Abstract Factory Design Pattern

- one of the most commonly used design pattern
- part of creational design pattern
- uses in almost all the libraries in JDK. Spring framework.

define an interface (A java interface or an abstract class) for creating object and let the subclasses decide which class to instantiate.

- promotes loose-coupling by eliminating the need to bind application-specific classes to the code

When to use Abstract Design pattern?

- objects does not need details of how classes are created and represented
- system need to operate with one of several families of products
- system needs to be configured with one of a multiple

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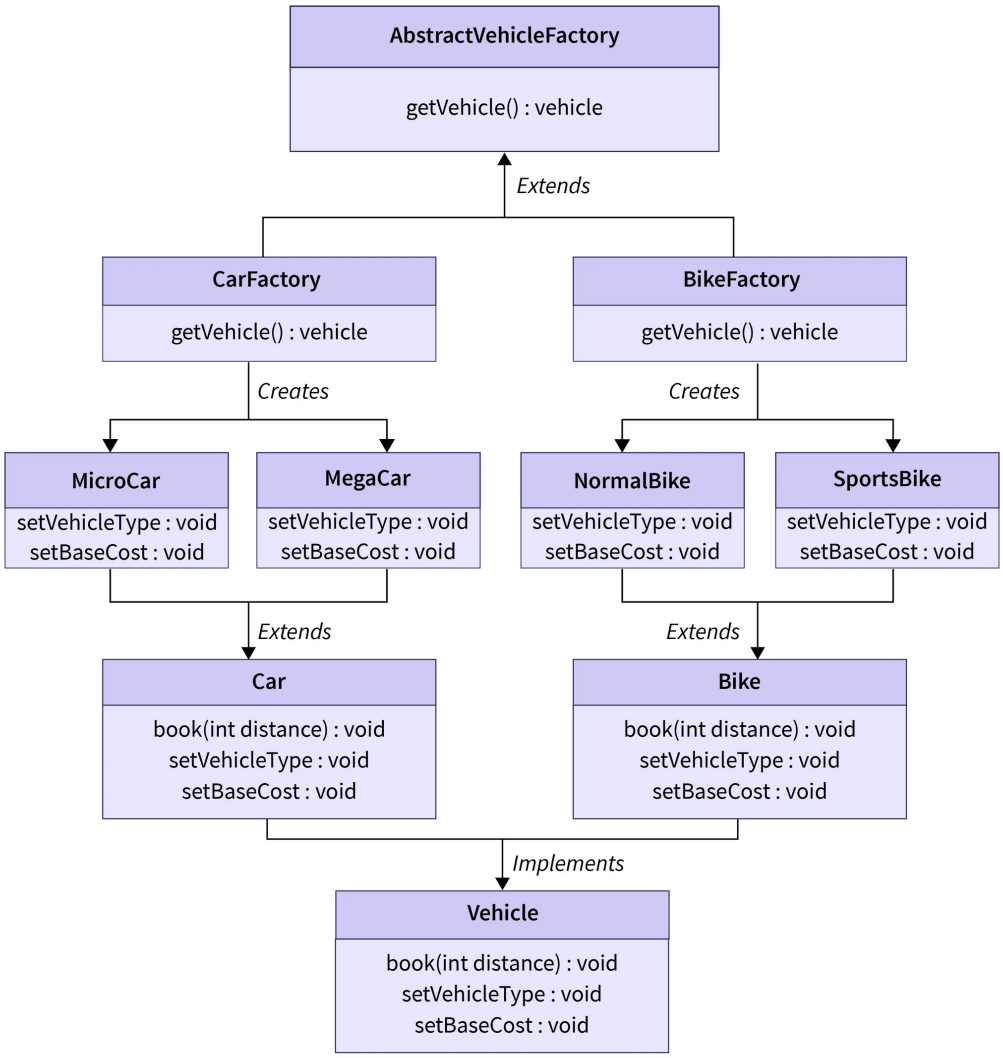
family of objects.

- provide a library and want to show just the interface. not implementation of the library components.

