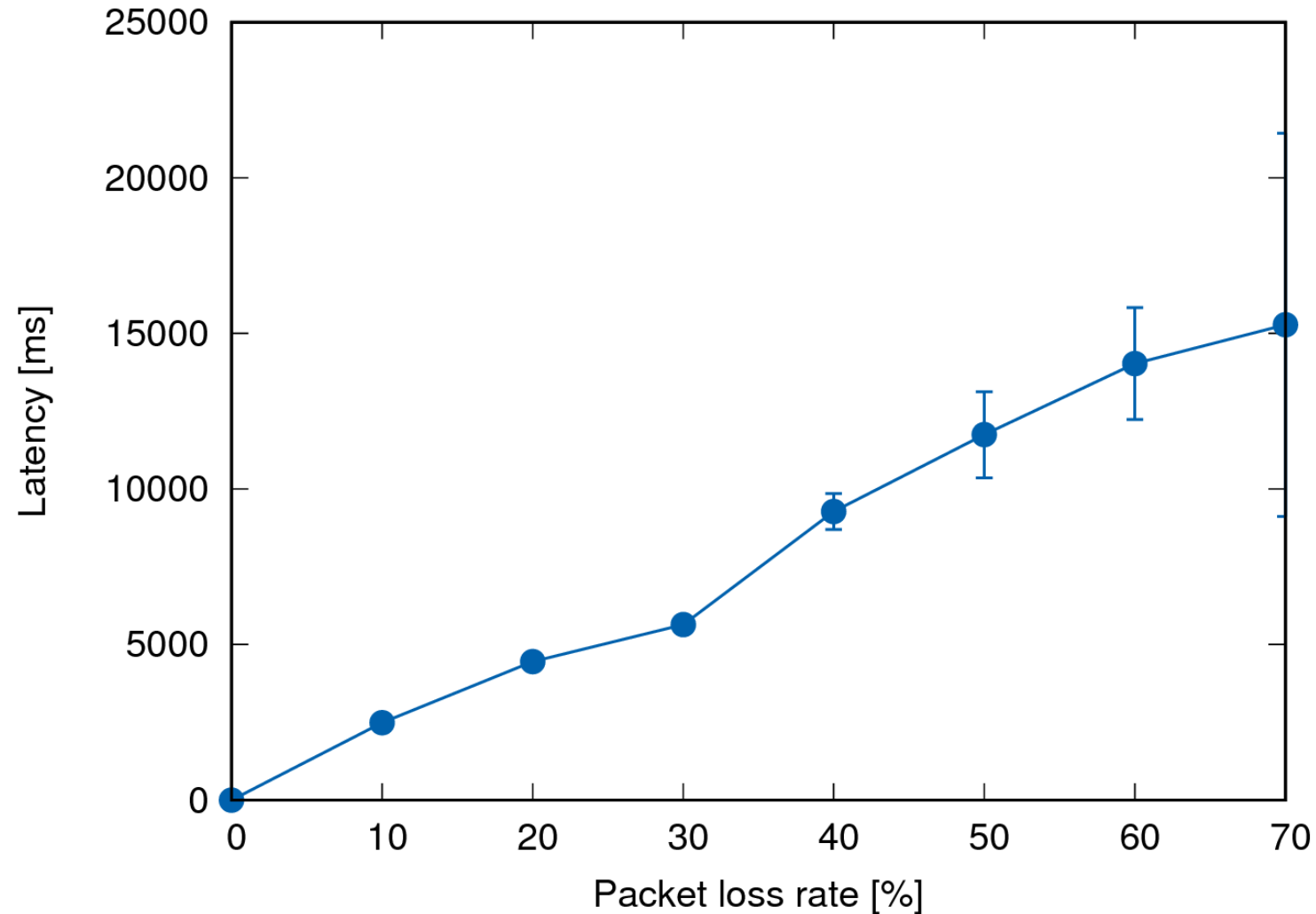
ROS2: reception rate for sensor data



ROS2: latency for critical messages



