Factories

More creational patterns

Variations on a theme

The factory pattern exists in a few different flavors. We'll look at three of them.

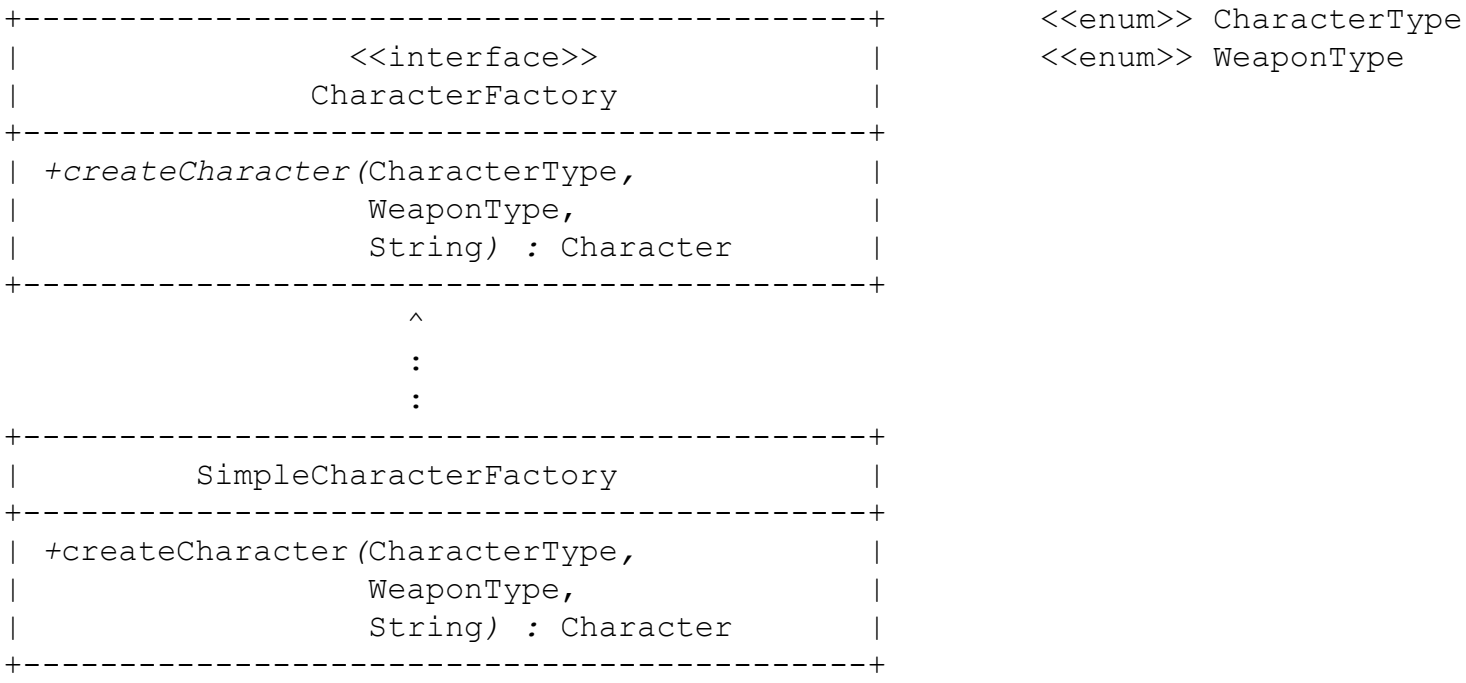
- Simple Factory
- Factory Method
- Abstract Factory

