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Behavioral Design Patterns

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Behavioral Patterns

- **Chain of Responsibility (CoR)**
- Command
- Interpreter
- Iterator
- **Mediator**
- Memento
- Observer
- **State**
- Strategy
- Template Method
- Visitor

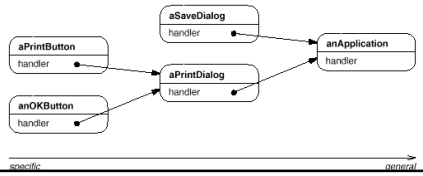
Chain of Responsibility (CoR)

Motivation

- Multiple objects can possible handle a request
  - The object that handles is not know
- The request gets passed along a chain of objects until one of them handles it
  - An object in the chain either handles the request or forwards it to the next object

Example of CoR

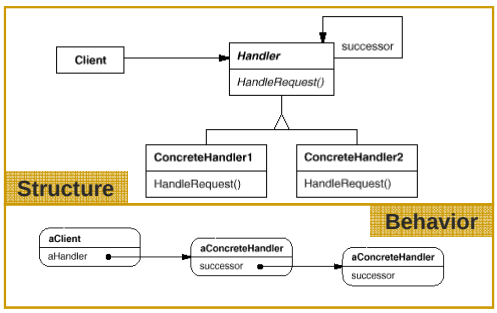
- Let's consider a context-sensitive help facility for a graphical user interface (GUI)
  - A button may explain how it works
  - If not, a dialog can provide a higher level help
  - If not, the application gives a general help



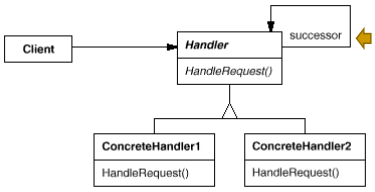
Chain of Responsibility

- Name
  - Chain of Responsibility (CoR)
- Problem Description
  - Give more than one object the chance to handle a request
- Solution (*next slide*)
- Consequences
  - Avoid coupling the sender to its receiver
  - Flexibility to add new handler objects

CoR Solution

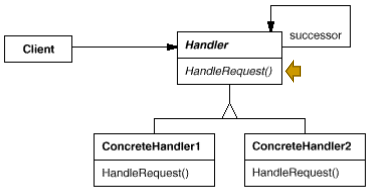


Successor in the Chain



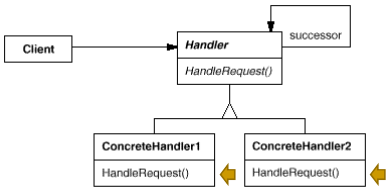
Every handler has a reference to the next object in the chain.

The Handler Class



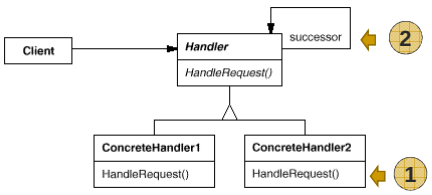
The abstract Handler class has a method signature to handle the request.

The ConcreteHandler Classes



Each ConcreteHandler class implements a specific handle method.

Object Options



A handler object has two options:
1. **Handle the request or**
2. **Forward the request to the next handler.**

Mediator

2

Motivation

- Object-oriented design encourages the distribution of behavior among objects
  - Objects have to interact with other objects
  - In the worst case, every object ends up knowing all other objects
- Lots of coupling connections make it difficult to change the system

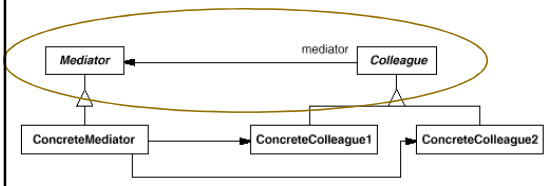
Example

- Let's consider widgets in a GUI
- For instance
  - A button is disabled when a field is empty
  - Selecting an entry in a list of choices might change the content of a text field

Mediator

- Name
  - Mediator
- Problem Description
  - Define an object that encapsulates how a set of objects interact
- Solution (*next slide*)
- Consequences
  - It decouples colleague objects
  - It centralizes control

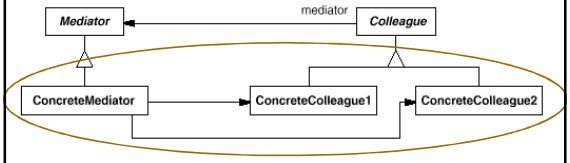
Mediator Solution



A Colleague class knows the Mediator class.

