

ASE Exercise 9 (WS21/22)

Task 1 (Activity diagram)

Create an Activity diagram using the following process description and specified activities, assigning them to the specified swim lanes.

The leading engineer has to fire the boiler and start the turbine to power up a coal power plant. Therefore, the following activities are needed:

- If the **boiler** is soiled, it will be cleaned. This is repeated until the boiler is no longer soiled.
- If the **boiler** is clean it starts firing itself and the **control** closes the valve.
- The **boiler** starts to supply itself with coal and awaits operational pressure values. *At the same time* the **turbine** activates the hydrostatic starting aid.
- After completion of these steps the **control** opens the valve.
- If the operational values of the **turbine** deviate from the requirements, the **turbine** shuts down (extinguishing the fire, stopping the coal supply) and the process is restarted with firing the boiler.

close valve

open valve

shut down

supply coal

activate
hydrostatic
starting aid

clean boiler

start firing

wait for
operational
pressure

Task 2 (Class diagram)

Create a simplified class diagram (only classes, relationships and cardinality, no methods or attributes within the class) for the following bullet points. Use the underlined terms as class names and show the relations of the classes through attributes, visibility and cardinality.

Use meaningful names! Note: composite nouns are written in camel case, i.e. "CamelCase".

- A coal power plant is a specialized power plant.
- The abstract classes SideUnit and MainUnit implement the interface Unit.
- A coal power plant consists of at least four instances of those units.
- A turbine is a specialized main unit.
- Additionally a coal power plant consists of one to three turbines.
- A turbine consists of any number of impellers and stators.
- A turbine uses a control unit (not an implementation of the interface unit).

Task 3 (Algorithms)

Imagine you found a piece of paper in the lecture. There are some letters and numbers on it. It looks like this:

```
14 28 25 32 3 33 38 11 40 31 15 0 1 13 29 4 8 18 6 37 9 16 26 21 35 27 2 30 19 20
17 22 24 10 12 23 39 5 34 36 7
```

```
onoirsaoehfwedgeyuespydreiatfoodcruegvmsr
```

Your clever friend found out that it is a secret message. The numbers show the order of the letters. I.e. the first number belongs to the first letter; the second number belongs to the second letter and so on. I.e. the 14th letter of the original message is "o", the 28th letter of the original message is "n", the 25th letter of the original message is "o" and so on.

Implement a decoder for messages encoded using this method and decode the given message. Please use Arrays and HashMaps for your solution.

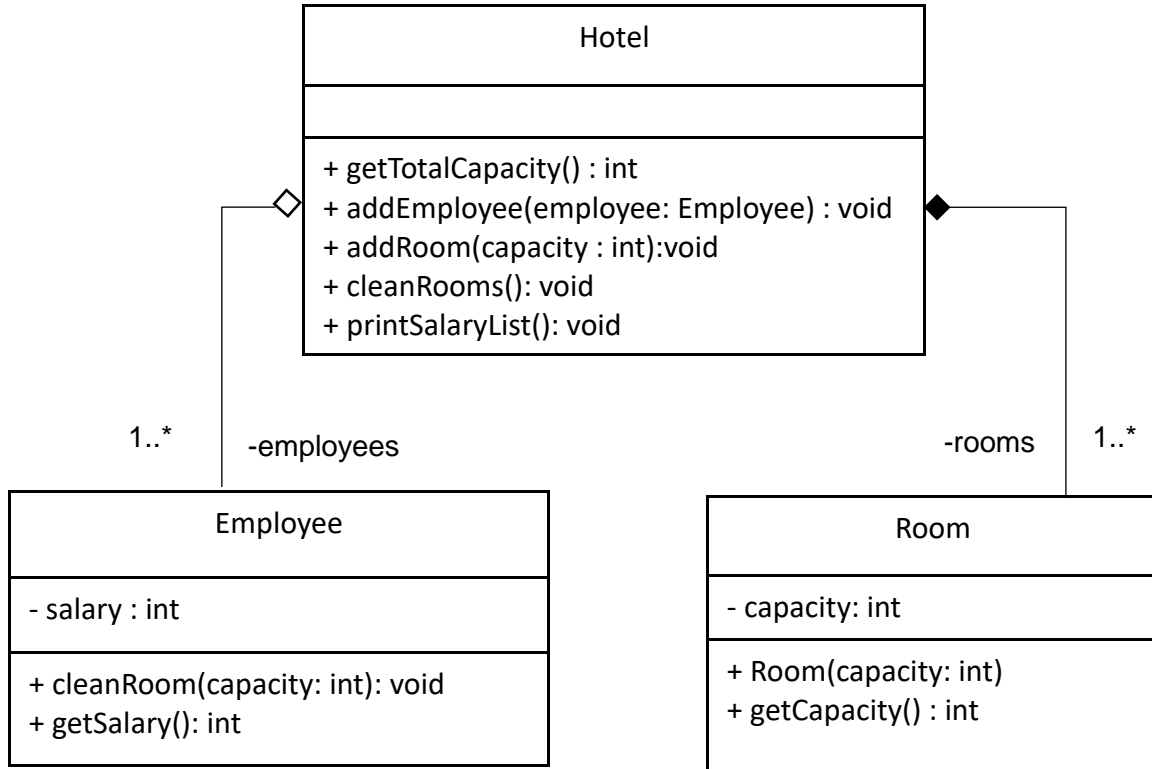
Task 4 (Aggregation and Composition)

Imagine you are the manager of a hotel with multiple rooms and employees. Give an implementation based on the following UML diagram. The total capacity of the hotel is the sum of capacities of all rooms. The salary of an employee calculates as follows: For each room which the employee has cleaned, 5€ are being added for each capacity unit. I.e. for cleaning a room with capacity **2** the employee gets 10€ (5€ x 2).

To test your implementation create 5 employees and 50 rooms: 20 rooms with capacity 1, 15 rooms with capacity 2, 10 rooms with capacity 4 and 5 rooms with capacity 6. Add the rooms in this order.

Make your employees clean all the rooms. Each employee must clean 10 rooms. Employee 1 cleans the first ten rooms, employee 2 the next ten rooms and so on.

Now show the resulting salaries of all employees. Also, show the total capacity of the hotel.



Output:

50
50
100
150
250
Total capacity: 120 people