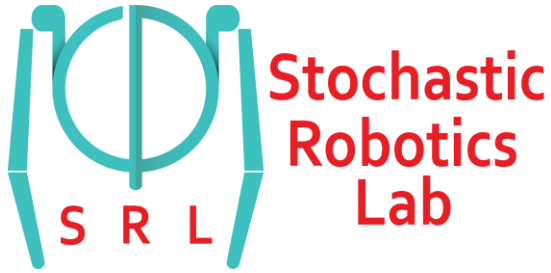
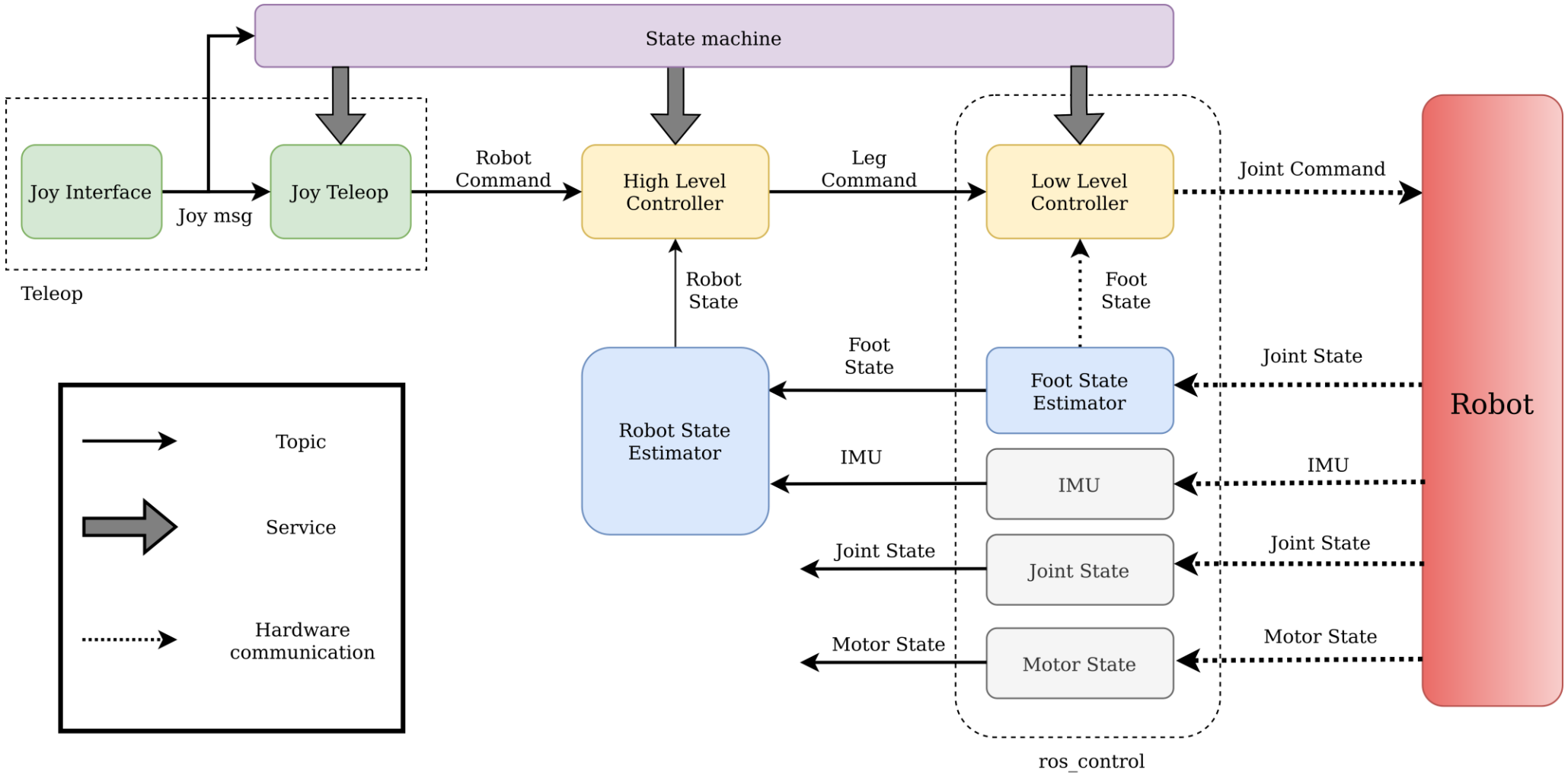
