Course of

Robot Programming with ROS 2

Day 1

3. Node Programming I

ikerlan

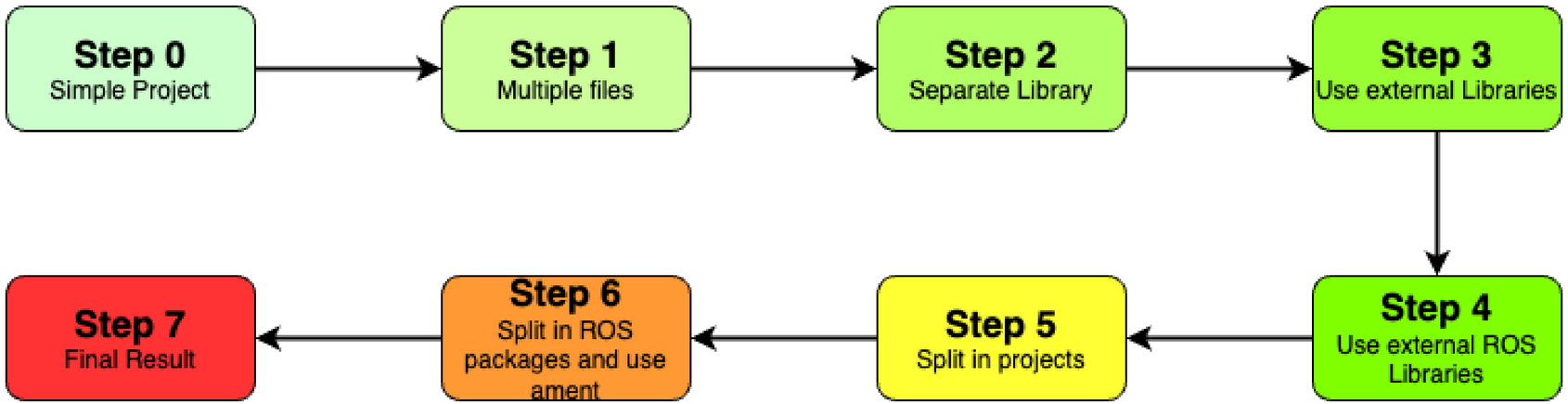
Universidad Rey Juan Carlos

Intelligent Robotics Lab

CMAKE

- Works on top of Makefile
- Make easier to manage projects
- Standard in Open Source development (and beyond)

- Let's walk into the examples



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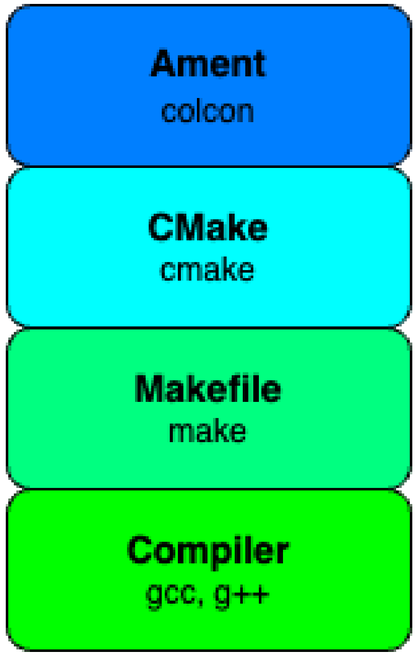
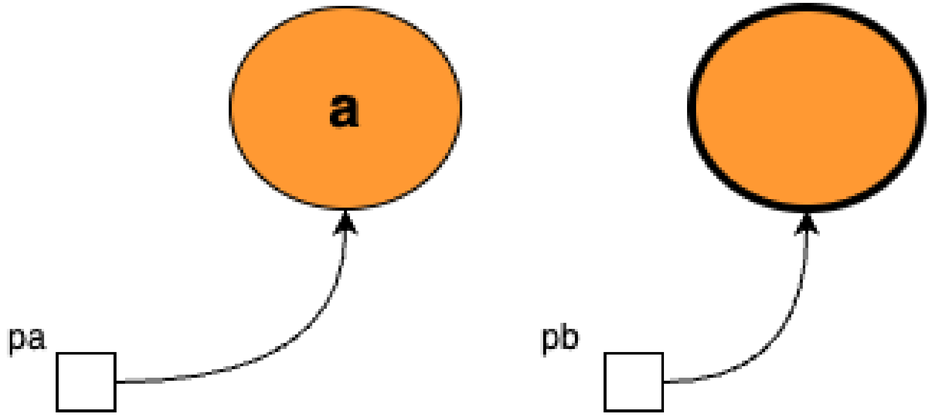


Smart Pointers

```
{
  Rectangle a;
  Rectangle * pa = &a;

  Rectangle * pb = new Reactangle();

}
```



