MERCURIA hackathon

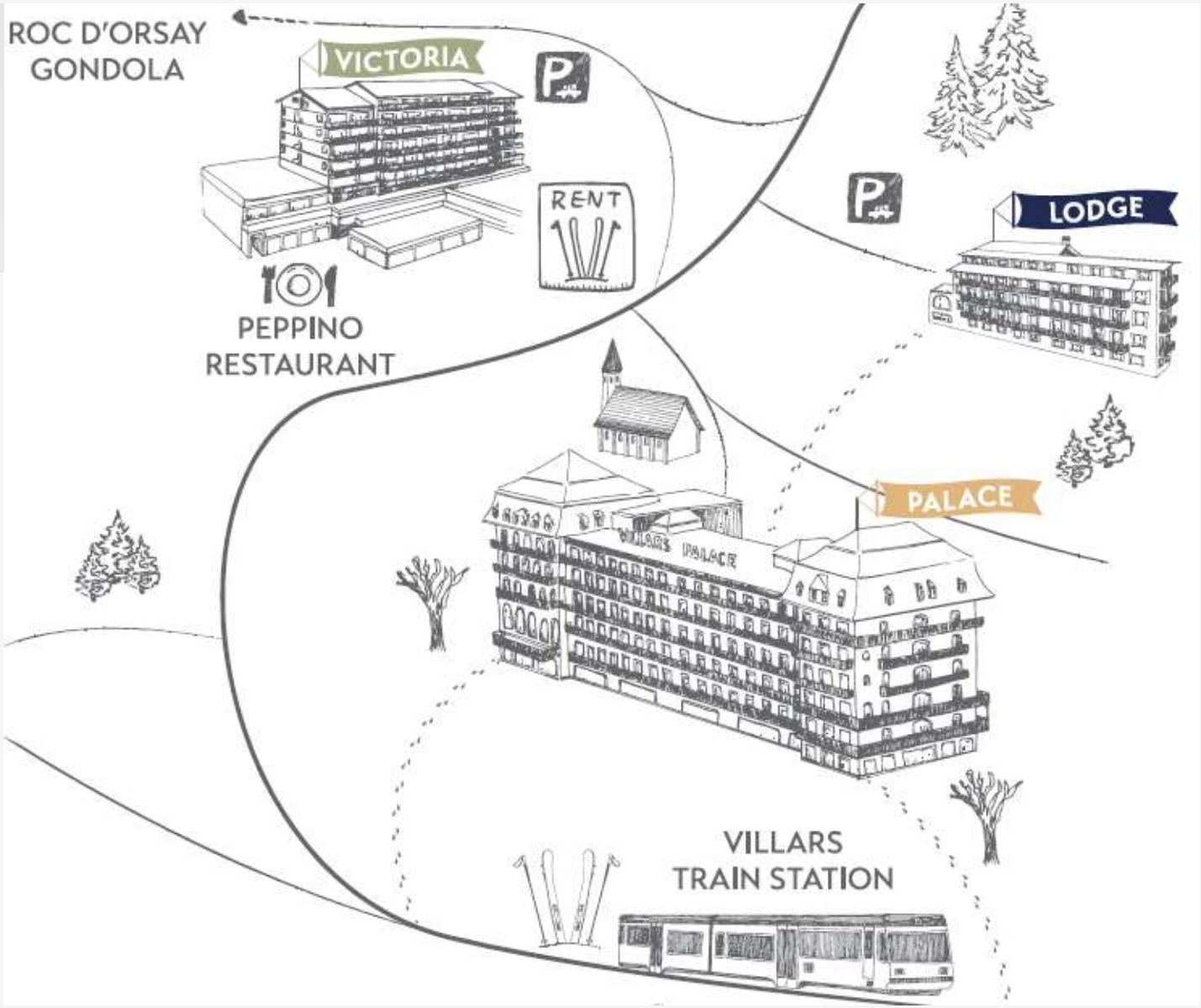
Helping to accelerate the energy transition and reduce the carbon emissions of the maritime industry

Welcome to Villars.
Welcome to the Mercuria Hackathon.

16 December 2022

VILLARS ALPINE
RESORT

Villars Alpine Resort is a hybrid destination that subtly blends hospitality, education and sustainability.



