Java Programming Test

Package Delivery game

For the purpose of this test, we will program a simple game without graphics. The player assumes the role of a manager of the DHL package delivery center in Berlin Lichtenberg, Josef-Orlopp-Straße. It is their task to make sure that all the packages are delivered to the recipients in time.

To achieve this goal, the following steps are involved:

- Randomly spawn packages in the facility
- Sort the packages for delivery
- Deliver the packages with your workforce

Interface and Controls

You can choose any simple interface that you see fit, console, Textfield, or anything like that. Graphics are not a task in this test. The interface should

- Print out the current state of the game regularly (in the main loop)
    - Current Balance (EUR)
    - Number of Packages in Facility
    - Number of Packages in delivery
    - Number of Packages delivered
    - Number of Entities per category (see below, e.g.: 1 Postman, 3 Parcel Trucks)
    - Time of Day
    - … What else?
- Transform the user input to game actions (see details below)

Configuration

On the following paragraphs, a lot of parameters will be listed. The game should load all these parameters from a clear textfile that can be edited by a user.

The user starts with an amount of cash, for example 10,000 EUR.

Time of Day

The game will have a simulated game time, a day starts at 6:00 am and ends at 12pm. To keep the game fun, feel free to skip the time between 12:00 pm and 6:00 am. That means a day might have 18 hours in our simulation.

Game Entities

For the purpose of this test, every single of the following entities should work in **their own Java thread**. They will be explained in detail below:

- Package Spawner

- Parcel Truck [DELIVERY]
- Parcel Bicycle [DELIVERY]
- Postman [DELIVERY]

Each game entity has an upkeep, which represents the cost in EUR per day. Cost is subtracted at the start of a new day or when an entity is added (hired) by the player.

Package Spawner

The package spawner is a simple thread that will randomly spawn a new package in the facility at Joseph-Orlopp-Str. with a randomly selected target address.

For target addresses, see attached **map.png.** For simplicity of this test, you may choose to ignore the road network and use the kilometer coordinates instead, with straight connection lines.

You can try the best speed of package spawning and suggest values here.

The Facility

The facility is the main station where packages are being collected from the spawner and sorted for delivery. Parcel vehicles and postmen will pick up the packages from here when they start their duty and bring back any packages they could not deliver on that day when their shift ends.

Delivery Entities

The player can choose to add and remove the following workforce for package delivery from the user interface:

Postman:

- Upkeep: 10 EUR
- Speed: 10 km/h
- Capacity: 25 packages

Parcel Bicycle:

- Upkeep: 80 EUR
- Speed: 25 km/h
- Capacity: 25 packages

Parcel Truck:

- Upkeep: 500 EUR
- Speed: 50 km/h

- Capacity: 100 packages

Whenever the player adds one of these entities, it should run on its own Java thread that fulfills these tasks in a loop:

- Starts at 6:00 am every morning in the facility
- Picks up a number of packages for delivery (max: see capacity)
- Finds a reasonable route for the loaded packages
- Travels to the next package (that means: make the thread wait for X hours, based on speed)
- Travels back to facility when all packages were delivered

For the simplicity of this test, you may choose to ignore road connections. Instead each target address has coordinates, and you can use the distance between two coordinates in kilometers instead of the real world road network.

Whenever a package is delivered, the entity will communicate this directly to the facility (we assume they have a radio connection to the facility)

The delivery workforce will be INTERRUPTED by the following events:

- Lunch break at 12:00 am for 1 hour, resumes work at 1:00 pm
- End of shift at 9:00 pm, will travel back to facility and drop any remaining packages at facility

Goals / Rewards

For each package delivered, the player will instantly receive money, depending how long the delivery took since the package spawned:

- 10 EUR per package delivered within 18 hours (i.e. 1 day) after spawn
- 5 EUR per package delivered within 54 hours (i.e. 3 days) after spawn
- 2.50 EUR else

