Understanding Ballasting System Connectivity

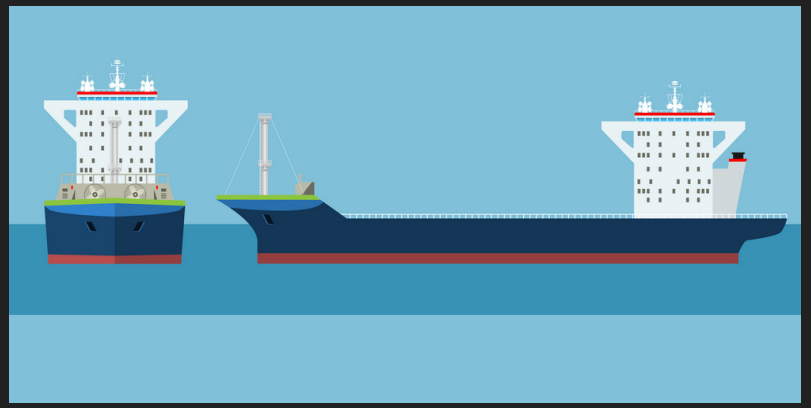
A solution for efficient valve control

What is a ballasting system?

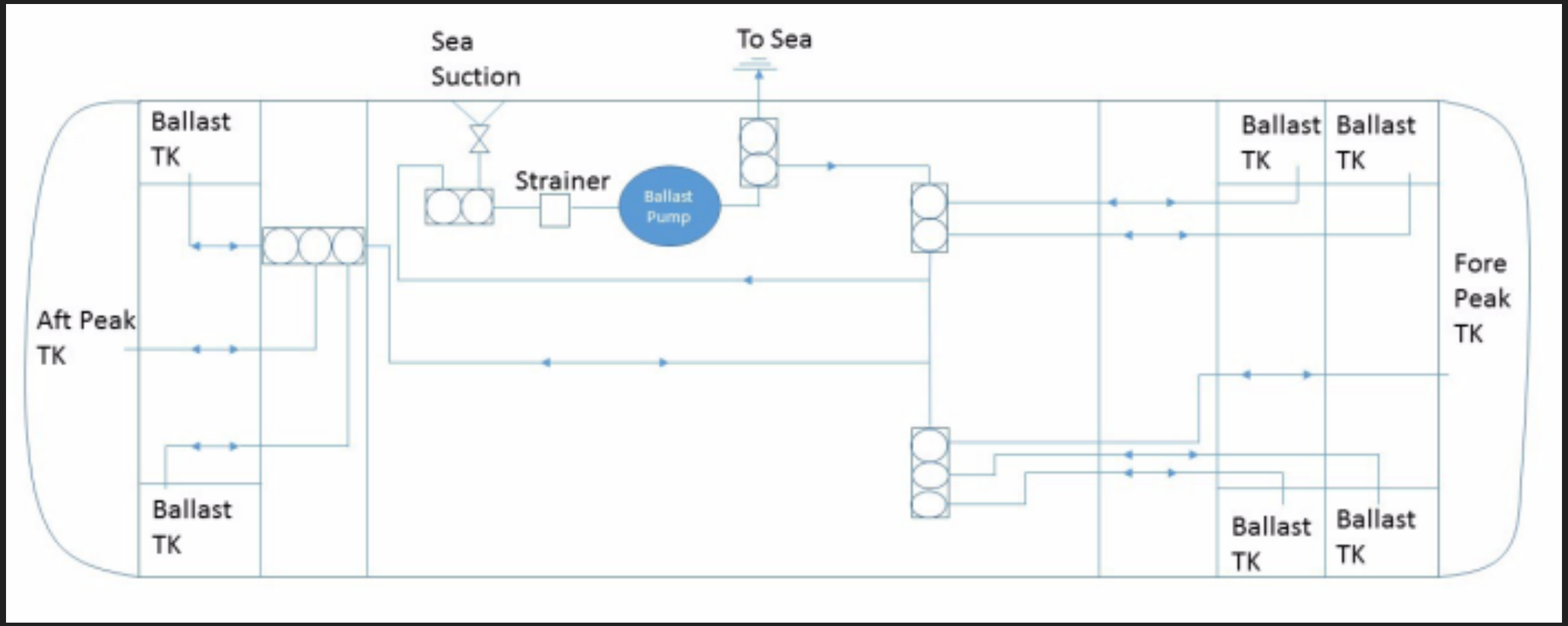
A ballasting system is a network of pipes, tanks, pumps, and valves used in ships to control the distribution of water