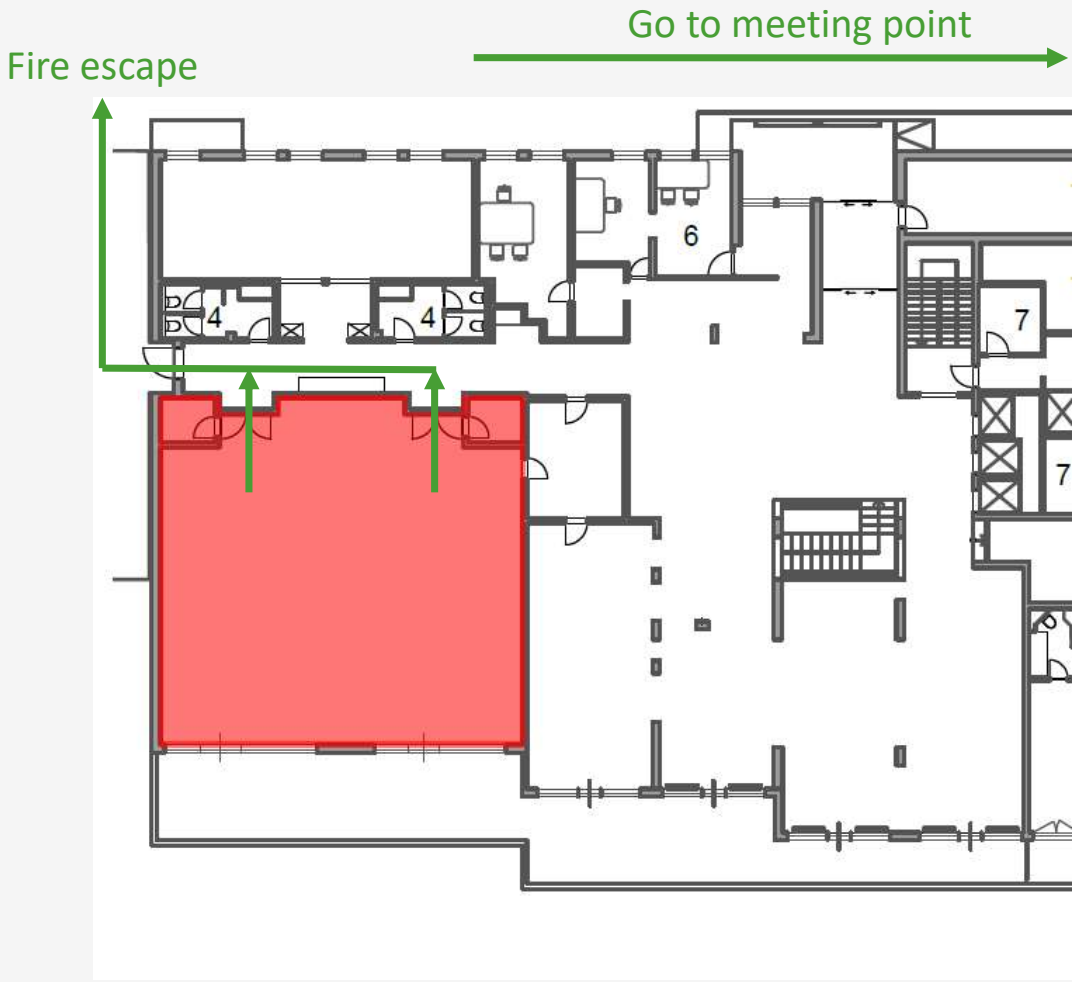
IMPORTANT MESSAGES

Health & Safety

- BE CAREFUL OF CABLES
- IN CASE OF FIRE
  - Continuous siren will sound
  - Leave the room, turn left, through the door and follow fire exit signs
  - Meeting point is past the front of the hotel in the car park by the ski rental

WIFI access

- Network = Varguest
- Password = Welcome1884



Agenda

- Introduction to Mercuria and our technology team
- How the Hackathon will work & timeline for the 3 days
- The Hackathon challenges