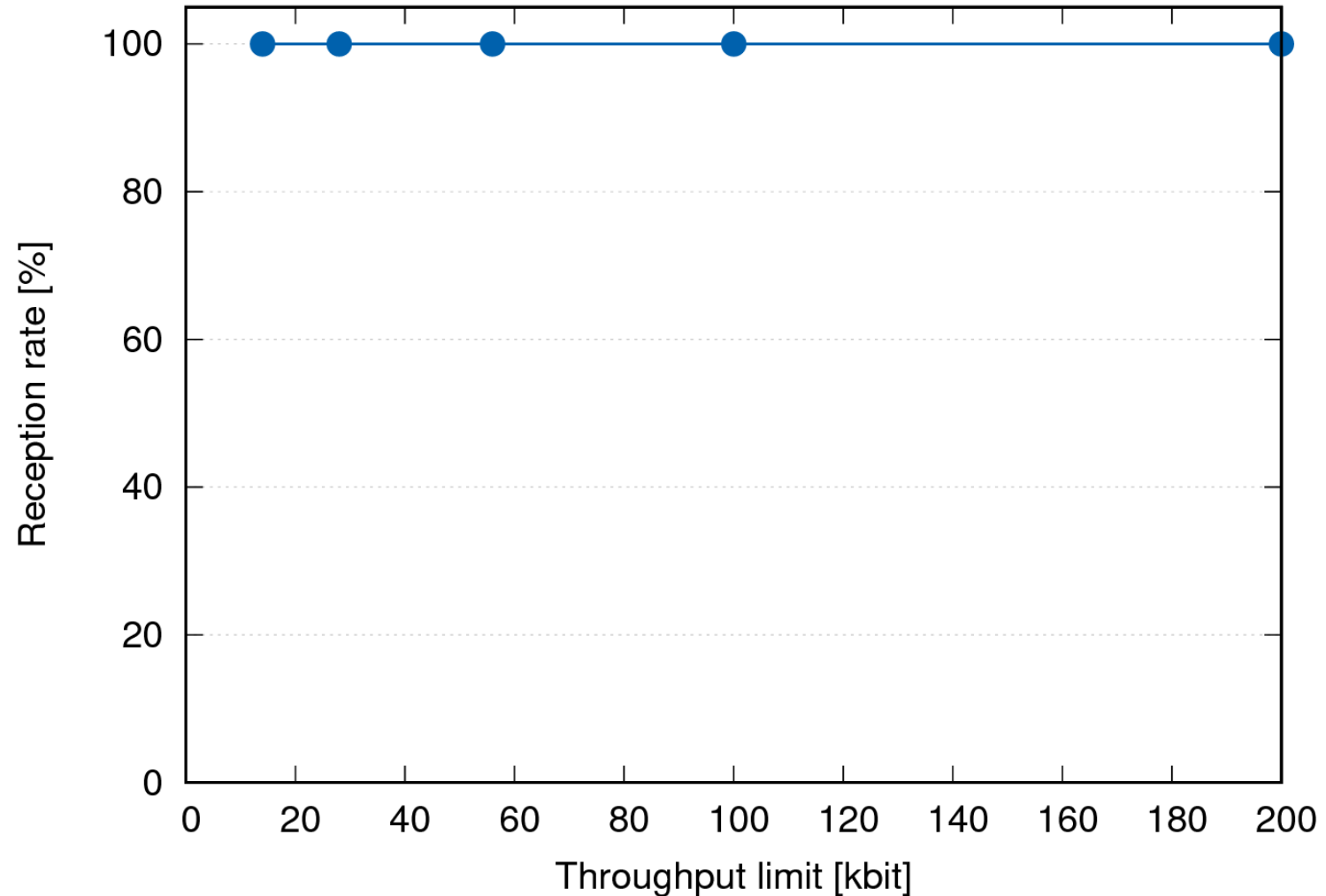
ROS2: latency for control messages



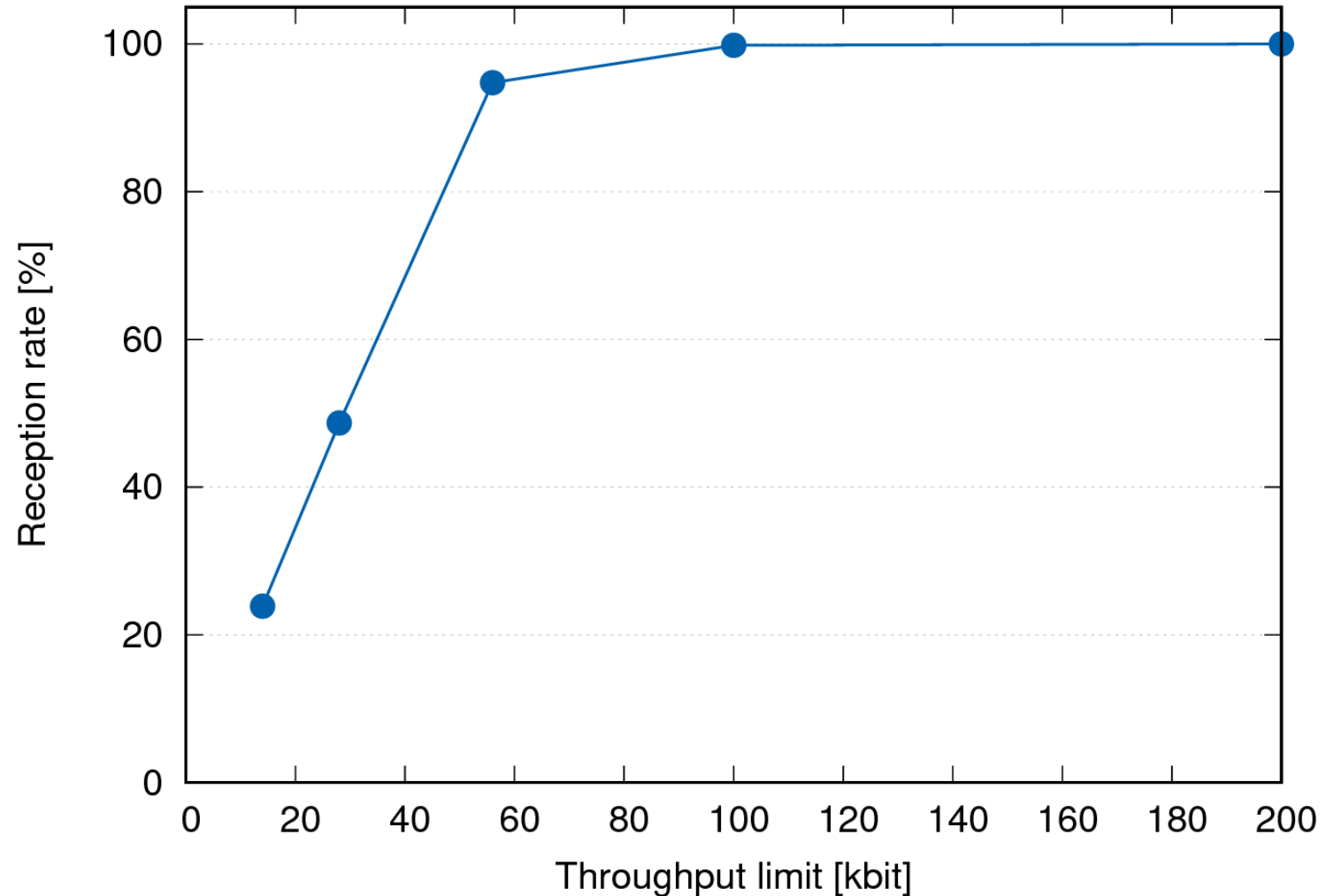
Scenario 2

- High volume of sensor data
- There is a limit on throughput
- Presented results are for eProxima Fast RTPS
- Graphs show mean values from 28 runs

