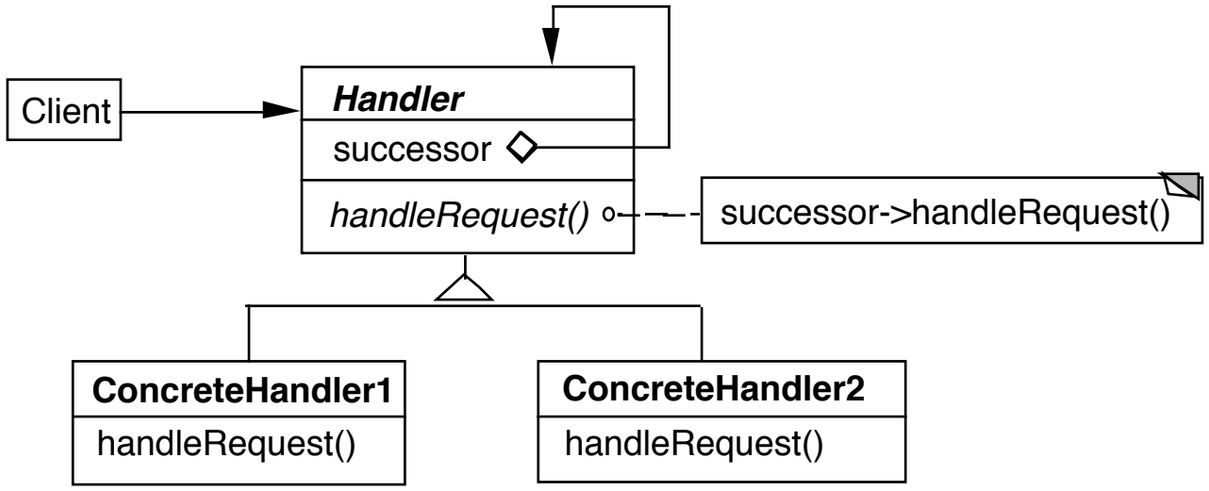
CS 635 Advanced Object-Oriented Design & Programming
Spring Semester, 2009
Doc 22 Chain of Responsibility
30 Apr 2009

