[BC] design pattern Factory

CHJ

Simple factory pattern

Order pizza

```
Pizza orderPizza(String type) {
        Pizza pizza;

        if (type.equals("cheese")) {
            pizza = new CheesePizza();
        } else if (type.equals("greek") {
            pizza = new GreekPizza();
        } else if (type.equals("pepperoni") {
            pizza = new PepperoniPizza();
        } else if (type.equals("clam") {
            pizza = new ClamPizza();
        } else if (type.equals("veggie") {
            pizza = new eggiePizza();
        }

        pizza.prepare();
        pizza.bake();
        pizza.cut();
        pizza.box();
        return pizza;
    }
```

This code is NOT closed for modification. If the Pizza Shop changes its pizza offerings, we have to get into this code and modify it.

This is what varies. As the pizza selection changes over time, you'll have to modify this code over and over.

This is what we expect to stay the same. For the most part, preparing, cooking, and packaging a pizza has remained the same for years and years. So, we don't expect this code to change, just the pizzas it operates on.

- 수정에 대해 닫혀있지 않음.

Create pizza

So now we know we'd be better off moving the object creation out of the orderPizza() method. But how? Well, what we're going to do is take the creation code and move it out into another object that is only going to be concerned with creating pizzas.

```
if (type.equals("cheese")) {
    pizza = new CheesePizza();
  } else if (type.equals("pepperoni") {
    pizza = new PepperoniPizza();
  } else if (type.equals("clam") {
    pizza = new ClamPizza();
  } else if (type.equals("veggie") {
    pizza = new VeggiePizza();
}
```

```
Pizza orderPizza(String type) {
        Pizza pizza;

        pizza.prepare();
        pizza.bake();
        pizza.cut();
        pizza.box();
        return pizza;
}
```

First we pull the object creation code out of the orderPizza Method

What's going to go here?

Then we place that code in an object that is only going to worry about how to create pizzas. If any other object needs a pizza created, this is the object to come to.

We've got a name for this new object: we call it a Factory.

Factories handle the details of object creation. Once we have a SimplePizzaFactory, our orderPizza() method just becomes

- 객체 생성 코드를 분리

Pizza factory

Here's our new class, the SimplePizzaFactory. It has one job in life: creating pizzas for its clients.

First we define a createPizza() method in the factory. This is the method all clients will use to instantiate new objects.

```
public class SimplePizzaFactory {
    public Pizza createPizza(String type) {
        Pizza pizza = null;

        if (type.equals("cheese")) {
            pizza = new CheesePizza();
        } else if (type.equals("pepperoni")) {
            pizza = new PepperoniPizza();
        } else if (type.equals("clam")) {
            pizza = new ClamPizza();
        } else if (type.equals("veggie")) {
            pizza = new VeggiePizza();
        }
        return pizza;
    }
}
```

Here's the code we plucked out of the orderPizza() method.

This code is still parameterized by the type of the pizza, just like our original orderPizza() method was.

- 피자 생성만을 담당하는 새로운 클래스

Pizza order with factory

Now we give PizzaStore a reference to a SimplePizzaFactory.

PizzaStore gets the factory passed to it in the constructor.

