Software Engineer Vehicle Identifier Problem
ADP

Overview

Engineers at ADP spend the majority of their time developing production code. As such, code quality and design fundamentals are critical to success here. The following problem is intended to serve as the basis for the remainder of the interview process. Please devote some time to providing us with an implementation which reflects your ideals of code quality and proper unit testing.

During the on-site interview we will make reference to this problem and your solution. Please be prepared to conduct a more in-depth analysis when you arrive. This will include discussing implications for more real life scenarios; addressing issues such as scaling, configurability, validation, and varying inputs.

If you have any questions concerning the problem we would be happy to clarify the requirements. Also, we have provided a sample Maven project. The attached project includes dummy classes and sample input to give you a starting point. You may use this sample project if you wish, but are not required to do so if you are not familiar with Maven.

Problem Description

Please write a program that can identify vehicle types by their components. Vehicle types are identified by their properties, such as frame material, number and material of the wheels, and power train. Given an input containing this information the program should be able to say what the vehicle type is (Big Wheel, Bicycle, Car, ...).

Your solution should expect an XML file as input. An XML file containing records specifying sample vehicles will be provided. It is reproduced below as well. The expected output of the solution is a report that lists each vehicle id and its type. The report should also provide a summary saying how many vehicles of each type are in the XML.

The program should be written in Java. Please provide the source code and unit tests in a runnable state. Feel free to use the accompanying Maven based project, but its use is not required if you are not familiar with Maven. Your unit tests should be written in either JUnit or TestNG.

You can spend as much time as you like on the project, but typically, we expect you to spend about an hour or two to come up with a solution and a backlog of ideas on how to improve the system.

Types of Known Vehicles by their Characteristics

Use the following table as the basis for your vehicle identification. The table indicates the unique characteristics for know vehicle types.

Vehicle Type	**Frame**	**Powertrain**	**Wheels**
Big Wheel	plastic	Human	3 plastic (front, rear left, rear right)
Bicycle	metal	Human	2 metal (front, rear)
Motorcycle	metal	Internal Combustion	2 metal (front, rear)

Hang Glider	plastic	Bernoulli	none
Car	metal	Internal Combustion	4 (front right, front left, rear right, rear left)

Sample Data

In the following sample data, `vehicle 1` is a Big Wheel because it has a plastic frame and 3 plastic wheels. `Vehicle 2` is a bicycle because it has a metal frame, 2 metal wheels and is powered by a single human.

```
<vehicles>

     <vehicle>
           <id>vehicle 1</id>
           <frame>
                 <material>plastic</material>
           </frame>
           <wheels>
                 <wheel>
                       <position>left rear</position>
                       <material>plastic</material>
                 </wheel>
                 <wheel>
                       <position>right rear</position>
                       <material>plastic</material>
                 </wheel>
                 <wheel>
                       <position>front</position>
                       <material>plastic</material>
                 </wheel>
           </wheels>
           <powertrain>
                 <human/>
           </powertrain>
           <vehicle>
           <vehicle>
                 <id>vehicle 2</id>
                 <frame>
                       <material>metal</material>
                 </frame>
                 <wheels>
                       <wheel>
                             <position>rear</position>
                             <material>metal</material>
                       </wheel>
                       <wheel>
                             <position>front</position>
                             <material>metal</material>
                       </wheel>
                 </wheels>
                 <powertrain>
                       <human/>
             </powertrain>
           <vehicle>
</vehicles>
```