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References

Wikipedia, http://en.wikipedia.org/wiki/Chain_of_responsibility_pattern

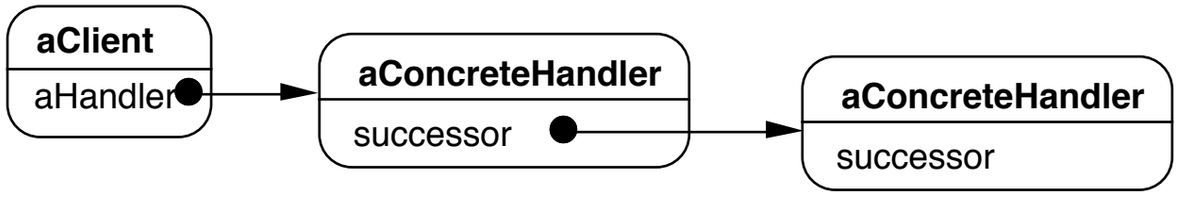
Chain of Responsibility



Dynamically create chain of handlers

Multiple handlers may be able to handle a request

Only one handler actually handles the request



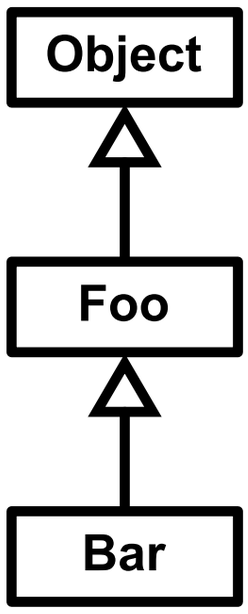
Consequences

Reduced coupling

Added flexibility in assigning responsibilities to objects

Not guaranteed that request will be handled

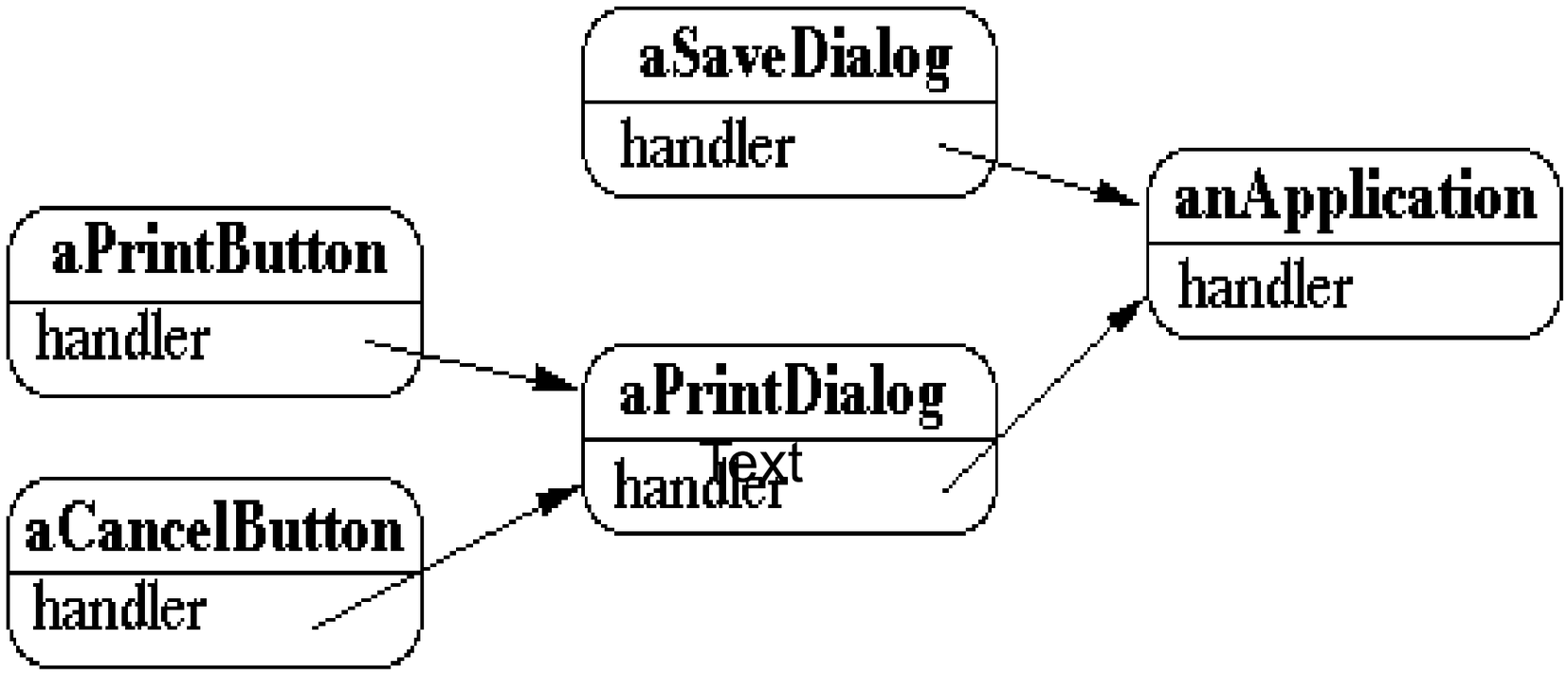
Finding Methods




```
test = new Bar();
test.toString();
```

