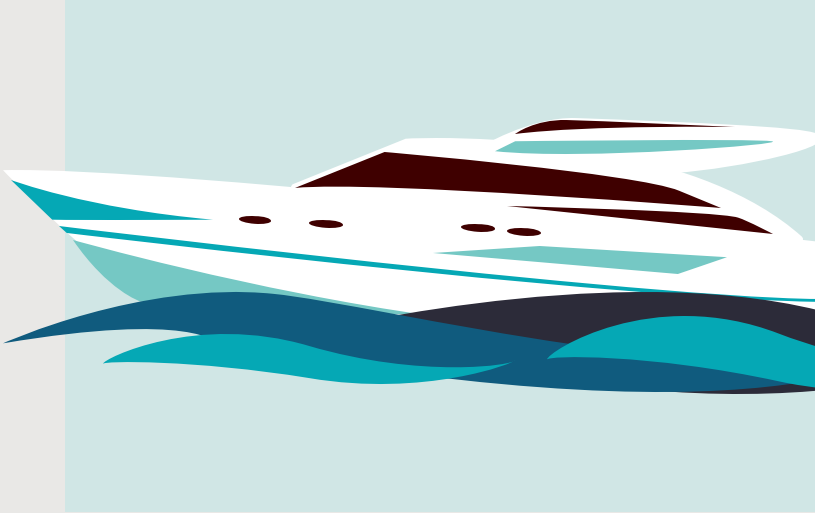
MACCS

Marine Autonomous Communication and Cleaning System



Redes e Sistemas Autónomos
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Description and Objectives

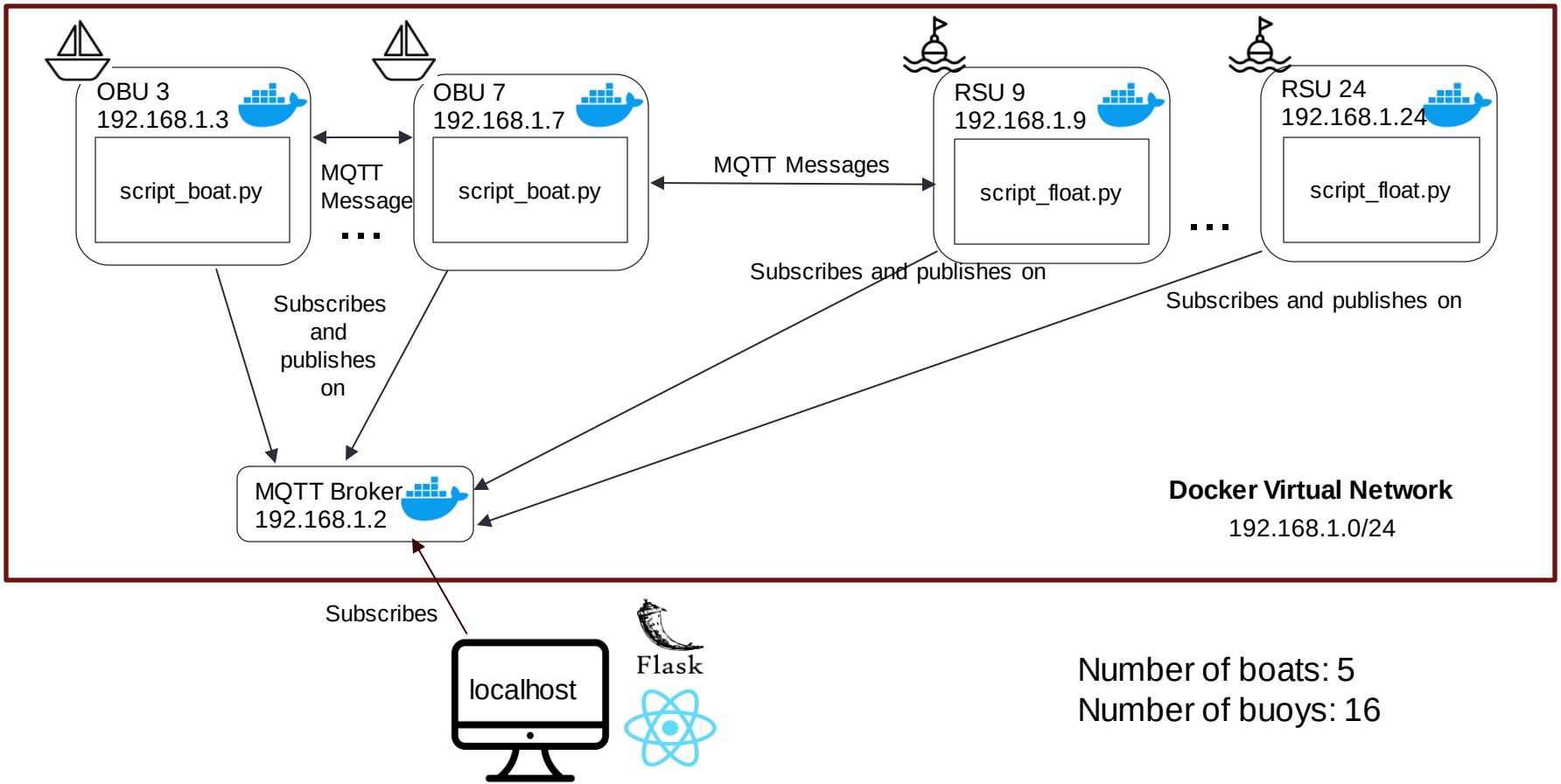
Our project aims to create a network capable of controlling autonomous boats for collecting trash in a water space.

