# Welcome to the ZeroNorth problem solving exercise

This exercise is meant to simulate a real-world experience for a **team** in the tech crew at ZN

You are given a *feature* level work item with the following:

Preconceptions:

- ZN advises and monitors shipping vessels. For the sake of this exercise, we will focus on 4 vessels, with unique registration numbers (known as IMO): 123456, 234567, 345678, 456789

- We give vessels instructions of where and how they should sail. These are in the form of timed routes. This is a list of coordinates in Decimal Degrees (DD) format with timestamps in UTC format. The shortest path lines between each pair of coordinates are guaranteed to be navigable. You can assume that in the list of points the vessels can safely follow the route from one point to the next via the shortest path with a constant speed.

- Vessels have a parameter that corresponds to how loaded they are. This is known as **draught (draft)** and signifies how deep into the water the vessel sinks while sailing.

- In order to estimate the fuel consumption of a vessel we have access to a Fuel Table per vessel. (Part of the digital twin model). In this fuel table each row gives the consumption in metric tons if the vessel sails with the given speed in knots (**kn**), draught **(meters)** and in the given weather (Beaufort scale) for 24 hours. Part of the problem is to consider a smart way to query values that are between the rows. If you prefer to spend your time on other aspects of the assignment, feel free to use a simple strategy that does a prioritized index. That is first find the closest row values to the given draught, next find the closest of those rows to the given weather factor, and finally the one closest to the required speed, which should give you a single consumption result (in metric tons per 24 hours).

- Weather factor is given in Beaufort scale units. We have a weather forecast api at this endpoint (Swagger interface):

https://irgesy5gfg.execute-api.eu-west-1.amazonaws.com/docs

Communication to this endpoint requires an api key provided in a `x-api-key` header. The secret key is: `d14bc5fb5ebb`

Specification:

*As a user I would like to send an **IMO**, a given **draught** and a **list** of **timed routes** and receive a response giving me the **amount** of fuel expected to be consumed (in metric tons) as well as the amount of **CO2** (metric tons) to be emitted per route. I also want to know which one of the routes gives me the lowest CO2 emissions as a **flag (eco = true)**. I know that 1 metric ton of fuel burned produces **3.114** times that amount of CO2.*

Bonus:

> Our optimisation colleagues are asking for this service to provide some way for them to get results as fast as possible (25k + results per second). They want to use this evaluation in order to quickly test multiple possible routes. Accuracy can be sacrificed here but if so, they want to know how much accuracy is sacrificed. In addition, they can't test in parallel in one request because each decision taken along a route depends on the previous decision.

Practicalities:

- Assume that this is going to production.
- Please create a github or a gitlab repo and mark it as private to your account. This will be the deliverable of the assignment as we will ask you to give **read** access to a member of our team provided to you along with this assignment. We will look at how you structure your repo and where you chose to spend your time.
- For information our native cloud environment is AWS.

**IMPORTANT**:

We recognize the size of this task and the completeness of the provided solution is not the thing that interests us the most. We want to see where you focus your efforts and what you find most interesting. Please include a **README.md** file in your repo where you record thoughts you might want to convey that are not part of the commit messages as well as instructions on how to run your code.We **do not** expect you to spend more than a few hours playing with this problem, which means it is important that you document your considerations and where you choose **not to** spend time.
You will find a sample set of Fuel Tables attached as well as a sample of the request format that you can expect. Feel free to extend this and find your own interesting examples to showcase.

We will have at least two ZN engineers review your solution and give you qualified feedback, which will potentially extend to a follow up discussion around the delivery. We want to honor the effort spent by you and in any event hope to give value back to you.

Most importantly, we hope you enjoy the challenge and in the process get an idea of a core part of the problem space we work in.