The Command Pattern

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Command

- ★ Behavioral Patterns
  - » strategy
  - » observer
  - » decorator
  - » command
- ★ Creational Patterns
  - » factory method
  - » abstract factory
  - » singleton

Problem

"your program has many different actions it can perform, implementing these would lead to huge if-elseif or switch blocks".

Dog Training

Roll

Bark

Sit

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Naive solution

```
public static void main(String[] args) {
Dog charles = new Dog("Snoop");
if (args[0].equals("bark")) {
  charles.bark(); }
else if (args[0].equals("bite")) {
  charles.bite(); }
else if (args[0].equals("roll")) {
  charles.rollover();
  }
}
```

should this even be in main?

Works but gets messy when you add lots of commands (bite, attack, eat homework, barf...)

Command Pattern

The Command Pattern: encapsulates a request as an object, thereby letting your parameterize other objects with different requests, queue or log requests, and support undoable operations

Command Pattern

- ★ Move the code for each individual action into it's own separate class.
- ★ Each of these classes implements the same Interface, allowing the code that uses them to interact solely with the Interface and not know or care about the individual classes.
- ★ This increases Cohesion because each class is responsible for one discrete set of logic.
- ★ This decreases Coupling because the code calling the command only deals with one type, the Interface.

Command Interface

```
public interface DogCommand {
   public void execute();
}
```

★ You can put any "generic" method in here:

- ★ log()
- ★ undo()
- ★ delete()
- ★ load()

Specific Commands

```
public class BarkCommand implements DogCommand {
    public void execute() {
        System.out.println("Bow wow!!");
    }
}
```

```
public class BiteCommand implements DogCommand {
    public void execute() {
        System.out.println("Munch..Munch");
    }
}
```

Dog

```
public class Dog {
String name;
DogCommand commands[] = new DogCommand[2];

    public Dog(String name) {
        this.name=name;
        commands[0] = new SitCommand();
        commands[1] = new BarkCommand();
    }
}
```

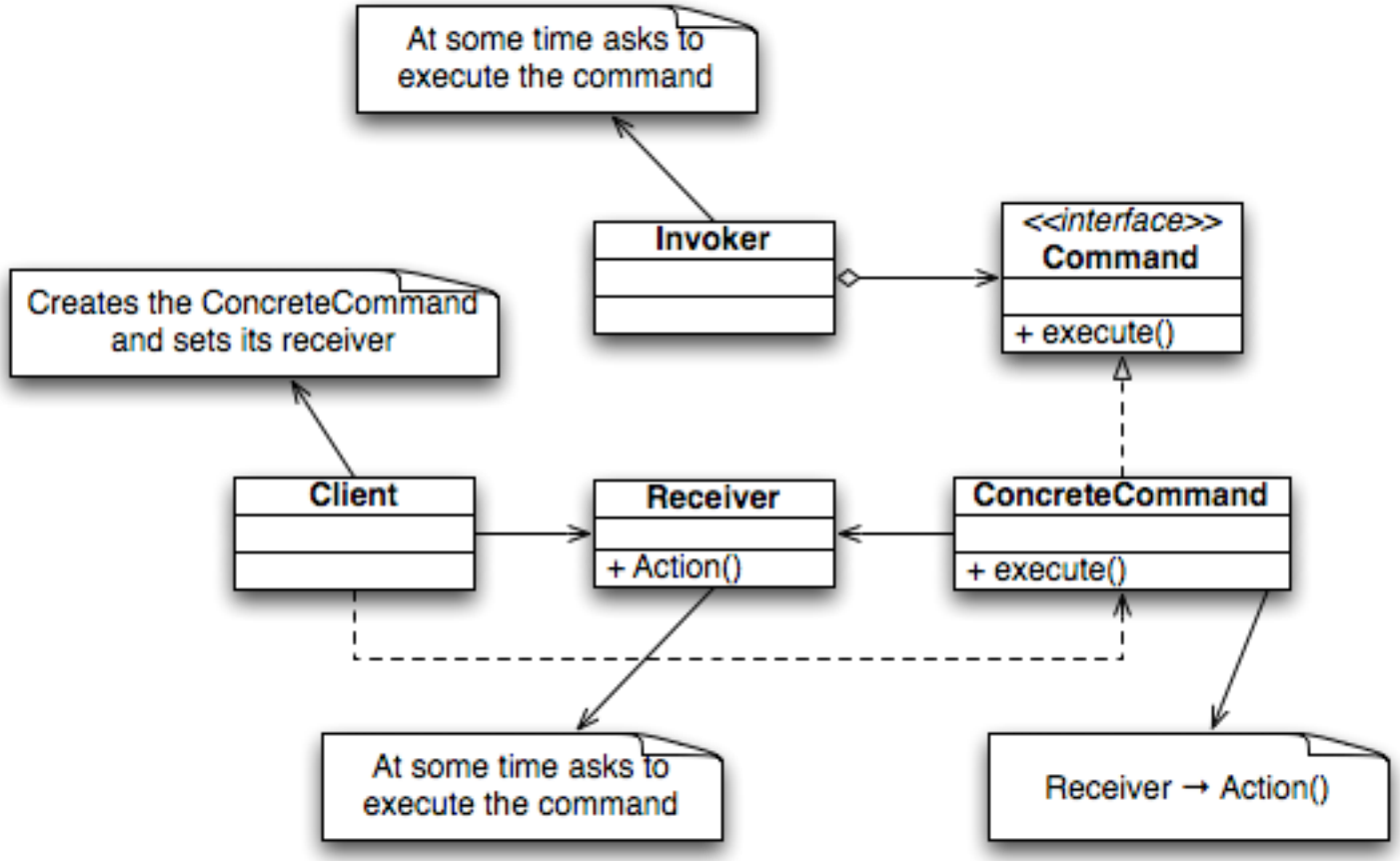
Main class

```
public class TestDogCommand {
    public static void main(String[] args) {
    DogCommand cmd;
    try {
        cmd = (DogCommand) Class.forName(args[0]).newInstance();
        cmd.execute();
    } catch (InstantiationException e) {
        e.printStackTrace();
    } catch (IllegalAccessException e) {
        e.printStackTrace();
    } catch (ClassNotFoundException e) {
        e.printStackTrace();
    }}}
```

