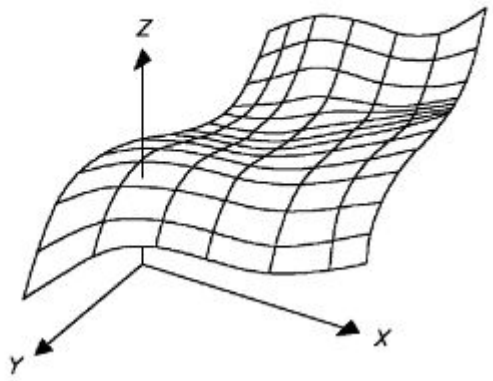
ETH zürich

Using ROS with other Simulators

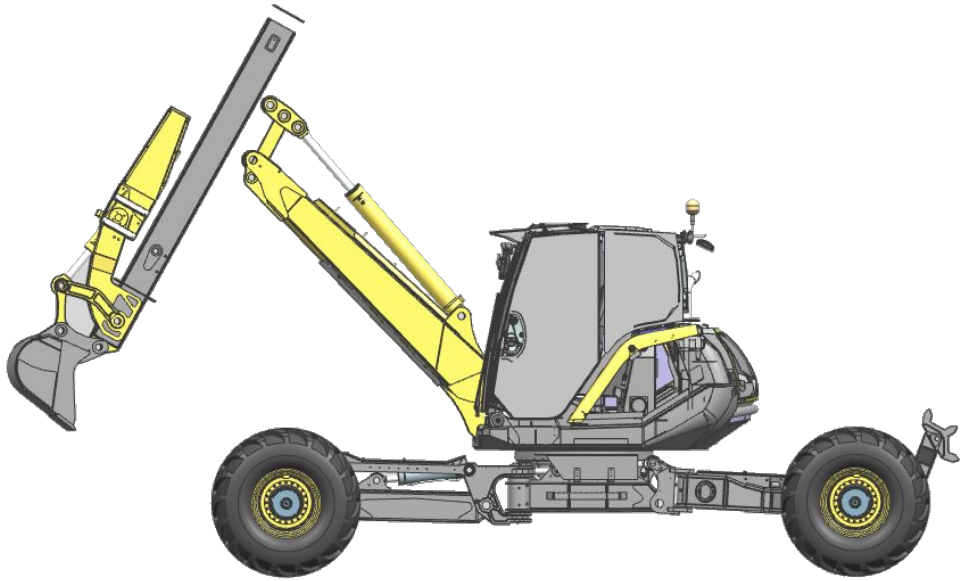
ROS Integration of Vortex Dynamics Simulation Engine

RSL Robotic Systems Lab

Autonomous Landscaping with a Walking Excavator



?



Autonomous Landscaping with a Walking Excavator

Simulators with ROS Integration

- Gazebo
- V-Rep
- Webots

Simulators with ROS Integration

- **Gazebo**
  - Open Dynamics Engine (ODE) via debian
  - Bullet via debian
  - Dynamic Animation and Robotics Toolkit (DART) via source
  - Simbody via source
- V-Rep
- Webots

Simulators with ROS Integration

- Gazebo
- **V-Rep**
  - ODE
  - Bullet
  - Vortex Dynamics (Earthwork plugin cannot be used through the V-Rep front end)
  - Newton Dynamics
- Webots

Simulators with ROS Integration

- Gazebo
- V-Rep
- **Webots**
  - ODE

Simulators with ROS Integration

- Gazebo
- V-Rep
- Webots

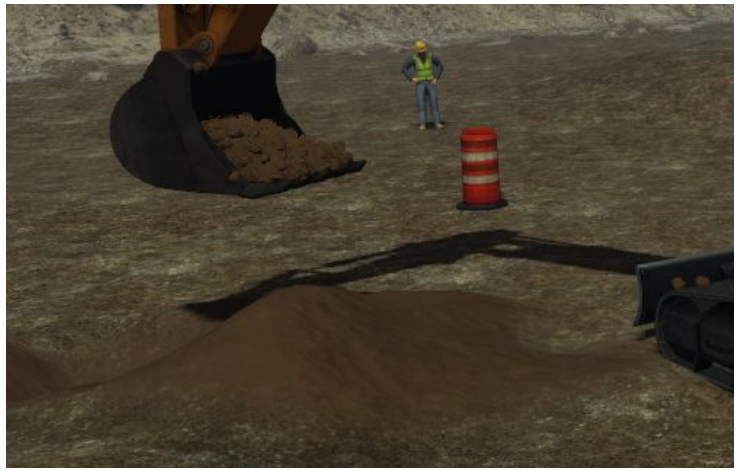
→ No earthwork possibilities in any of the simulators!

