Adapter Pattern

Adapter pattern is similar to how an electrical adapter lets your laptop work both in the US or UK even though voltages are different.

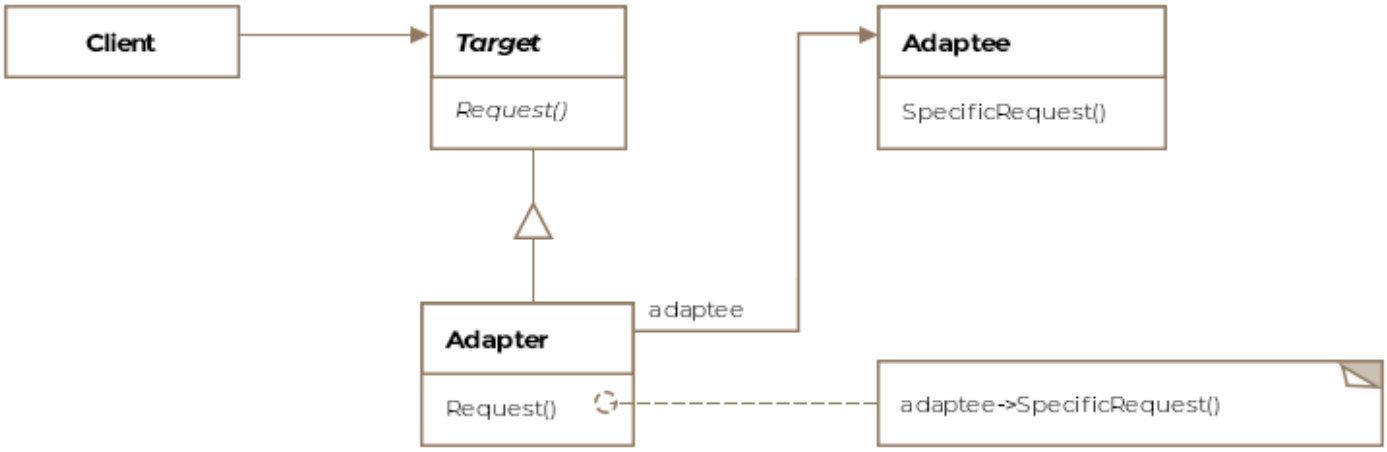
What is it ?

> When two heads of states who don't speak a common language meet, usually a language interpreter sits between the two and translates the conversation, thus enabling communication. The Adapter pattern is similar in that it sits between two incompatible classes that otherwise can't work with eachother and lets them work together. Another example to consider is when one buys electronics from USA and tries to use them in India. The two countries have different power voltages being distributed to consumers and using an electronic appliance from one country in another requires a physical adapter which steps up or down the voltage appropriately. The concept of the software adapter pattern is similar.
>
> Formally, the adapter pattern is defined as ***allowing incompatible classes to work together by converting the interface of one class into another expected by the clients***
>
> .

Class Diagram

> The class diagram consists of the following entities
>
> - **Target**
> - **Client**
> - **Adaptee**

- **Adapter**



Class Diagram

Example

Let's take our aircraft example again. Your software only deals with fancy jets but suddenly you are required to *adapt* your software to cater to a local hot air balloon company. Rewriting your software from scratch is not feasible. To complicate matters the balloon company already provides you with classes that represent hot air balloons which are incompatible with your `IAircraft` interface, which you use to represent modern aircraft. We'll use the adapter pattern to make the hot air balloon classes work with our existing infrastructure for aircraft. Let's see what the balloon class looks like:

```
public class HotAirBalloon {

    String gasUsed = "Helium";

    void fly(String gasUsed) {
        // Take-off sequence based on the kind of feul
        // Followed by more code.
    }

    // Function returns the gas used by the balloon for flight
    String inflateWithGas() {
        return gasUsed;
    }
}
```

Unfortunately, the `fly` method for the `HotAirBalloon` class is parametrized and can't work with the `IAircraft` interface. We'll need an adapter here that can make the `HotAirBalloon` class work with the `IAircraft` interface. The **adapter** in pattern-speak should implement the client interface, which is the `IAircraft` interface.

```
public interface IAircraft {
    void fly();
}
```

The adapter implementation would be the following:

```
public class Adapter implements IAircraft {

    HotAirBalloon hotAirBalloon;

    public Adapter(HotAirBalloon hotAirBalloon) {
        this.hotAirBalloon = hotAirBalloon;
    }

    @Override
    public void fly() {
        String feulUsed = hotAirBalloon.inflateWithGas();
        hotAirBalloon.fly(feulUsed);
    }
}
```

The important things to note about the adapter are:

- The adapter is ***composed*** with the **Adaptee** object, which in our case is the HotAirBalloon object.
- The adapter implements the interface the client knows about and consumes. In this case, it is the `IAircraft`.

Let's see the client code now

```
public void main() {

    HotAirBalloon hotAirBalloon = new HotAirBalloon();
    Adapter hotAirBalloonAdapter = new Adapter(hotAirBalloon);

    hotAirBalloonAdapter.fly();
}
```

Note the client is manipulating objects that implement the `IAircraft` interface. It doesn't know anything about the `HotAirBalloon` class and the adapter is responsible for masking the gory details for the client. The client can now make a hot air balloon fly even though it deviates from the `fly()` method enforced by the `IAircraft` interface.

Object Adapter

The hot air balloon example that we just discussed is really an *object adapter* example. We *composed* the adapter with the adaptee object to make incompatible classes work together. In the case of Java, we can only practice object adaptation for reasons you'll learn shortly.

Using objects for adaptation gains us the usual benefits of object composition, The design becomes flexible and the adapter can stand in place of the adaptee or any of its subclassed-objects.

Class Adapter

Class Adapter

The complementary concept to object adapter is the *class adapter*. The class adapter works via multiple inheritance which isn't supported in Java. However, the idea is that the adapter extends both, the interface in use by the client, as well as, the adaptee class. Adaptation works via inheritance instead of composition.

One benefit of the adaptation via inheritance is that behavior can be overridden or new functionality can be added in the adapter.

Other Examples

- If you have two applications, one spits out output as XML and the other takes in input as JSON then you'll need an adapter between the two to make them work seamlessly.
- `Enumeration` is a read-only interface from early days of Java which had only two methods `hasMoreElements` and `nextElement`. Later on, when Sun released Collections, it introduced the `Iterator` interface which also allows to remove elements. To support legacy code, we can create an adapter class to translate between the two interfaces and since enumeration is read-only, it can throw a runtime exception, when an item removal is requested.
- In the Java API, one can find `java.io.InputStreamReader` and `java.io.OutputStreamWriter` as examples of the adapter pattern

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