Strategy Considerations

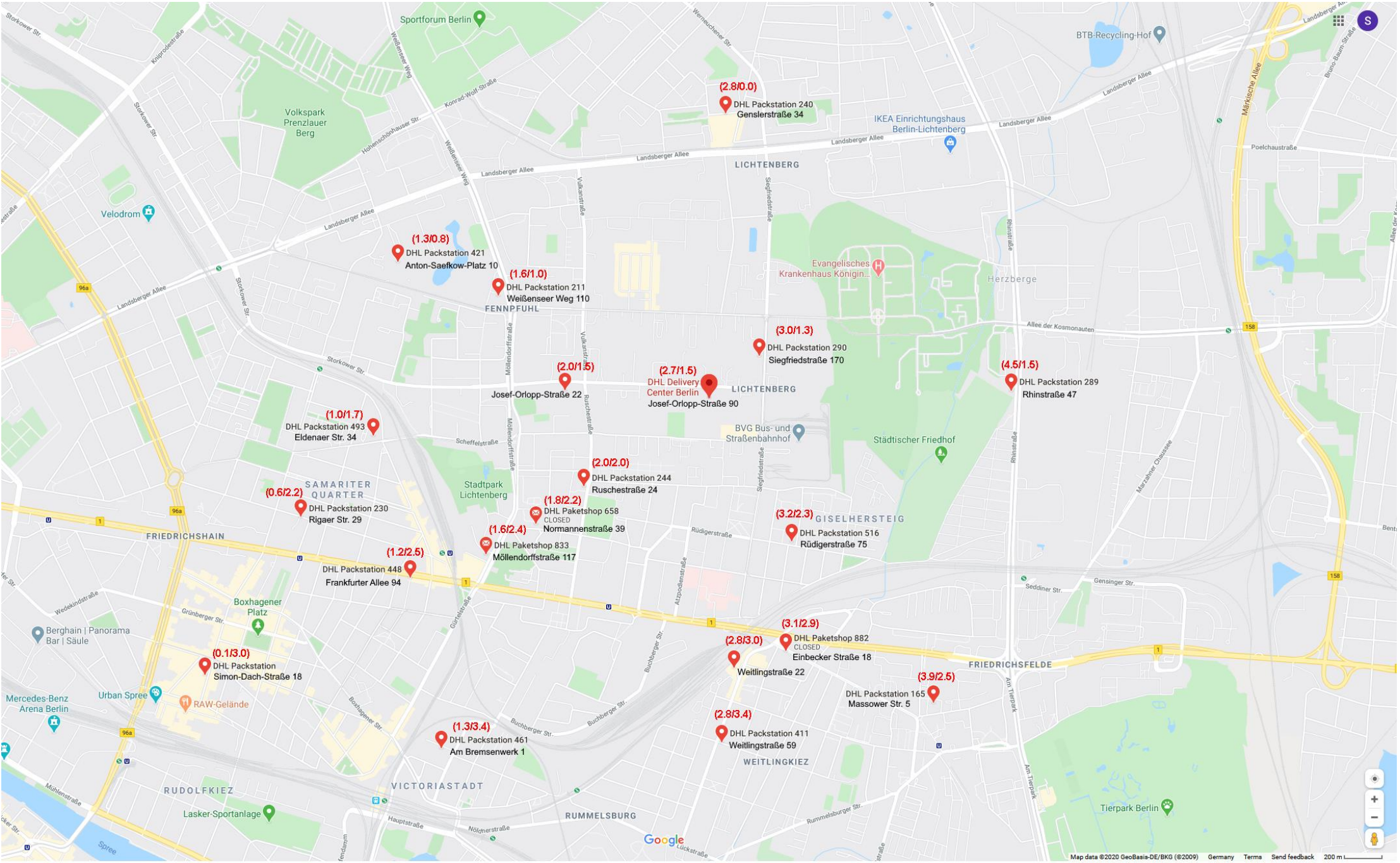
It will be your task as a programmer to make the delivery of the packages efficient, from the facility to the delivery address. Note that the delivery problem is complex and that you might not always find the best solution: https://en.wikipedia.org/wiki/Travelling_salesman_problem

If you find that the balancing of the game does not work, feel free to suggest different cash rewards for delivery.

Consider different delivery strategies. You are free to deliver the packages in any order to maximize revenue. Which strategies work best?

Closure

In case of any questions, feel free to contact us via email to jobs@spiele-palast.de. The test was designed so that it should take between 4 and 8 hours to complete. Your test results will be used exclusively to evaluate your programming skills and nothing else. We will judge the quality of the code and structure of your project, the efficiency of solutions you have chosen and the comments in your source code (Write comments where needed, but keep comments meaningful, not spammy).



(X/Y) Coordinates in Kilometers (100m accuracy)