Composite Design Pattern

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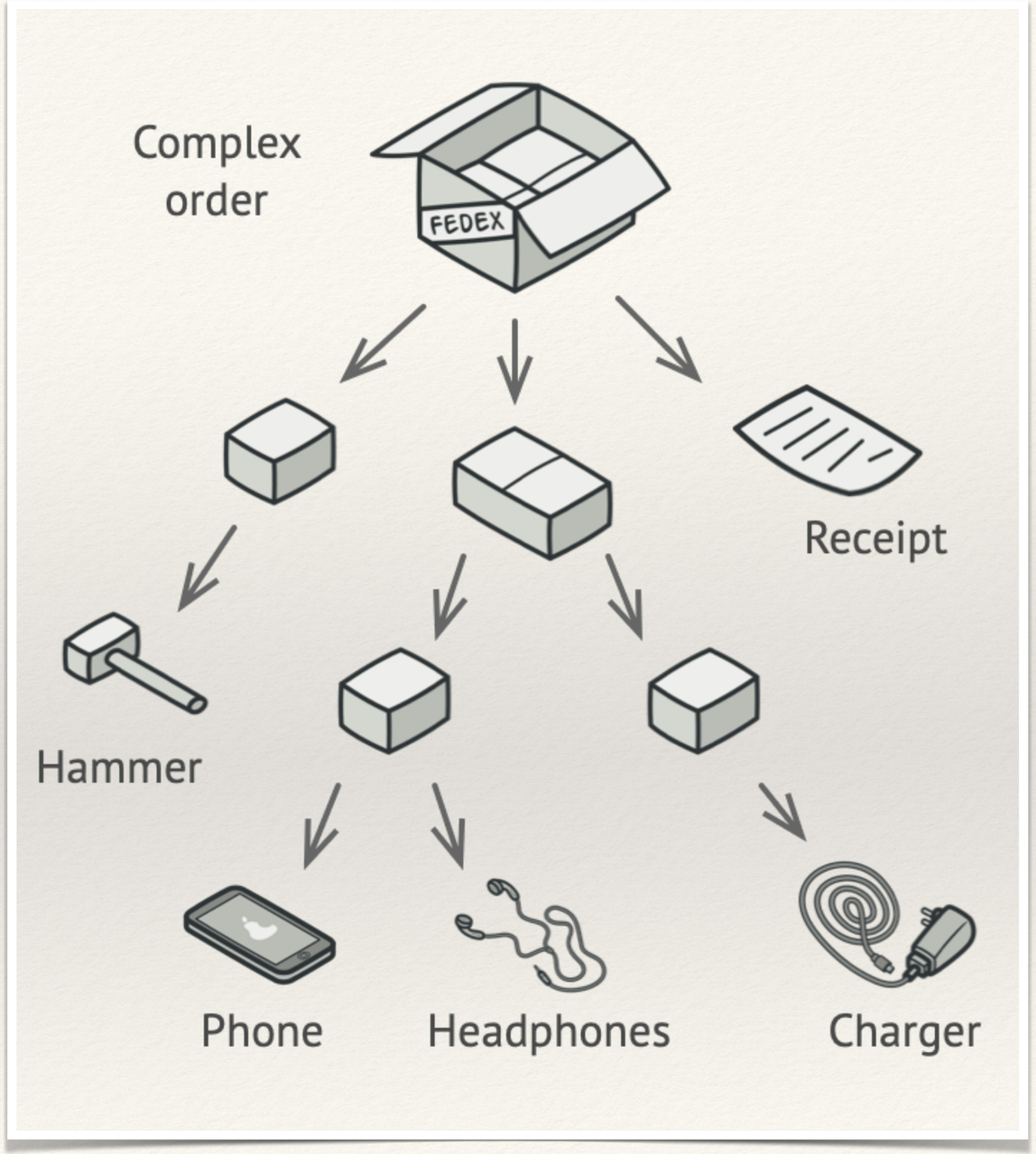
Intent