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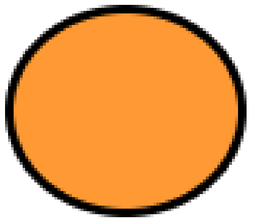
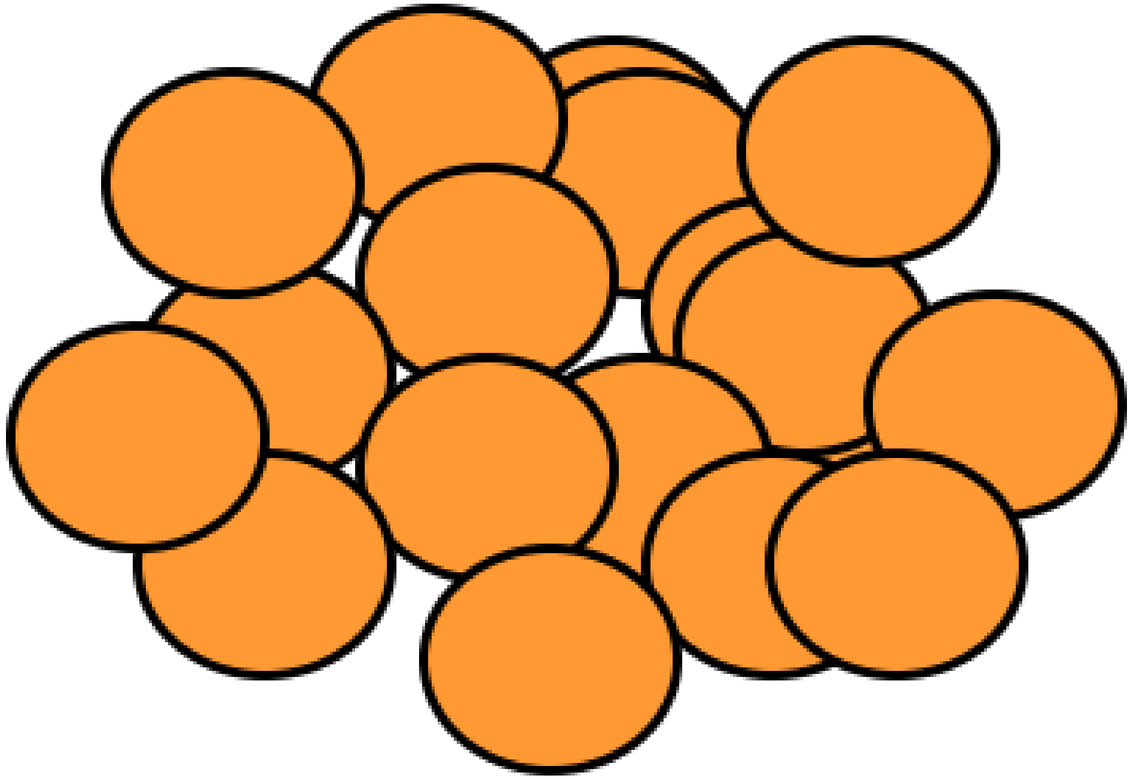


Smart Pointers

```
for (int i = 0; i < 100; i++) {
  Rectangle a;
  Rectangle * pa = &a;

  Rectangle * pb = new Reactangle();

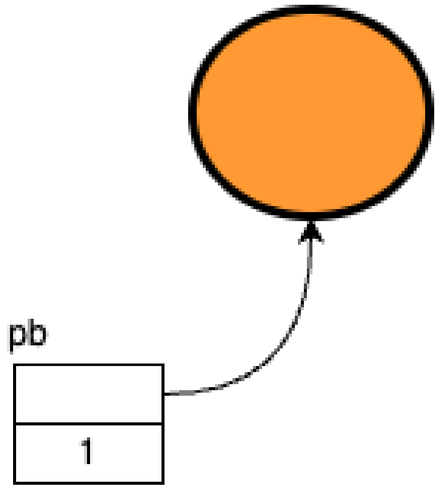
}
```



Smart Pointers

```
{
    std::shared_ptr<Rectangle> pb = std::shared_ptr<Rectangle>(new Reactangle());

}
```



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{
    auto pb = std::shared_ptr<Rectangle>(new Reactangle());
}
```

