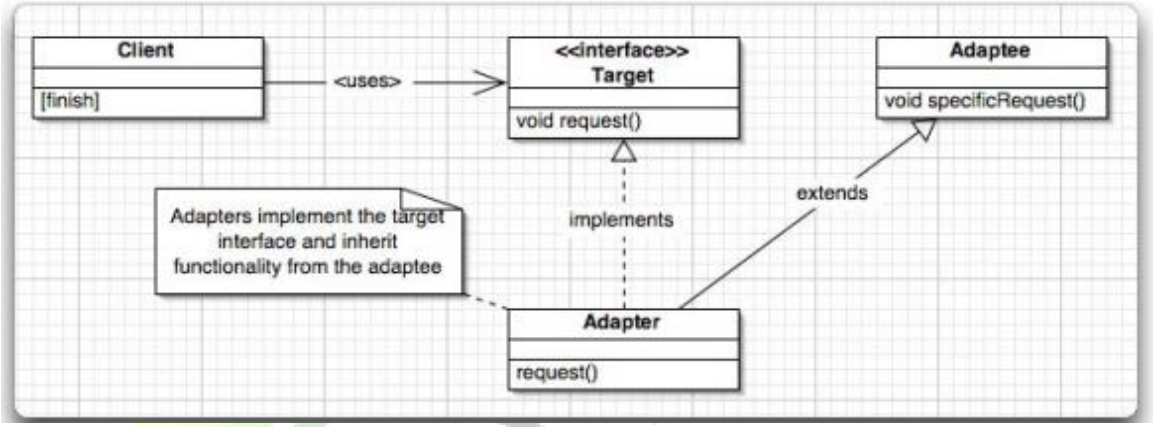
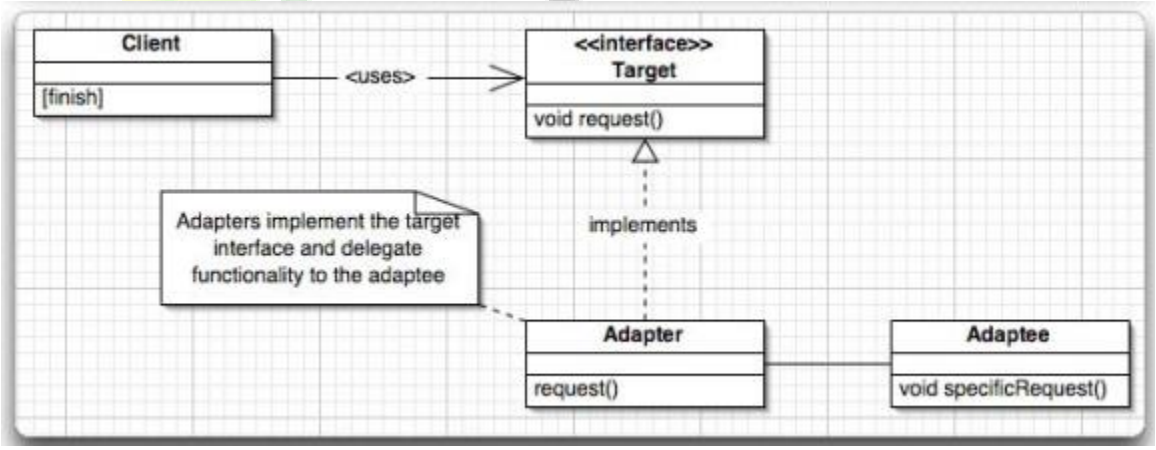
Practical Object oriented design (Theoretical Analysis)

Solve the following problems.

Problem1: Analyzing implementation choices in Adapter pattern

There are two variations of the Adapter pattern. In the first picture, the Adapter class inherits the Target's interface and the Adaptee's implementation. In the second picture, the Adapter class still inherits the target's interface, but accesses the Adaptee's functionality by having an instance of the Adaptee as an attribute. Describe the relative advantages of these two approaches with respect to flexibility, modifiability, and efficiency.





