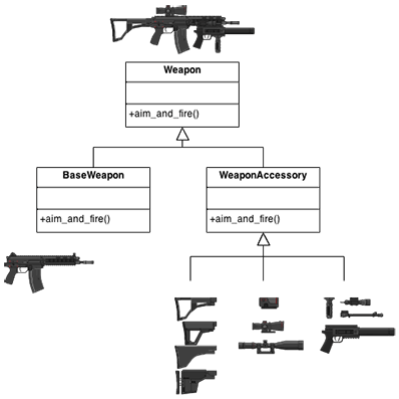
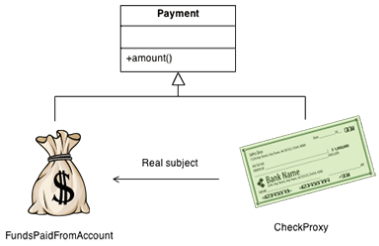
Structural patterns

In Software Engineering, Structural Design Patterns are Design Patterns that ease the design by identifying a simple way to realize relationships between entities.



- **Adapter**
  Match interfaces of different classes
- **Bridge**
  Separates an object's interface from its implementation
- **Composite**
  A tree structure of simple and composite objects
- **Decorator**
  Add responsibilities to objects dynamically
- **Facade**
  A single class that represents an entire subsystem
- **Flyweight**
  A fine-grained instance used for efficient sharing
- **Private Class Data**
  Restricts accessor/mutator access
- **Proxy**
  An object representing another object



Rules of thumb

1. **Adapter** makes things work after they're designed; **Bridge** makes them work before they are.

2. **Bridge** is designed up-front to let the abstraction and the implementation vary independently. **Adapter** is retrofitted to make unrelated classes work together.

3. **Adapter** provides a different interface to its subject. **Proxy** provides the same interface. **Decorator** provides an enhanced interface.

4. **Adapter** changes an object's interface, **Decorator** enhances an object's responsibilities. **Decorator** is thus more transparent to the client. As a consequence, **Decorator** supports recursive composition, which isn't possible with pure **Adapters**.

5. **Composite** and **Decorator** have similar structure diagrams, reflecting the fact that both rely on recursive composition to organize an open-ended number of objects.

6. **Composite** can be traversed with **Iterator**. **Visitor** can apply an operation over a **Composite**. **Composite** could use **Chain of responsibility** to let components access global properties through their parent. It could also use **Decorator** to override these properties on parts of the composition. It could use **Observer** to tie one object structure to another and **State** to let a component change its behavior as its state changes.

7. **Composite** can let you compose a **Mediator** out of smaller pieces through recursive composition.

8. **Decorator** lets you change the skin of an object. **Strategy** lets you change the guts.

9. **Decorator** is designed to let you add responsibilities to objects without subclassing. **Composite**'s focus is not on embellishment but on representation. These intents are distinct but complementary. Consequently, **Composite** and **Decorator** are often used in concert.

10. **Decorator** and **Proxy** have different purposes but similar structures. Both describe how to provide a level of indirection to another object, and the implementations keep a reference to the object to which they forward requests.

11. **Facade** defines a new interface, whereas **Adapter** reuses an old interface. Remember that **Adapter** makes two existing interfaces work together as opposed to defining an entirely new one.

12. **Facade** objects are often **Singleton** because only one **Facade** object is required.

13. **Mediator** is similar to **Facade** in that it abstracts functionality of existing classes. **Mediator** abstracts/centralizes arbitrary communication between colleague objects, it routinely "adds value", and it is known/referenced by the colleague objects. In contrast, **Facade** defines a simpler

interface to a subsystem, it doesn't add new functionality, and it is not known by the subsystem classes.

14. **Abstract Factory** can be used as an alternative to **Facade** to hide platform-specific classes.

15. Whereas **Flyweight** shows how to make lots of little objects, **Facade** shows how to make a single object represent an entire subsystem.

16. **Flyweight** is often combined with **Composite** to implement shared leaf nodes.

17. **Flyweight** explains when and how **State** objects can be shared.

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