```
{
    auto pb = std::make_shared<Rectangle>();
}
```

Smart Pointers

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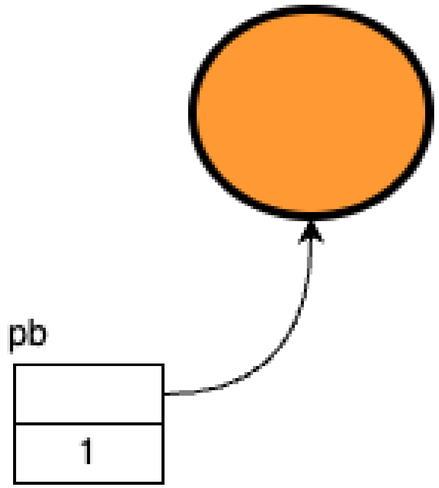

Smart Pointers

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  std::shared_ptr<Rectangle> pa;

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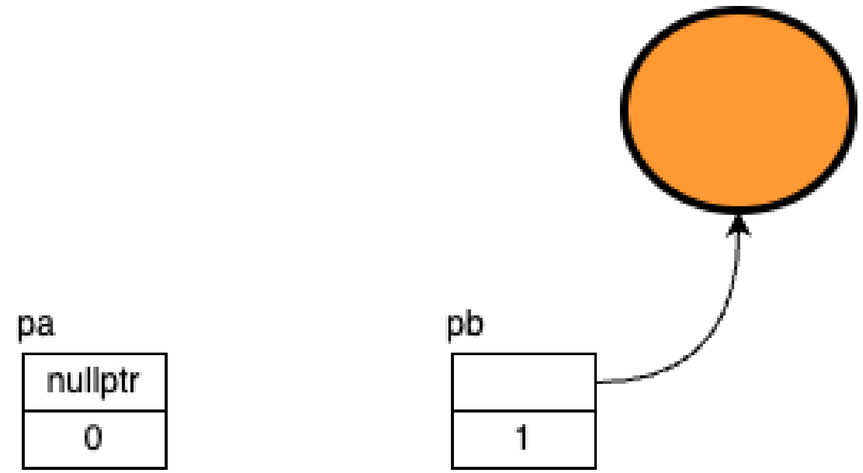
}
```



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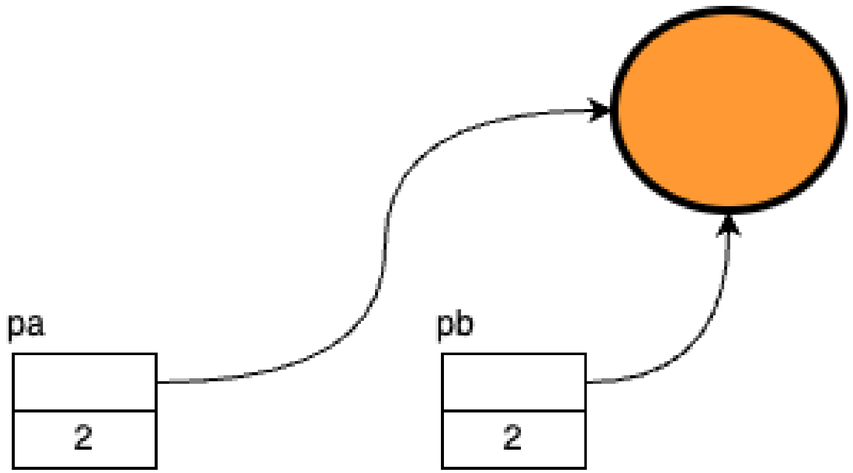

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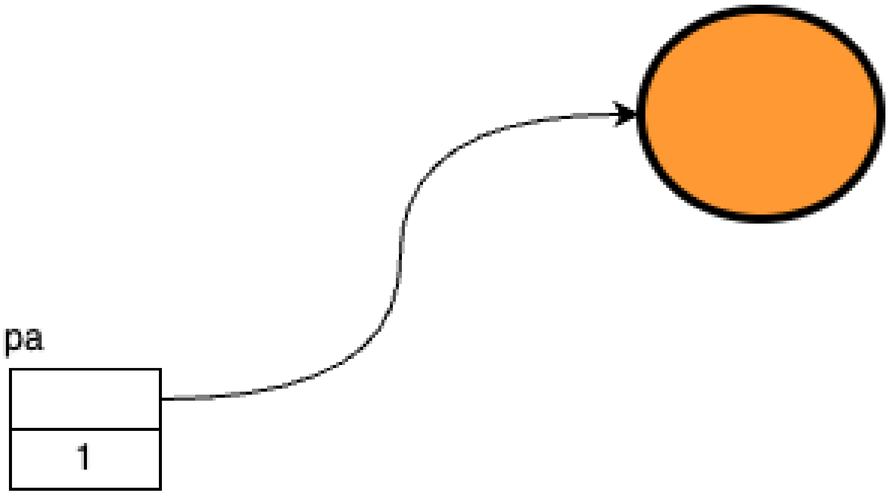

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}
```

Smart Pointers

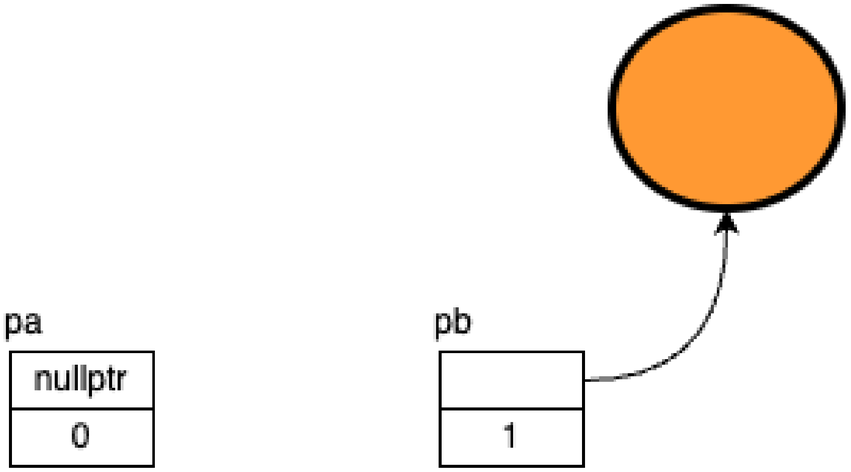
```
{
  std::unique_ptr<Rectangle> pa;