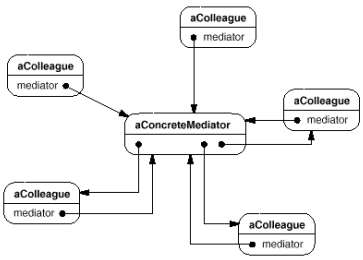
ConcreteColleague classes interact with the Mediator by means of this relationship.

ConcreteMediator



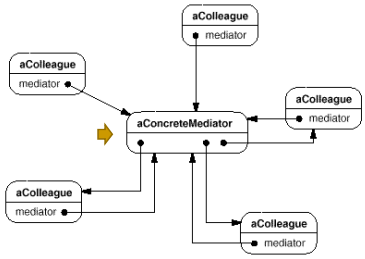
The ConcreteMediator knows all ConcreteColleague classes.

Behavioral Collaboration



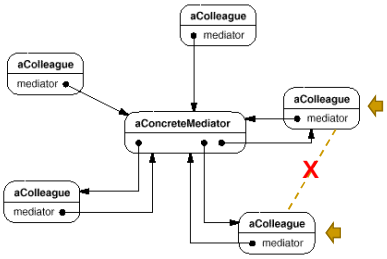
The Mediator knows Colleague objects. All Colleague objects know the Mediator.

The Mediador Role



A mediator replaces many-to-many interactions by one-to-many interactions.

Colleague Communication



A Colleague object cannot call another colleague directly

State

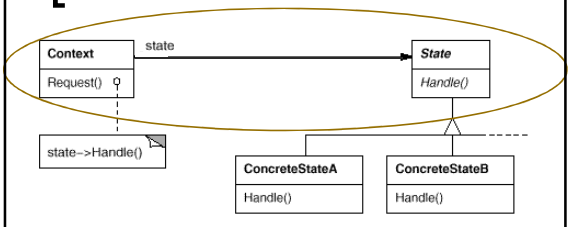
Motivating Example

- Let's consider a system to manage tasks
  - A task can be in several states, such as in progress, concluded, or cancelled
- A task has different behavior depending on its current state
  - For instance, if a task is cancelled, it cannot be allocated to anybody

State

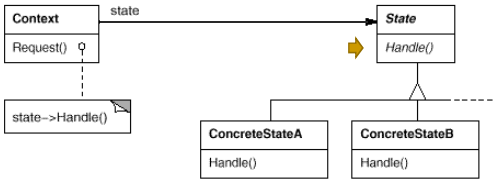
- Name
  - State
- Problem Description
  - Allow an object to alter its behavior when its internal state changes
- Solution (*next slide*)
- Consequences
  - It makes state transitions explicit
  - State objects can be shared

State Solution



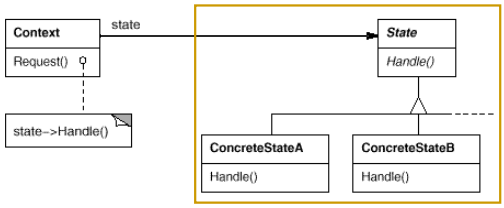
The Context class has one active state. Context has access to its state by association.

The State Class



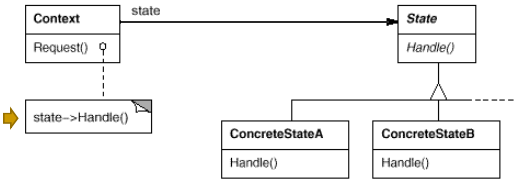
The abstract State class defines common methods to all states

Concrete States



ConcreteState classes realize the possible states. They override appropriate methods to provide specific behavior to objects

Concext Behavior



A specific context behavior depends on methods in the current state

Bibliography

- E. Gamma, R. Helm, R. Johnson, J. Vlissides. **Design Patterns**, 1st. Edition. Addison Wesley, 1994.
  - Chain of Responsibility, Mediator and State