Use the MQTT protocol to establish efficient and reliable communication between the boats and buoys, enabling the exchange of messages related to location, intentions, and operational status.

Implement a distributed system using Docker containers to facilitate the deployment and management of project components, ensuring portability and scalability.

Develop autonomous navigation algorithms for the boats, enabling them to move intelligently and efficiently to fulfill their tasks.

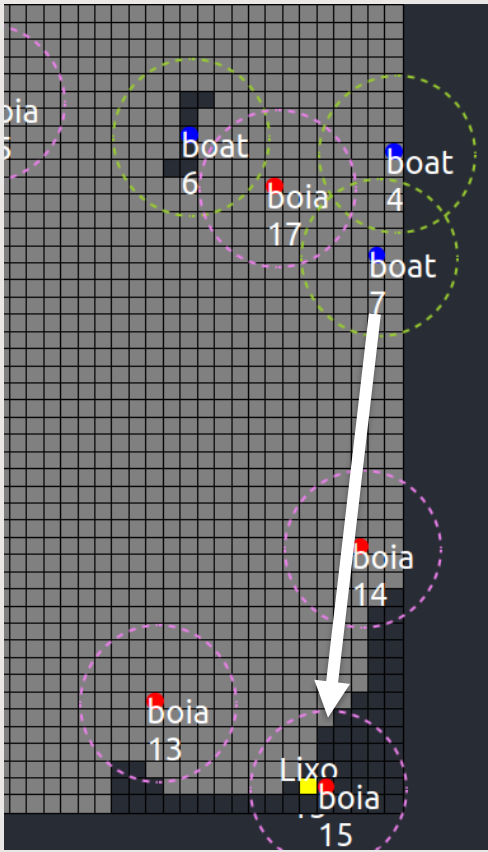
Architecture



Number of boats: 5
Number of buoys: 16

Boat Searching Algorithm

- Aims to find a near, random, unvisited location
- Searches in a small area around the current location
  - If no suitable locations are found, the search area gradually expands
  - Each location needs to have 10 unvisited locations nearby otherwise it is ignored
- If a suitable location is found, it is selected
- Otherwise, the search continues until the maximum radius is reached