  {
    auto pb = std::make_unique<Rectangle>();

    pa = std::move(pb);

  }

}
```



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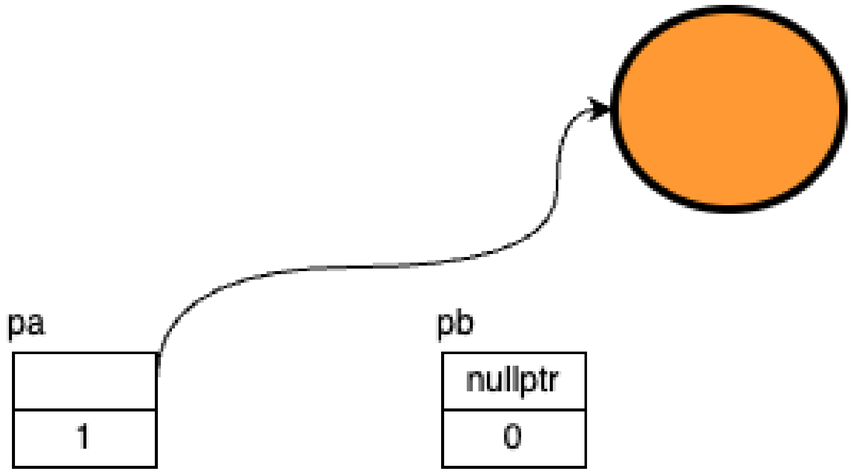

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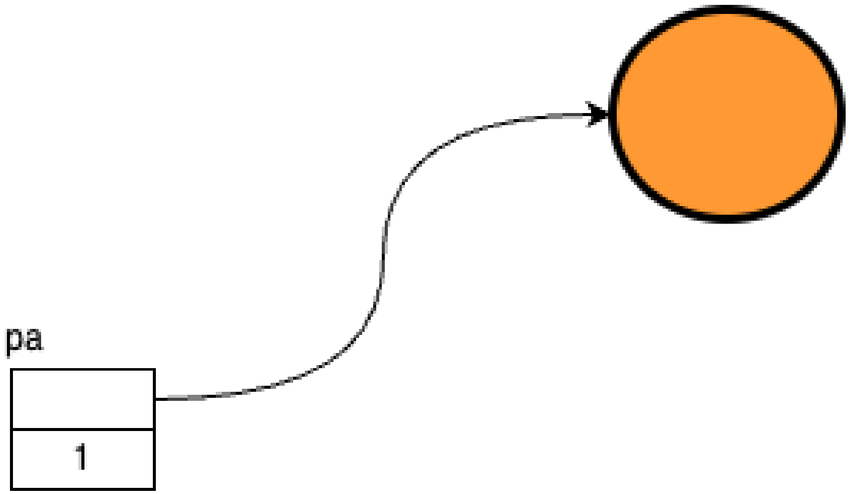

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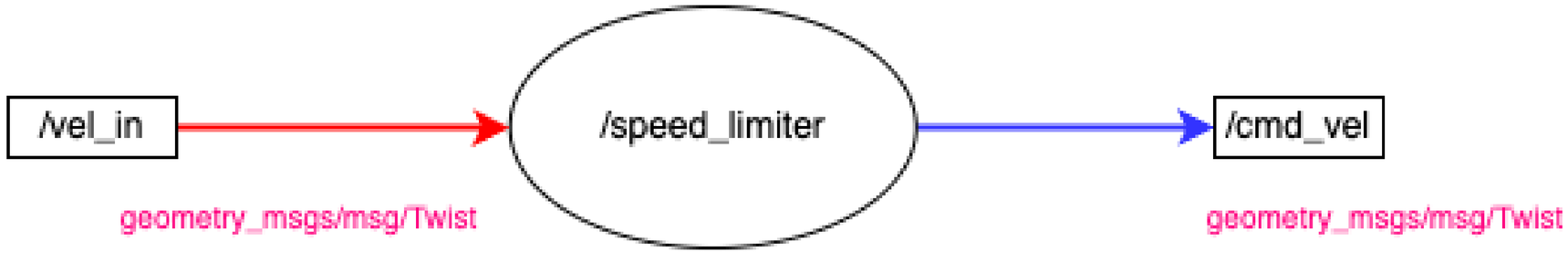
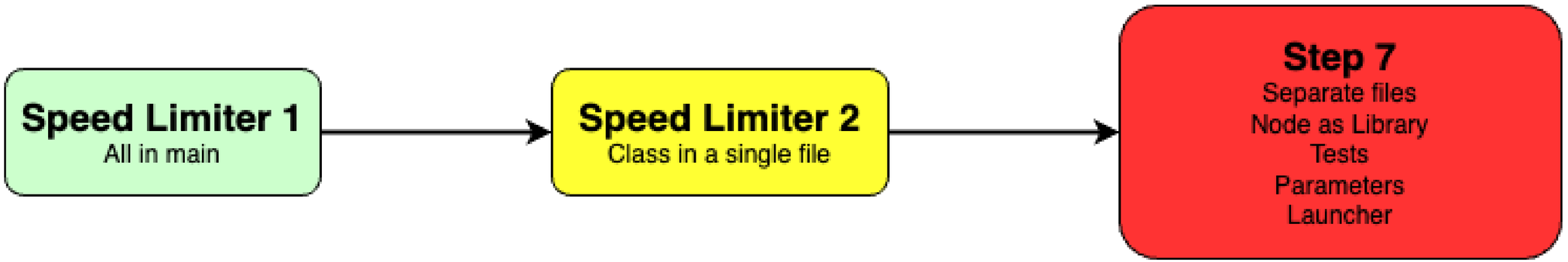
