Design Pattern Concept

with the example of Chain of Responsibility

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Creational pattern

Abstract factory pattern, which provides an interface for creating related or dependent objects without specifying the objects' concrete classes.

Builder pattern, which separates the construction of a complex object from its representation so that the **same construction process** can create different representation.

Factory method pattern, which allows a class to **defer instantiation to subclasses.**

Prototype pattern, which specifies the kind of object to create using a prototypical instance, and creates new objects by **cloning** this prototype.

Singleton pattern, which ensures that a class only has **one instance**, and provides a global point of access to it.

Behavioral Pattern

Chain of responsibility pattern: Services for client are to be passed on **a chain of server objects**…

Command pattern: invoker, receiver, and command example…

Iterator pattern: Iterators are used to access the **elements of an aggregate object** sequentially without exposing its underlying representation

Memento pattern: Provides the ability to restore an object to its previous state (rollback)

Mediator pattern: Provides a **unified interface** to a set of interfaces in a subsystem

Observer pattern: **distributed event handling**…

Strategy pattern: **Algorithms can be selected on the fly**

Visitor pattern: A way to **separate an algorithm from an object**

structural design patterns

Adapter pattern: allows you to make an existing class work with other existing class libraries **without changing the code of the existing class**.

Bridge pattern: decouple an abstraction from its implementation so that the two can vary independently
Example: DrawingAPI.java; Shape.java

Composite pattern: a tree structure of objects where every object has the same interface

Decorator pattern: add additional functionality to a class at runtime where subclassing would result in an exponential rise of new classes

Facade pattern: create a simplified interface of an existing interface **to ease usage for common tasks**

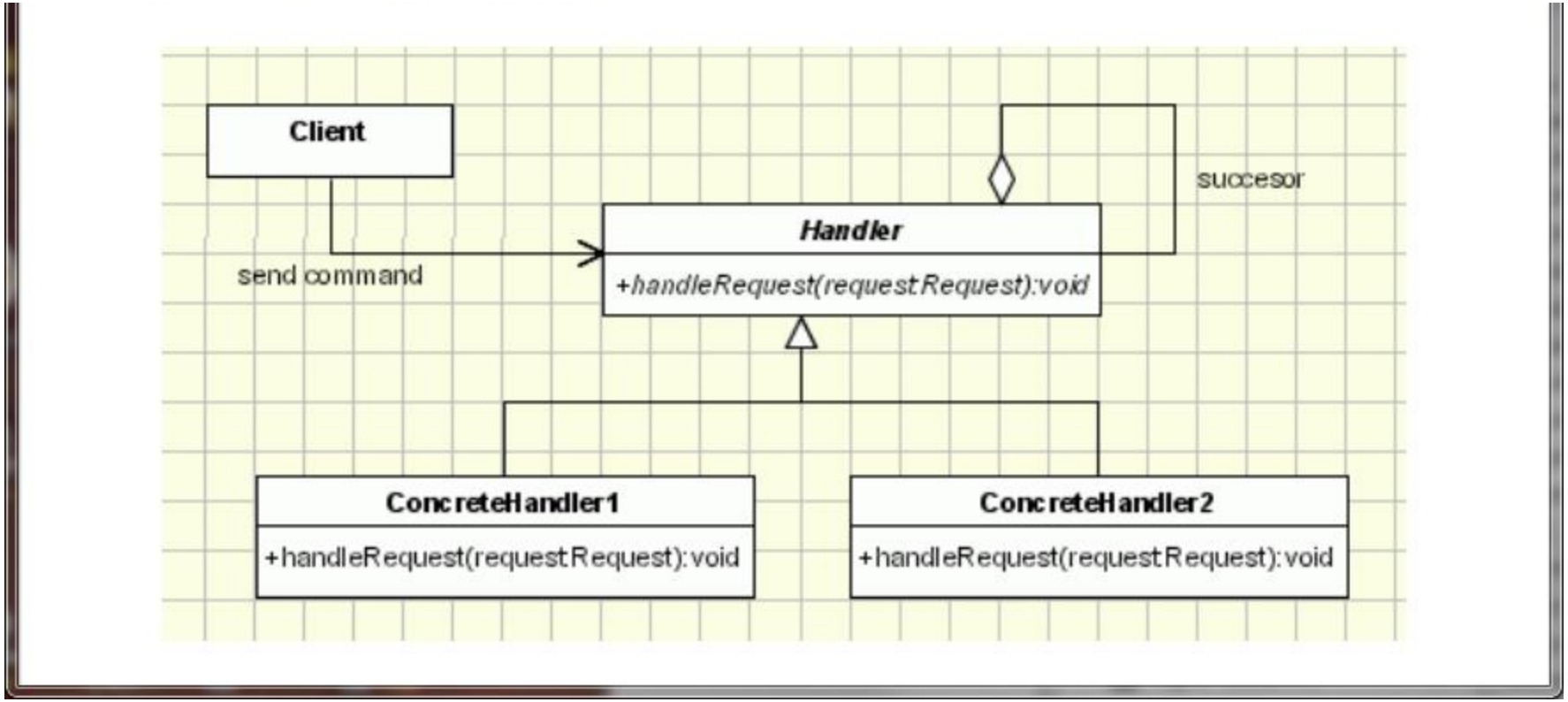
Flyweight pattern: a high quantity of objects share a common properties object to **save space**