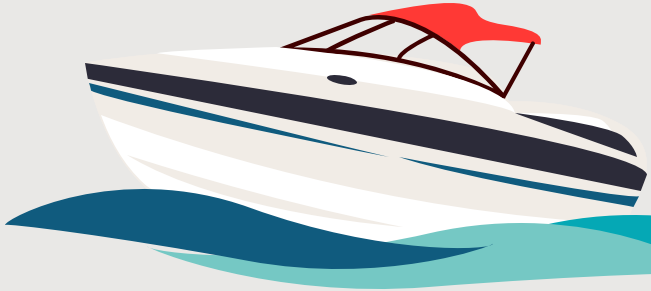


Messages Types

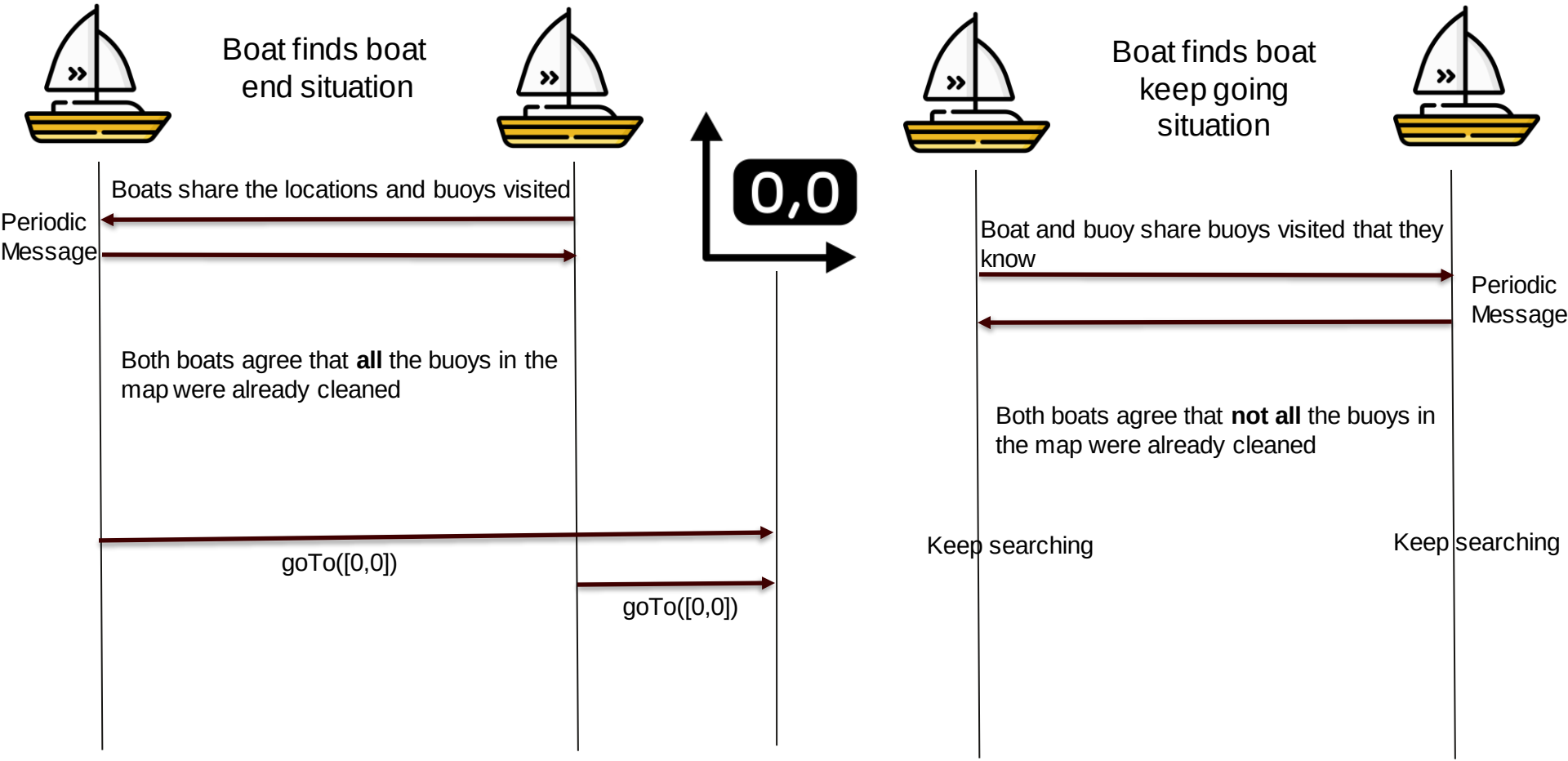
We have two types of messages

- From Boats
  - Id: <Number>
  - Intention: [] || [‘id’, [x,y](buoy location),[x,y] (trash location)]
  - Location: [x,y]
  - Status: Searching || Cleaning
  - Learning: { ‘id’, [x,y] (buoy location) }
  - Visited_locations: [[x,y](map locations)]

