

Pre Lab Submission

Index: 200506K, 200556L, 200520X

1. The binaries are generated in the install/ and build/ directories within our workspace (On relative path where colcon build command is executed)
- 2.

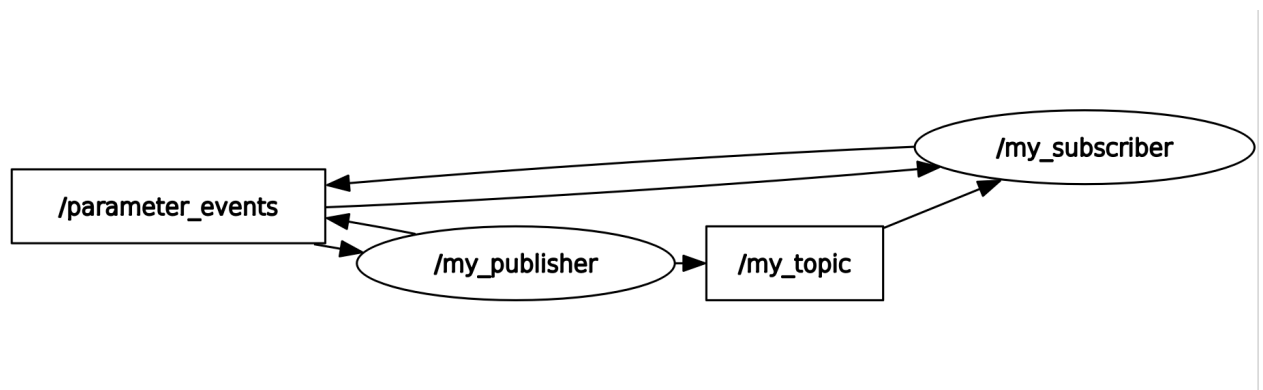
```
rajana@HP-Pavillon-Laptop: ~/ros2_ws
rajana@HP-Pavillon-Laptop: ~/ros2_ws 204x32

[INFO] [1729136972.415579490] [my_publisher]: Publishing: 'Hello, world! 86'
[INFO] [1729136972.915585665] [my_publisher]: Publishing: 'Hello, world! 87'
[INFO] [1729136973.415585890] [my_publisher]: Publishing: 'Hello, world! 88'
[INFO] [1729136973.915603683] [my_publisher]: Publishing: 'Hello, world! 89'
[INFO] [1729136974.415577005] [my_publisher]: Publishing: 'Hello, world! 90'
[INFO] [1729136974.915587658] [my_publisher]: Publishing: 'Hello, world! 91'
[INFO] [1729136975.415614552] [my_publisher]: Publishing: 'Hello, world! 92'
[INFO] [1729136975.915632499] [my_publisher]: Publishing: 'Hello, world! 93'
[INFO] [1729136976.415715063] [my_publisher]: Publishing: 'Hello, world! 94'
[INFO] [1729136976.915674217] [my_publisher]: Publishing: 'Hello, world! 95'
[INFO] [1729136977.41580352] [my_publisher]: Publishing: 'Hello, world! 96'
[INFO] [1729136977.915717370] [my_publisher]: Publishing: 'Hello, world! 97'
[INFO] [1729136978.415812684] [my_publisher]: Publishing: 'Hello, world! 98'
[INFO] [1729136978.915765135] [my_publisher]: Publishing: 'Hello, world! 99'
[INFO] [1729136979.415855119] [my_publisher]: Publishing: 'Hello, world! 100'
[INFO] [1729136979.915805880] [my_publisher]: Publishing: 'Hello, world! 101'
[INFO] [1729136980.415891992] [my_publisher]: Publishing: 'Hello, world! 102'
[INFO] [1729136980.915920929] [my_publisher]: Publishing: 'Hello, world! 103'
[INFO] [1729136981.41582187] [my_publisher]: Publishing: 'Hello, world! 104'
[INFO] [1729136981.915892965] [my_publisher]: Publishing: 'Hello, world! 105'
[INFO] [1729136982.415983928] [my_publisher]: Publishing: 'Hello, world! 106'
[INFO] [1729136982.915954187] [my_publisher]: Publishing: 'Hello, world! 107'
[INFO] [1729136983.416032931] [my_publisher]: Publishing: 'Hello, world! 108'
[INFO] [1729136983.915995067] [my_publisher]: Publishing: 'Hello, world! 109'