Node Programming

Speed limiter





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Node Programming

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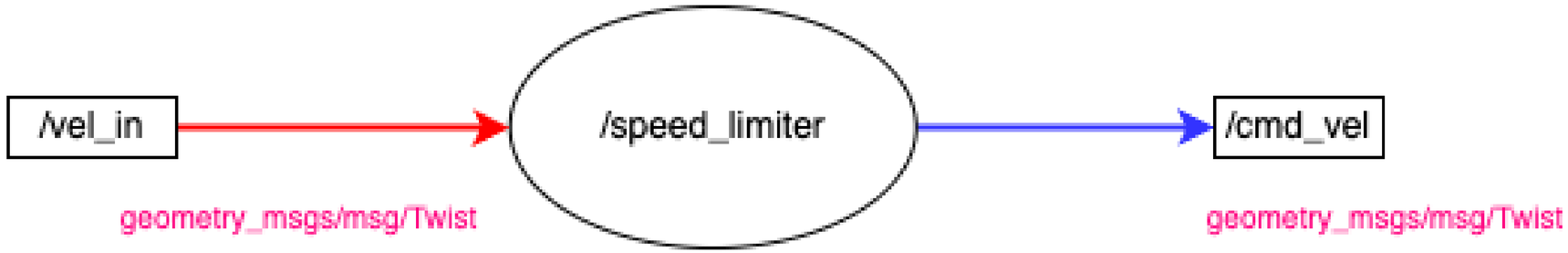

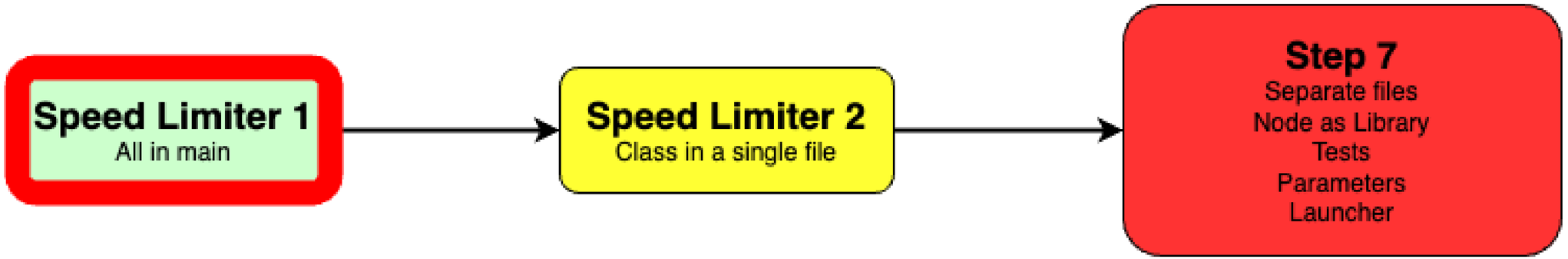

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Node Programming

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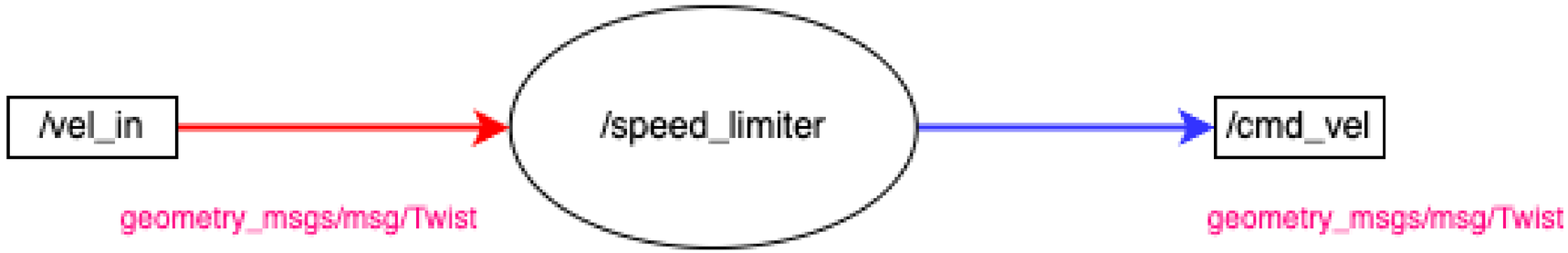

