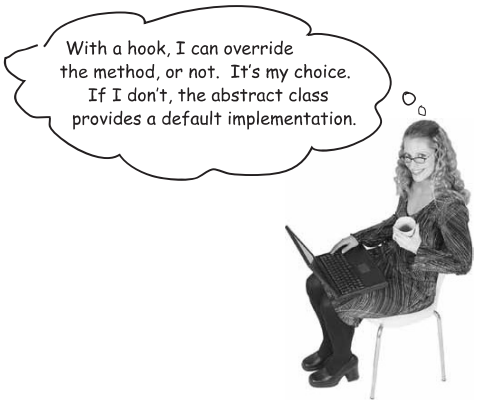
implement a hook

Hooked on Template Method...

A hook is a method that is declared in the abstract class, but only given an empty or default implementation. This gives subclasses the ability to "hook into" the algorithm at various points, if they wish; a subclass is also free to ignore the hook.

There are several uses of hooks; let's take a look at one now. We'll talk about a few other uses later:




```
public abstract class CaffeineBeverageWithHook {

    void prepareRecipe() {
        boilWater();
        brew();
        pourInCup();
        if (customerWantsCondiments()) {
            addCondiments();
        }
    }

    abstract void brew();

    abstract void addCondiments();

    void boilWater() {
        System.out.println("Boiling water");
    }

    void pourInCup() {
        System.out.println("Pouring into cup");
    }

    boolean customerWantsCondiments() {
        return true;
    }
}
```

We've added a little conditional statement that bases its success on a concrete method, customerWantsCondiments(). If the customer WANTS a condiments, only then do we call addCondiments().

Here we've defined a method with a (mostly) empty default implementation. This method just returns true and does nothing else.

This is a **hook** because the subclass can override this method, but doesn't have to.

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Using the hook

To use the hook, we override it in our subclass. Here, the hook controls whether the CaffeineBeverage evaluates a certain part of the algorithm; that is, whether it adds a condiment to the beverage.

How do we know whether the customer wants the condiment? Just ask !

```
public class CoffeeWithHook extends CaffeineBeverageWithHook {

    public void brew() {
        System.out.println("Dripping Coffee through filter");
    }

    public void addCondiments() {
        System.out.println("Adding Sugar and Milk");
    }

    public boolean customerWantsCondiments() {
        String answer = getUserInput();

        if (answer.toLowerCase().startsWith("y")) {
            return true;
        } else {
            return false;
        }
    }

    private String getUserInput() {
        String answer = null;

        System.out.print("Would you like milk and sugar with your coffee (y/n)? ");

        BufferedReader in = new BufferedReader(new InputStreamReader(System.in));
        try {
            answer = in.readLine();
        } catch (IOException ioe) {
            System.err.println("IO error trying to read your answer");
        }
        if (answer == null) {
            return "no";
        }
        return answer;
    }
}
```

Here's where you override the hook and provide your own functionality.

Get the user's input on the condiment decision and return true or false, depending on the input.

This code asks the user if he'd like milk and sugar and gets his input from the command line.

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test drive

Let's run the TestDrive

Okay, the water's boiling... Here's the test code where we create a hot tea and a hot coffee

```
public class BeverageTestDrive {
    public static void main(String[] args) {

        TeaWithHook teaHook = new TeaWithHook();
        CoffeeWithHook coffeeHook = new CoffeeWithHook();

        System.out.println("\nMaking tea...");
        teaHook.prepareRecipe();

        System.out.println("\nMaking coffee...");
        coffeeHook.prepareRecipe();
    }
}
```

← Create a tea.

← A coffee.

And call prepareRecipe() on both!

And let's give it a run...

```
File Edit Window Help send-more-honesttea
%java BeverageTestDrive

Making tea...
Boiling water
Steeping the tea
Pouring into cup
Would you like lemon with your tea (y/n)? y
Adding Lemon

Making coffee...
Boiling water
Dripping Coffee through filter
Pouring into cup
Would you like milk and sugar with your coffee (y/n)? n
%
```

A steaming cup of tea, and yes, of course we want that lemon!

And a nice hot cup of coffee, but we'll pass on the waistline expanding condiments.

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You know what? We agree with you. But you have to admit before you thought of that it was a pretty cool example of how a hook can be used to conditionally control the flow of the algorithm in the abstract class. Right?

We're sure you can think of many other more realistic scenarios where you could use the template method and hooks in your own code.

there are no Dumb Questions

Q: When I'm creating a template method, how do I know when to use abstract methods and when to use hooks?

A: Use abstract methods when your subclass MUST provide an implementation of the method or step in the algorithm. Use hooks when that part of the algorithm is optional. With hooks, a subclass may choose to implement that hook, but it doesn't have to.

Q: What are hooks really supposed to be used for?

A: There are a few uses of hooks. As we just said, a hook may provide a way for a subclass to implement an optional part of an algorithm, or if it isn't important to the subclass' implementation, it can skip it. Another use is to give the subclass a chance to react to some step in the template method that is about to happen, or just happened. For instance, a hook method like justReOrderedList() allows the subclass to perform some activity (such as redisplaying an onscreen representation) after an internal list is reordered. As you've seen a hook can also provide a subclass with the ability to make a decision for the abstract class.

