Key Concepts 1/2

Object-Oriented programming

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The Object-Oriented programming paradigm

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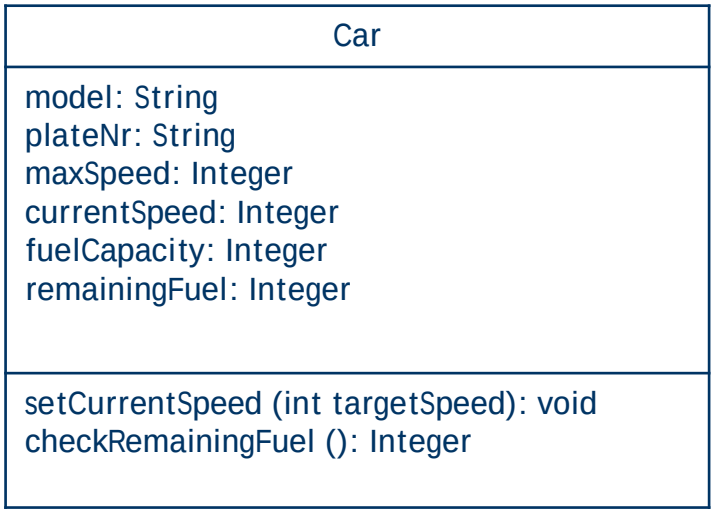
- Reflects a natural (”human”) way of viewing the world and the relationship of ”objects” in this world
  - Customer, Purchase Order, Shopping Cart, Hotel Reservation
- Programs are built with well-defined abstractions (Classes) that represent real world ”objects”. A Class contains:
  - Attributes (properties of an object. Data)
  - Behaviors (What an object can do. In Java: Methods)
- In a OO program, objects interact with each other
- Class vs. Object
  - Class is a ”template” that defines the Attributes and Methods of all objects that belong to the class
  - An Object is an instance of a Class
    - Each object contains its own values (data) for the Class attributes

Example: ”Car” Class and Objects

Class name

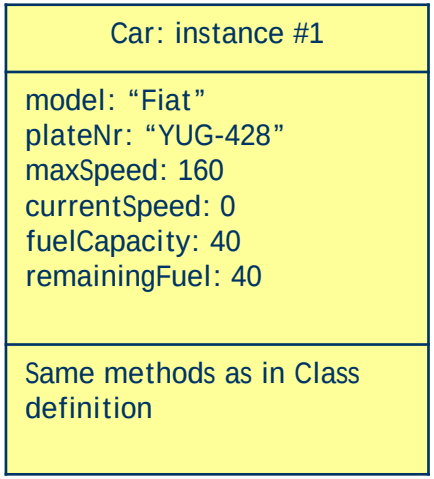
Attributes

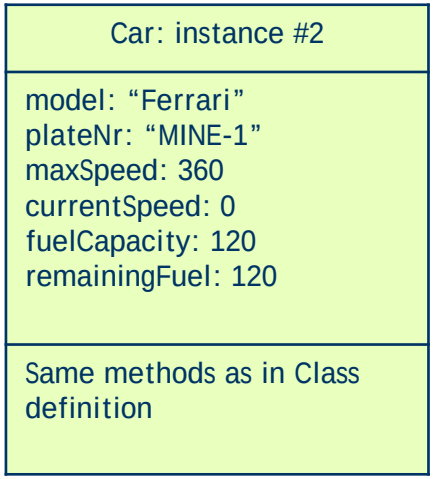
Behaviors (Methods)



Class definition

(UML notation: Class diagram)





Objects (instances of the class)

Note that each object has its own set of values for its attributes. These define the object’s properties!

Defining a class in Java

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```
public class Car {

    String model;
    String plateNr;
    int maxSpeed;
    int currentSpeed;
    int fuelCapacity;
    int remainingFuel;

    void setCurrentSpeed (int targetSpeed)
    {
        currentSpeed = targetSpeed;
    }

    int checkRemainingFuel()
    {
        return remainingFuel;
    }
}
```

Class declaration

Attributes declaration

Definition of methods

How can I create an instance of a Class (i.e object) in my program? Isn't there a method for it?

Constructors

- Special methods to initialize an instance of a class (object)
- Always has the same name as the Class name. It doesn't have any return value.
- If you don't define the constructor in your class, Java will use a default constructor. Ex:
  - `Car myCar = new Car();`
- The default constructor does not accept any input parameter and will initialize all instance attributes with NULL values or zeroes
- If you want to initialize objects with attribute values provided by the calling program, you need to define the constructor method in your class

Constructor method

```
public class Car {

    String model;
    String plateNr;
    int maxSpeed;
    int currentSpeed;
    int fuelCapacity;
    int remainingFuel;

    Car (String inputPlateNr)
    {
        plateNr = inputPlateNr;
    }

    void setCurrentSpeed (int targetSpeed)
    {
        currentSpeed = targetSpeed;
    }

    int checkRemainingFuel()
    {
        return remainingFuel;
    }
}
```

Definition of the constructor method

In this example, the constructor is taking one input parameter, the car's plate number

How to call methods of an object

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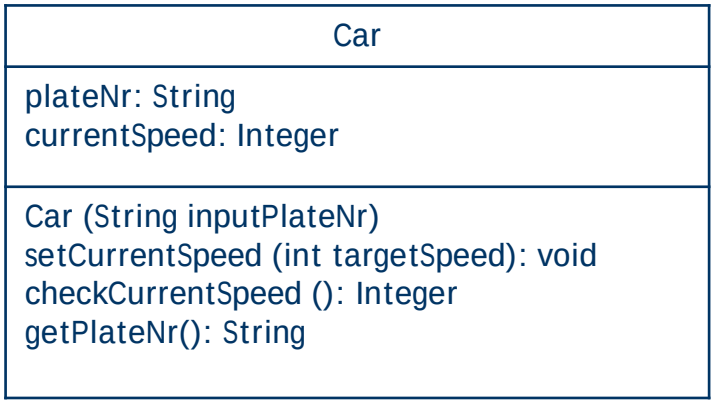
```
public class ExampleOOP {
    public static void main(String[] args) {
        int carSpeed;

        Car myCar = new Car("MINE-1");

        myCar.setCurrentSpeed(250);
        carSpeed = myCar.checkCurrentSpeed();

        System.out.println("The speed of my car is " + myCar.checkCurrentSpeed() + " km/h");
    }
}
```

Initialize an object instance by calling the constructor method

Methods are called with: <object instance>.<method()>

Exercise 1/2

- Create a new Java project in Eclipse
- Create a Class Car according to the following UML Class diagram. Hint: Use the example code shown in the previous slides



Exercise 2/2

- Under the same project, create a Class MyFirstOOProgram. Define a main method for this class
- Under this main method do the following operations:
  - Create a Car object, set the plateNr as “OOP-001”
  - Set the car’s speed to “120”
  - Use System.out.print to print the following text to the screen: *The car with plate number xxxxxxx has a current speed of yyy km/h*
  - Note that xxxxxxx and yyy are values you need to get from the Car object you have created
- Run the program “MyFirstOOProgram” and check if you got it right
- An example solution is available at the course’s GitHub private repository Laurea-University-Of-Applied-Sciences/Object-Oriented-Java (check the homework)