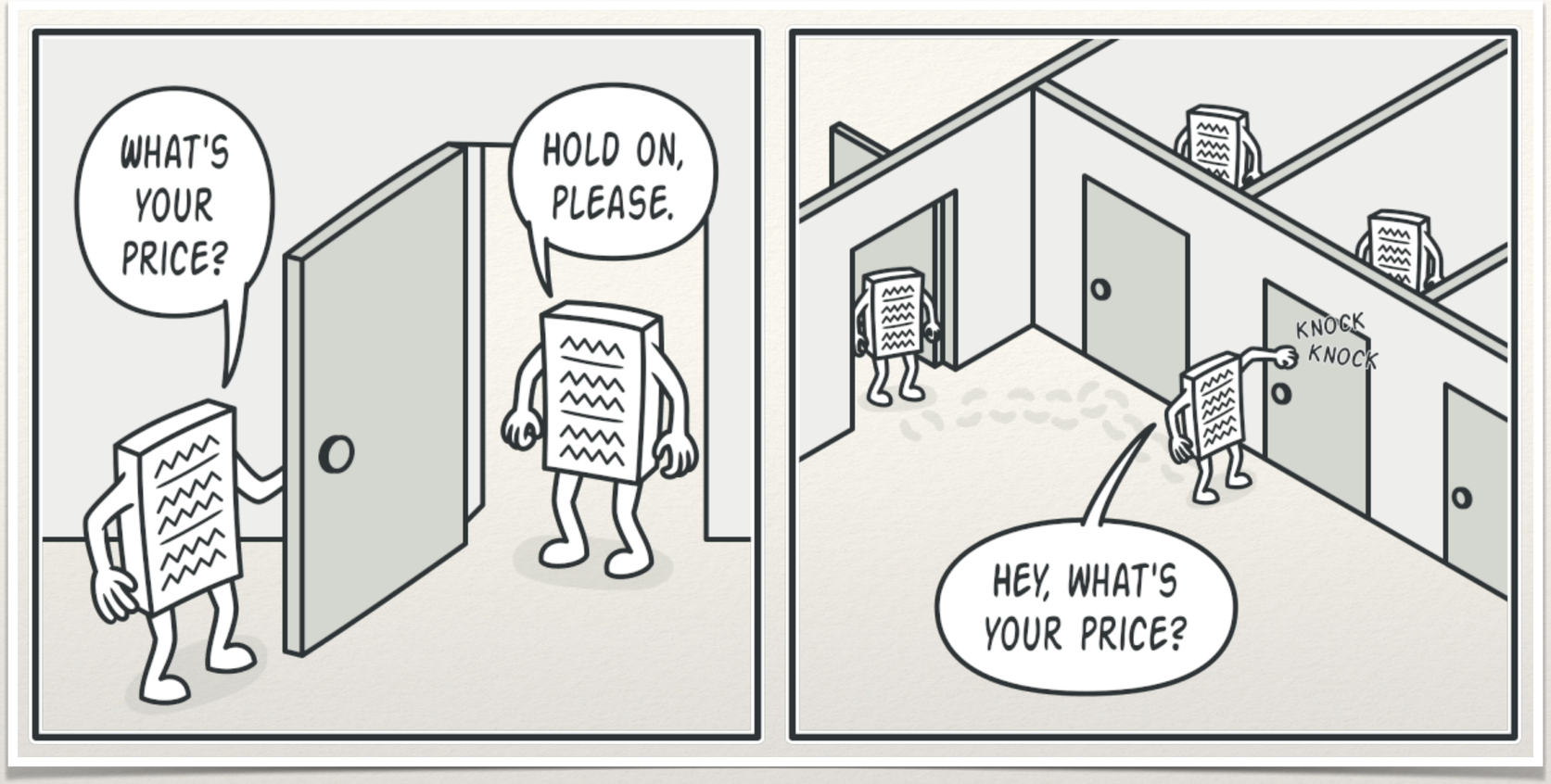
Composite is a structural design pattern that lets you compose objects into tree structures and then work with these structures as if they were individual objects.

Problem

Imagine that you have two types of objects: **Products** and **Boxes**. A Box can contain several Products as well as a number of smaller Boxes.

We want to implement ordering system and calculate order's price.





Work with Products and Boxes through a common interface which declares a method for calculating the total price.