Context Help System

User clicks on component for help



Tree of handlers

From specific to general

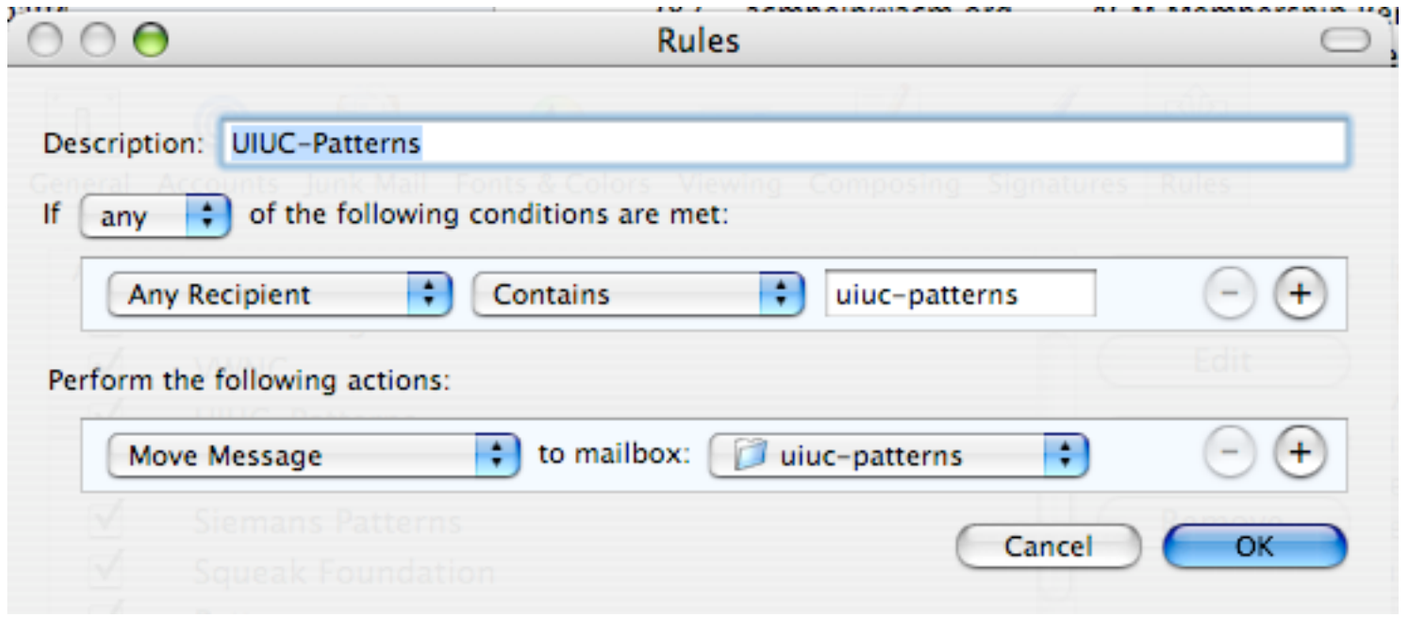
Email Filters in Mail Client

User creates a set of rules

- delete
- move
- modify

Chain the rules

First rule that applies handles the mail



Other Examples

Java 1.0 AWT action(Event)

http://wiki.cs.uiuc.edu/PatternStories/JavaAWT

javax.servlet.Filter

http://tomcat.apache.org/tomcat-4.1-doc/servletapi/javax/servlet/Filter.html

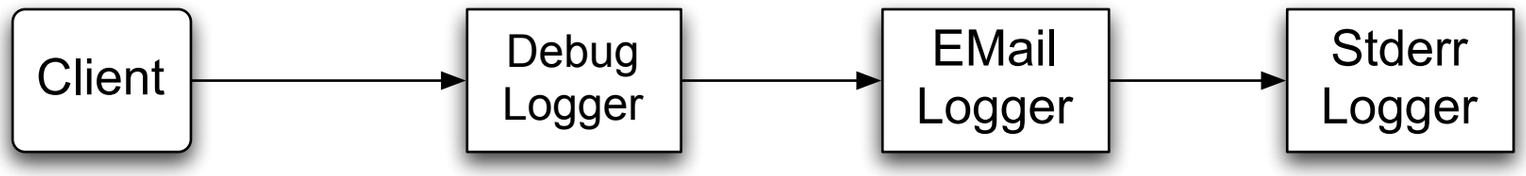
Microsoft Windows global keyboard events

http://www.javaworld.com/javaworld/jw-08-2004/jw-0816-chain.html

Apache Commons Chain

http://commons.apache.org/chain/

Logger Example




```
class ChainOfResponsibilityExample {
   public static void main(String[] args) {
       // building the chain of responsibility
       Logger l = new DebugLogger(Logger.DEBUG).setNext(
                  new EMailLogger(Logger.ERR).setNext(
                   new StderrLogger(Logger.NOTICE) ) );

       l.message("Entering function x.", Logger.DEBUG);    // handled by DebugLogger
       l.message("Step1 completed.", Logger.NOTICE);       // handled by Debug- and
StderrLogger
       l.message("An error has occurred.", Logger.ERR);    // handled by all three Logger
   }
}
```