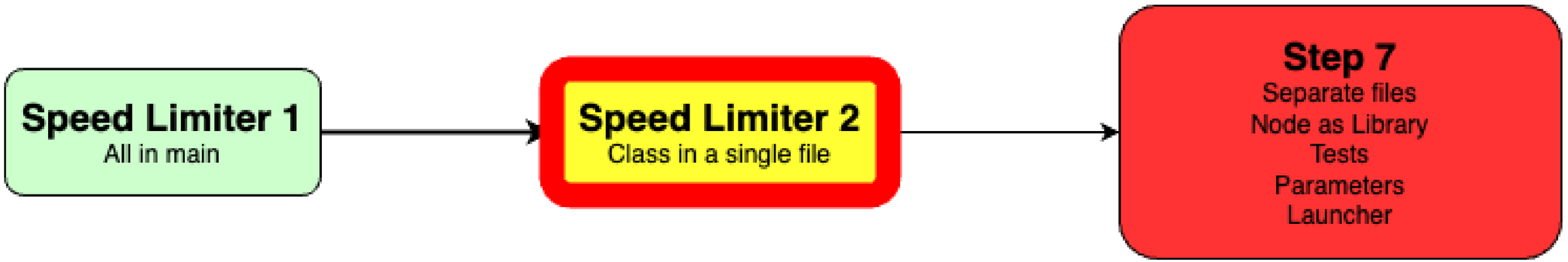

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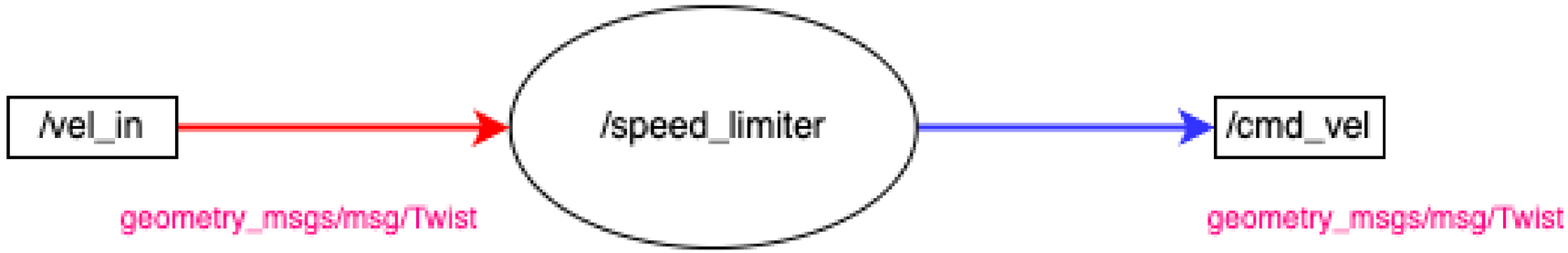

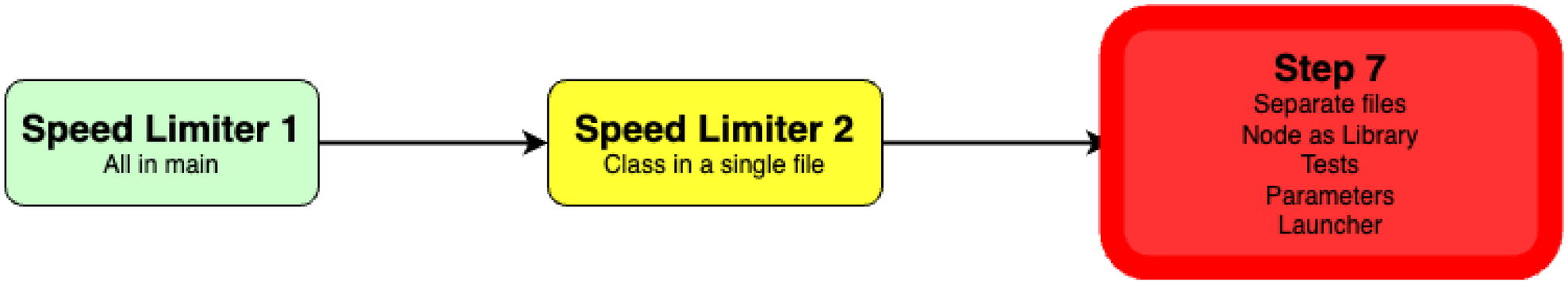

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Further topics

About QoS

Default	Reliable	Volatile	Keep Last
Services	Reliable	Volatile	Normal Queue
Sensor	Best Effort	Volatile	Small Queue
DParameters	Reliable	Volatile	Large Queue