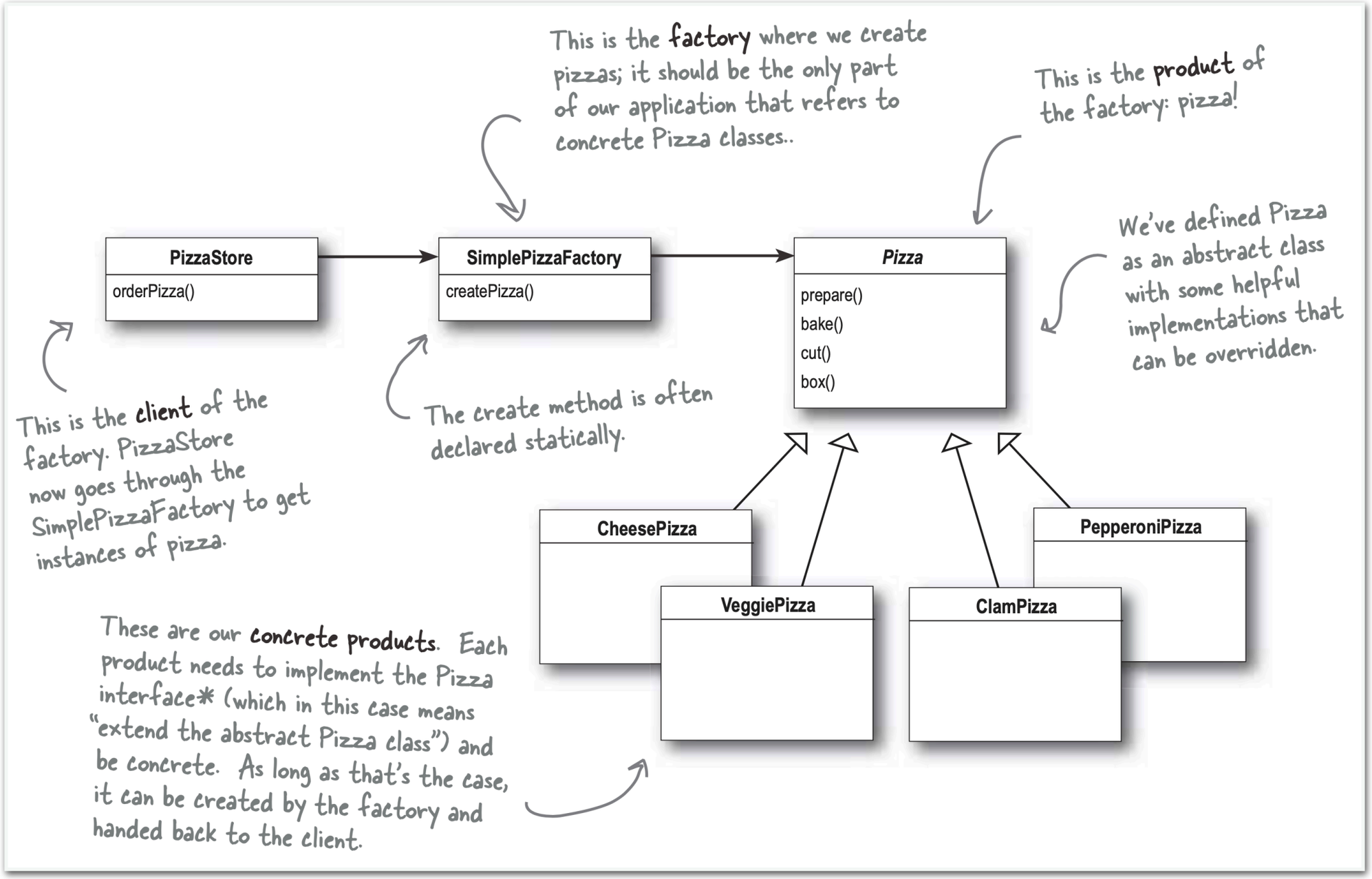
```
public class PizzaStore {
    SimplePizzaFactory factory;

    public PizzaStore(SimplePizzaFactory factory) {
        this.factory = factory;
    }

    public Pizza orderPizza(String type) {
        Pizza pizza;

        pizza = factory.createPizza(type);

        pizza.prepare();
        pizza.bake();
        pizza.cut();
        pizza.box();
        return pizza;
    }

    // other methods here
}
```

And the orderPizza() method uses the factory to create its pizzas by simply passing on the type of the order.

Notice that we've replaced the **new operator** with a create **method** on the factory object. No more concrete instantiations here!

