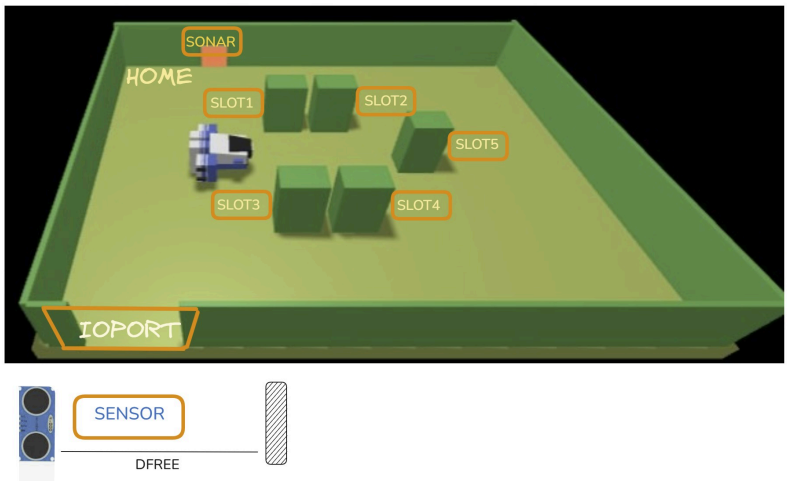
TemaFinale25

A *Maritime Cargo shipping company* (fron now on, simply *company*) intends to automate the operations of load of freight in the ship's cargo hold (or simply *hold*). To this end, the company plans to employ a *Differential Drive Robot* (from now, called *cargorobot*) for the loading of goods (named *products*) in the ship's hold.

The products to be loaded must be placed in a container of predefined dimensions and registered, by specifying its *weight*, within a database, by using a proper service (*productservice*). After the registration, the *productservice* returns a **unique product identifier** as a natural number `PID, PID>0` .

The hold is a rectangular, flat area with an Input/Output port (*IOPort*). The area provides `4 slots` for the product containers.



In the picture above:

- The **slots** depict the *hold storage areas*, when they are ocuupied by *product containes*
- The **slots5** area is permanentely occupied, while the other slots are initially empty
- The **sensor** put in front of the *IOPort* is a sonar used to detect the presence of a product container, when it measures a distance `D` , such that `D < DFREE/2` , during a reasonable time (e.g. `3` secs).

TF2025 Requirements

The company asks us to build a software systems (named *cargoservice*) that:

1. is able to receive the **request to load** on the cargo a product container already registered in the *productservice*.

   The request is rejected when:

   - the product-weight is evaluated too high, since the ship can carry a maximum load of `MaxLoad>0 kg` .
   - the hold is already full, i.e. the `4 slots` are alrready occupied.

   If the request is accepted, the *cargoservice* associates a slot to the product `PID` and returns the name of the reserved slot. Afttwerds, it waits that the product container is delivered to the *ioport*. In the meantime, other requests are not elaborated.

2. is able to detect (by means of the *sonar* **sensor**) the presence of the product container at the *ioport*

3. is able to ensure that the product container is placed by the *cargorobot* within its reserved slot. At the end of the work:

   - the *cargorobot* should returns to its HOME location.
   - the *cargoservice* can process another *load-request*

4. is able to show the current state of the *hold*, by mesans of a dynamically updated **web-gui**.

5. interrupts any activity and turns on a led if the *sonar sensor* measures a distance `D > DFREE` for at least `3` secs (perhaps a sonar failure). The service continues its activities as soon as the sonar measures a distance `D <= DFREE` .