```
publisher = node->create_publisher<std_msgs::msg::String>(
  "chatter", rclcpp::QoS(100).transient_local().best_effort());
```

```
publisher_ = create_publisher<sensor_msgs::msg::LaserScan>(
  "scan", rclcpp::SensorDataQoS().reliable());
```

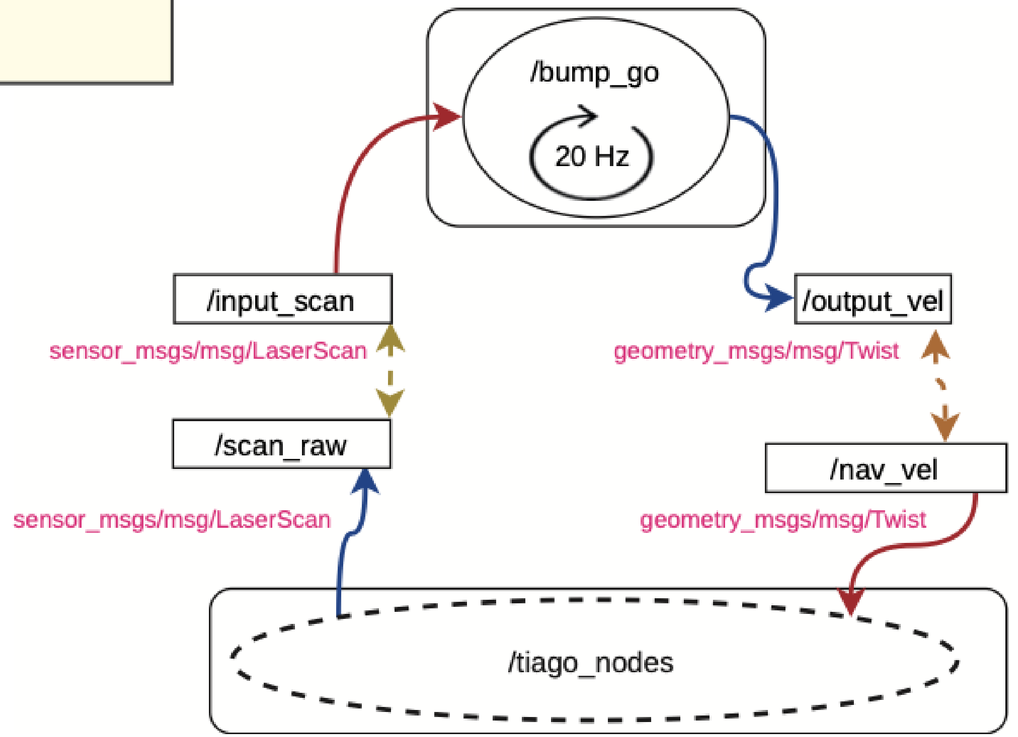
Compatibility of QoS **durability** profiles		**Subscriber**	
		Volatile	**Transient Local**
Publisher	**Volatile**	Volatile	**No Connection**
	Transient Local	Volatile	Transient Local

Compatibility of QoS **reliability** profiles		**Subscriber**	
		Best Effort	**Reliable**
Publisher	**Best Effort**	Best Effort	**No Connection**
	Reliable	Best Effort	Reliable

Further topics

About topic names and remaps

