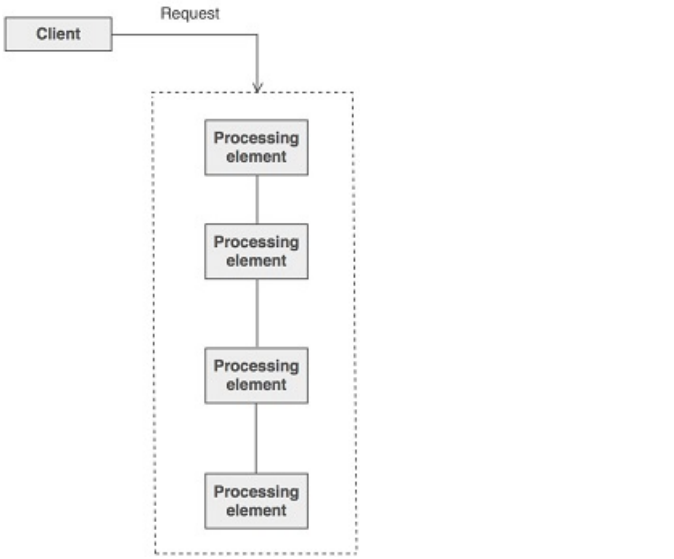
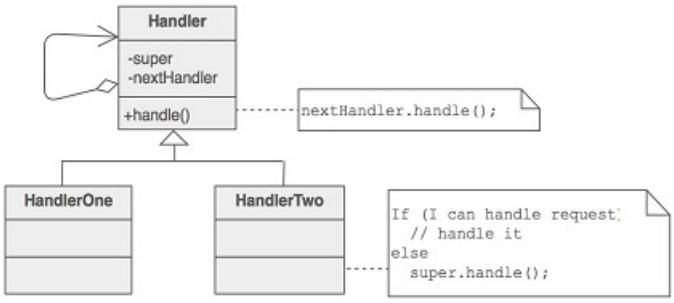
Behavioral

General:

Identify common communication patterns between objects and realize these patterns

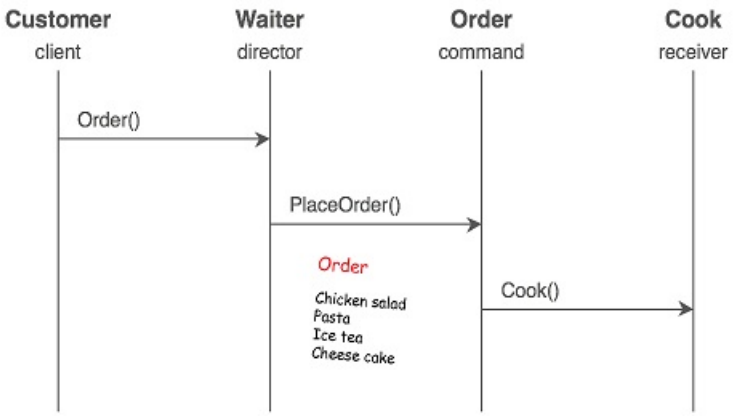
Chain of responsibility:

- Definition/Use
  - command objects are handled or passed on to other objects by logic-containing processing objects
  - avoid coupling the sender of a request to its receiver by giving more than one object a chance to handle the request
- Structure
  - 

  - 

- Notes
  - base class maintains a next pointer
  - if the request needs to be "passed on", then the derived class "calls back" to the base class, which delegates to the "next" pointer

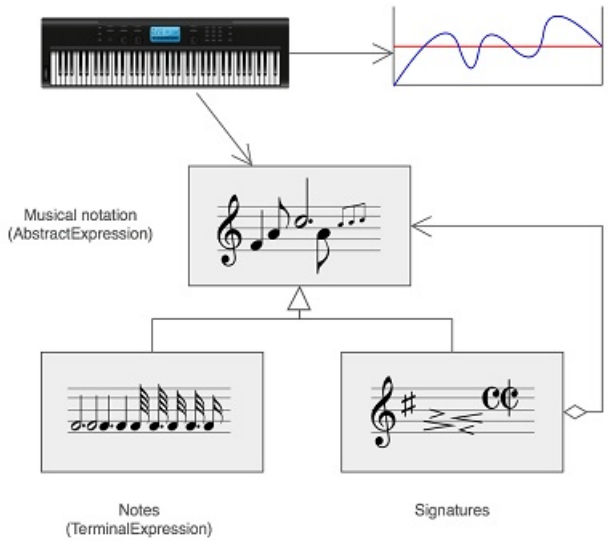
Command:

- Definition/Use
  - command objects encapsulate an action and its parameters
  - Need to issue requests to objects without knowing anything about the operation being requested or the receiver of the request
  - separation provides flexibility in the timing and sequencing of commands
  - command objects can be thought of as "tokens",created by one client that knows what need to be done, passed to another client that has the resources for doing it
- Structure
  - 

- Notes
  - define a Command interface with a method signature like execute()

Interpreter:

- Definition/Use
  - implement a specialized computer language to rapidly solve a specific set of problems
  - map a domain to a language, the language to a grammar, and the grammar to a hierarchical object
  - oriented design
- Structure



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- Notes
  - the pattern doesn't address parsing. When the grammar is very complex, other techniques (such as a parser) are more appropriate

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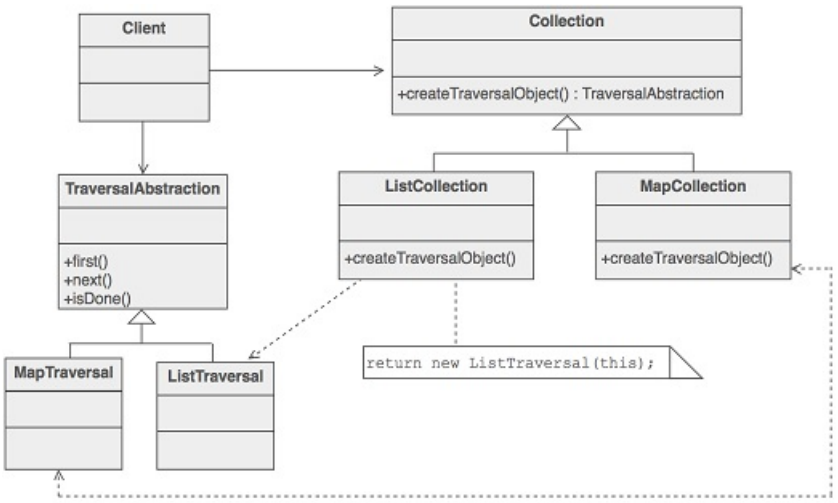
Iterator:

- Definition/Use
  - iterators are used to access the elements of an aggregate object sequentially without exposing its underlying representation
  - need to "abstract" the traversal of wildly different data structures so that algorithms can be defined that are capable of interfacing with each transparently
- Structure