Q: Does a subclass have to implement all the abstract methods in the AbstractClass?

A: Yes, each concrete subclass defines the entire set of abstract methods and provides a complete implementation of the undefined steps of the template method's algorithm.

Q: It seems like I should keep my abstract methods small in number, otherwise it will be a big job to implement them in the subclass.

A: That's a good thing to keep in mind when you write template methods. Sometimes this can be done by not making the steps of your algorithm too granular. But it's obviously a trade off: the less granularity, the less flexibility.

Remember, too, that some steps will be optional; so you can implement these as hooks rather than abstract classes, easing the burden on the subclasses of your abstract class.

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The Hollywood Principle

We've got another design principle for you; it's called the Hollywood Principle:

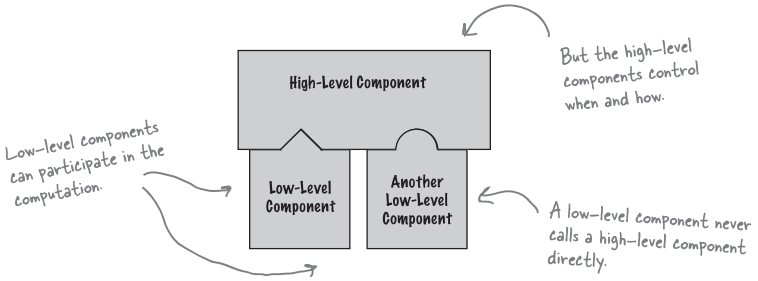
The Hollywood Principle

Don't call us, we'll call you.

Easy to remember, right? But what has it got to do with OO design?

The Hollywood principle gives us a way to prevent "dependency rot." Dependency rot happens when you have high-level components depending on low-level components depending on high-level components depending on sideways components depending on low-level components, and so on. When rot sets in, no one can easily understand the way a system is designed.

With the Hollywood Principle, we allow low-level components to hook themselves into a system, but the high-level components determine when they are needed, and how. In other words, the high-level components give the low-level components a "don't call us, we'll call you" treatment.



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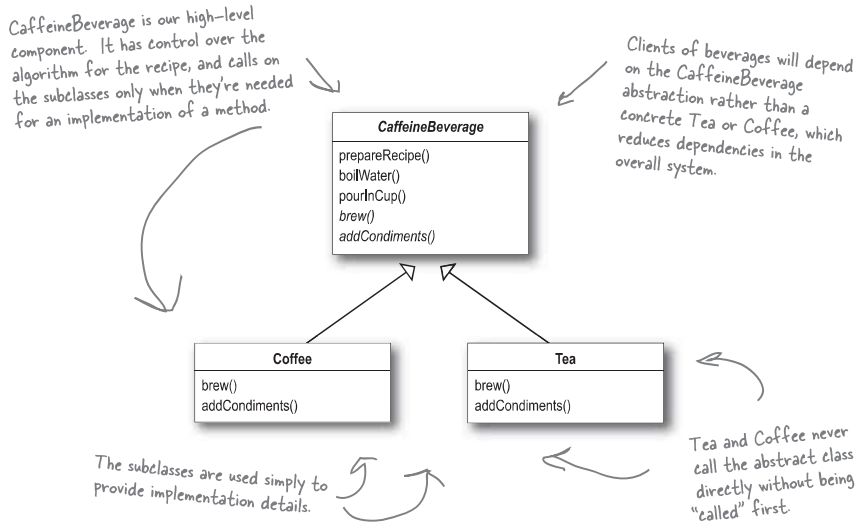
The Hollywood Principle and Template Method

The connection between the Hollywood Principle and the Template Method Pattern is probably somewhat apparent: when we design with the Template Method Pattern, we're telling subclasses, "don't call us, we'll call you." How? Let's take another look at our CaffeineBeverage design:



BRAIN POWER

What other patterns make use of the Hollywood Principle?

The Factory Method, Observer; any others?

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who does what

there are no Dumb Questions

Q: How does the Hollywood Principle relate to the Dependency Inversion Principle that we learned a few chapters back?

A: The Dependency Inversion Principle teaches us to avoid the use of concrete classes and instead work as much as possible with abstractions. The Hollywood Principle is a technique for building frameworks or components so that lower-level components can be hooked into the computation, but without creating dependencies between the lower-level components and the higher-level layers. So, they both have the goal of decoupling, but the Dependency Inversion Principle makes a much stronger and general statement about how to avoid dependencies in design.

The Hollywood Principle gives us a technique for creating designs that allow low-level structures to interoperate while preventing other classes from becoming too dependent on them.

Q: Is a low-level component disallowed from calling a method in a higher-level component?

A: Not really. In fact, a low level component will often end up calling a method defined above it in the inheritance hierarchy purely through inheritance. But we want to avoid creating explicit circular dependencies between the low-level component and the high-level ones.

WHO DOES WHAT?

Match each pattern with its description:

Pattern	Description
Template Method	Encapsulate interchangeable behaviors and use delegation to decide which behavior to use
Strategy	Subclasses decide how to implement steps in an algorithm
Factory Method	Subclasses decide which concrete classes to create

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