[INFO] [1729136984.416011884] [my_publisher]: Publishing: 'Hello, world! 110'
[INFO] [1729136984.916019404] [my_publisher]: Publishing: 'Hello, world! 111'
[INFO] [1729136985.416038358] [my_publisher]: Publishing: 'Hello, world! 112'
[INFO] [1729136985.916065049] [my_publisher]: Publishing: 'Hello, world! 113'
[INFO] [1729136986.416192407] [my_publisher]: Publishing: 'Hello, world! 114'
[INFO] [1729136986.916106407] [my_publisher]: Publishing: 'Hello, world! 115'
[INFO] [1729136987.416213289] [my_publisher]: Publishing: 'Hello, world! 116'

rajana@HP-Pavillon-Laptop: ~/ros2_ws 204x22

[INFO] [1729136977.416231885] [my_subscriber]: I heard: 'Hello, world! 96'
[INFO] [1729136977.916054059] [my_subscriber]: I heard: 'Hello, world! 97'
[INFO] [1729136978.416100048] [my_subscriber]: I heard: 'Hello, world! 98'
[INFO] [1729136978.916059999] [my_subscriber]: I heard: 'Hello, world! 99'
[INFO] [1729136979.416278442] [my_subscriber]: I heard: 'Hello, world! 100'
[INFO] [1729136979.916146357] [my_subscriber]: I heard: 'Hello, world! 101'
[INFO] [1729136980.416318890] [my_subscriber]: I heard: 'Hello, world! 102'
[INFO] [1729136980.916310227] [my_subscriber]: I heard: 'Hello, world! 103'
[INFO] [1729136981.416198310] [my_subscriber]: I heard: 'Hello, world! 104'
[INFO] [1729136981.916317247] [my_subscriber]: I heard: 'Hello, world! 105'
[INFO] [1729136982.416437290] [my_subscriber]: I heard: 'Hello, world! 106'
[INFO] [1729136982.916312294] [my_subscriber]: I heard: 'Hello, world! 107'
[INFO] [1729136983.416380691] [my_subscriber]: I heard: 'Hello, world! 108'
[INFO] [1729136983.916330863] [my_subscriber]: I heard: 'Hello, world! 109'
[INFO] [1729136984.416360250] [my_subscriber]: I heard: 'Hello, world! 110'
[INFO] [1729136984.916320821] [my_subscriber]: I heard: 'Hello, world! 111'
[INFO] [1729136985.416373279] [my_subscriber]: I heard: 'Hello, world! 112'
[INFO] [1729136985.916405246] [my_subscriber]: I heard: 'Hello, world! 113'
[INFO] [1729136986.41622839] [my_subscriber]: I heard: 'Hello, world! 114'
[INFO] [1729136986.916512751] [my_subscriber]: I heard: 'Hello, world! 115'
[INFO] [1729136987.416665598] [my_subscriber]: I heard: 'Hello, world! 116'
```