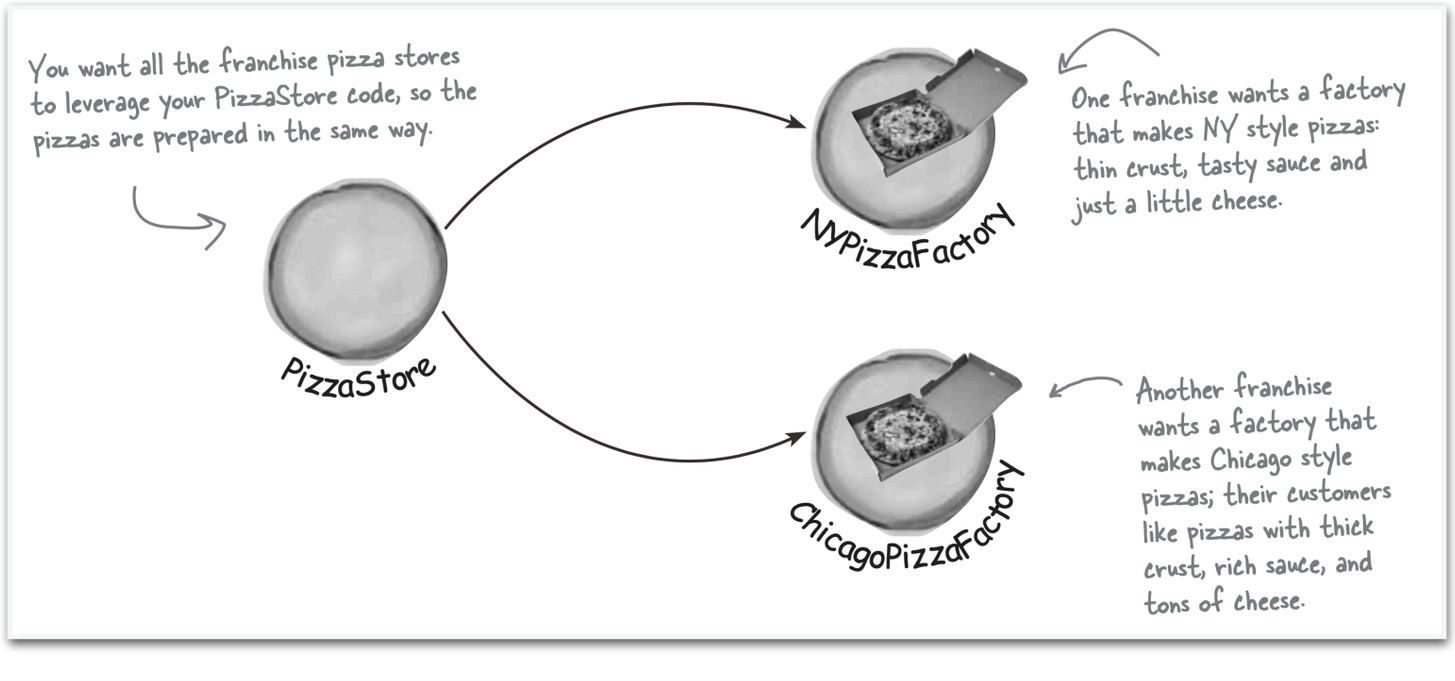
- 클라이언트가 피자 주문시, orderPizza 부분은 수정에 대해 닫힌다.
- factory는 composition을 이용해 동적으로 바리에이션이 가능하다.

Class diagram



- PizzaStore는 Pizza생성 책임을 PizzaFactory에게 위임
- Pizza를 보니 데자뷰가..?

Store and Factory




```
NYPizzaFactory nyFactory = new NYPizzaFactory();
PizzaStore nyStore = new PizzaStore(nyFactory);
nyStore.order("Veggie");
```

Here we create a factory for making NY style pizzas.

Then we create a PizzaStore and pass it a reference to the NY factory.

...and when we make pizzas, we get NY-styled pizzas.

- Factory를 다형화 하기 위해서, composition을 사용 가능

- 그러나 피자 생산을 지역화 하고 싶다면? (뉴욕 피자가게는 뉴욕스타일 피자를, 시카고 피자가게는 시카고스타일 피자를…)

Factory method pattern

Responsible to store

PizzaStore is now abstract (see why below).

```
public abstract class PizzaStore {

    public Pizza orderPizza(String type) {
        Pizza pizza;

        pizza = createPizza(type);

        pizza.prepare();
        pizza.bake();
        pizza.cut();
        pizza.box();

        return pizza;
    }

    abstract createPizza(String type);
}
```

Now createPizza is back to being a call to a method in the PizzaStore rather than on a factory object.