→ Implement ROS integration for Vortex Dynamics

Vortex Dynamics

Vortex Dynamics - Earthwork Plugin

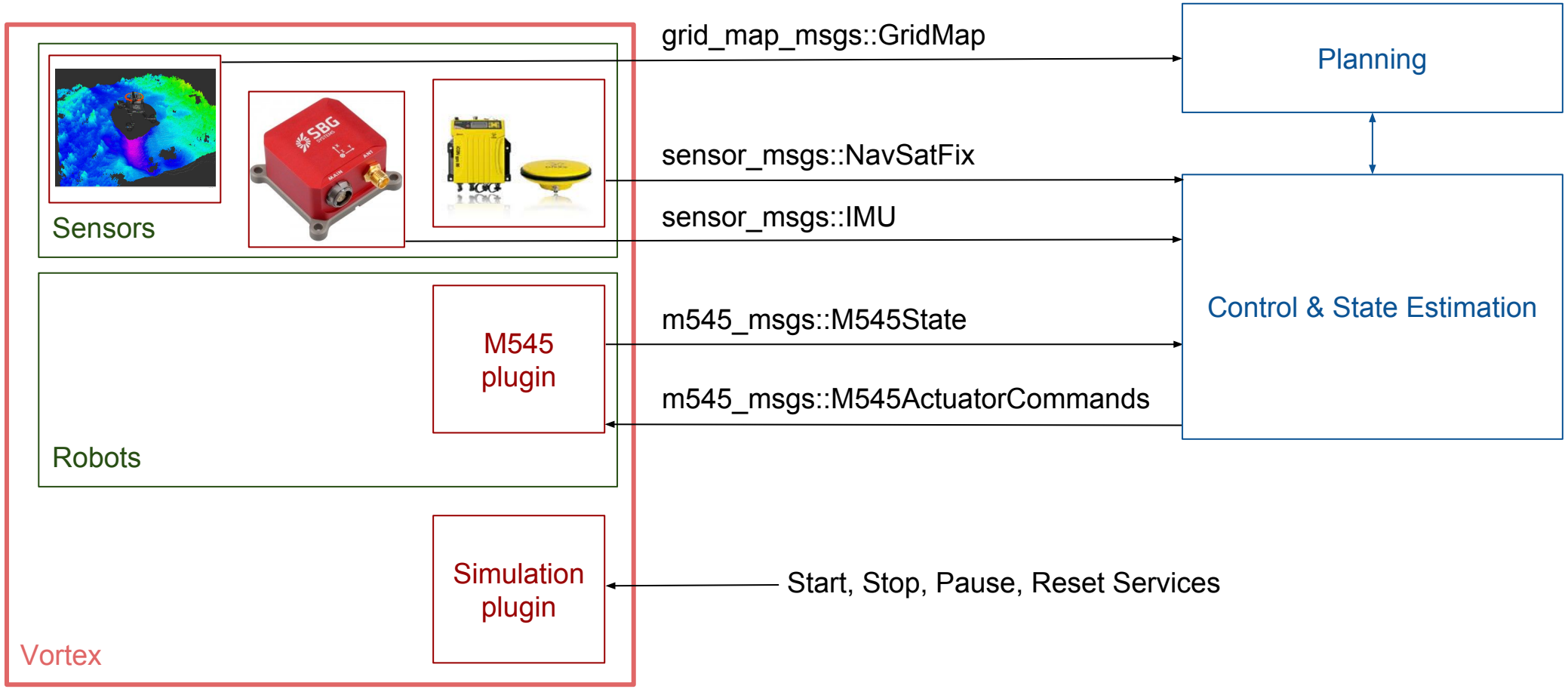
- Soil can only be simulated properly using a particle simulation
  → Millions of particles cannot be simulated in real-time
  → Vortex only uses particles around the shovel, the rest is merged into a mesh surface!