Proxy pattern: a class functioning as an **interface to another thing**

Goals of Chain of Responsibility Pattern

1. to **avoid coupling the sender of a request to its receiver**, by giving more than one object a chance to handle the request.
2. **to isolate the clients from knowledge of how responsibilities are assigned.**
3. A request will be sent to the chain of objects. The request will be handled by a chain of servers until the request is resolved.

Loose Connection between Requester and Server



Make sure to understand the code logic of the given example.

- the role of abstract keyword;
- how to chain multiple objects; and
- the role of toString() method.

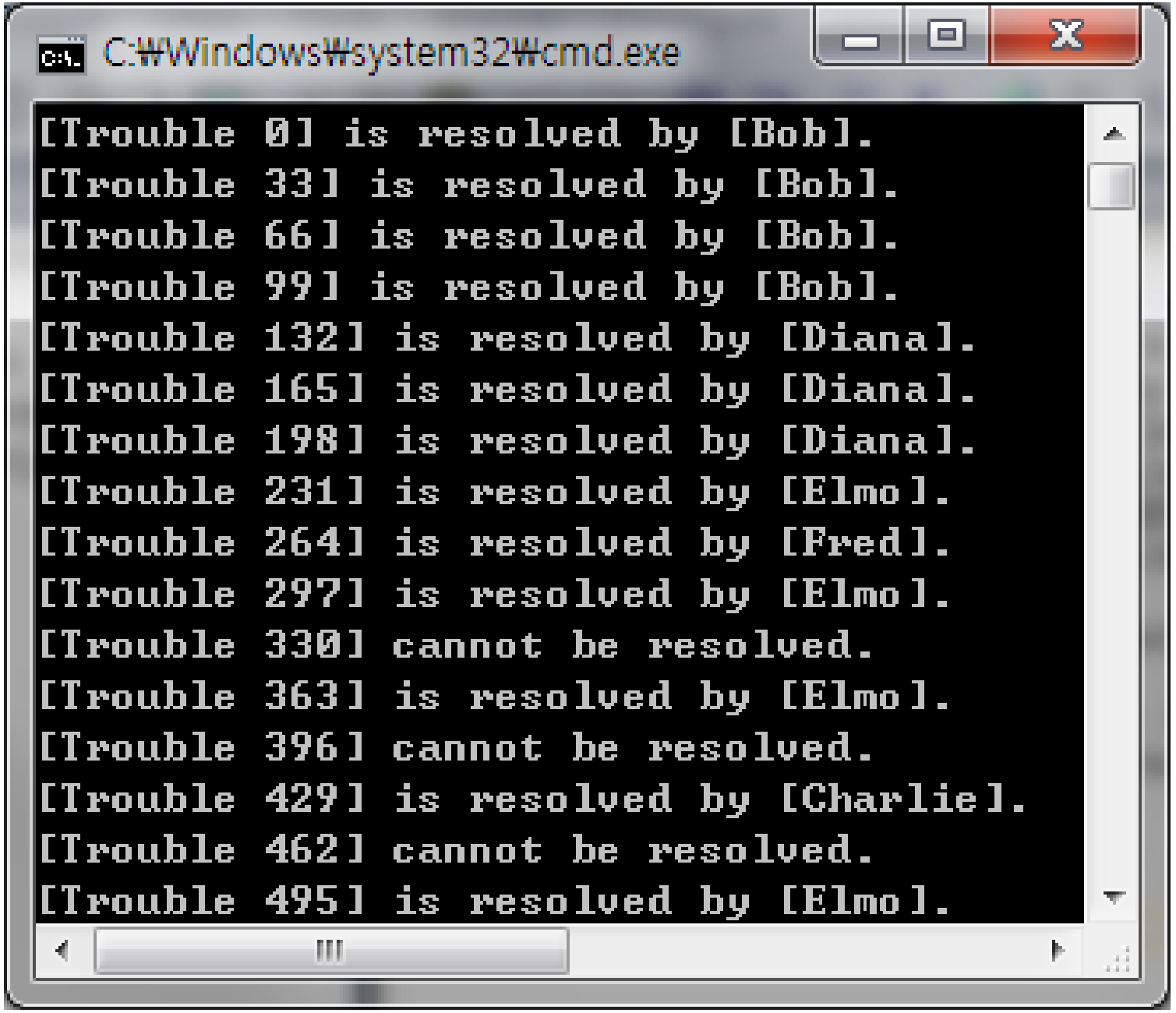
```
public class Main {
    public static void main(String[] args) {
        Support alice   = new NoSupport("Alice");
        Support bob     = new LimitSupport("Bob", 100);
        Support charlie = new SpecialSupport("Charlie", 429);
        Support diana   = new LimitSupport("Diana", 200);
        Support elmo    = new OddSupport("Elmo");
        Support fred    = new LimitSupport("Fred", 300);

        alice.setNext(bob).setNext(charlie).setNext(diana).
         setNext(elmo).setNext(fred);

        for (int i = 0; i < 500; i += 33) {
            alice.support(new Trouble(i));
        }
    }
}
```

```
public abstract class Support {
    private String name;
    private Support next;
    public Support(String name) {
        this.name = name;
    }
    public Support setNext(Support next) {
        this.next = next;
        return next;
    }
    public final void support(Trouble trouble) {
        if (resolve(trouble)) {
            done(trouble);
        } else if (next != null) {
            next.support(trouble);
        } else {
            fail(trouble);
        }
    }
```

```
 public String toString() {
        return "[" + name + "]";
    }
    protected abstract boolean resolve(Trouble trouble);
    protected void done(Trouble trouble) {
        System.out.println(trouble + " is resolved by " + this + ".");
    }
    protected void fail(Trouble trouble) {
        System.out.println(trouble + " cannot be resolved.");
    }
}
```

```
public class OddSupport extends Support {
    public OddSupport(String name) {
        super(name);
    }
    protected boolean resolve(Trouble trouble) {
        if (trouble.getNumber() % 2 == 1) {
            return true;
        } else {
            return false;
        }
    }
}
```

```
public class SpecialSupport extends Support {
    private int number;
    public SpecialSupport(String name, int number) {
        super(name);
        this.number = number;
    }
    protected boolean resolve(Trouble trouble) {
        if (trouble.getNumber() == number) {
            return true;
        } else {
            return false;
        }
    }
}
```