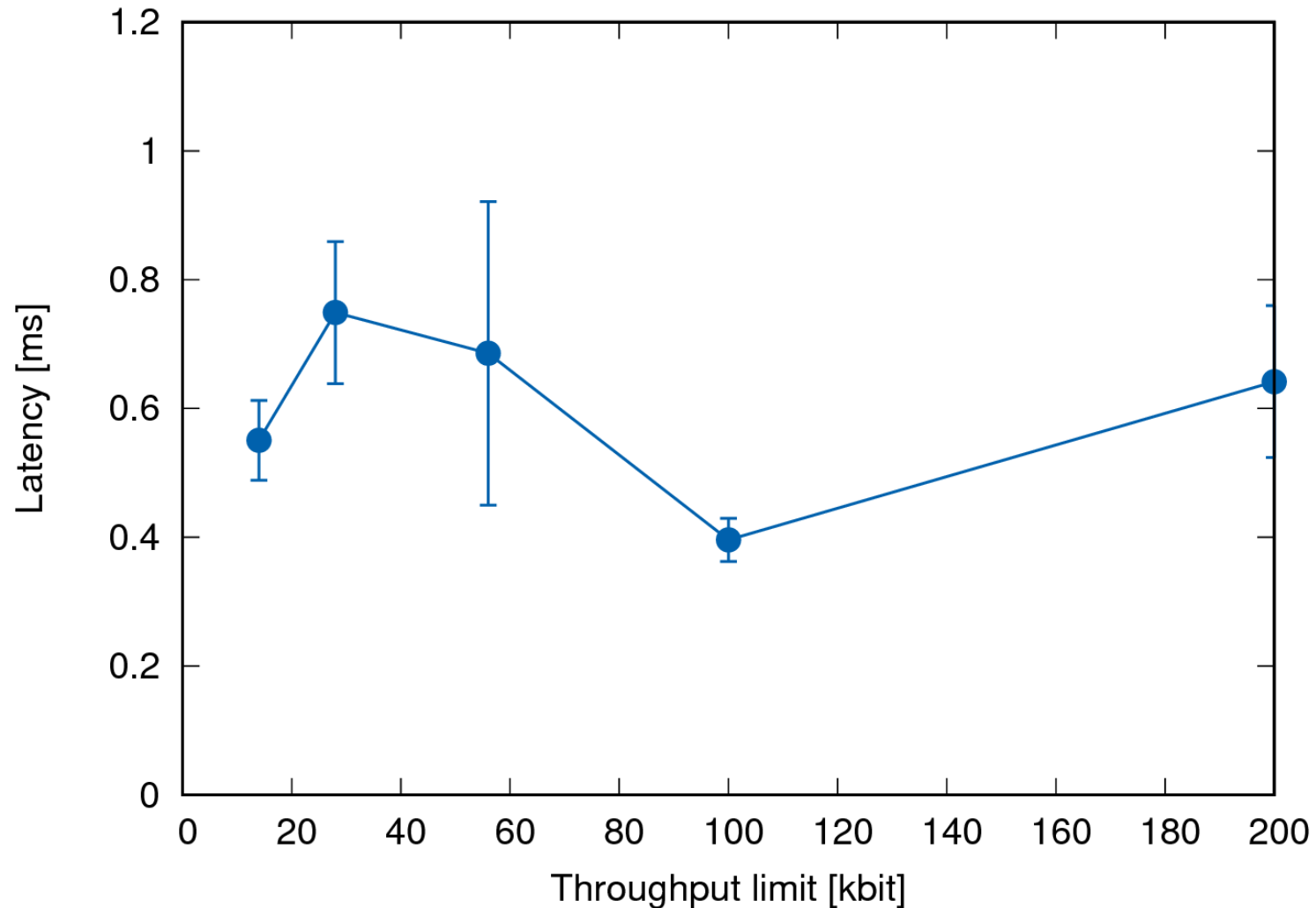
ROS2: reception rate for critical messages