3. rqt_graph result



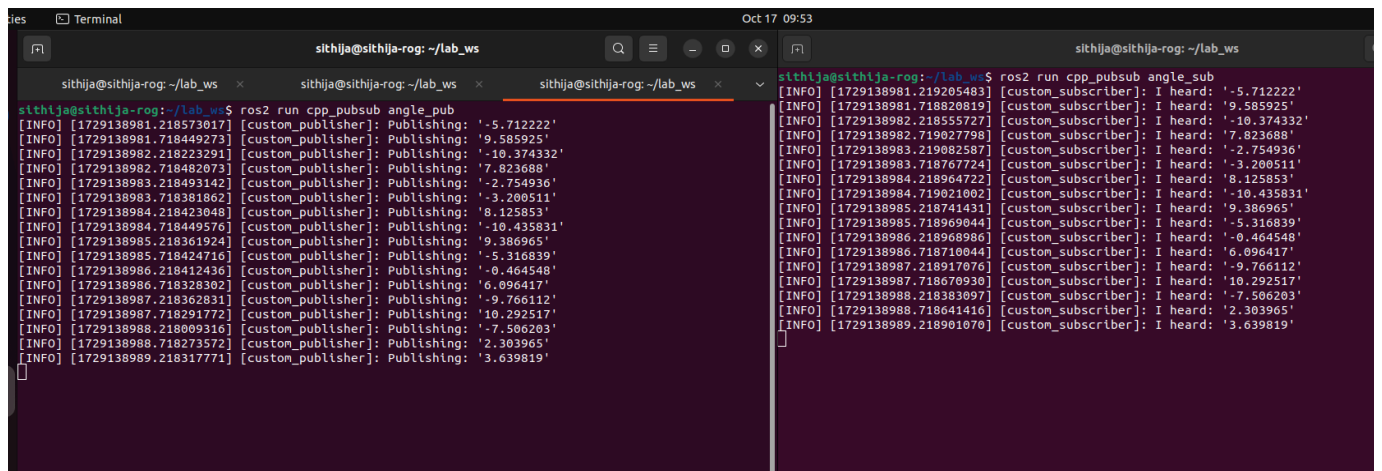
4. Custom Publisher

```
1  #include <chrono>
2  #include <functional>
3  #include <memory>
4  #include <string>
5  #include <cmath>
6  #include "rclcpp/rclcpp.hpp"
7  #include "std_msgs/msg/float32.hpp"
8
9  using namespace std::chrono_literals;
10
11 class CustomPublisher : public rclcpp::Node
12 {
13 public:
14     CustomPublisher()
15         : Node("custom_publisher"), count_(0)
16     {
17         float timePeriod = 0.5;
18         publisher_ = this->create_publisher<std_msgs::msg::Float32>("topic", 10);
19         timer_ = this->create_wall_timer(
20             std::chrono::duration<float>(timePeriod),
21             std::bind(&CustomPublisher::timer_callback, this));
22     }
23
24 private:
25     float A = 10.5;
26     float omega = 20.0;
27     int timeSteps = 1;
28     float timePeriod = 0.5;
29     void timer_callback()
30     {
31         auto message = std_msgs::msg::Float32();
32         message.data = A * sin(omega * timePeriod * timeSteps);
33         RCLCPP_INFO(this->get_logger(), "Publishing: '%f'", message.data);
34         publisher_>publish(message);
35         timeSteps += 1;
36     }
37
38     rclcpp::TimerBase::SharedPtr timer_;
39     rclcpp::Publisher<std_msgs::msg::Float32>::SharedPtr publisher_;
40     size_t count_;
41 };
42
43 int main(int argc, char * argv[])
44 {
45     rclcpp::init(argc, argv);
46     rclcpp::spin(std::make_shared<CustomPublisher>());
47     rclcpp::shutdown();
48     return 0;
49 }
```