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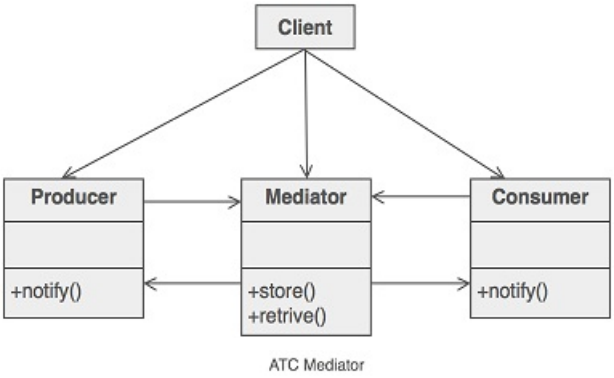
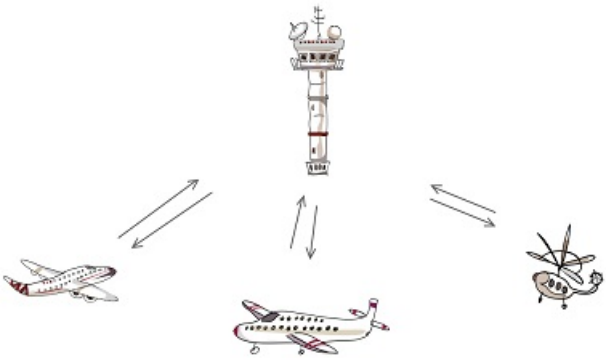
- Notes
  - ```
    clients use the first(), is_done(), next(), and current_item() protocol to
        access the elements of the collection class
    ```

Mediator:

- Definition/Use
  - provides a unified interface to a set of interfaces in a subsystem
  - promotes loose coupling by keeping objects from referring to each other explicitly
- Structure
  - 

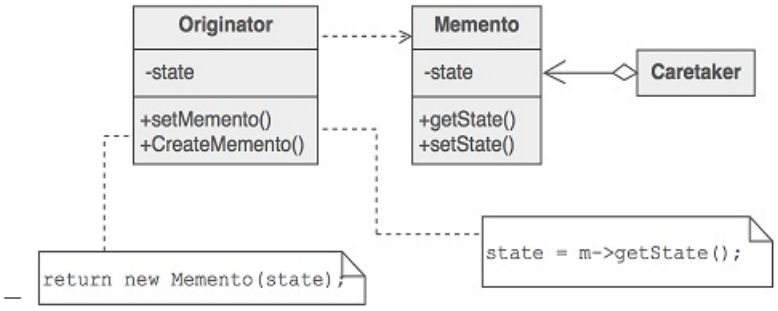
ATC Mediator
  - 
- Notes
  - be careful not to create a "controller" or "god" object

Memento:

- Definition/Use
    ```

  - provides the ability to restore an object to its previous state (rollback)
  - pattern defines three distinct roles
    * originator : the object that knows how to save itself
    * caretaker : the object that knows why and when the originator needs to save and restore itself
    * memento : the lock box that is written and read by the originator, and shepherded by the caretaker

- Structure



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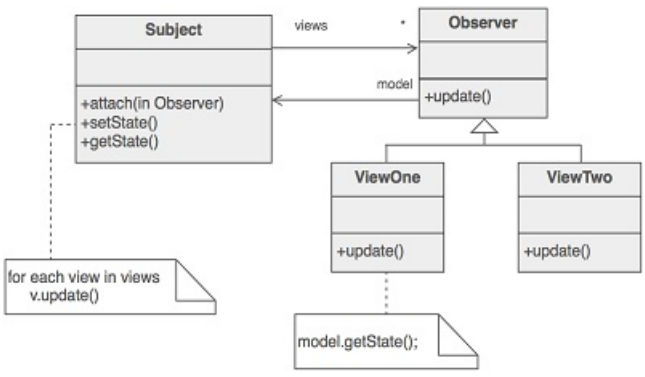
- Notes
  - identify the roles of caretaker and originator

Observer(Publish/Subscribe or Event Listener):

- Definition/Use
  - objects register to observe an event that may be raised by another object
  - defines a one
  - to
  - many relationship so that when one object changes state, the others are notified and updated automatically

- Structure



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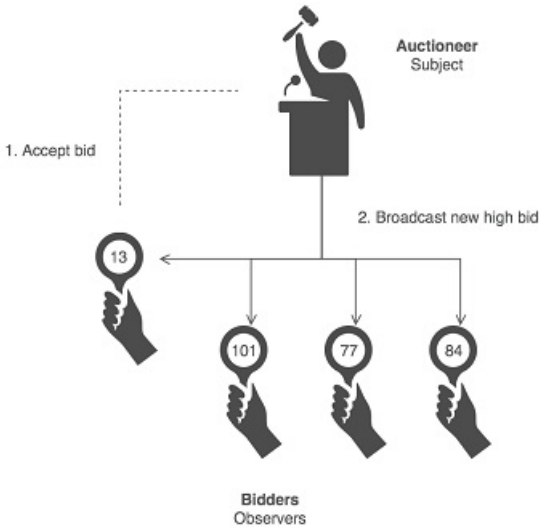

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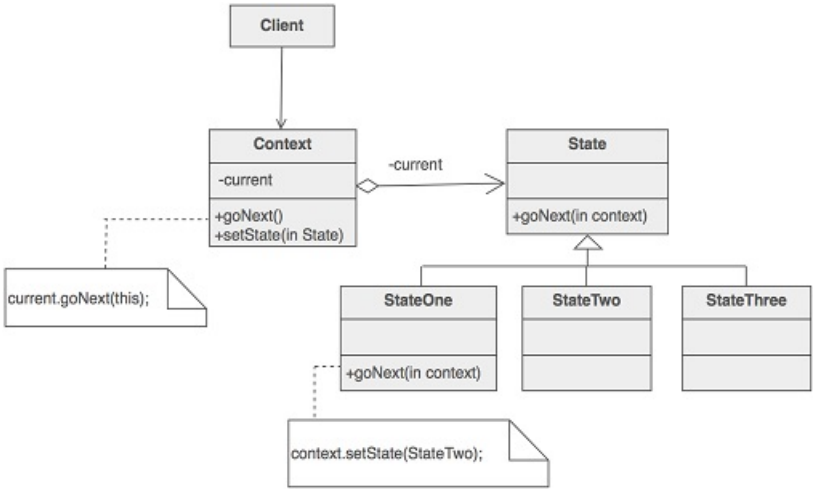
- Notes
