Object-Oriented Design

Lecturer: Raman Ramsin

Lecture 22

GoF Design Patterns – Behavioral

GoF Behavioral Patterns – Class

- **Class**
  - ***Interpreter:*** Given a language, define a representation for its grammar along with an interpreter that uses the representation to interpret sentences in the language.
  - ***Template Method:*** Define the skeleton of an algorithm in an operation, deferring some steps to subclasses; lets subclasses redefine certain steps of an algorithm without changing the algorithm's structure.

GoF Behavioral Patterns – Object

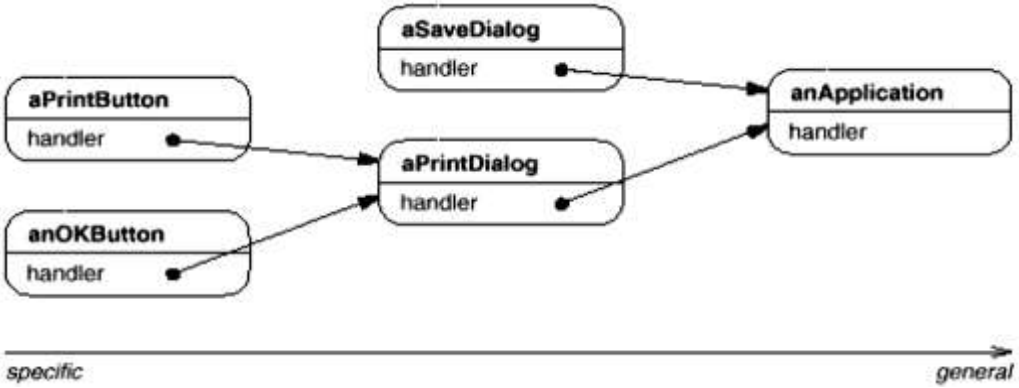
- **Object**
  - ***Chain of Responsibility:*** Avoid coupling the sender of a request to its receiver by giving more than one object a chance to handle the request. Chain the receiving objects and pass the request along the chain until an object handles it.
  - ***Command:*** Encapsulate a request as an object, thereby letting you parameterize clients with different requests, queue or log requests, and support undoable operations.
  - ***Iterator:*** Provide a way to access the elements of an aggregate object sequentially without exposing its underlying representation.
  - ***Mediator:*** Define an object that encapsulates how a set of objects interact; promotes loose coupling by keeping objects from referring to each other explicitly.

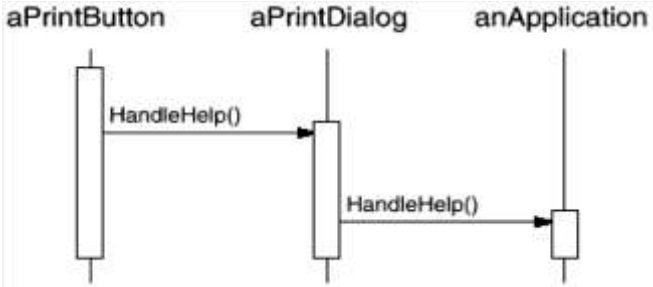
GoF Behavioral Patterns – Object (Contd.)

- **Object (Contd.)**
  - ***Memento:*** Without violating encapsulation, capture and externalize an object's internal state so that the object can be restored to this state later.
  - ***Observer:*** Define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically.
  - ***State:*** Allow an object to alter its behavior when its internal state changes. The object will appear to change its class.
  - ***Strategy:*** Define a family of algorithms, encapsulate each one, and make them interchangeable; lets the algorithm vary independently from clients that use it.
  - ***Visitor:*** Represent an operation to be performed on the elements of an object structure; lets you define a new operation without changing the classes of the elements.

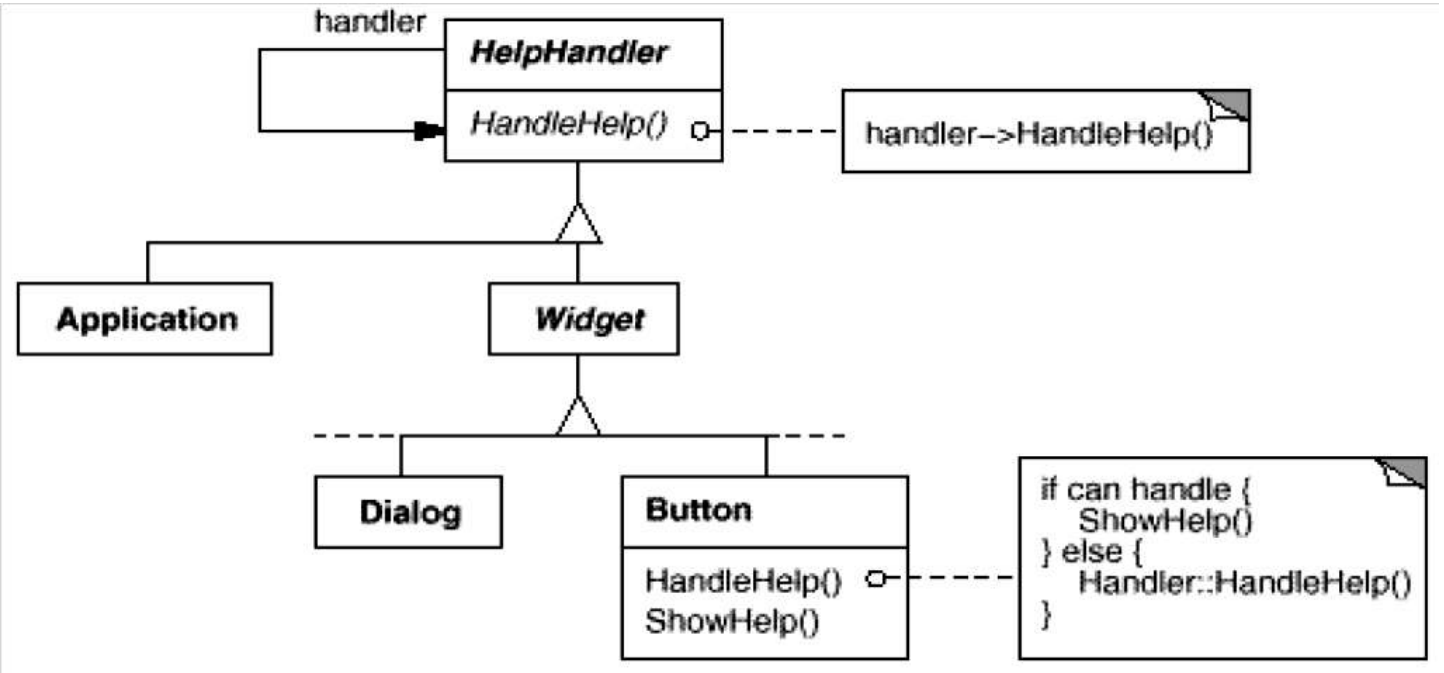
Chain of Responsibility

- Intent:
  - Avoid coupling the sender of a request to its receiver by giving more than one object a chance to handle the request. Chain the receiving objects and pass the request along the chain until an object handles it.