OK this is ugly, but it scales up a lot better

```
Eelke-Folmers-MacBook-Pro:bin eelke$ java TestDogCommand BarkCommand
Woof!!
```

Class Diagram



Exercise I

Chess

Command interface

```
public interface Command {
     public void execute();
     public void undo();
     public char toChar(int i);
}
```

Jump Command

```
public class JumpCommand implements Command {

private ChessPiece cp;

    public JumpCommand(ChessPiece cp) {
        this.cp=cp;
    }

    public void execute() {
    int x=cp.getX();
    int y=cp.getY();
    char c = toChar(x);
    cp.setPos(x+1,y+2);
    System.out.println(cp.toString()+" jumps from "+c+y+" to
"+toChar(cp.getX())    +cp.getY());
    }
```

Move Command

```
public class MoveCommand implements Command {

private ChessPiece cp;

    public JumpCommand(ChessPiece cp) {
        this.cp=cp;
    }

    public void execute() {
    int x=cp.getX();
    int y=cp.getY();
    char c = toChar(x);
    cp.setPos(x,y+1);
    System.out.println(cp.toString()+" moves from "+c+y+" to
"+toChar(cp.getX())    +cp.getY());
    }
```

Chess piece

```
public abstract class ChessPiece {
     public int Xpos;
     public int Ypos;
     String name;
     Command move;


     int getX(){  return Xpos;}

     int getY() { return Ypos; }

     void setPos(int x, int y){
          Xpos=x;
          Ypos=y;
     }
     public String toString() {
          return name;
     }
}
```

Knight & Pawn

```
public class Pawn extends ChessPiece {
    public Pawn(int x, int y){
    this.setPos(x, y);
    this.move = new MoveCommand(this);
    this.name="Pawn";
    }
}

public class Knight extends ChessPiece {
    public Knight(int x, int y){
    this.setPos(x, y);
    this.move = new JumpCommand(this);
    this.name="Knight";
    }
}
```

Chess Board

```
public class ChessBoard {
      public int XMAX=8;
      public int YMAX=8;

      public ChessPiece white[] = new ChessPiece[2];
      public ChessPiece black[] = new ChessPiece[2];

     public ChessBoard() {
               white[0]=new Knight(0,0);
               white[1]=new Pawn(1,0);
               black[0]=new Knight(7,7);
               black[1]=new Pawn(6,7);
     }
}
```

player

```
public class Player {
private ChessBoard cb;
private int id;
private int lastplayer;
private int lastpiece;

      public Player(ChessBoard cb, int id){
            this.cb=cb;
            this.id=id;
      }

      public void move(int i) {
            if (id==0) System.out.print("White:");
            else System.out.print("Black:");
            if (i==-1) {
                  if (id==0) cb.white[lastpiece].move.undo();
                  else cb.black[lastpiece].move.undo();
            }
            else if (id==0) {
                  cb.white[i].move.execute();
            }
            else {
                  cb.black[i].move.execute();
            }
            lastplayer=id;
            lastpiece=i;
      }
}
```

Game

```
public class Game {

    public Game() {
        ChessBoard gb = new ChessBoard();
        Player one = new Player(gb,0);
        Player two = new Player(gb,1);
        one.move(0, 0);
        two.move(1,1);
        one.move(1,0);
        one.move(-1,0);
        one.move(2,0);
    }
}
```