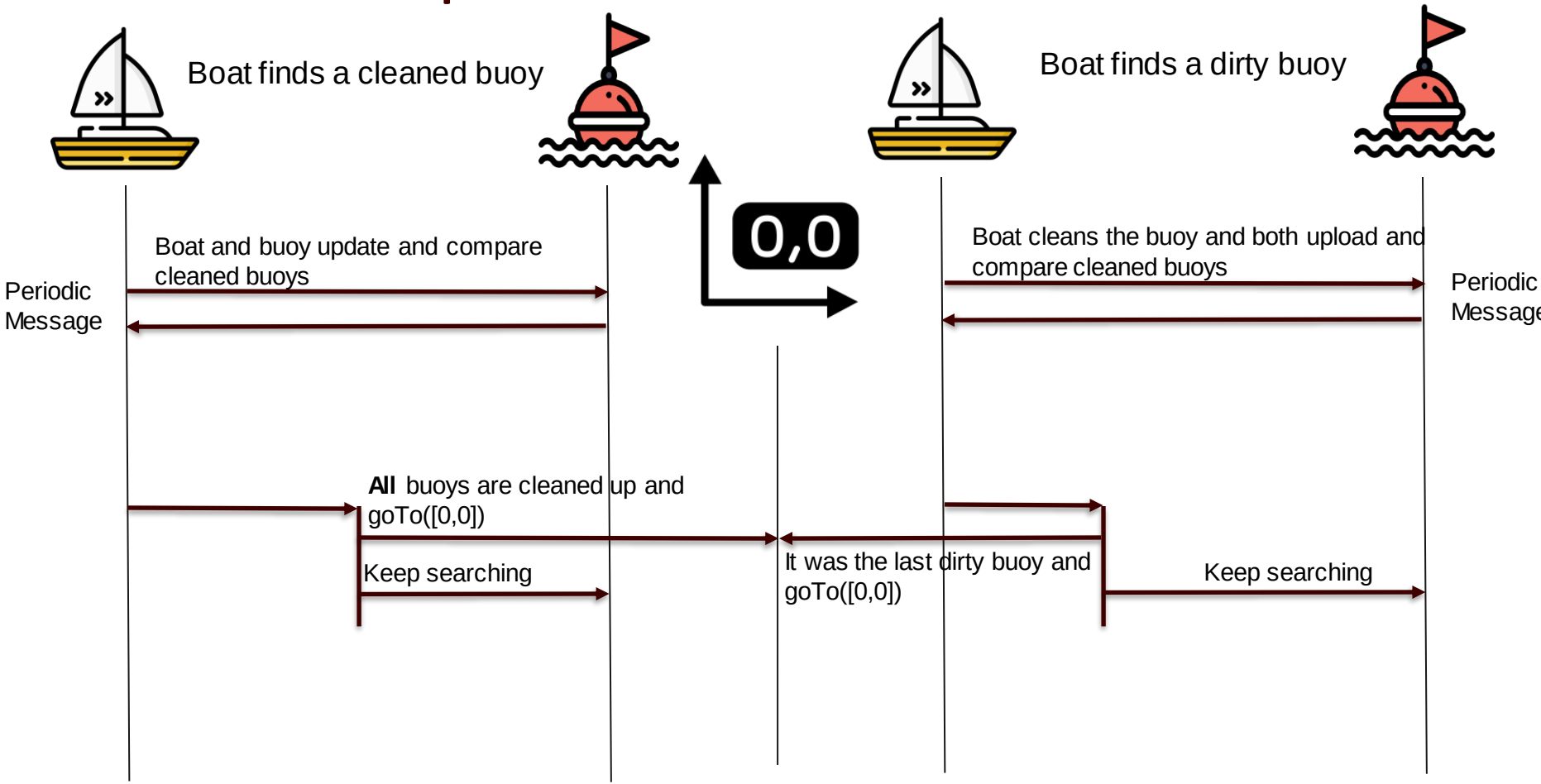
- From Buoys
  - Id: <Number>
  - Location: [x,y]
  - Status: Clean || Dirty
  - Trash_Location: [] || : [[x,y](map location)]
  - Learning: { ‘id’, [x,y] (buoy location) }