All this looks just the same...

Now we've moved our factory object to this method.

Our "factory method" is now abstract in PizzaStore.

- 피자 생성의 책임을 factory에서 store로! 따라서 store는 더이상 factory가 필요하지 않음 (그러나 단일 책임의 원칙을 위배.. 커플링도 강해지는듯)

- store를 추상화하여 각 지역 가게별로 createPizza를 overriding하도록 구현

NY PizzaStore

createPizza() returns a Pizza, and the subclass is fully responsible for which concrete Pizza it instantiates

The NYPizzaStore extends PizzaStore, so it inherits the orderPizza() method (among others).

```
public class NYPizzaStore extends PizzaStore {
    Pizza createPizza(String item) {
        if (item.equals("cheese")) {
            return new NYStyleCheesePizza();
        } else if (item.equals("veggie")) {
            return new NYStyleVeggiePizza();
        } else if (item.equals("clam")) {
            return new NYStyleClamPizza();
        } else if (item.equals("pepperoni")) {
            return new NYStylePepperoniPizza();
        } else return null;
    }
}
```

We've got to implement createPizza(), since it is abstract in PizzaStore.

Here's where we create our concrete classes. For each type of Pizza we create the NY style.

* Note that the orderPizza() method in the superclass has no clue which Pizza we are creating; it just knows it can prepare, bake, cut, and box it!

- NYPizzaStore는 createPizza()를 overriding하여, 뉴욕 스타일 피자를 만든다.
- Super class인 PizzaStore는 무슨 피자를 만들지 모른다. (피자 생성에 대한 책임이 없음)

How about Pizza?

We'll start with an abstract Pizza class and all the concrete pizzas will derive from this.

Each Pizza has a name, a type of dough, a type of sauce, and a set of toppings.

The abstract class provides some basic defaults for baking, cutting and boxing.

Preparation follows a number of steps in a particular sequence.

```
public abstract class Pizza {
    String name;
    String dough;
    String sauce;
    ArrayList toppings = new ArrayList();

    void prepare() {
        System.out.println("Preparing " + name);
        System.out.println("Tossing dough...");
        System.out.println("Adding sauce...");
        System.out.println("Adding toppings: ");
        for (int i = 0; i < toppings.size(); i++) {
            System.out.println("   " + toppings.get(i));
        }
    }

    void bake() {
        System.out.println("Bake for 25 minutes at 350");
    }
```

- 피자의 종류는 다양하므로, 추상화하자

Pizzas

```
public class NYStyleCheesePizza extends Pizza {
    public NYStyleCheesePizza() {
        name = "NY Style Sauce and Cheese Pizza";
        dough = "Thin Crust Dough";
        sauce = "Marinara Sauce";

        toppings.add("Grated Reggiano Cheese");
    }
}
```

The NY Pizza has its own marinara style sauce and thin crust.

And one topping, reggiano cheese!