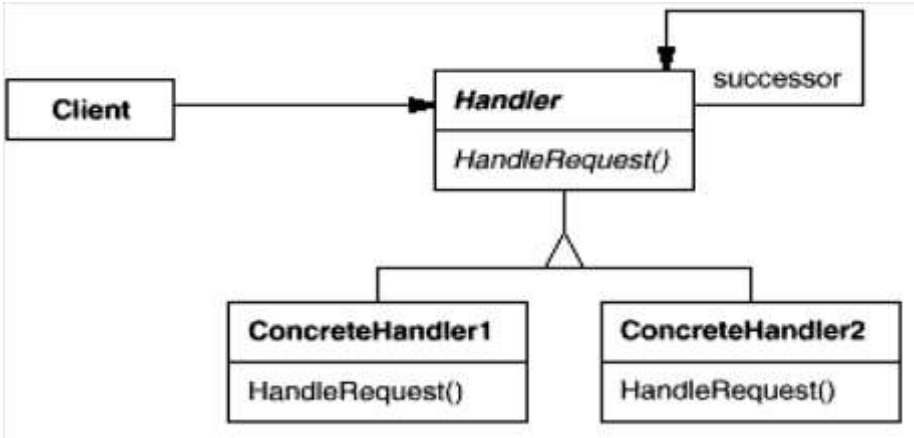


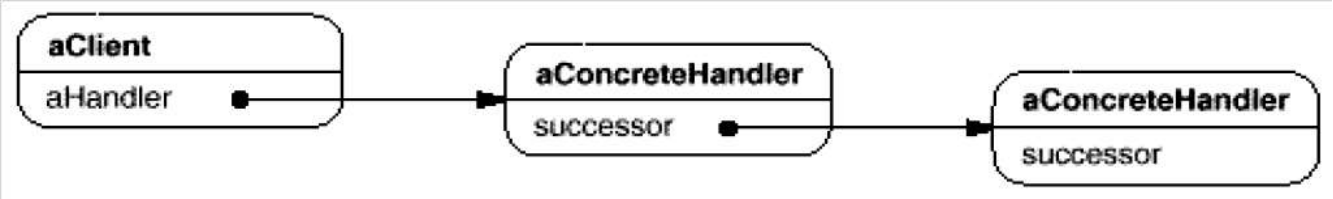


Chain of Responsibility: Class Hierarchy



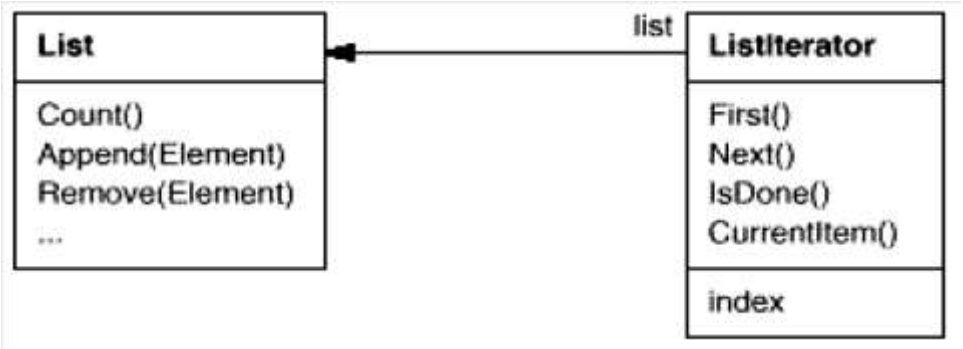
Chain of Responsibility: Structure



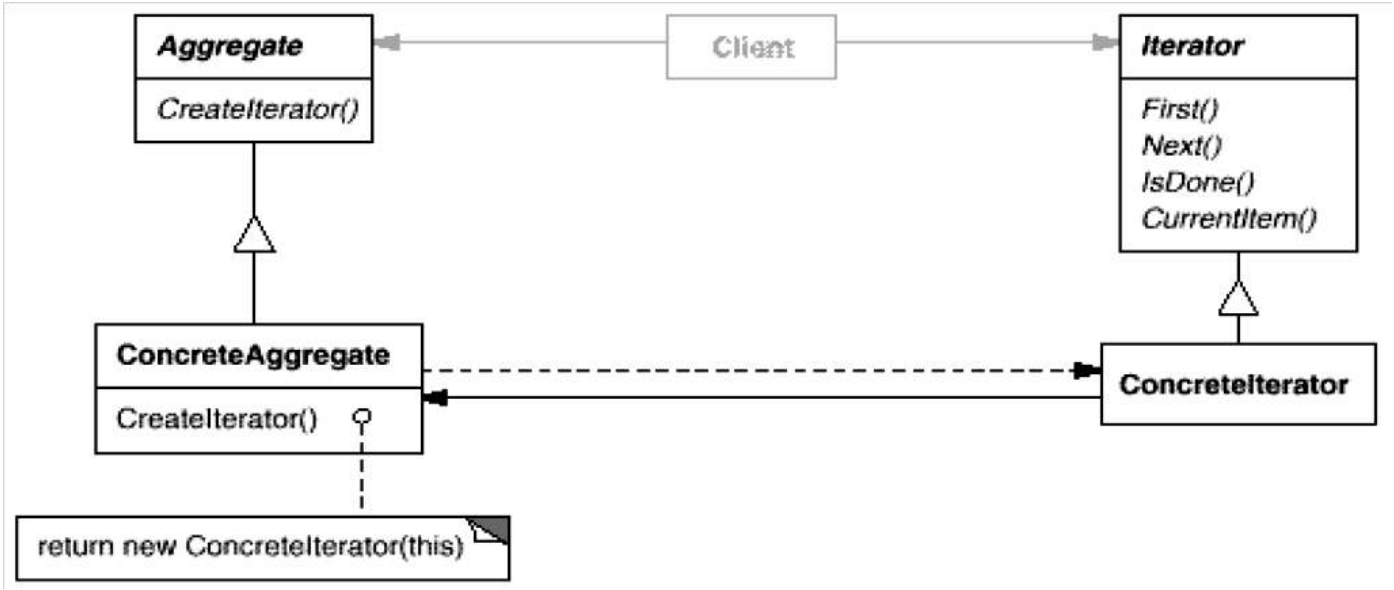


Iterator

- Intent:
  - Provide a way to access the elements of an aggregate object sequentially without exposing its underlying representation.