  - subject broadcasts events to all registered observers

State:

- Definition/Use
  - a clean way for an object to partially change its type at runtime
  - a monolithic object's behavior is a function of its state
- Structure



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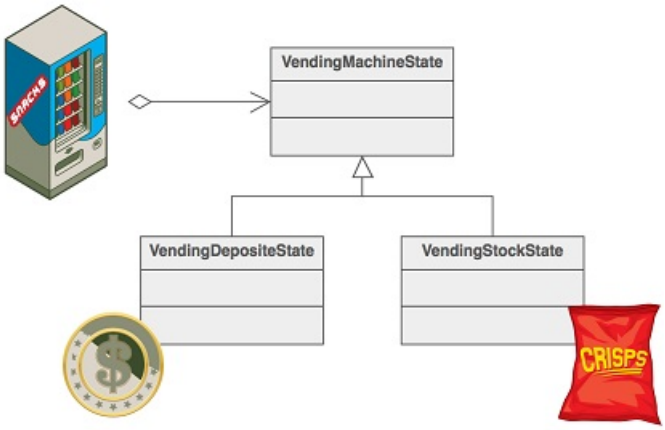

- Notes
  - pattern does not specify where the state transitions will be defined
    - the "context" object
    - each individual State derived class
      - advantage is ease of adding new State derived classes
      - disadvantage is each State derived class has knowledge of (coupling to) its siblings, which introduces dependencies between subclasses

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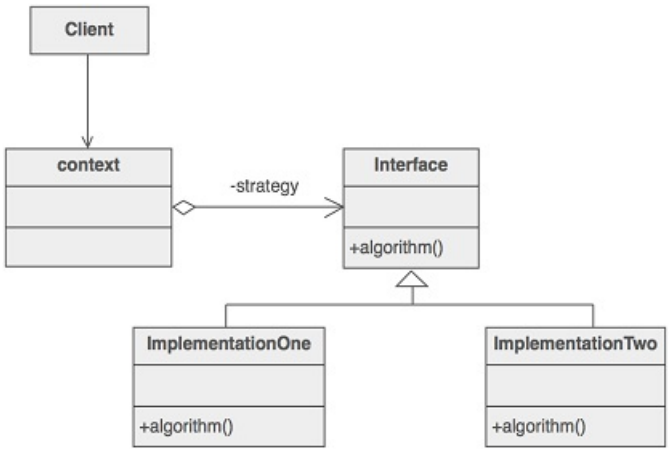
Strategy:

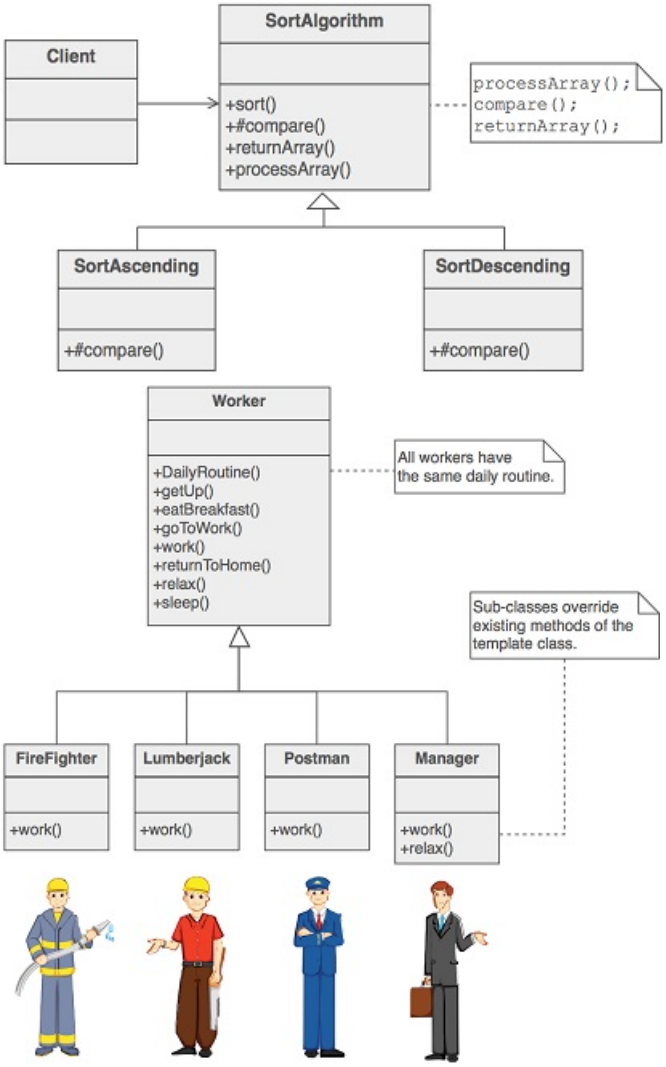
- Definition/Use
  - algorithms can be selected on the fly
  - defines a set of algorithms that can be used interchangeably
- Structure



- Notes

- identify an algorithm (i.e. a behavior) that the client would prefer to access through a "flex point"

Template method:

- Definition/Use
  - describes the program skeleton of a program
  - component designer decides which steps of an algorithm are invariant (or standard), and which are variant (or customizable)
- Structure
  -


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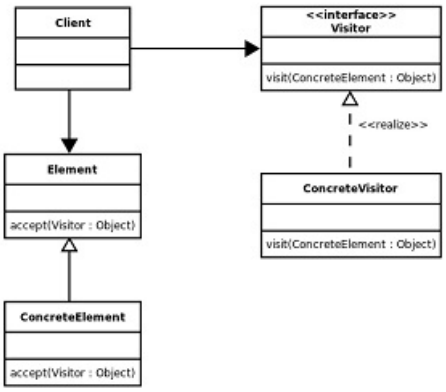
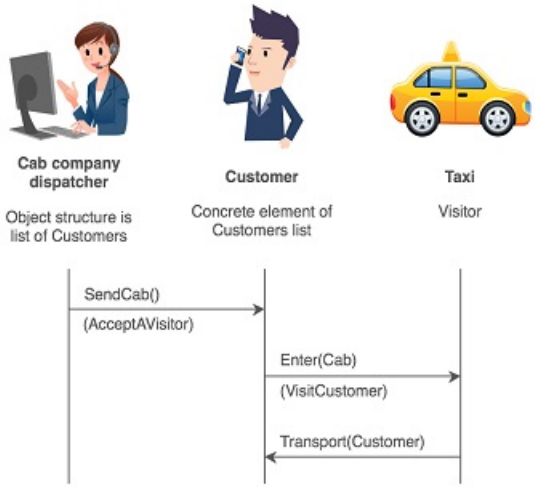
- Notes
  - examine the algorithm, and decide which steps are standard and which steps are peculiar to each of the current classes

Visitor:

- Definition/Use
  - a way to separate an algorithm from an object
- Structure
  - 

  - 

- Example
  - ```
    public interface CharacterVisitor {