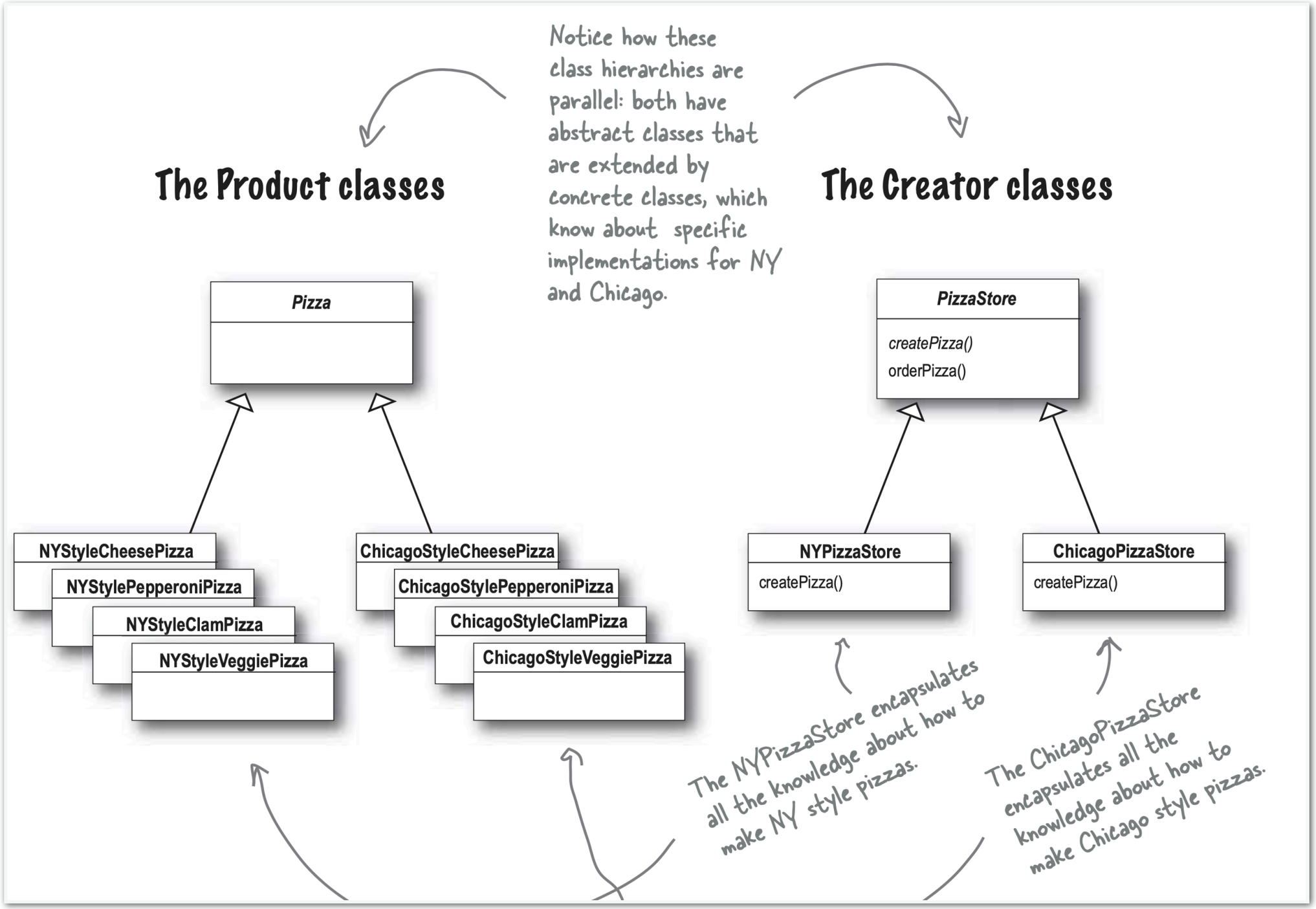
```
public class ChicagoStyleCheesePizza extends Pizza {
    public ChicagoStyleCheesePizza() {
        name = "Chicago Style Deep Dish Cheese Pizza";
        dough = "Extra Thick Crust Dough";
        sauce = "Plum Tomato Sauce";

        toppings.add("Shredded Mozzarella Cheese");
    }

    void cut() {
        System.out.println("Cutting the pizza into square slices");
    }
}
```

The Chicago Pizza uses plum tomatoes as a sauce along with extra thick crust.

The Chicago style deep dish pizza has lots of mozzarella cheese!

The Chicago style pizza also overrides the cut() method so that the pieces are cut into squares.