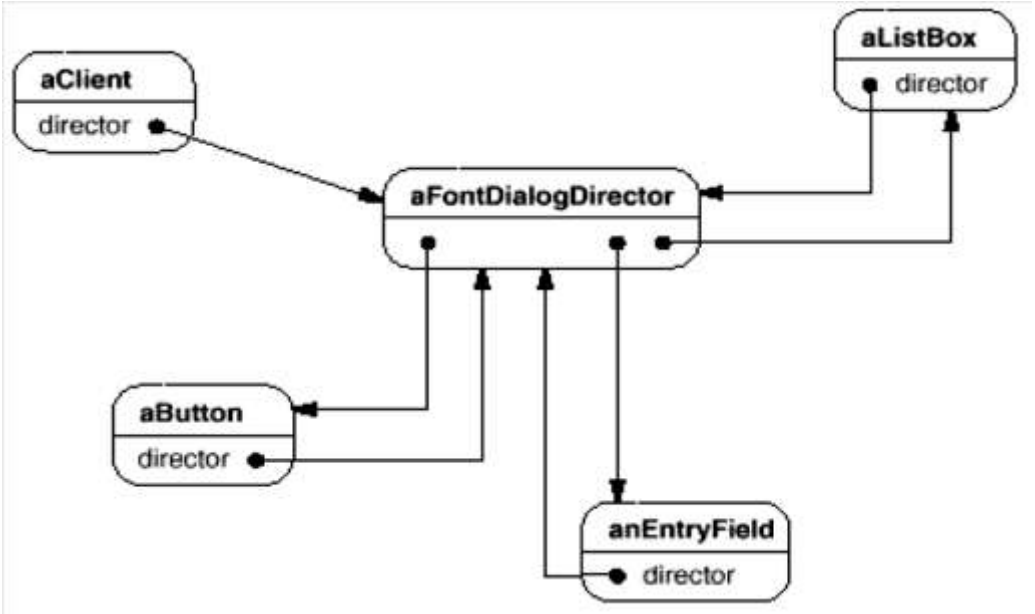


Iterator: Structure

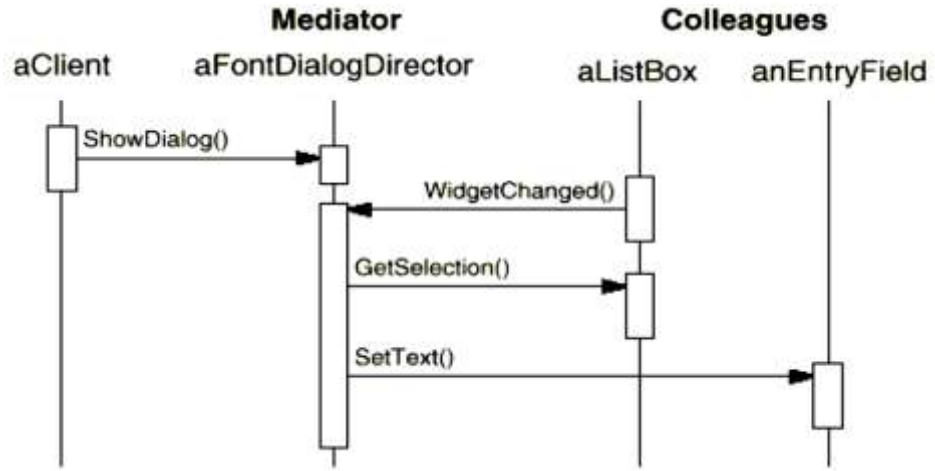


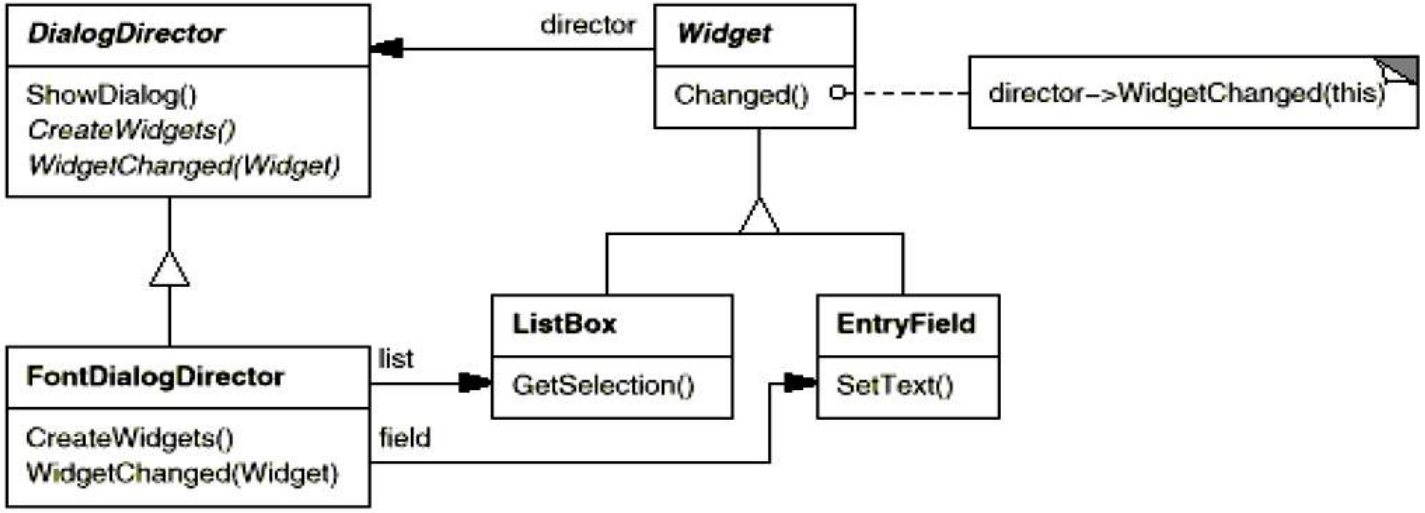
Mediator

- Intent:
  - Define an object that encapsulates how a set of objects interact: promotes loose coupling by keeping objects from referring to each other explicitly, and lets you vary their interaction independently.