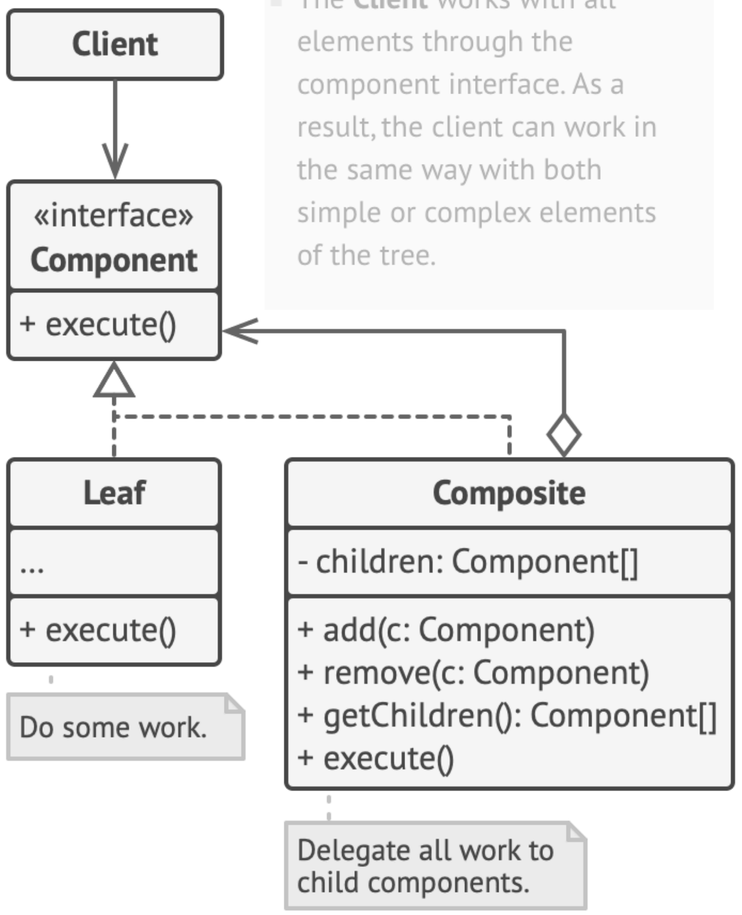
Solution

Structure

1 The **Component** interface describes operations that are common to both simple and complex elements of the tree.

2 The **Leaf** is a basic element of a tree that doesn't have sub-elements.

Usually, leaf components end up doing most of the real work, since they don't have anyone to delegate the work to.



4 The **Client** works with all elements through the component interface. As a result, the client can work in the same way with both simple or complex elements of the tree.

3 The **Container** (aka *composite*) is an element that has sub-elements: leaves or other containers. A container doesn't know the concrete classes of its children. It works with all sub-elements only via the component interface.

Upon receiving a request, a container delegates the work to its sub-elements, processes intermediate results and then returns the final result to the client.

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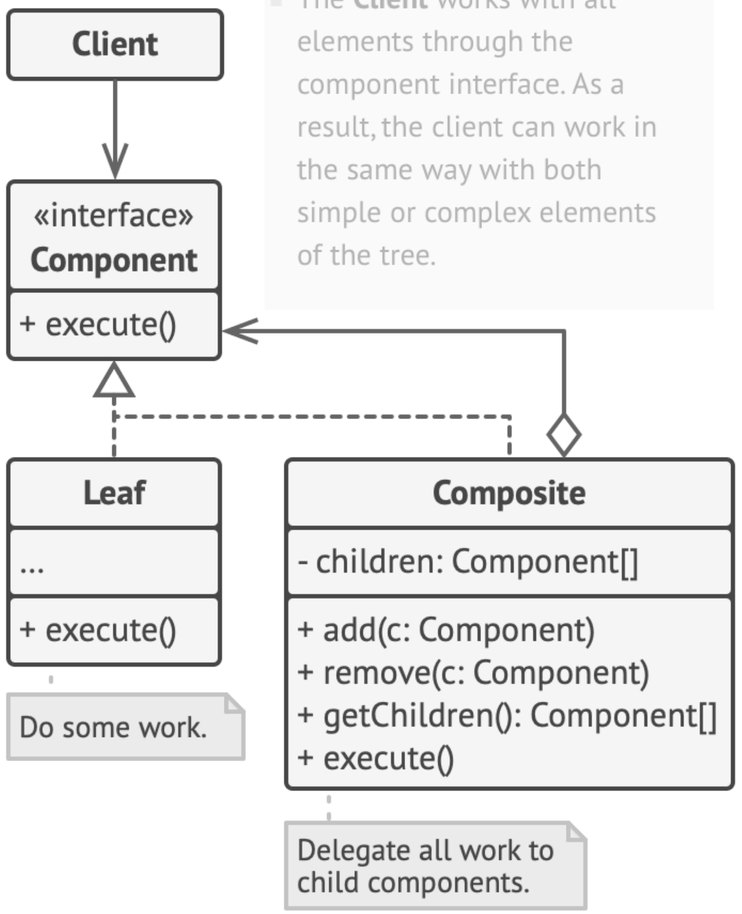