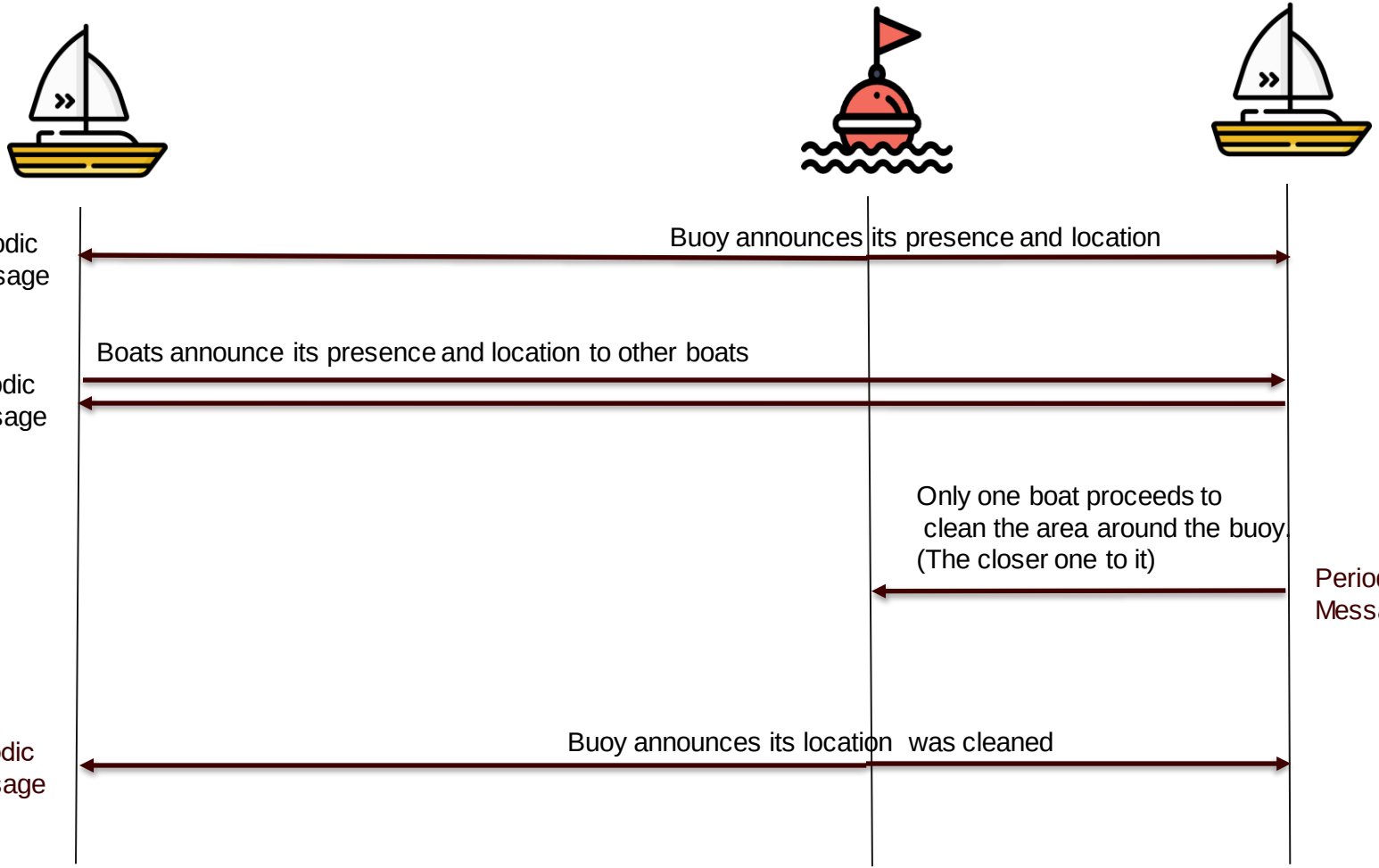
Sequence of Events



Sequence of Events



Sequence of Events



Demo