Class Diagram example



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Pseudo code for the example:

```
1) interface Vehicle
    book(int distance)
    setVehicleType()
    setBaseCost()
    setVehicleChargesPerUnitDistance()
    int calculateCostOfBooking(int distance)

2) abstract class Car implements Vehicle
    String carType
    int baseCost
    int chargesPerUnitDistance

    book(int distance){
        setVehicleType()
        setBaseCost()
        setVehicleChargesPerUnitDistance()
        int cost = calculateCostOfBooking(distance)
        print(carType + ". " + distance + ". " + cost + ". ")

    int calculateCostOfBooking(int distance){
        int serviceCharge = 3
        return baseCost + chargesPerUnitDistance * distance + serviceCharge

3) abstract class Bike implements Vehicle
    String bikeType
    int baseCost
    int chargesPerUnitDistance

    book(int distance)
        setVehicleType()
        setBaseCost()
        setVehicleChargesPerUnitDistance()
        int cost = calculateCostOfBooking(distance)
        print(bikeType+ "." + distance + "." + cost + ". ")
```

define generic vehicle

define abstract class Car that implement Vehicle

define abstract class Bike that implement Vehicle

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```
    int calculateCostOfBooking(int distance){
      int serviceCharge = 3
      return baseCost + chargesPerUnitDistance * distance + serviceCharge
```

4) class MicroCar extends Car

```
    MicroCar()

    setVehicleType()
       carType = "Micro"

    setBaseCost()
       baseCost = 50

    setVehicleChargesPerUnitDistance()
       chargesPerUnitDistance = 10
```

define concrete class MicroCar for Car

5) class SportsBike extends Bike

```
    PersonalAuto()

    setVehicleType()
       bikeType = "Sports"

    setBaseCost()
       baseCost = 10

    setVehicleChargesPerUnitDistance()
       chargesPerUnitDistance = 15
```

define concrete class SportsBike for Bike

6) abstract class AbstractVehicleFactory

```
    abstract Vehicle getVehicle(String type)
```

define abstract class AbstractVehicleFactory which is factory of factory

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7) class CarFactory extends AbstractVehicleFactory

```
Vehicle getVehicle(String type)
    if(type.equalsIgnoreCase("Micro"))
        return new MicroCar()
    else if(type.equalsIgnoreCase("Mini"))
        return new MiniCar()
    else if(type.equalsIgnoreCase("Mega"))
        return new MegaCar()
    else
        return new MiniCar()
```

define concrete class CarFactory that extends AbstractVehicleFactory

8) class BikeFactory extends AbstractVehicleFactory

```
Vehicle getVehicle(String type)
    if(type.equalsIgnoreCase("Sports"))
        return new SportsBike()
    else if(type.equalsIgnoreCase("Normal"))
        return new NormalBike()
    else
        return new NormalBike()
```

define concrete class BikeFactory that extends AbstractBikeFactory

9) class FactoryProvider

```
static AbstractVehicleFactory getVehicleFactory(String factoryType)
    if(factoryType.equalsIgnoreCase("Car"))
        return new CarFactory()
    else if(factoryType.equalsIgnoreCase("Auto"))
        return new AutoFactory()
    else if(factoryType.equalsIgnoreCase("Bike"))
        return new BikeFactory()
    else
        return new CarFactory()
```

define FactoryProvider that provides required vehicle factory

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10) class AbstractFactoryPatternDemoClient

main()

int distance = 10

Client class

```
/*
* Book a Micro Car for a distance of 10 kms
*/
AbstractVehicleFactory carFactory = FactoryProvider.getVehicleFactory("Car")
Vehicle miniCar = carFactory.getVehicle("Micro")
miniCar.book(distance)

/*
* Book a Personal Auto for a distance of 10 kms
*/
AbstractVehicleFactory autoFactory = FactoryProvider.getVehicleFactory("Auto")
Vehicle personalAuto = autoFactory.getVehicle("Personal")
personalAuto.book(distance)
```

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Advantages

- offers loose coupling in the code
- supports open close principle since the code can be easily extended for supporting new classes
- enforces consistent creation of objects

Disadvantages

- increased complexity