```
$ ros2 run br2_fsm_bumpgo_cpp bumpgo --ros-args -r output_vel:=/nav_vel -r
input_scan:=/scan_raw -p use_sim_time:=true
```



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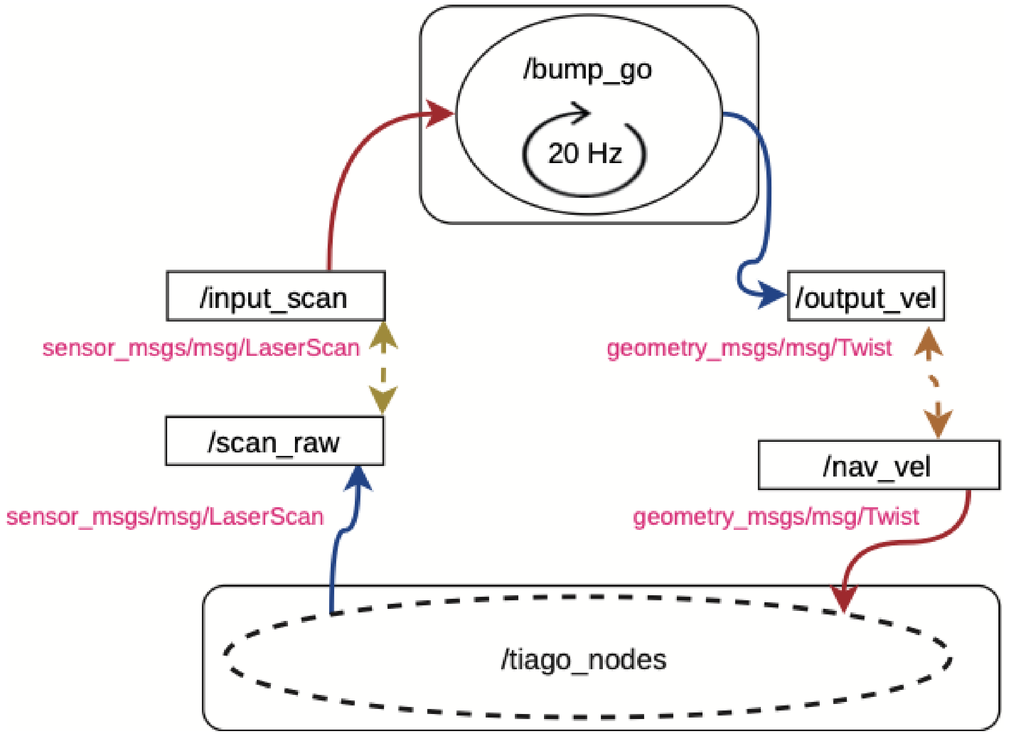
Further topics

About topic names and remaps

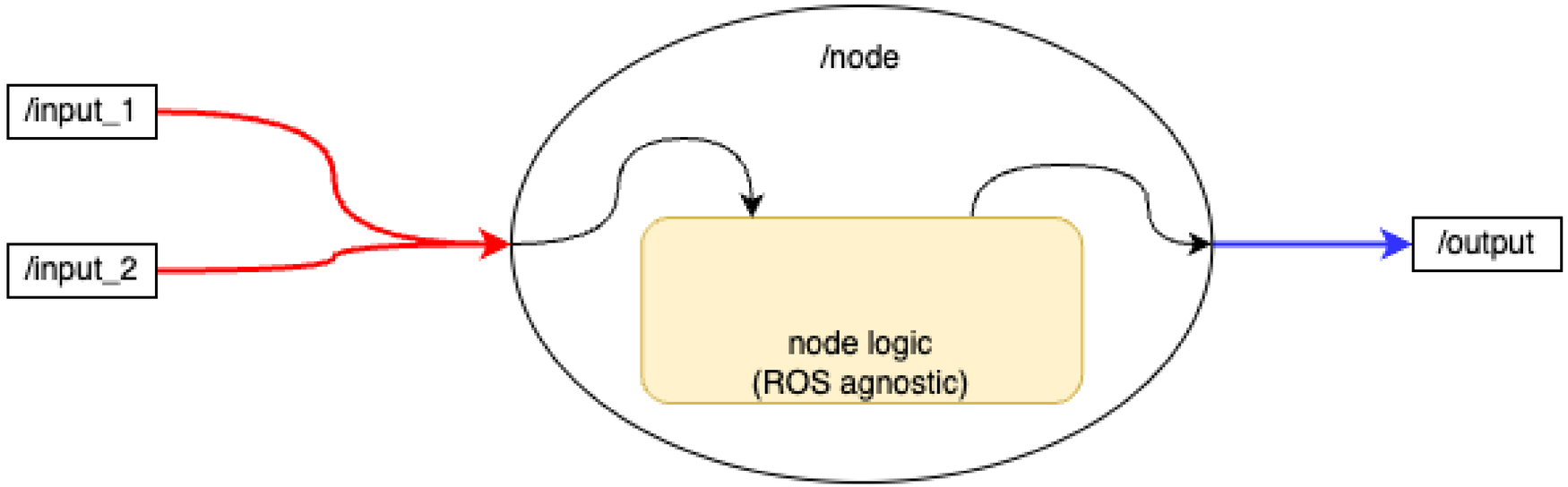
launch/bump_and_go.launch.py

```
bumpgo_cmd = Node(package='br2_fsm_bumpgo_cpp',
    executable='bumpgo',
    output='screen',
    parameters=[{
      'use_sim_time': True
    }],
    remappings=[
      ('input_scan', '/scan_raw'),
      ('output_vel', '/nav_vel')
    ])
```



Further topics

About logic separation



Further topics

About publication

Check your subscribers!!!

Don’t waste CPU time if nobody is interested in your result

```
void
ObstacleMonitorNode::control_cycle()
{
  if (marker_pub_->getNumSubscribers() == 0) {
    return;
  }

  geometry_msgs::msg::TransformStamped robot2obstacle;

  try {
    robot2obstacle = tf_buffer_.lookupTransform(
      "base_footprint", "detected_obstacle", tf2::TimePointZero);
```