F R E E L A N C E R

A programming challenge based on the space trading and combat simulation game Freelancer from 2000.

Introduction

The destruction of Freeport 7 left you with almost nothing. The only thing you managed to save was your ship and a star map.

You decide to head to you home planet in the Codestar system and rebuild, trading at each planet you find along the way, so you have plenty of money when you arrive.

Your star map contains a list of all the planets you pass on your way to your new home. For each planet, it contains the prices for each commodity you might want to buy or sell. Planning what commodities you will buy/sell at which planet will be your challenge for today.

Your situation

1. You have no money,
2. You own a small ship that has a cargo capacity of 10 units of cargo,
3. Your cargo hold contains one unit of ore, one unit of water and one unit of engine parts: one of each commodity you can buy/sell.

Maximum cargo capacity: 10

Commodity	In cargo hold
Ore	1
Water	1
Engine parts	1

Your star map

The star map contains a list of planets in JSON-format. The star map has the following structure:

```
[
  {
    "name": "CRETE",
    "orePrice": 7,
    "waterPrice": 7,
    "enginePartsPrice": 7,
  },
  {
    "name": "BADEN_BADEN",
    "orePrice": 13,
    "waterPrice": 14,
    "enginePartsPrice": 17,
  },
  ...
]
```

You can find your star map at https://u3jbutkvth.execute-api.eu-west-1.amazonaws.com/prod/planets?seed=4. You'll have to provide a *seed* as a query parameter to initialize the pseudorandom planet generator.

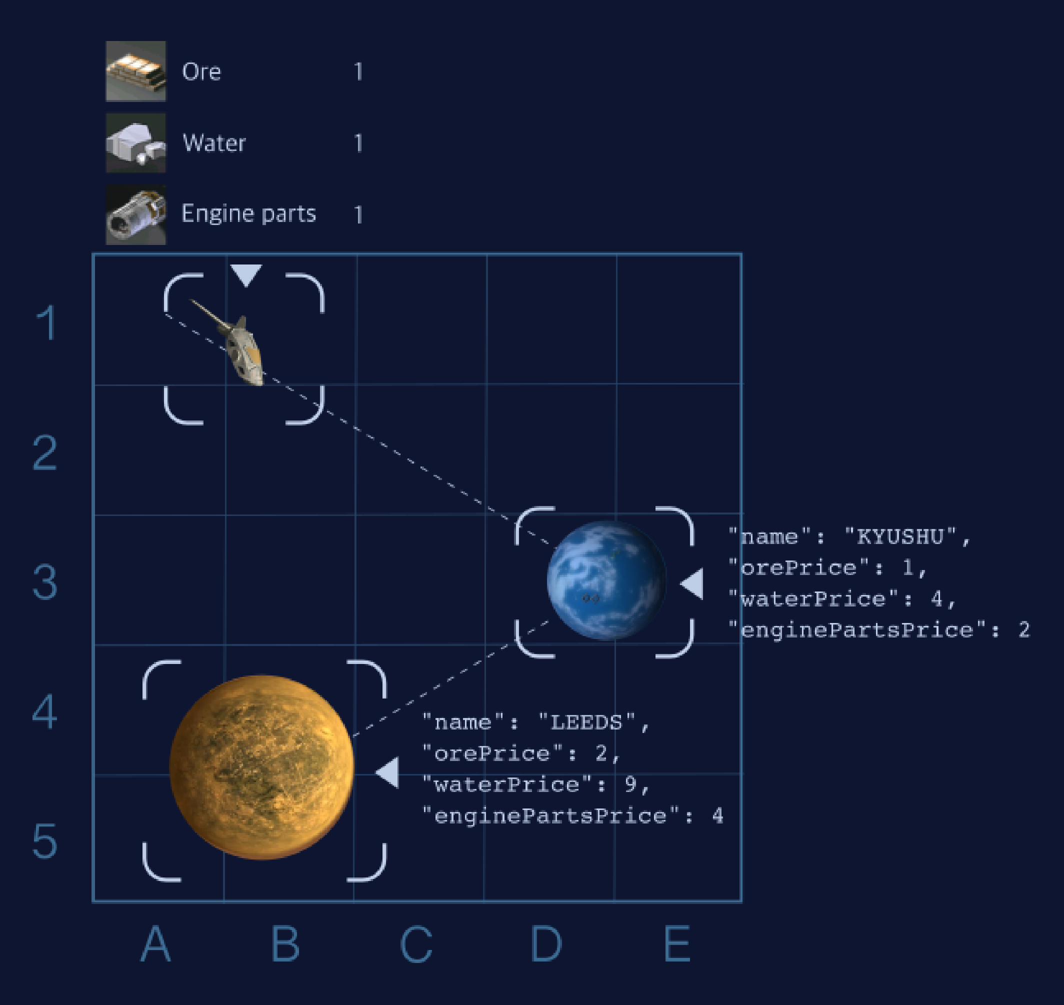
Note: the JSON contains some additional properties per planet (`deltaContraband` and `faction`) that will be used in additional challenges. You can ignore these for the moment.