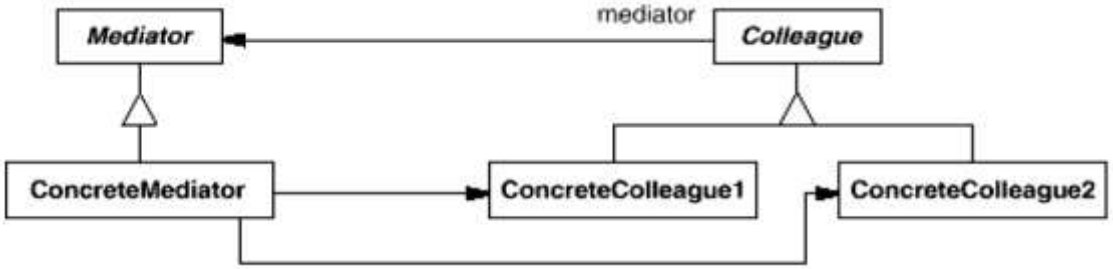


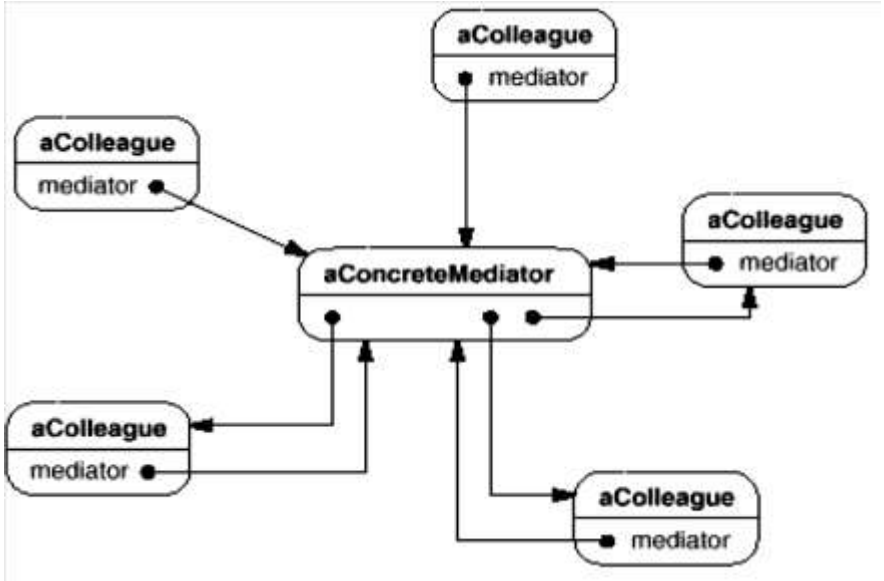
Mediator: Typical Collaboration and Class Hierarchy