5. Custom Subscriber

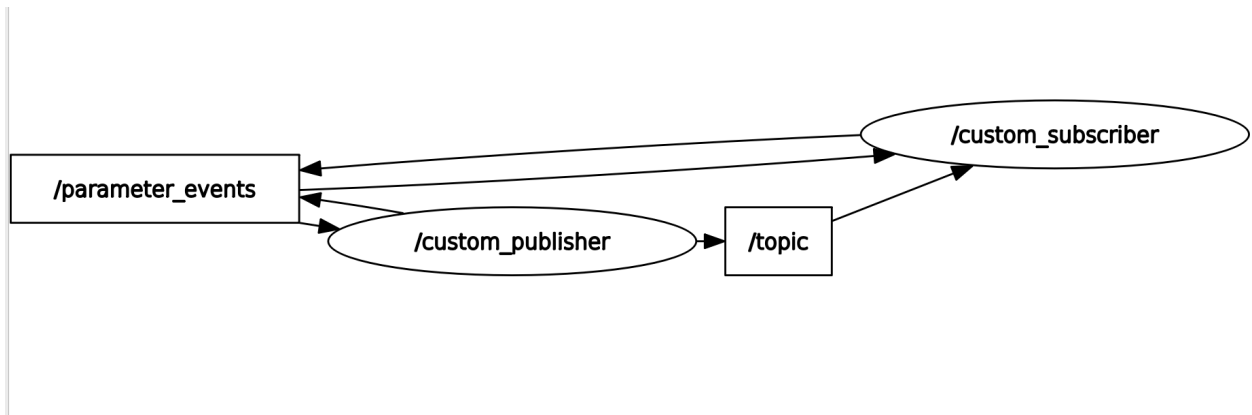
```
cpp_pubsub > src > custom_subscriber.cpp > _1
1 #include <memory>
2 #include "rclcpp/rclcpp.hpp"
3 #include "std_msgs/msg/float32.hpp"
4 using std::placeholders::_1;
5
6 class MinimalSubscriber : public rclcpp::Node
7 {
8 public:
9     MinimalSubscriber()
10     : Node("custom_subscriber")
11     {
12         subscription_ = this->create_subscription<std_msgs::msg::Float32>(
13             "topic", 10, std::bind(&MinimalSubscriber::topic_callback, this, _1));
14     }
15
16 private:
17     void topic_callback(const std_msgs::msg::Float32 & msg) const
18     {
19         RCLCPP_INFO(this->get_logger(), "I heard: '%f'", msg.data);
20     }
21     rclcpp::Subscription<std_msgs::msg::Float32>::SharedPtr subscription_;
22 };
23
24 int main(int argc, char * argv[])
25 {
26     rclcpp::init(argc, argv);
27     rclcpp::spin(std::make_shared<MinimalSubscriber>());
28     rclcpp::shutdown();
29     return 0;
30 }
31
```