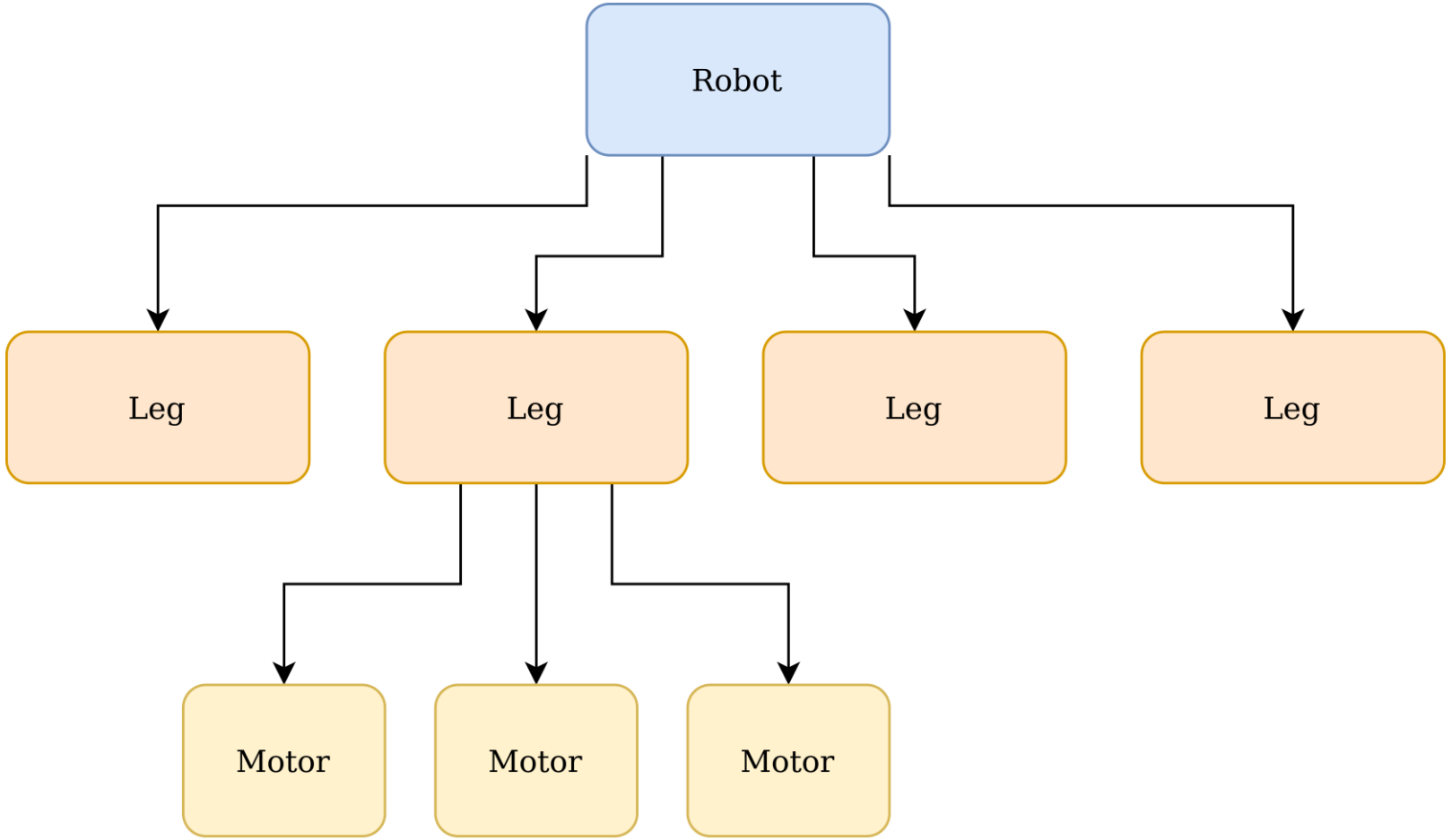