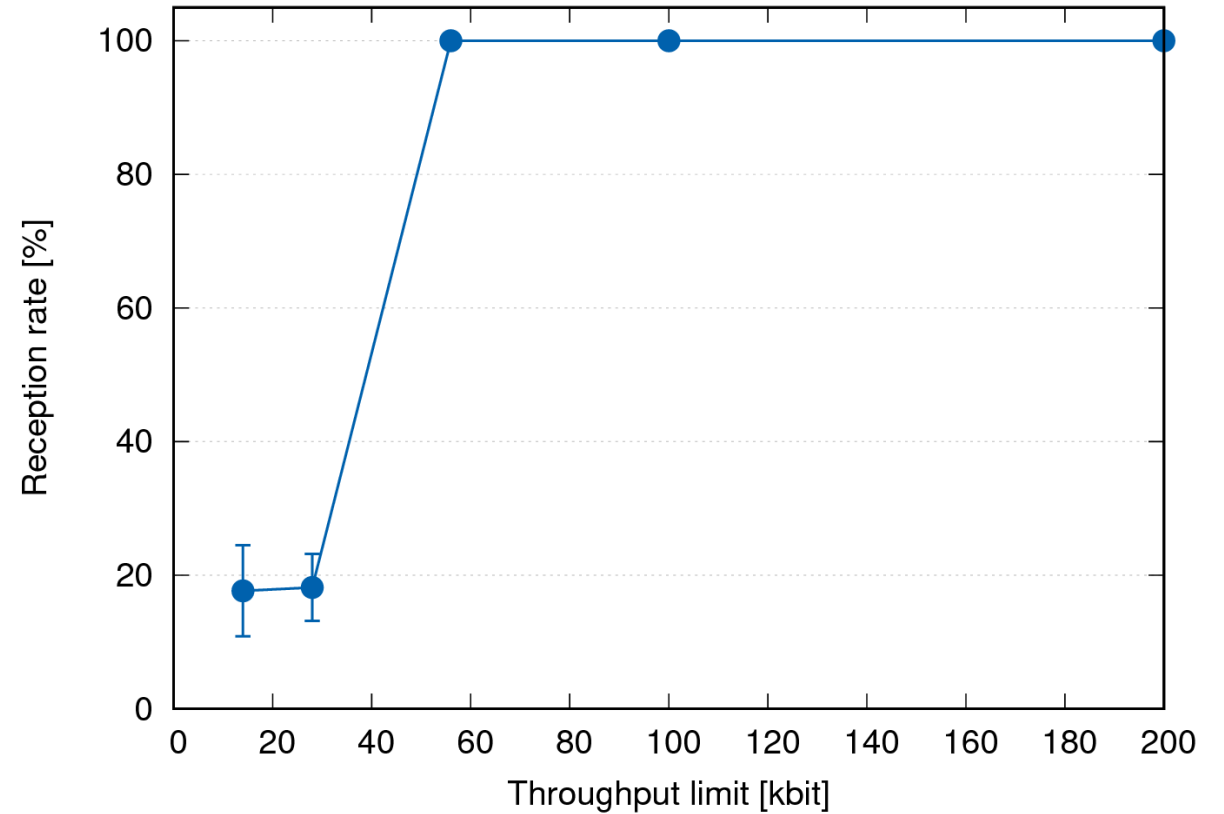
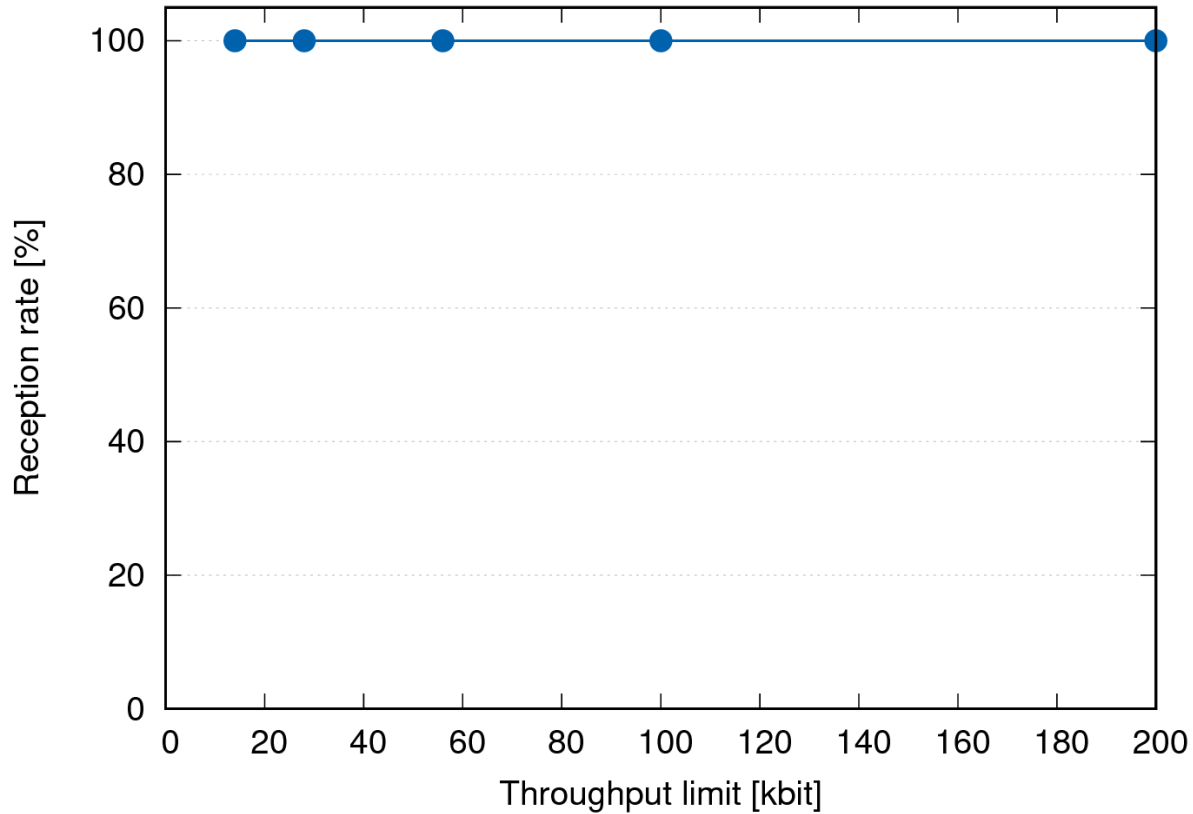
ROS2: reception rate for sensor data



ROS2: latency for critical messages



Differences in implementations



Limitations of simplified DDS API

- Missing Quality of Service settings:
 - Deadline
 - LatencyBudget
- No access to useful events:
 - Liveliness lost
 - Offered deadline missed
- Limited configuration
 - Participant liveliness
 - Heartbeat period

Pros

- ROS2 makes use of the mature and powerful DDS standard
- Flexibility to choose a suitable implementation

Cons

- DDS is a complex standard with ample configuration options
- Differences between the implementations
- Limited access to the DDS features

Thank you!



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https://github.com/piappl/ros2_benchmarking