First Attempt

```
abstract class Logger {
   public static int ERR = 3;
   public static int NOTICE = 5;
   public static int DEBUG = 7;
   protected int mask;

   protected Logger next;
   public Logger setNext(Logger l) {
      next = l;
      return this; }

   abstract public void message(String msg, int priority);
}

class DebugLogger extends Logger {
   public DebugLogger(int mask) {
      this.mask = mask; }

   public void message(String msg, int priority) {
      if (priority <= mask) debug log here
      if (next != null) next.message(msg, priority);
   }
}
```

```
class EMailLogger extends Logger {
   public EMailLogger(int mask) { this.mask = mask; }

   public void message(String msg, int priority) {
      if (priority <= mask) send email here;
      if (next != null) next.message(msg, priority);
   }
```

Improved Logger

```
abstract class Logger {
   public static int ERR = 3;
   public static int NOTICE = 5;
   public static int DEBUG = 7;
   protected int mask;

   protected Logger next;
   public Logger setNext(Logger l) {
          next = l;
         return this; }

   public void message(String msg, int priority) {
      if (priority <= mask) log(msg);
      if (next != null) next.message(msg, priority);
   }

   abstract void log(String message);
}

class StderrLogger extends Logger {
   public StderrLogger(int mask) { this.mask = mask; }

   void message(String msg, int priority) { send to err}
}
```

```
class EMailLogger extends Logger {
   public EMailLogger(int mask) { this.mask = mask; }

    void message(String msg, int priority) { email here}
   }
}

class DebugLogger extends Logger {
   public DebugLogger(int mask) { this.mask = mask; }

   void message(String msg, int priority) { debug stuff}
   }
}
```

Is this the Chain of Responsibility?

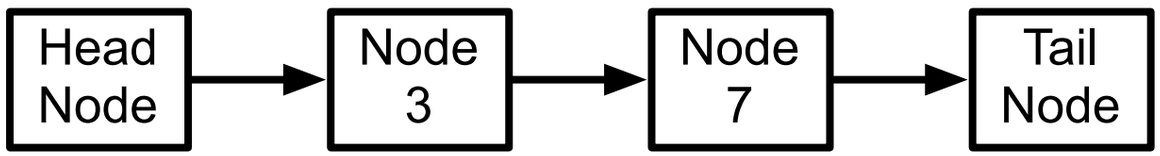
Object-Oriented Recursion

A method polymorphically sends its message to a different receiver

Eventually a method is called that performs the task

The recursion then unwinds back to the original message send

Linked List toString



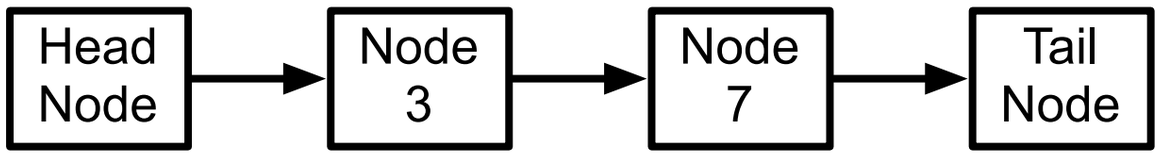
(3 7)

```
class HeadNode {
        public String toString() {
                return "(" + next.toString();
        }
}
```

```
class TailNode {
        public String toString() {
                return " )";
        }
}
```

```
class Node {
        public String toString() {
                return " " + element + next.toString();
        }
}
```

Linked List add




```
class HeadNode {
        public void add(int value) {
                next.add(value);
        }
}
```

```
class TailNode {
        public void add(int value) {
                prependNode(value);
        }
}
```

```
class Node {
        public void add(int value) {
                if (element > value)
                        prependNode(value);
                else
                        next.add(value);
        }
}
```

OO Recursion

Decorator

Chain of Responsibility