Code overview: *stoch3_ros*

Software Architecture



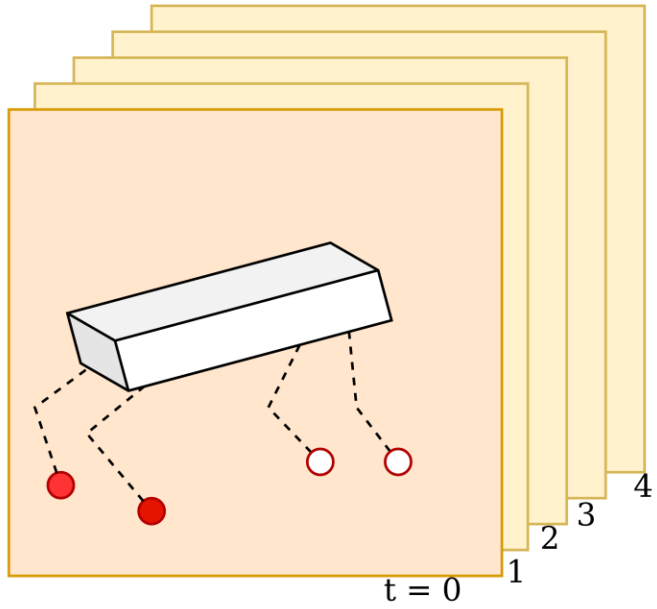
Physical Abstraction



Temporal Abstraction

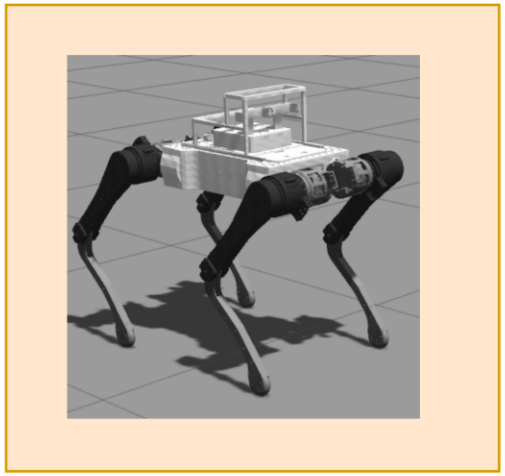
High-Level Control

Simplified dynamics + Long time horizon



Low-Level Control

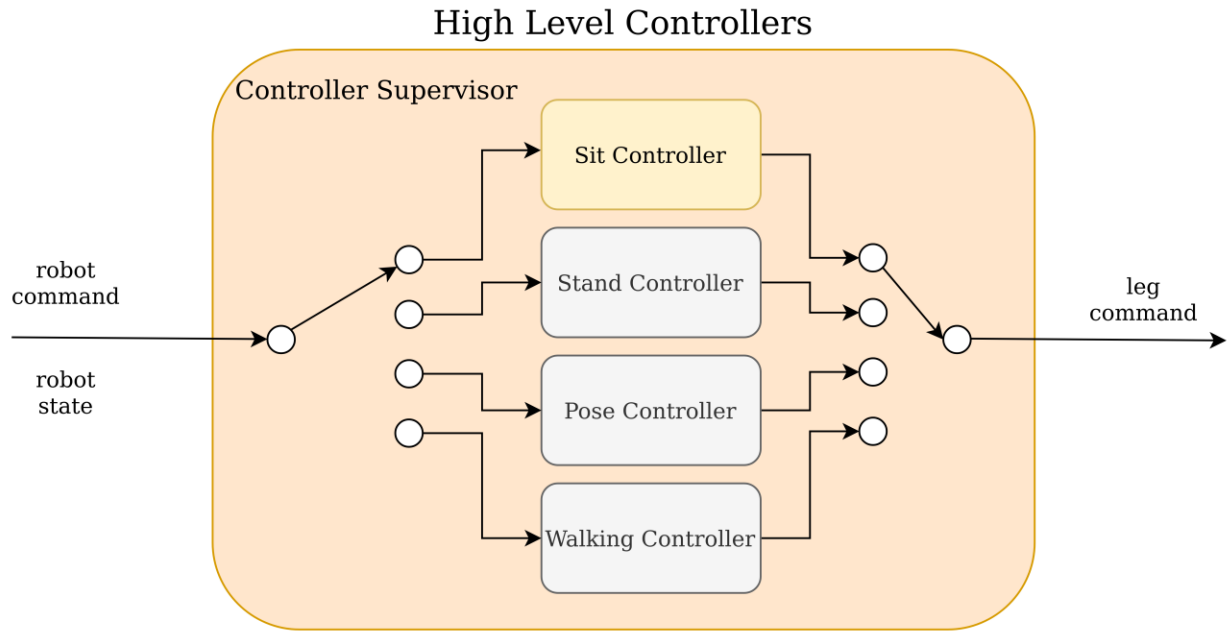
Full system dynamics + Zero time horizon