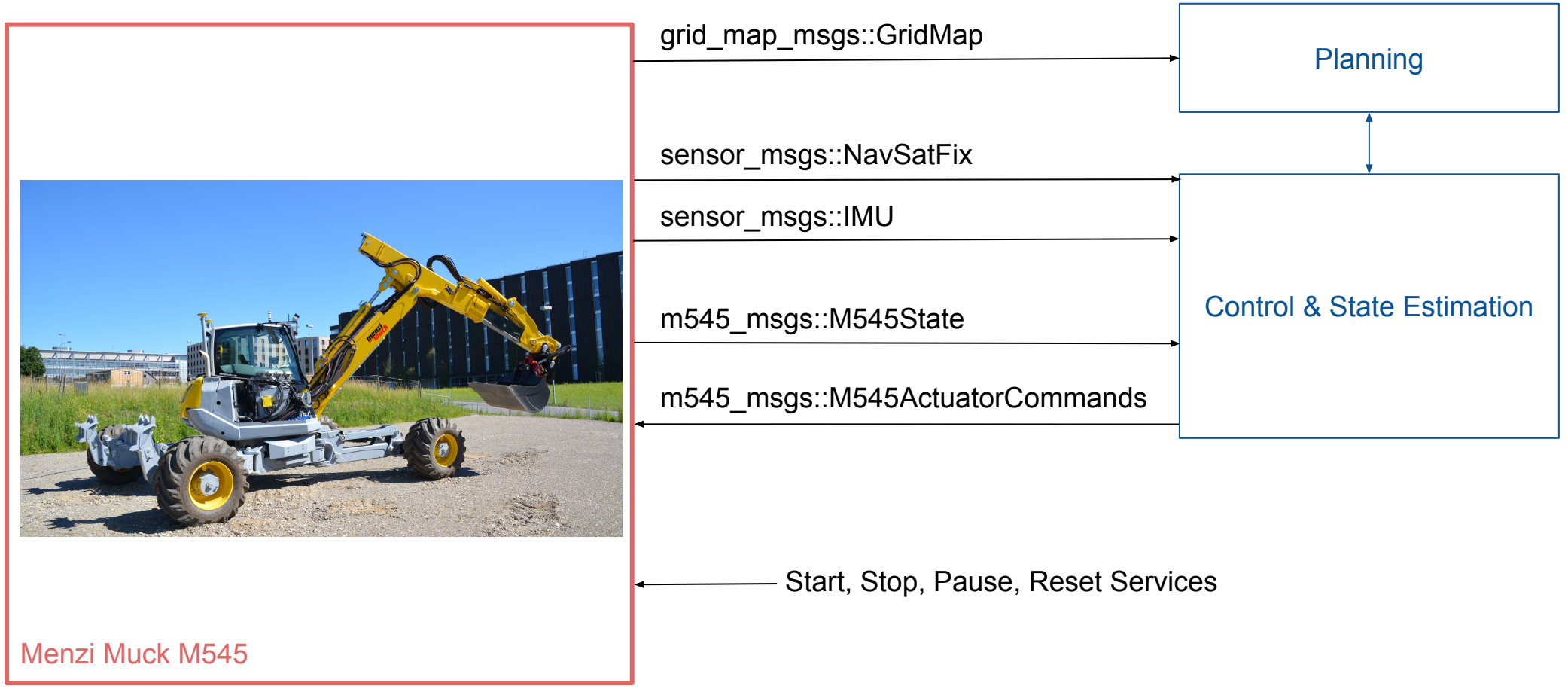
Vortex ROS Integration

- Most simulations allow plugin based integration of other software, e.g. ROS.
- Each sensor needs its own plugin
  - Realistic noise characteristics
  - Configurable
- Ideally, write an URDF parser to parse the robot model from the description
- Plugin for robot includes:
  - State publisher
  - Actuator commands subscriber

Vortex ROS Integration



Vortex ROS Integration



Final Result - Autonomous Excavation in Simulation