Meet the Mercuria team

How the Hackathon will work & agenda

How the Hackathon will work

- We'll introduce the 3 challenges – you can tackle any 1 or all 3 as a team
- Working as a team create the best solution(s) for the challenge(s) you tackle
- You'll have all weekend to hack but with set breaks in the agenda. You're **not** expected to work all hours!
- Make friends, network, take the opportunity to meet new people and try new things.
- Most hackathons are very serious and competitive. This is supposed to be fun whilst also being a challenge.
- We'll help you get set up on the tools you'll need;
  - Slack for communicating (if you haven't already joined)
  - Git
  - Swagger
- Beyond that, use anything else you have access to that would solve the problem
- Part of the assessment will be the "greenness" of your code so you will need to package it so we can test it – again, we will help with that

Agenda – Friday 16th December

Time	Activity	Location
3.00pm	**ARRIVE AND CHECK-IN**	Hotel Victoria
5.00pm	**HACKATHON MEET & GREET**	Salon Villars 1 & 2 – Level 0
5.15pm	**OPENING ANNOUCEMENTS**	Salon Villars 1 & 2 – Level 0
5.30pm	**TEAM FORMATION / SET-UP**	Salon Villars 1 & 2 – Level 0
6.00pm	**START HACKING**	Salon Villars 1 & 2 – Level 0
7.30pm	**DRINKS & DINNER**	Peppino Restaurant (Level -2 in Victoria Hotel)
9.00pm	**HACK CONTINUES**	Salon Villars 1 & 2 – Level 0

Agenda – Saturday 17th December

Time	Activity	Location
From 7.00am	**BREAKFAST**	4 Seasons Restaurant (Level -1 in Victoria Hotel)
From 7.00am	**HACK CONTINUES**	Salon Villars 1 & 2 – Level 0
8.30am	**DAY'S ANNOUCEMENTS**	Salon Villars 1 & 2 – Level 0
8.30am	**JUDGING WINDOW OPENS**	
12.00 – 2.00pm	**BUFFET LUNCH**	LOCATION TO BE CONFIRMED
2.00 – 6.30pm	**HACK CONTINUES**	Salon Villars 1 & 2 – Level 0
6.30pm	**HACK BREAK & JUDGING WINDOW CLOSES**	Salon Villars 1 & 2 – Level 0
7.00pm	***"TRANSITION TO A NET ZERO ECONOMY"*** **Talk by Lee Howells**, from Villars Institute	The Lounge (within The Lodge)
7.30pm	**SWISS DINNER**	The Lounge (within The Lodge)
10.00pm	**HACK CONTINUES**	Salon Villars 1 & 2 – Level 0

Agenda – Sunday 18th December

Time	Activity	Location
From 7.00am	**BREAKFAST**	4 Seasons Restaurant (Level -1 in Victoria Hotel)
From 7.00am	**HACK CONTINUES**	Salon Villars 1 & 2 – Level 0
8.30am	**DAY'S ANNOUCEMENTS**	Salon Villars 1 & 2 – Level 0
8.30am	**JUDGING WINDOW OPENS**	
10.00am	**CODE FREEZE & FINAL PACKAGING**	Salon Villars 1 & 2 – Level 0
10.30am	**FINAL CODE JUDGING – PITCH PREPARATION** **JUDGING WINDOW CLOSES**	Salon Villars 1 & 2 – Level 0
11.30am	**JUDGING FINISHES & SOLUTION PITCHES**	Salon Villars 1 & 2 – Level 0
12.30pm	**JUDGES DELIBERATE**	Salon Villars 1 & 2 – Level 0
12.45pm	**WINNERS ANNOUNCED & CLOSING COMMENTS**	Salon Villars 1 & 2 – Level 0
1.00pm	**EVENT CLOSE: BUFFET LUNCH / SANDWICHES**	

The Hackathon challenges

Challenge 1

Monitoring, reporting and verification of CO2 emissions from large ships using EU ports.

Description

In 2013, the Commission set out a strategy towards reducing GHG emissions from the shipping industry. The strategy consists of 3 consecutive steps starting with monitoring, reporting and verification of CO_2 emissions from large ships using EU ports.

Teaser

- Wouldn't it be helpful if we could better track and verify shipping journeys and categorise the worst polluters?

Why it matters

- Mercuria has subsidiaries that supply bunker fuel to the world's shipping fleet as well as operating a fleet of ships.