Why are they needed?

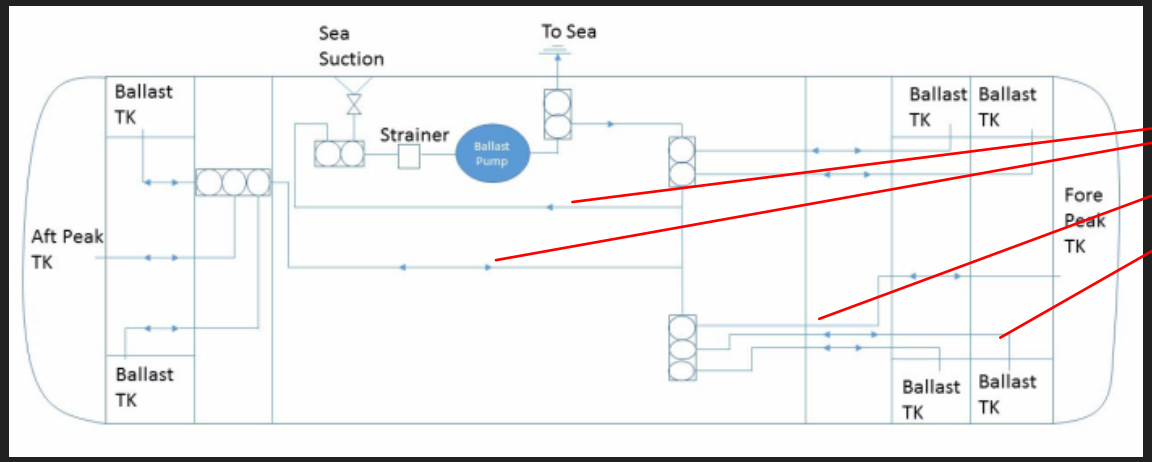
- They maintain the ship's stability and trim
- They distribute fluids for optimal weight distribution
- They allow for dynamic weight distributions and quantities to account for varying loads and routes used (e.g canals)



System Overview



The challenge



At times, some valves are closed while others are open.

How can we know which parts of the system are still connected to others when various combinations of valves are closed/open?

As the number of components increase, so too does the complexity of this program

Getting from home to the town hall

Getting from home to the town hall

The Process

1. See if destination is accessible
2. See if intersection is accessible from position
3. Move to next intersection
4. Note possible routes to more intersections
5. Try one route, if unsuccessful, record this and return to previous intersection
6. Repeat

If at any point we cannot move forward and have exhausted all routes, the destination is unreachable