The rules

- You have to visit the planets in the order given in the JSON.
- You cannot go back to revisit a planet.
- You cannot go into debt.
- The last planet in the star map is your destination.
- You can assume that your star ship does not require any fuel to travel.

Some Pointers

A good space trader knows to buy low and sell high. A great space trader also knows to hold on to his/her cargo when the prices are not right. The following (simplified) example illustrates that most wealth can be obtained by trading nothing at all at the KYUSHU. Whichever commodity you try to buy or sell at the first planet, LEEDS always offers a better deal.



It's your job to design an algorithm that determines the sequence of trades that results in the most money!

There are many ways to tackle this problem:

- You could use a *brute-force search*, although you might need require something like a Spark cluster if you try that for the additional challenges.
- You could create a smart trading algorithm, finding the best possible prices in the next couple of planets.
- You could also implement a *backtracking algorithm* (basically a more sophisticated brute-force search) like you would do to solve the N-queens problem.
- You could approach this problem with a *Monte Carlo simulation* (doing many different, random trades over the course of many simulations to find the one that performs best).
- You could even implement a *genetic algorithm*!

Be creative, but most of all: have fun!

Checking your solution

You can use our API to check your solution.

```
POST https://u3jbutkvth.execute-api.eu-west-1.amazonaws.com/prod/solution HTTP/1.1
Content-Type: application/json

{
  "seed": 4,
  "name": "Edison Trent",
  "transactions": [
    {
      "planet": "CRETE",
      "deltaOre": -1,
      "deltaWater": -1,
      "deltaEngineParts": 2,
    },
    {
      "planet": "BADEN_BADEN",
      "deltaOre": 0,
      "deltaWater": 0,
      "deltaEngineParts": -3
    },
    ...
  ]
}
```

Besides the seed and your name, you'll have to provide a transaction at every planet you visit (whether you actually make a trade there or not). The `deltaOre`, `deltaWater` and `deltaEngineParts` properties describe changes to your cargo hold at that planet. Negative means you are selling cargo, while positive means that you are buying a commodity. If everything checks out (you are not selling more of a commodity than you have in your cargo hold, and you are not buying more of a commodity than you can pay for) you'll receive a response along the lines of

```
HTTP/1.1 200 OK
Content-Type: text/plain
Content-Length: 53

Your final account balance (17877) has been recorded!
```

You can have a look at how others did (for the same seed) at https://u3jbutkvth.execute-api.eu-west-1.amazonaws.com/prod/scores?seed=4

Additional challenges

Buying a bigger ship

At some point, you will likely grow out of your little ship. At each planet you can buy one of the following larger ships:

Type	Name	Price	Cargo capacity
Light freighter	RHINO	500	15
Medium freighter	DRONE	1000	20
Heavy freighter	HUMPBACK	2000	30

These ships are available on all planets you visit. When you buy a new ship, you leave behind your old ship. You get nothing in return.

You can buy a ship with the (optional) `shipPurchase` property:

```
{
  "planet": "ATKA",
  "deltaOre": 0,
  "deltaWater": -10,
  "deltaEngineParts": 15,
  "shipPurchase": "RHINO"
}
```

Smuggling contraband

Each system belongs to one of two factions:

LIBERTY_POLICE XENOS

LIBERTY_POLICE planets are heavily patrolled, while XENOS planets are only loosely governed. Certain goods that can be bought and sold at XENOS planets are considered contraband in LIBERTY_POLICE territory, and they have to be sold before visiting these planets (or you will be arrested when you arrive with contraband on LIBERTY_POLICE planets). Naturally, contraband cannot be bought on LIBERTY_POLICE planets.

The two other properties you might have seen on your star map describe the alignment of each planet. Here's what the star map actually looks like:

```
[
  {
    "name": "CRETE",
    "orePrice": 7,
    "waterPrice": 7,
    "enginePartsPrice": 7,
    "contrabandPrice": 0,
    "faction": "LIBERTY_POLICE"
  },
  {
    "name": "BADEN_BADEN",
    "orePrice": 13,
    "waterPrice": 14,
    "enginePartsPrice": 17,
    "contrabandPrice": 32,
    "faction": "XENOS"
  },
  ...
]
```

Similar to ore, water and engine parts, you can buy/sell contraband with the (optional) `deltaContraband` property:

```
{
  "planet": "TEGAKIS",
  "deltaOre": 0,
  "deltaWater": -15,
  "deltaEngineParts": 0,
  "deltaContraband": 15
}
```

Attribution

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- Freelancer logo from https://r3dmis7stuff.blogspot.com/2010/12/freelancer.html
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