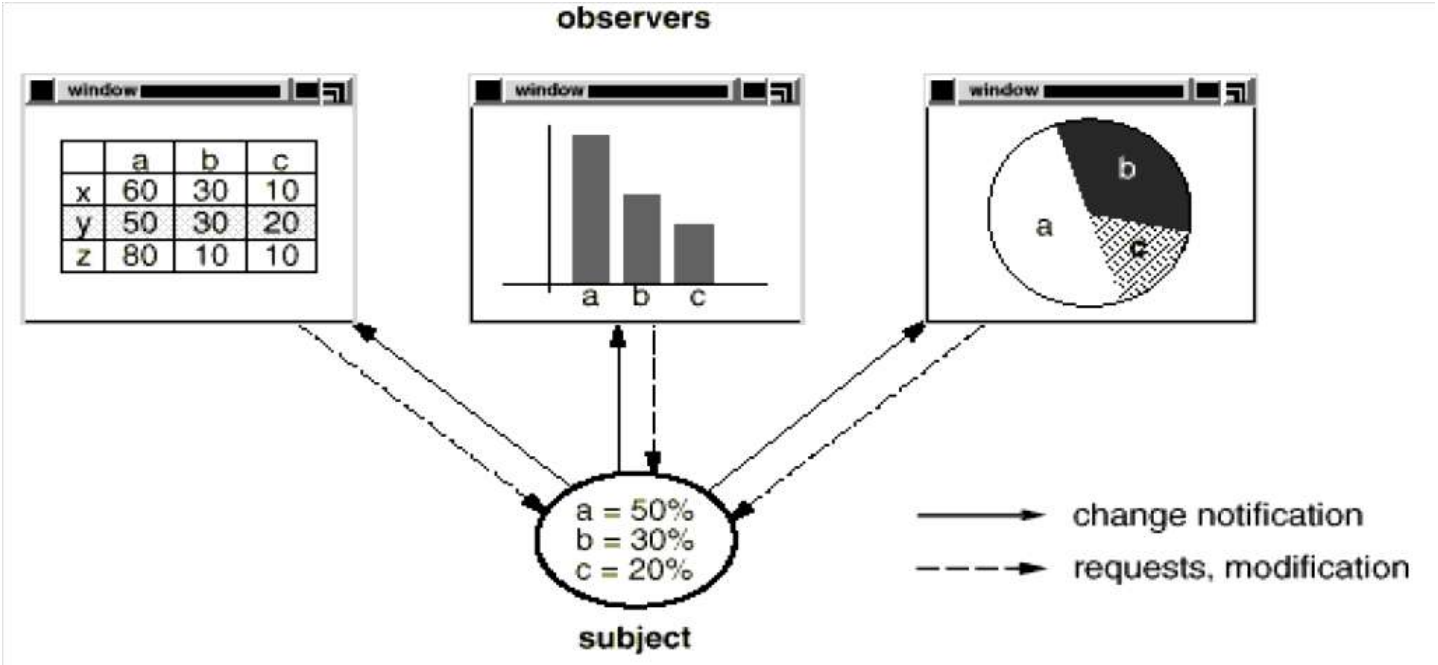
Mediator: Structure



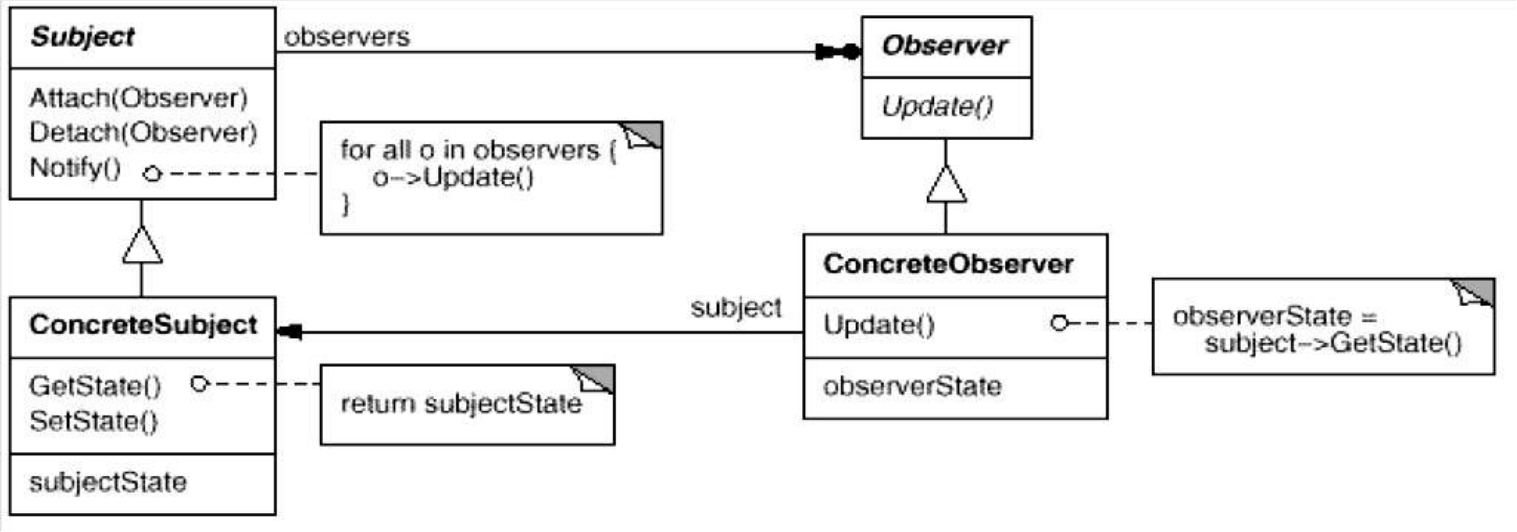


Observer

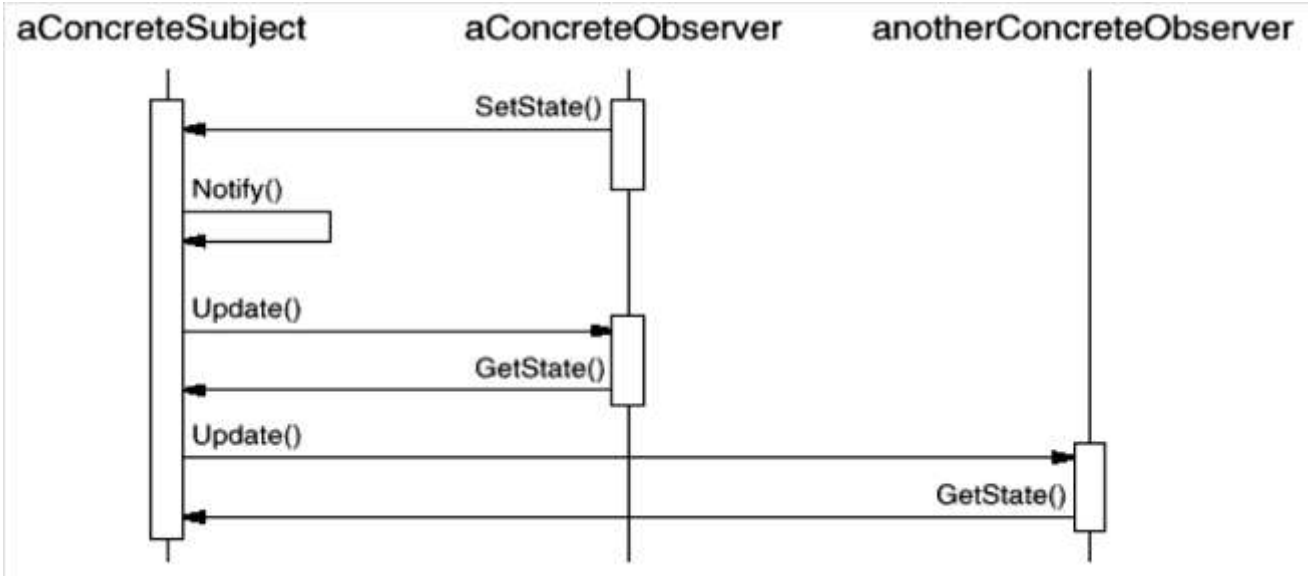
- Intent:
  - Define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically.