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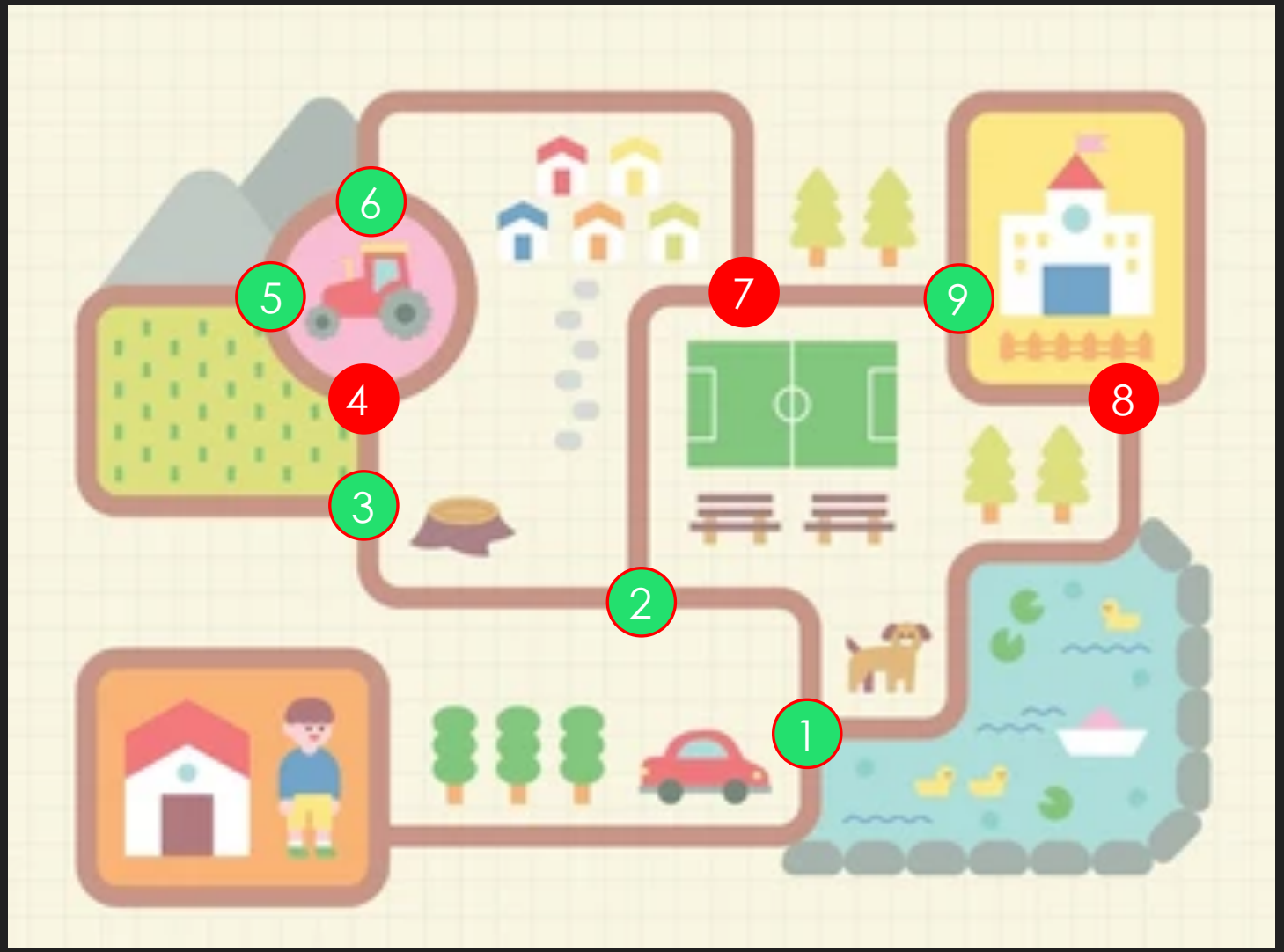