t = 0

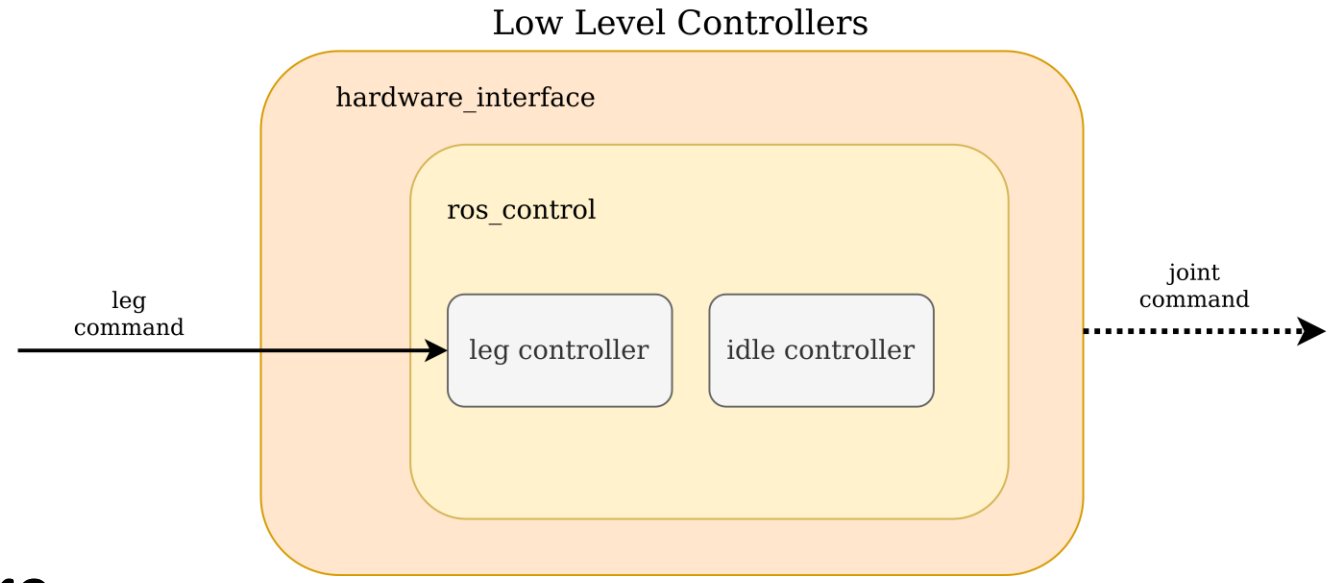
High-level Controllers

- Multiple controllers (behaviours)
- Mutually exclusive
- Seamless transition required
- Same input/output interface
- Same operating frequency