Observer: Structure

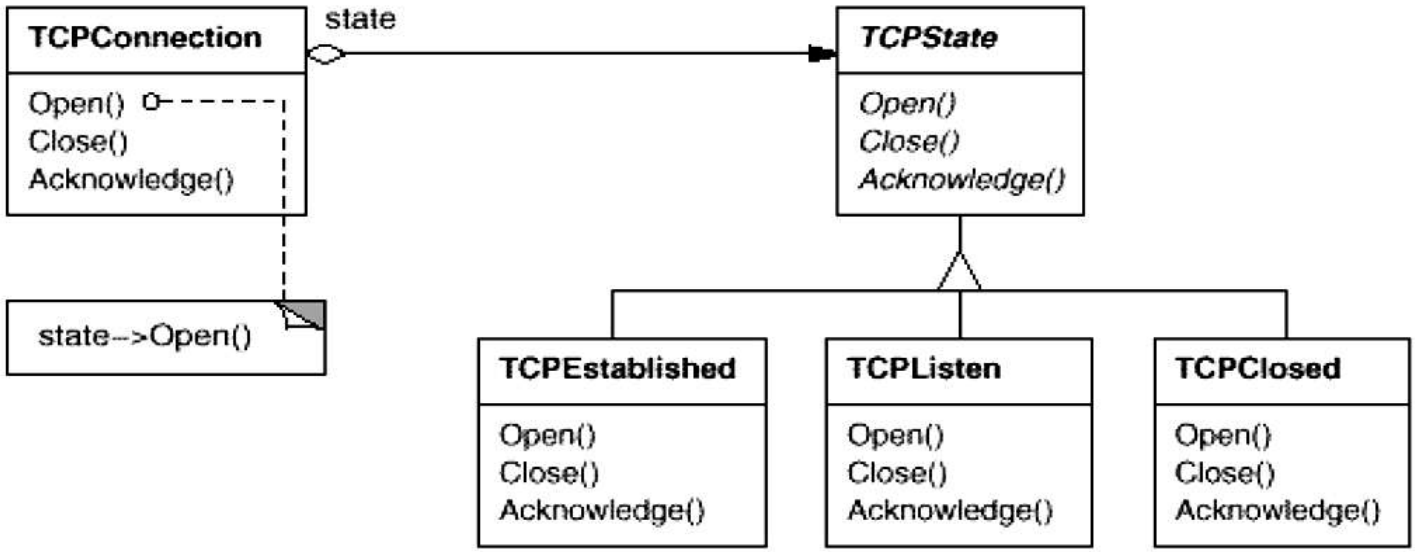


Observer: Collaboration

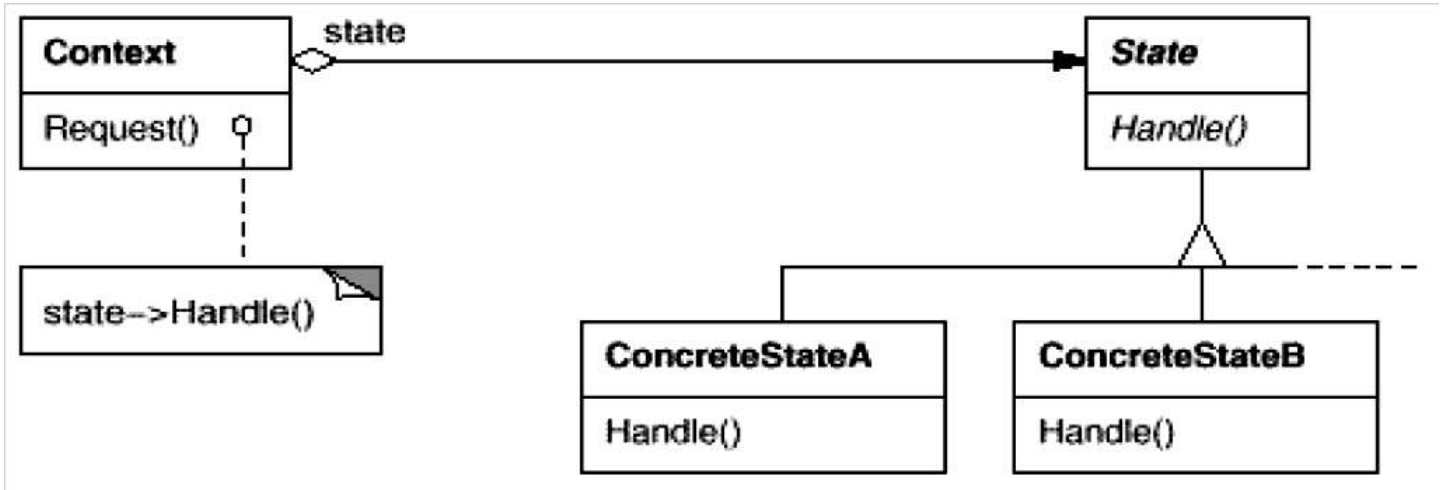


State

- Intent:
  - Allow an object to alter its behavior when its internal state changes. The object will appear to change its class.