      public void visit(char aChar);

    }

    public class MyString {

    // ... other methods, fields

      // Our main implementation of the visitor pattern
      public void foreach(CharacterVisitor aVisitor) {
    ```
    ```

```
    int length = this.length();
    // Loop over all the characters in the string
    for (int i = 0; i < length; i++) {
      // Get the current character, and let the visitor visit it.
      aVisitor.visit(this.getCharAt(i));
    }
  }

// ... other methods, fields

}// end class MyString

public class MyStringPrinter implements CharacterVisitor {

  // We have to implement this method because we're implementing the
      CharacterVisitor
  // interface
  public void visit(char aChar) {
    // All we're going to do is print the current character to the standard
        output
    System.out.print(aChar);
  }

  // This is the method you call when you want to print a string
  public void print(MyString aStr) {
    // we'll let the string determine how to get each character, and
    // we already defined what to do with each character in our
    // visit method.
    aStr.foreach(this);
  }

} // end class MyStringPrinter
```

- Notes
  - if you have and will always have only one visitor, you'd rather implement the composite pattern

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Comparison:

- chain of Responsibility, command, mediator, and observer, address how you can decouple senders and receivers, but with different trade
- offs
  - chain of Responsibility passes a sender request along a chain of potential receivers
- command and memento act as magic tokens to be passed around and invoked at a later time
  - in command, the token represents a request

- in memento, it represents the internal state of an object at a particular time
- polymorphism is important to command, but not to memento because its interface is so narrow that a memento can only be passed as a value