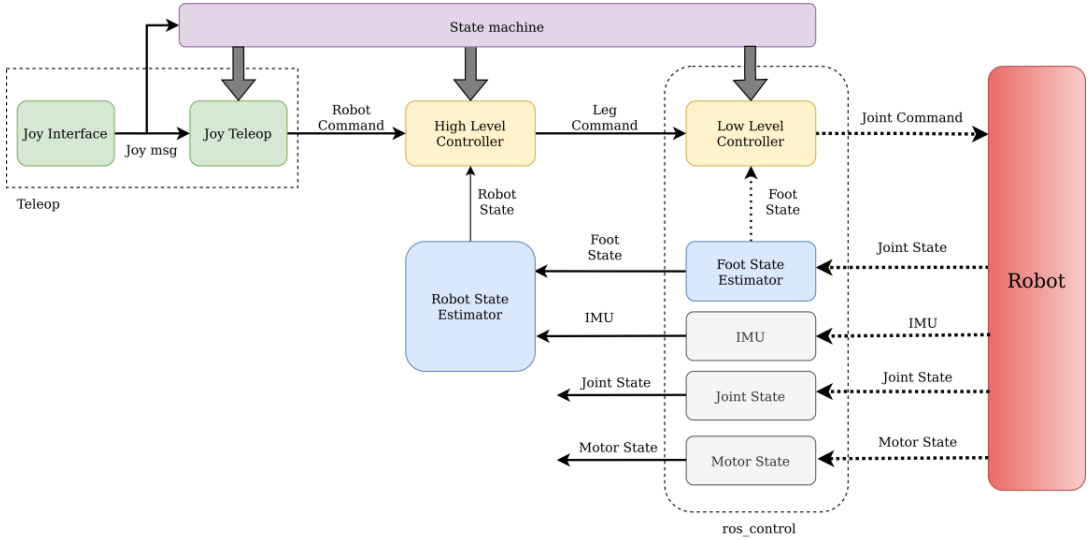
Low-level Controllers

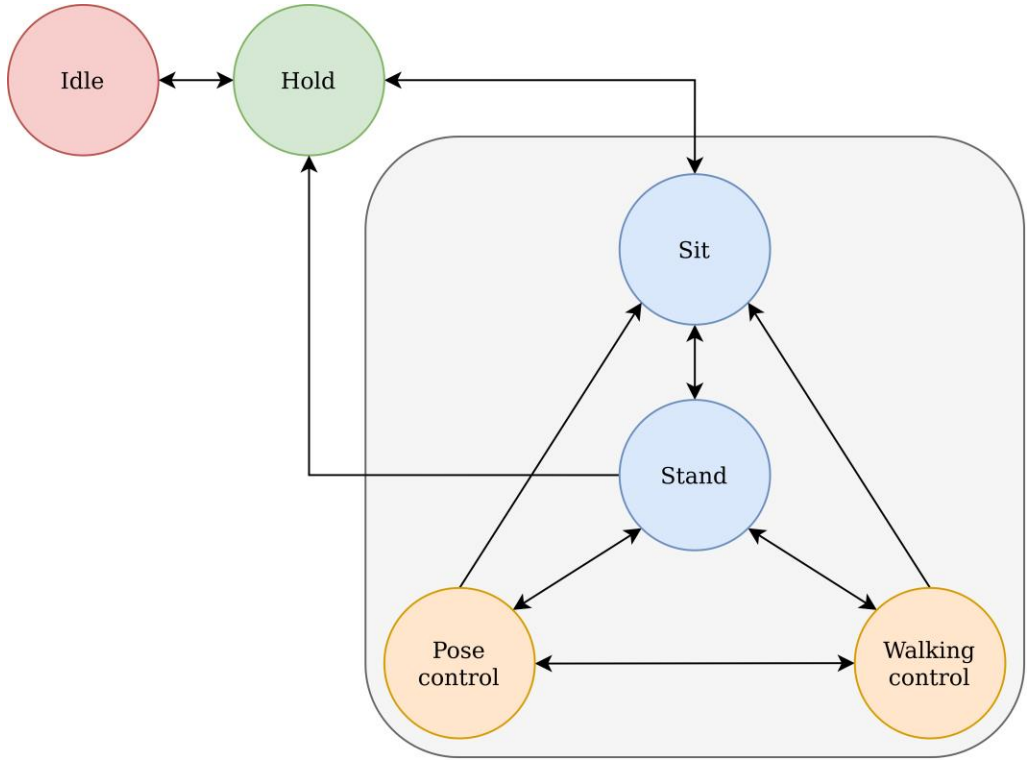
- Multiple controllers
- Some mutually exclusive
- Simultaneous execution
- Same operating frequency
- Same controllers used in simulation and on real hardware