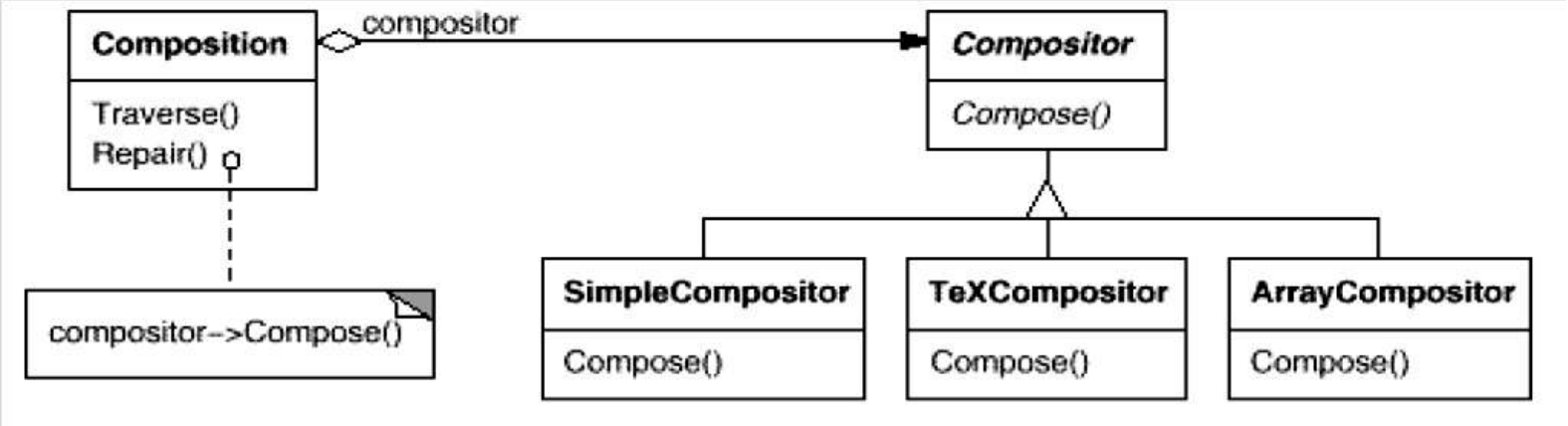


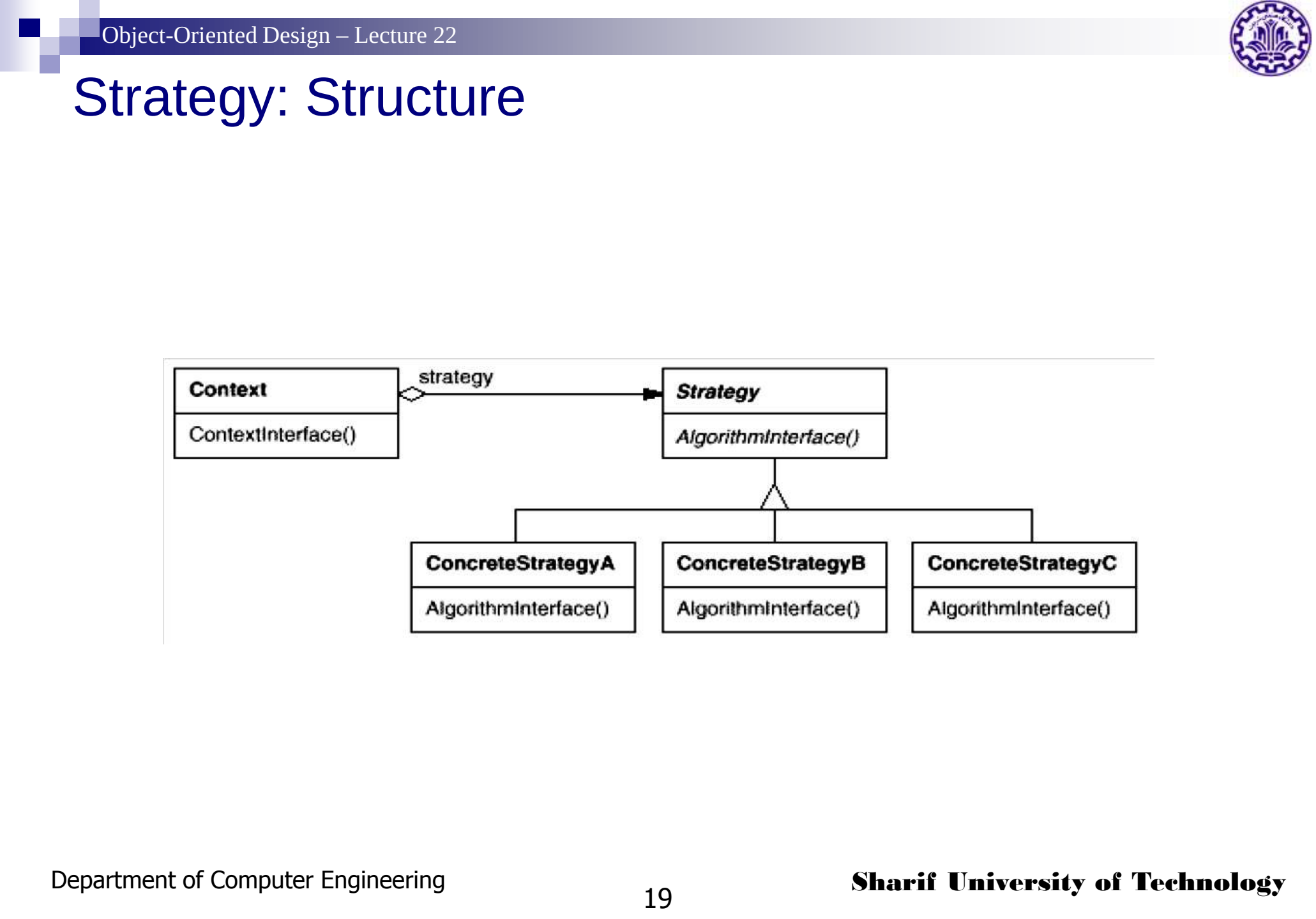
State: Structure



Strategy

- Intent:
  - Define a family of algorithms, encapsulate each one, and make them interchangeable. Strategy lets the algorithm vary independently from clients that use it.