Simple Factory - motivation

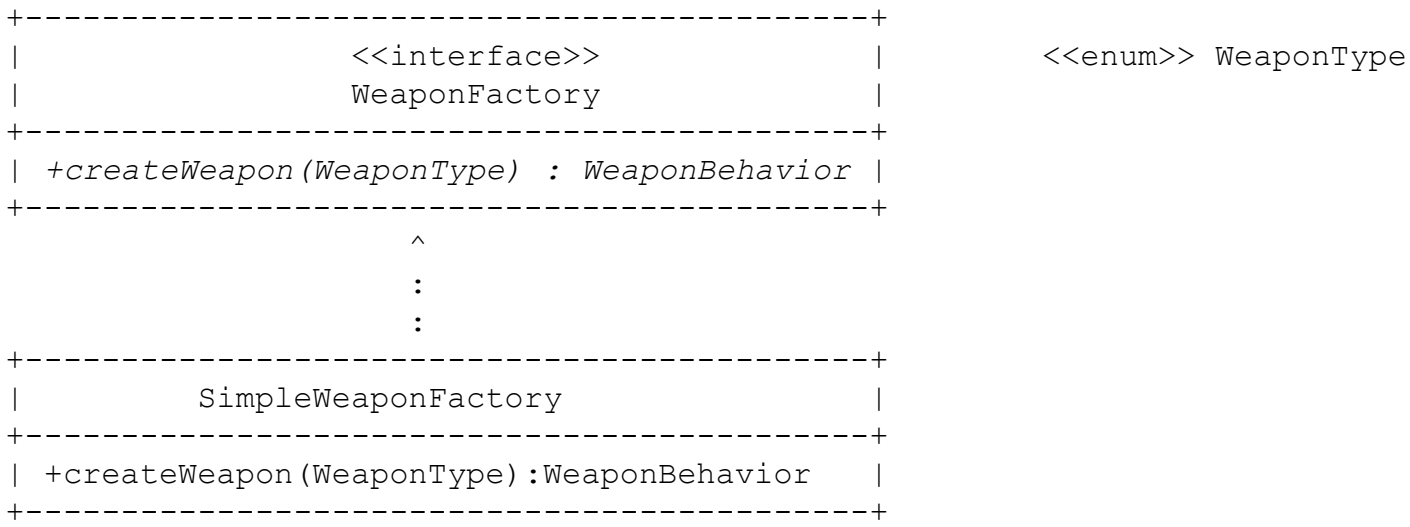
```
public class Game{
  public static void main(String[] args){
    Troll troll = new Troll("Lillfjant", new Club());
    Knight sirJames = new Knight("Sir James", new Sword());
    Knight blackKnight = new Knight("Fistfighting Black Knight");
  }
}
```

- Sensitive to changes!
  - Class name changes?
  - We need to know how the constructors work (if that changes, we'll have to change too)
  - We need to know about Club and Sword
  - Overloaded constructors lack undescriptive names

Simple Factory - Design



Simple Factory - Design



Simple Factory - Client code

```
public class Game{
  public static void main(String[] args){
    CharacterFactory cFactory = new SimpleCharacterFactory();
    Character troll =
      cFactory.createCharacter(CharacterType.TROLL,
                               WeaponType.CLUB,
                               "Lillfjant");
    Character sirJames =
      cFactory.createCharacter(CharacterType.KNIGHT,
                               WeaponType.SWORD,
                               "Sir James");
    Character blackKnight =
      cFactory.createCharacter(CharacterType.KNIGHT,
                               WeaponType.UNARMED,
                               "Fistfighting Black Knight");

  }
}
// Creation is decoupled from the client
```

Simple Factory - Benefits

Where do we have code to change if we

- Create a new concrete character Class
- Create a new WeaponBehavior
- Change the constructor of Character?
- Change the constructor of a Weapon?

Simple Factory - Benefits

Where do we have code to change if we

- Create a new concrete character Class
  - CharacterType (enum)
  - SimpleCharacterFactory - createCharacter
- Create a new WeaponBehavior
  - WeaponType (enum)
  - SimpleWeaponFactory - createWeapon
- Change the constructor of Character?
  - SimpleCharacterFactory - createCharacter
- Change the constructor of a Weapon?
  - SimpleWeaponFactory - createWeapon

Client code will not break.

Simple Factory - Benefits

We can add a method to the factory which will be more descriptive than an overloaded constructor.

Method for creating an unarmed character:

```
public Character createUnarmedCharacter(CharacterType character, String
name){
  return createCharacter(character, WeaponType.UNARMED, name);
}
```

SimpleFactory - more client code

```
CharacterFactory cFactory = new SimpleCharacterFactory();
Character troll =
  cFactory.createCharacter(CharacterType.TROLL,
                           WeaponType.CLUB,
                           "Lillfjant");
Character sirJames =
  cFactory.createCharacter(CharacterType.KNIGHT,
                           WeaponType.SWORD,
                           "Sir James");
Character blackKnight =
  cFactory.createCharacter(CharacterType.KNIGHT,
                           WeaponType.UNARMED,
                           "Fistfighting Black Knight");
Character evilOrch =
  cFactory.createCharacter(CharacterType.ORCH,          // new character type!
                           WeaponType.SHOTGUN,
                           "Ugly scary Orch");
Character unarmedOrch =
  cFactory.createUnarmedCharacter(CharacterType.ORCH,  // new factory method!
                                  "Ugly scary unarmed Orch");
```

Simple Factory - Problems

- Still a lot of work to add new types
  - we have to change both the enum and the factory method
- Can you see any other problems?