6. Publisher and subscriber output windows

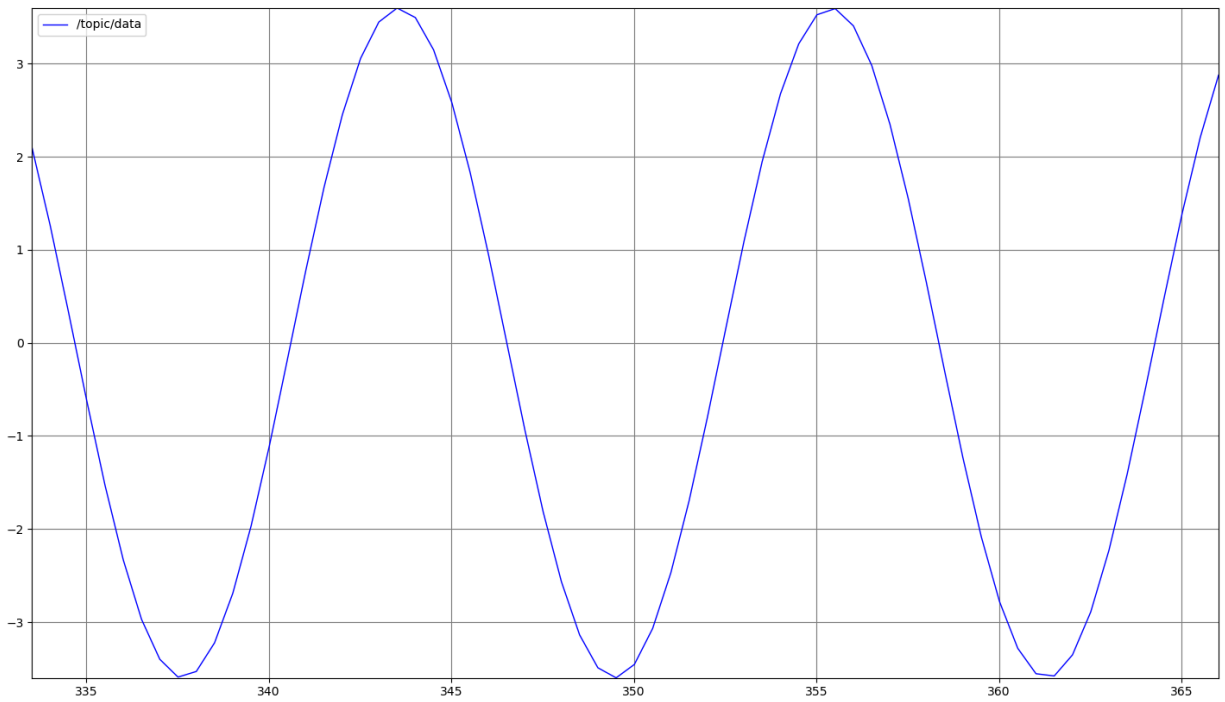


```
sithija@sithija-rog: ~/lab_ws
sithija@sithija-rog: ~/lab_ws
sithija@sithija-rog: ~/lab_ws
sithija@sithija-rog: ~/lab_ws$ ros2 run cpp_pubsub angle_pub
[INFO] [1729138981.218573017] [custom_publisher]: Publishing: '-5.712222'
[INFO] [1729138981.718449273] [custom_publisher]: Publishing: '9.585925'
[INFO] [1729138982.218223291] [custom_publisher]: Publishing: '-10.374332'
[INFO] [1729138982.718482073] [custom_publisher]: Publishing: '7.823688'
[INFO] [1729138983.218493142] [custom_publisher]: Publishing: '-2.754936'
[INFO] [1729138983.718381862] [custom_publisher]: Publishing: '-3.200511'
[INFO] [1729138984.218423048] [custom_publisher]: Publishing: '8.125853'
[INFO] [1729138984.718449576] [custom_publisher]: Publishing: '-10.435831'
[INFO] [1729138985.218361924] [custom_publisher]: Publishing: '9.386965'
[INFO] [1729138985.718424716] [custom_publisher]: Publishing: '-5.316839'
[INFO] [1729138986.218412436] [custom_publisher]: Publishing: '-0.464548'
[INFO] [1729138986.718328302] [custom_publisher]: Publishing: '6.096417'
[INFO] [1729138987.218362831] [custom_publisher]: Publishing: '-9.766112'
[INFO] [1729138987.718291772] [custom_publisher]: Publishing: '10.292517'
[INFO] [1729138988.218009316] [custom_publisher]: Publishing: '-7.506203'
[INFO] [1729138988.718273572] [custom_publisher]: Publishing: '2.303965'
[INFO] [1729138989.218317771] [custom_publisher]: Publishing: '3.639819'
sithija@sithija-rog: ~/lab_ws$ ros2 run cpp_pubsub angle_sub
[INFO] [1729138981.219205483] [custom_subscriber]: I heard: '-5.712222'
[INFO] [1729138981.718820819] [custom_subscriber]: I heard: '9.585925'
[INFO] [1729138982.218555727] [custom_subscriber]: I heard: '-10.374332'
[INFO] [1729138982.719027798] [custom_subscriber]: I heard: '7.823688'
[INFO] [1729138983.219082587] [custom_subscriber]: I heard: '-2.754936'
[INFO] [1729138983.718767724] [custom_subscriber]: I heard: '-3.200511'
[INFO] [1729138984.218964722] [custom_subscriber]: I heard: '8.125853'
[INFO] [1729138984.719021002] [custom_subscriber]: I heard: '-10.435831'
[INFO] [1729138985.218741431] [custom_subscriber]: I heard: '9.386965'
[INFO] [1729138985.718969044] [custom_subscriber]: I heard: '-5.316839'
[INFO] [1729138986.218968986] [custom_subscriber]: I heard: '-0.464548'
[INFO] [1729138986.718710044] [custom_subscriber]: I heard: '6.096417'
[INFO] [1729138987.218917076] [custom_subscriber]: I heard: '-9.766112'
[INFO] [1729138987.718670930] [custom_subscriber]: I heard: '10.292517'
[INFO] [1729138988.218383097] [custom_subscriber]: I heard: '-7.506203'
[INFO] [1729138988.718641416] [custom_subscriber]: I heard: '2.303965'
[INFO] [1729138989.218901070] [custom_subscriber]: I heard: '3.639819'
```

7. a) rqt_graph for custom publisher and subscriber



b)



$A = 3.6$

$\omega = 100.0$

$T = 0.5$