Challenge 1: Monitoring, reporting and verification

Step 1: AIS monitoring

Using AIS data, track a vessel over a voyage and report on:

- Distance travelled
- Velocity
- Bunkers consumed
- GHG emissions

Step 2: Reporting

Each day, the vessel crew will provide a Noon Report to the Operator who is managing their voyage.

Create a process for vessel activity report data to be uploaded to your application.

Create a process for your application to automatically submit vessel activity reports.

Step 3: Verification

Compare manual reports with automated reports from Step 2.

Create a verification method for the data manually provided with the ability to highlight incorrect reporting.

Step 4: Analyse

For the data provided, across all time, rank the top 100 most polluting vessels along with the GHGs they emitted.

Challenge 2

Voyage route optimization.

Description

Ships can use Just In Time (JIT) arrival to optimise voyage speed and arrive in port when berth / nautical services are available. Avoiding travelling unnecessarily fast and then waiting outside port can reduce fuel consumption and carbon dioxide emissions by 14% on a per voyage basis.

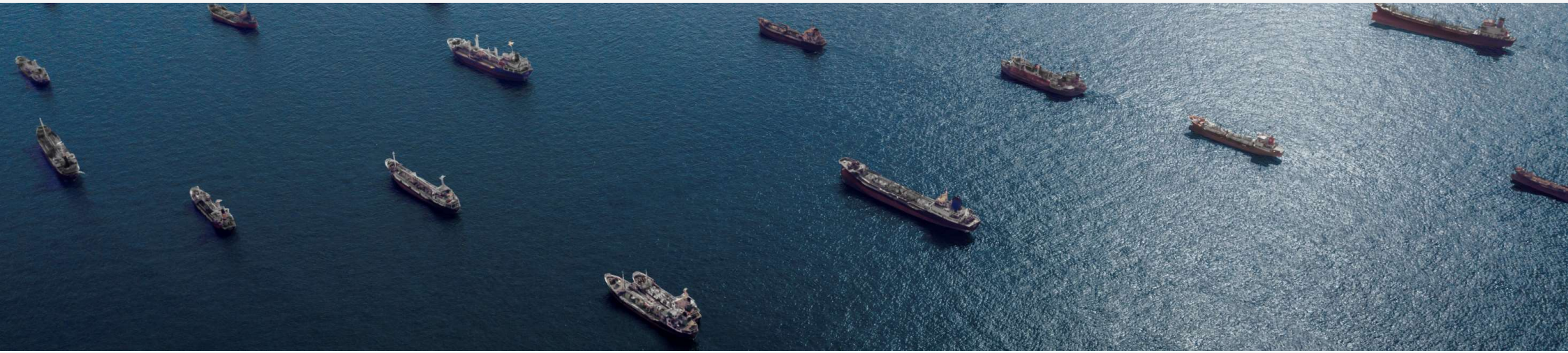
Teaser

- How can we help vessels to plan optimised routes that reduce fuel consumption and emissions in any scenario?

Why it matters

- Mercuria's Minerva bunkering subsidiary would be able to work with customers to reduce their fuel consumption as well as optimise our own shipping fleet.

Challenge 2: Voyage route optimisation



Step 1: Simple routing

Using a theoretical voyage between the ports provided, estimate:

- Distance to travel
- Time required for voyage
- Bunkers consumed
- GHG emissions produced

Step 2: Advanced routing

Building on Step 1, build an application which proposes multiple voyage routes and the estimated GHG emissions for all vessel types.

Your proposed voyages should be significantly different from each other, and be careful not to run your ship aground!

Output your voyage in GeoJSON.

Step 3: Intelligent routing

Your vessel has to arrive at its destination on a due date. How does this effect your GHG emissions?

What other factors can your model consider, and how can you use those to reduce GHG emissions?

Step 4: Analyse

Using the Voyage data, generate GHG efficient voyages for 100 unique voyages.

Challenge 3

Cargo logistics optimization.

Description

Around 90% of world trade is transported by sea and carbon emissions from shipping are increasing.