State machine

- Helps manage different behaviours (sit, stand, walk etc.)
- Each behaviour is a robot state
- Also, maintains system state

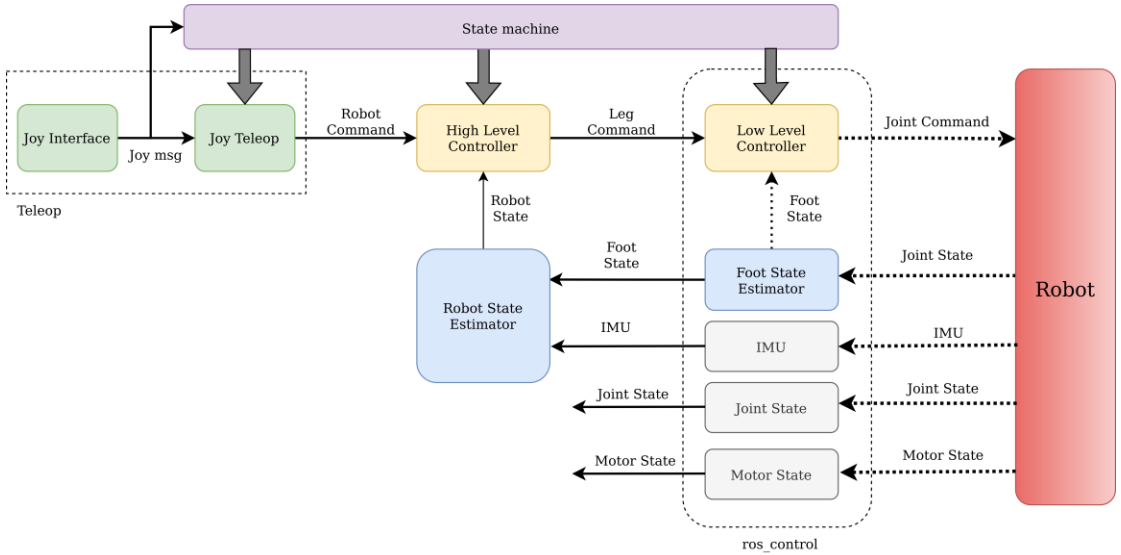




Robot Command

stoch3_msgs/RobotCommand

```
Header                  header
geometry_msgs/Twist     twist
geometry_msgs/Pose      pose
```