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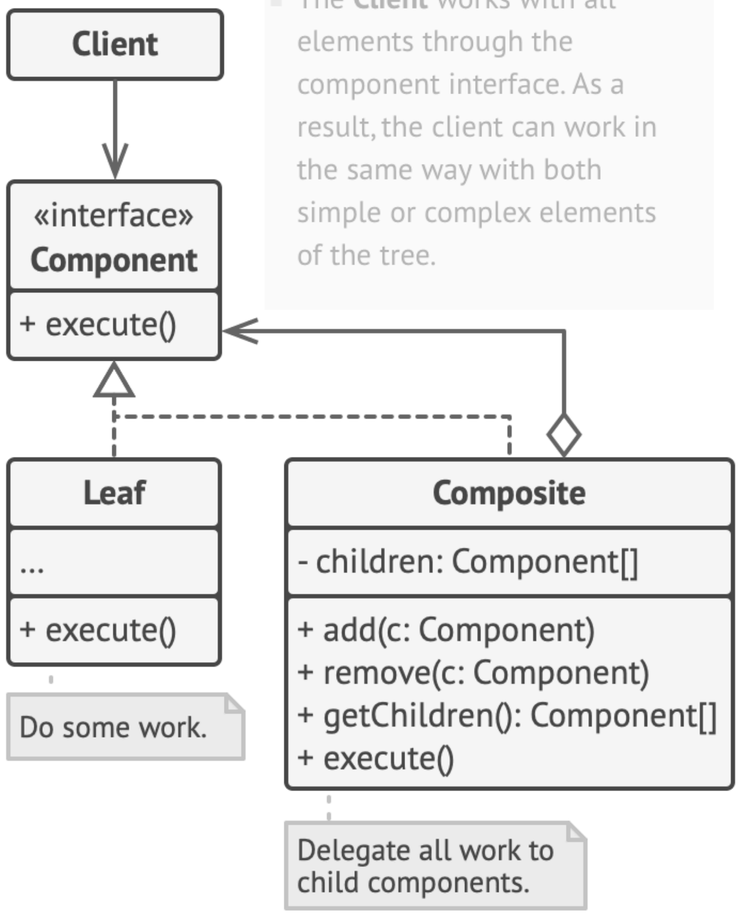

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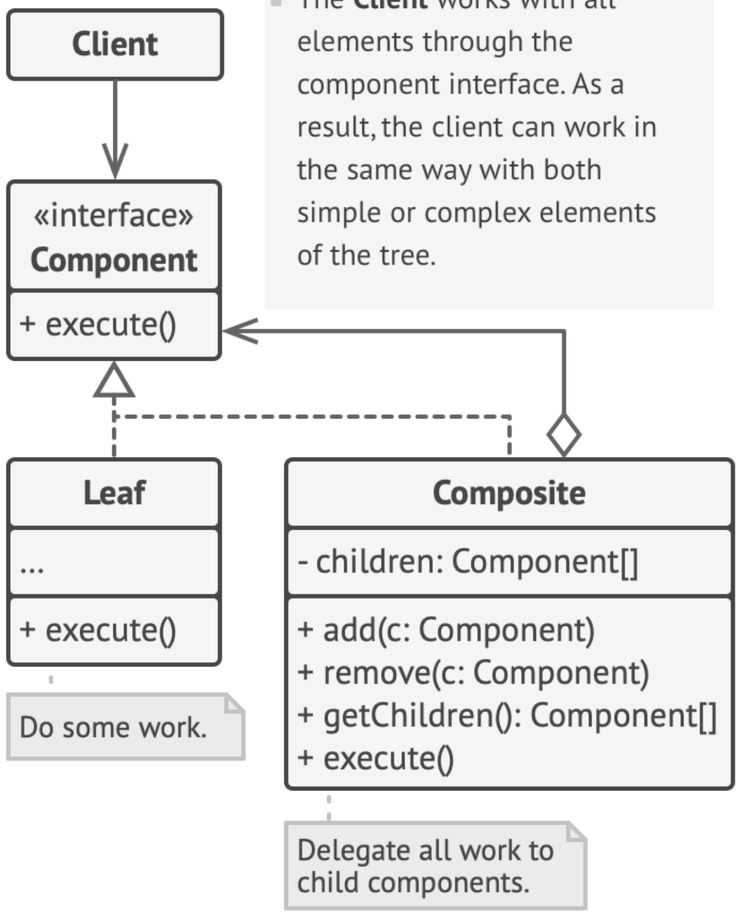

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Pros

- Can manage complex tree structures more conveniently.
- Makes it easier to add new kinds of components (Interfaces)

Cons

- It might be difficult to provide a common interface for classes whose functionality differs too much. (or makes it too general to be understood)
- Only works with tree-like object structure

That’s all folks!