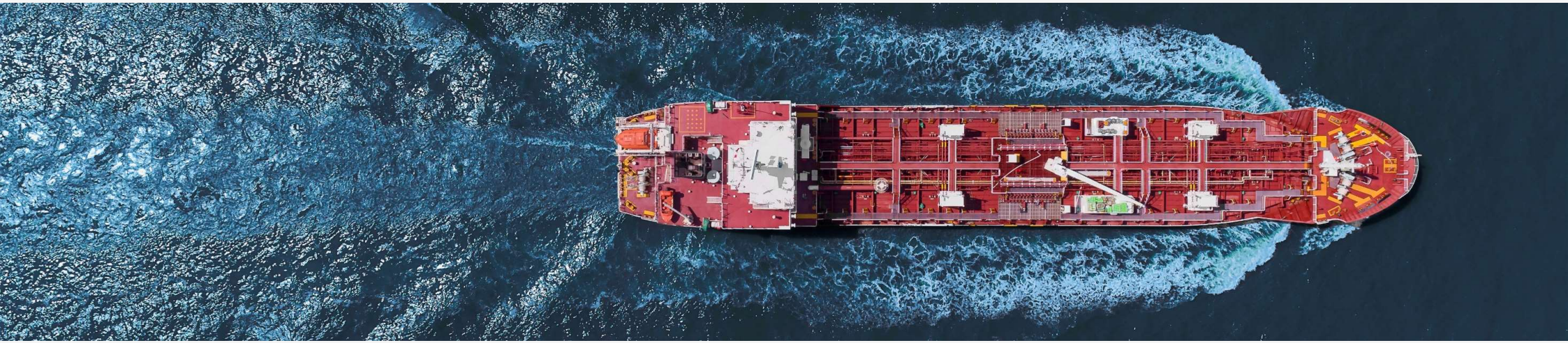
Teaser

- Vessel operators and cargo exporters want to optimise their logistics planning to minimize their impact on the environment. There should be an app for that!

Why it matters

- If Mercuria could offer this app to vessel owners and shippers it could help minimise empty shipping space and improve the emissions per tonne of cargo transported by ship.

Challenge 3: Cargo logistics optimisation.



Step 1: Cargo emissions

Looking at the AIS data provided, track a cargo ship on a voyage.

- How much cargo can this vessel carry? How much do you think is on board at the time you are observing it?
- How many tonnes of GHG is this vessel emitting per tonne of cargo?

Step 2: Vessel logistics

Create an application which allows vessel owners to register their planned voyages and the cargo capacity they have available.

The total voyage emissions should be shown, as well as emissions per tonne of cargo.

Step 3: Cargo logistics

Building on your application created in Step 2, allow exporters to register cargo they need to ship, including size, weight, destination, and due date.

Step 4: Logistics optimisation

Using the data gathered in Step 2 and 3, create matches between vessel voyages and cargo export needs.

How much can your application reduce GHG emissions per tonne of cargo?

You can ignore drag, or not!

Judging criteria

Scoring

3x challenges. 3x categories per challenge. 0-5 points per category. Maximum of 45 standard points from all 3 challenges.

- Final score is averaged across 3 the challenges (e.g. 15 + 0 + 0 = average of 5 points).

Bonus points & help card deductions are applied to averaged challenge score after averaging.

- Bonus points: any 5 scores adds 1 bonus point. Help cards: any help card used subtracts 2 points.

Categories

- Completeness
- Greenness
- Innovation

Example

Challenge 1 → 3 + 4 + 5 = 12 (plus 1 bonus point)

Challenge 2 → 5 + 5 + 0 = 10 (plus 2 bonus points)

Challenge 3 → 3 + 3 + 2 = 8

TOTAL SCORE = 12 + 10 + 8 = 30 points

AVERAGED SCORE = 30 ÷ 3 = 10 points

Team used 1 help card on challenge 2 = -2 points

FINAL SCORE = 10 + 3 (bonus) – 2 (help) = 11 points

Help cards

Any used will be -2 points

1. Generic help – need a little help and there's not specific help card for your question? Use me!

2. Missing data – we think we need some data but don't know where to find it, can we please have some help?

3. Conversion factors – how do we convert between units?

4. Vessel-specific information – we are missing some information on a vessel, where can we find this please?

5. Solution Packaging / Containerisation – can we please have some help in packaging our solution. **USE EARLY!!**
   - Friday night --> 12:00 CET Saturday -2 points
   - After 12:00 CET Saturday --> Sunday morning -4 points

Let’s begin!

hackathon

MERCURIA