C:¥Windows¥system32¥cmd.exe
[Trouble 0] is resolved by [Bob].
[Trouble 33] is resolved by [Bob].
[Trouble 66] is resolved by [Bob].
[Trouble 99] is resolved by [Bob].
[Trouble 132] is resolved by [Diana].
[Trouble 165] is resolved by [Diana].
[Trouble 198] is resolved by [Diana].
[Trouble 231] is resolved by [Elmo].
[Trouble 264] is resolved by [Fred].
[Trouble 297] is resolved by [Elmo].
[Trouble 330] cannot be resolved.
[Trouble 363] is resolved by [Elmo].
[Trouble 396] cannot be resolved.
[Trouble 429] is resolved by [Charlie].
[Trouble 462] cannot be resolved.
[Trouble 495] is resolved by [Elmo].

```
public class Main {
    public static void main(String[] args) {
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        Support charlie = new SpecialSupport("Charlie", 429);
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        alice.setNext(bob).setNext(charlie).setNext(diana).
         setNext(elmo).setNext(fred);

        for (int i = 0; i < 500; i += 33) {
            alice.support(new Trouble(i));
        }
    }
}
```

Software Design Pattern

Design Pattern in General Meaning

- A **generic or reusable** solution to a **recurring** problem
- Can be **adapted** and **combined** in many different ways to generate endless possibilities (or *to provide numerous solutions to various problems*)

Software Design Pattern: **reusable** description of ***solutions to recurring (many similar) problems*** in software design, which may be easily **adapted** to various applications

The Purpose of using Software design pattern

- document the experience in a relatively small number of design patterns
- support **reuse** in design that has been proven **effective**
- provide the **common vocabulary** for software designers to communicate about software design in variety
- Program component that can be ***extended***, ***adapted***, and ***reused*** in many different contexts **without** having to modify the source code (or a **minor change)**