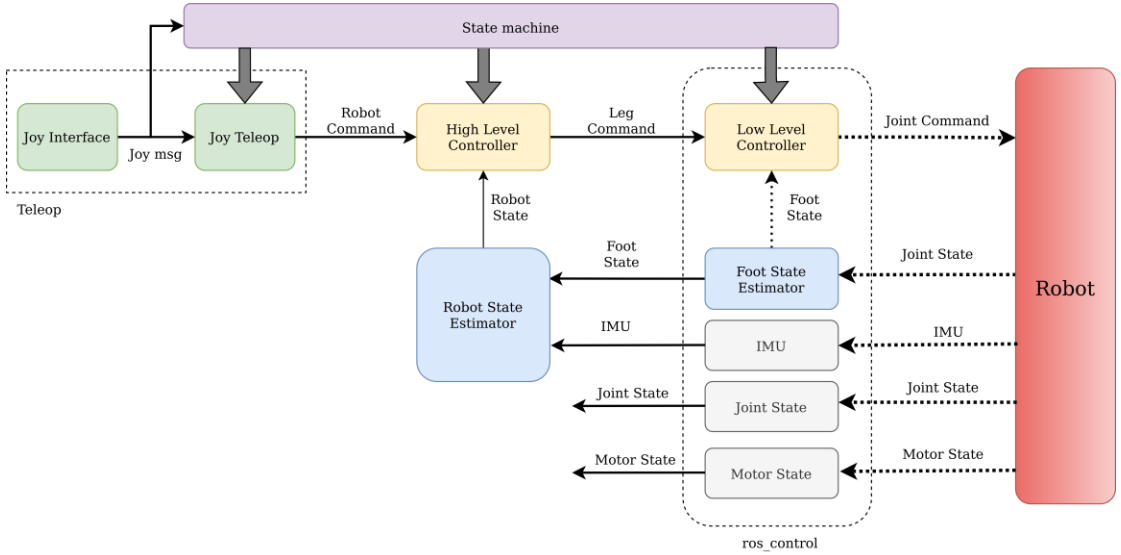
Leg Command

stoch3_msgs/LegCommand

```
geometry_msgs/Vector3 position   # Position of foot
geometry_msgs/Vector3 velocity   # Velocity of foot
geometry_msgs/Vector3 force      # Force exerted by foot on environment
float64 kp_scale
float64 kd_scale
```

stoch3_msgs/QuadrupedLegCommand

```
Header    header
stoch3_msgs/LegCommand fl
stoch3_msgs/LegCommand fr
stoch3_msgs/LegCommand bl
stoch3_msgs/LegCommand br
```



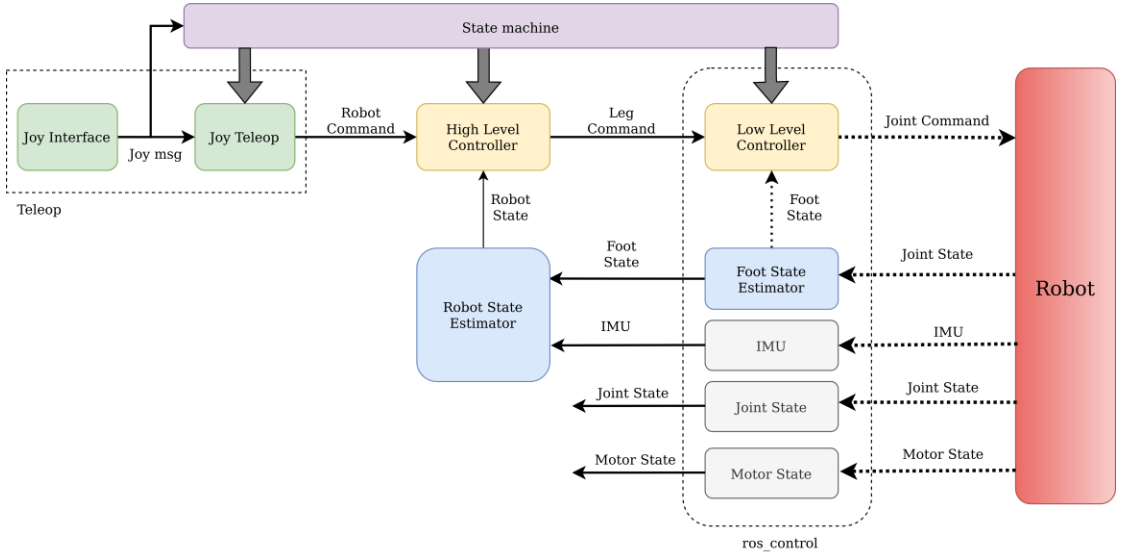
Leg State

stoch3_msgs/LegState

```
string name
geometry_msgs/Vector3 position
geometry_msgs/Vector3 velocity
geometry_msgs/Vector3 force
float64 support_probability        # [0, 1] , probability that the leg is a support leg.
                                   # Limit the value to range [0, 1] if it is outside the range.
```

stoch3_msgs/QuadrupedLegState

```
Header header
stoch3_msgs/LegState fl
stoch3_msgs/LegState fr
stoch3_msgs/LegState bl
stoch3_msgs/LegState br
```



Robot State

stoch3_msgs/QuadrupedRobotState

```
Header header
geometry_msgs/Pose pose
geometry_msgs/Twist twist
stoch3_msgs/LegState fl
stoch3_msgs/LegState fr
stoch3_msgs/LegState bl
stoch3_msgs/LegState br
```