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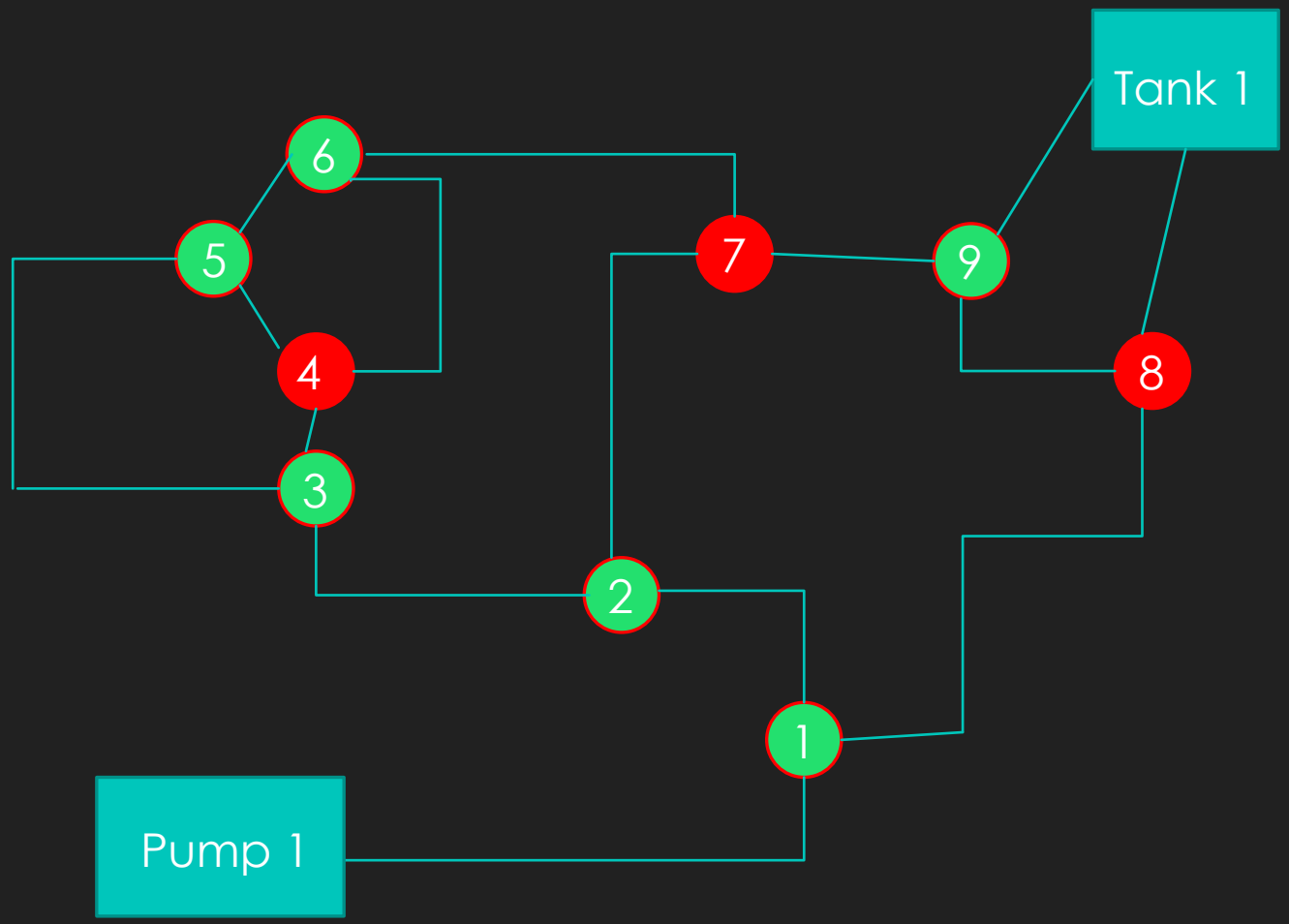
Checking if 2 components are connected



The Process

1. See if destination is accessible
2. See if valve is accessible from position
3. Move to next valve
4. Note possible routes to more valves
5. Try one route, if unsuccessful, record this and return to previous intersection
6. Repeat

If at any point we cannot move forward and have exhausted all routes, the destination is unreachable

The Solution: A high level overview

A program to simulate the system architecture & solving algorithm

- Import a list of components and their connected valves
- Use this list to infer the overall system and build a model of it
- Allow a user to turn valves on and off in the program
- Allow a user to select two parts they wish to see the connectivity status of
- Automate the process described on the previous slide
- Return an answer: Parts are connected OR Parts are disconnected