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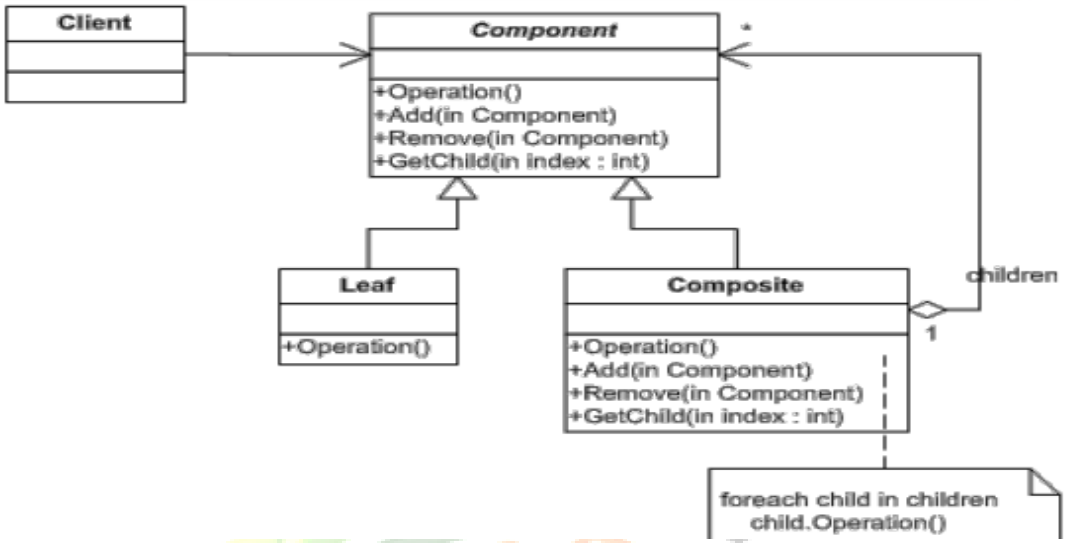
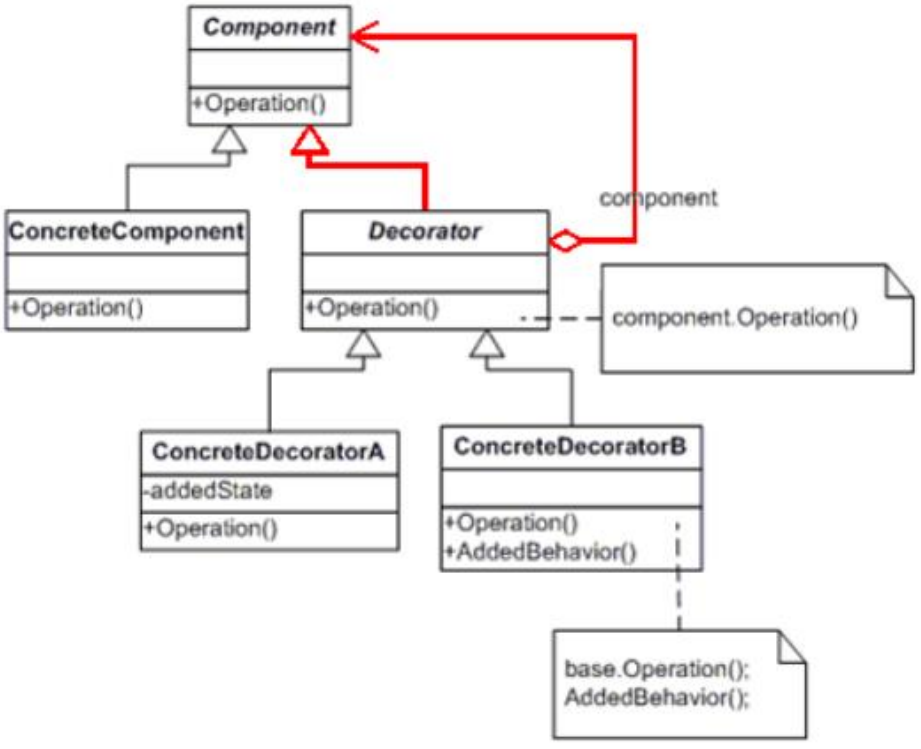
Problem2: Analyzing implementation choices in Composite pattern

In the Composite pattern, illustrated below, there are two possible locations where "child management" operations (e.g., adding a child, removing a child) could be placed: the Composite class or the Component class. Explain the relative merits of each possibility.



Problem3: Analyzing the Decorator pattern

In the Decorator pattern, given below, the Decorator class has two relationships with the Component class: a generalization relationship (i.e., the Decorator is a subclass of the Component) and an aggregation relationship (i.e., the Component is part of the Decorator class). Explain why both of these relationships are needed in order to accomplish what the Decorator pattern attempts to do (i.e., why is neither relationship sufficient by itself?)



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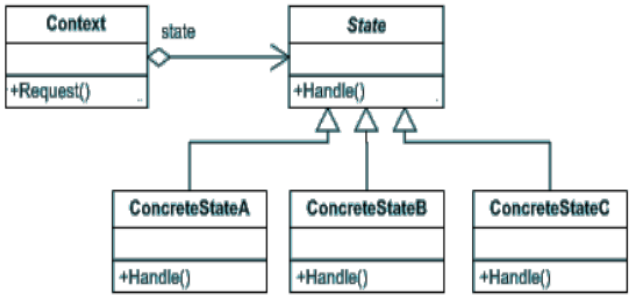
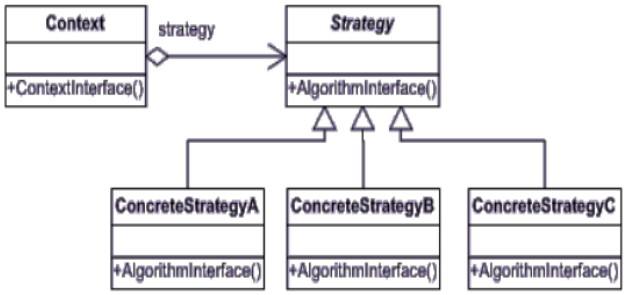
Problem4: Analyzing the Observer pattern

There are two principal implementation approaches for the Observer pattern. In the first approach, all Observers are automatically notified whenever the Subject experiences any state changes and each Observer determines whether or not to retrieve any of the new state information from the Subject. In the second approach, the Subject automatically transmits all state-change information to every Observer. Discuss the relative advantages of each approach, providing an example for which each approach would be appropriate.

Problem5: Strategy vs State Pattern

Notice that the State pattern (illustrated at left below) and the Strategy pattern (illustrated at right below) have exactly the same class diagram. Explain, then, the fundamental difference between these two patterns with respect to their intent.





Problem6: Find the pattern

Modern network protocols use message-passing techniques that require each message to pass through several internal network devices on its way from its source to its destination. At any point in this process, the message has a set of headers and trailers that identify the network protocol layer at which the message is currently operating (e.g., the end user's Application Layer, the specially encrypted Presentation Layer, the path finding Network Layer, etc.). Each device may alter the message (usually by modifying the various headers and trailers), simply forward the message, or even discard the message (if some serious problem is detected). Specify which design pattern corresponds to this means of handling messages.