Class diagram



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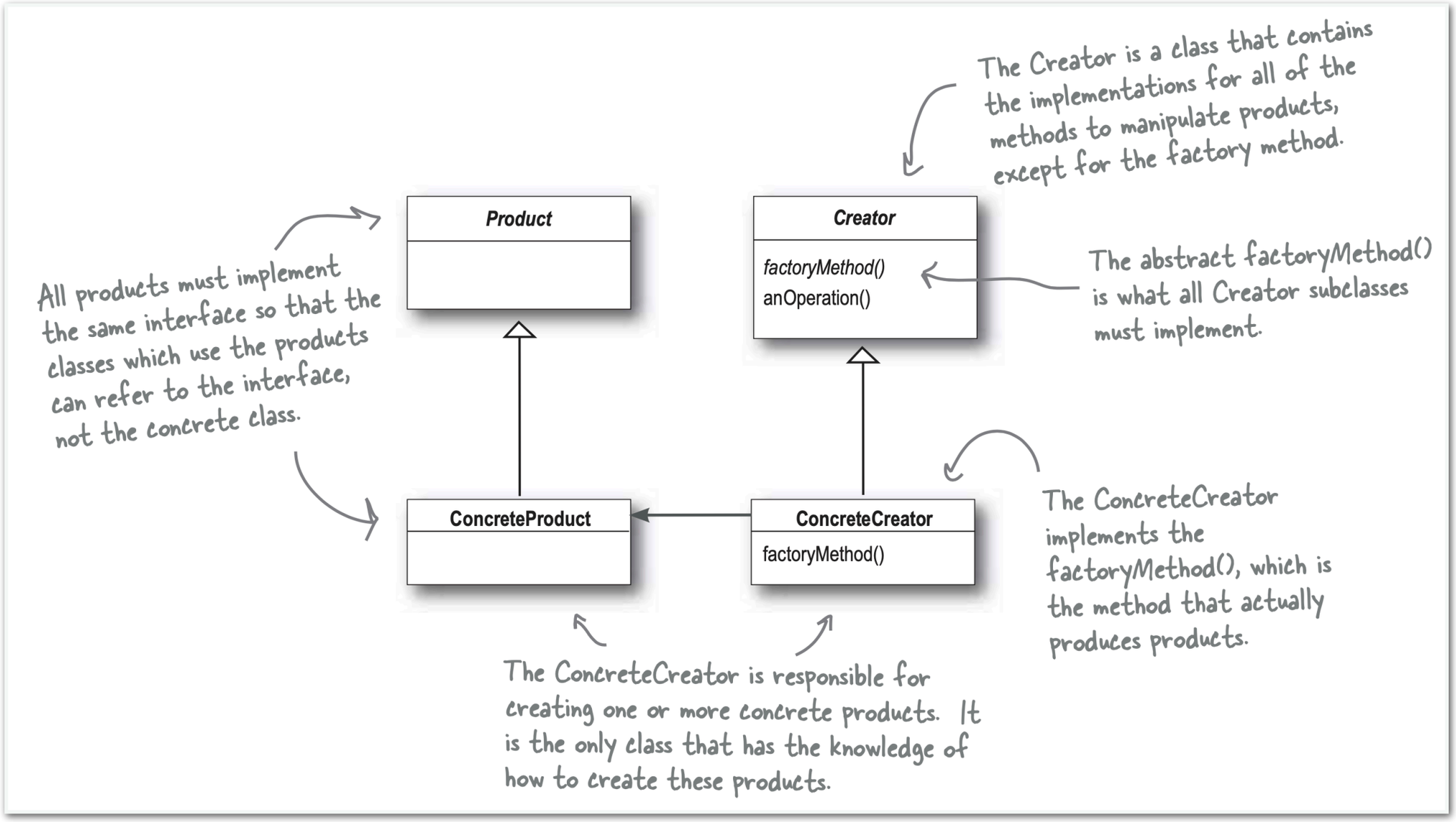

- Factory method 패턴은 구체적인 인스턴스 생성을 캡슐화한다.
- 오직 subclass만 factory method를 override하고 product를 만든다.

The Factory Method pattern defines an interface for creating an object, but lets subclasses decide which class to instantiate. Factory Method lets a class defer instantiation to subclasses.

–head first

나머지는 각자 공부해보세요..

(ingredient factory, abstract factory)