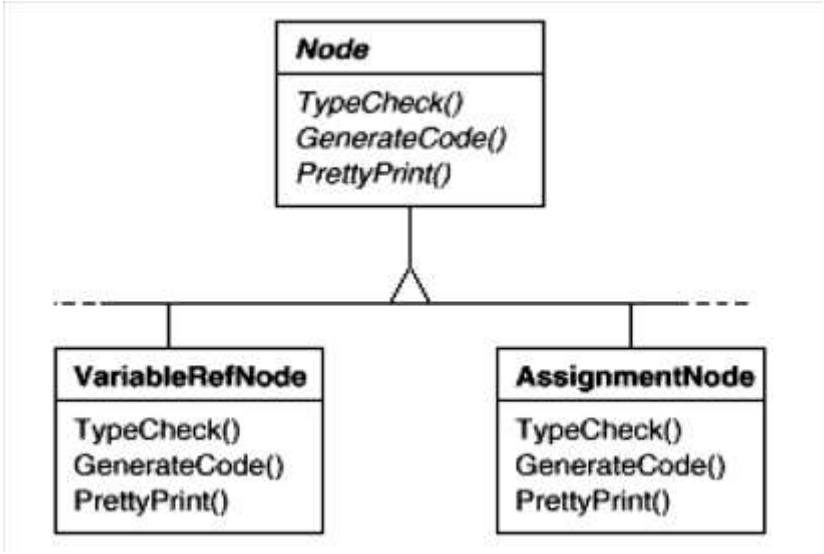


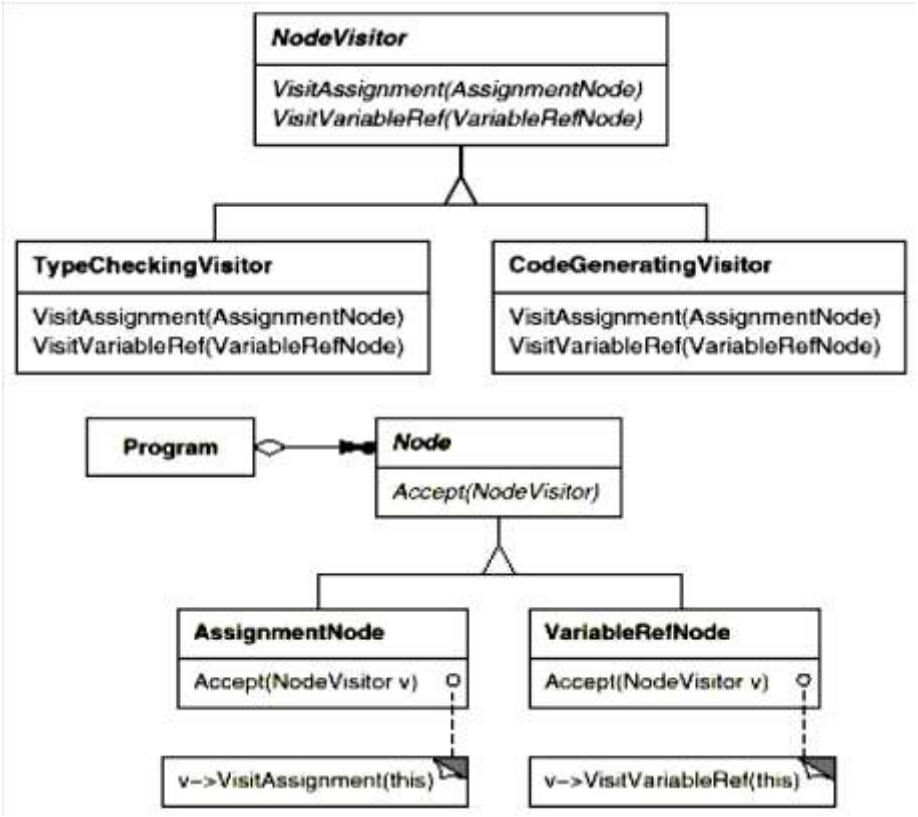


Strategy: Structure

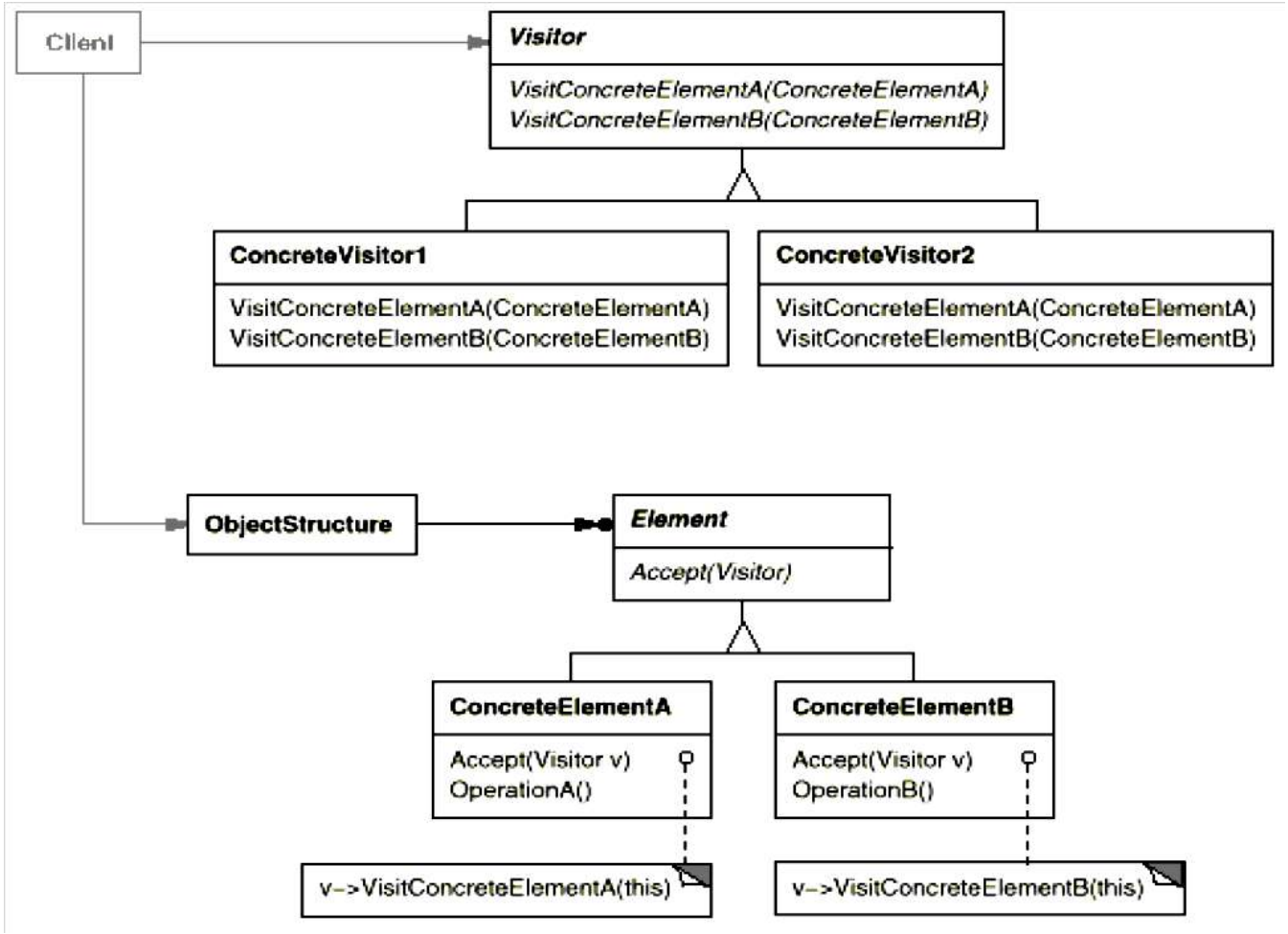
Visitor

- Intent:
  - Represent an operation to be performed on the elements of an object structure; lets you define a new operation without changing the classes of the elements on which it operates.

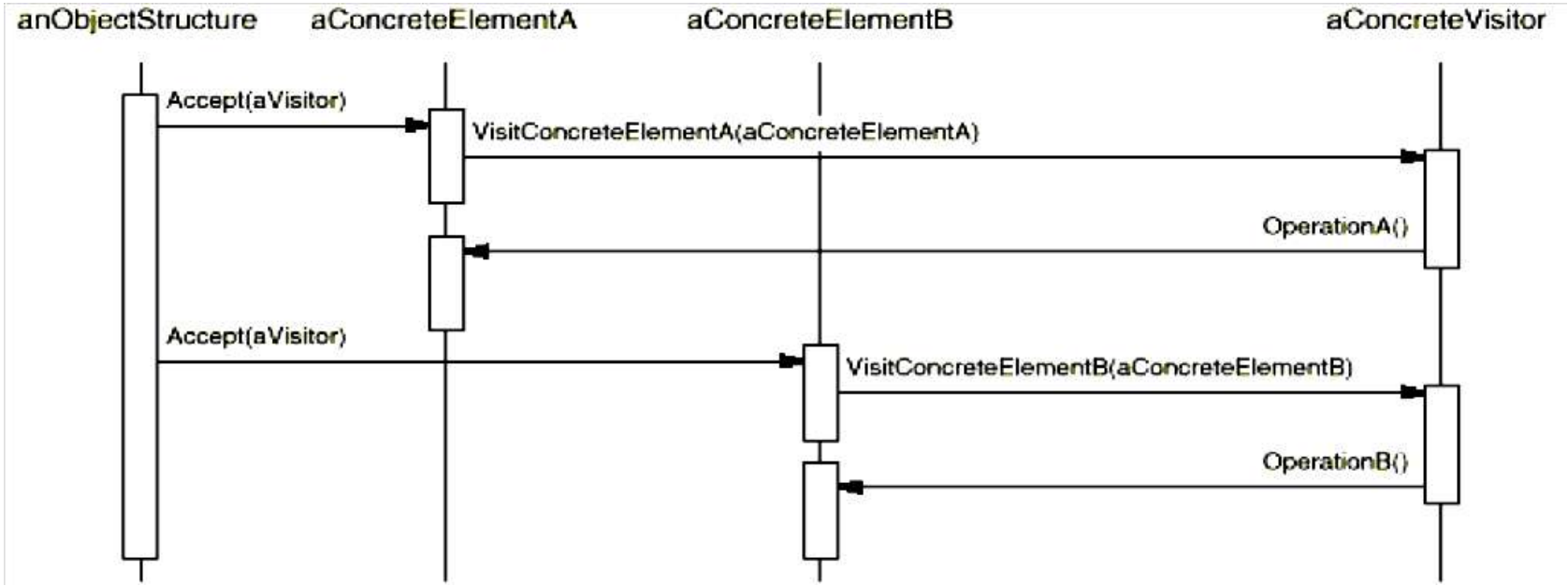




Visitor: Structure



Visitor: Collaborations



Reference

- Gamma, E., Helm, R., Johnson, R., and Vlissides, J., *Design Patterns: Elements of Reusable Object-oriented Software.* Addison-Wesley, 1995.