Design Patterns

MSc in Communications Software

Produced by

Eamonn de Leastar (edeleastar@wit.ie)

Department of Computing, Maths & Physics
Waterford Institute of Technology

http://www.wit.ie

http://elearning.wit.ie

Waterford Institute of Technology
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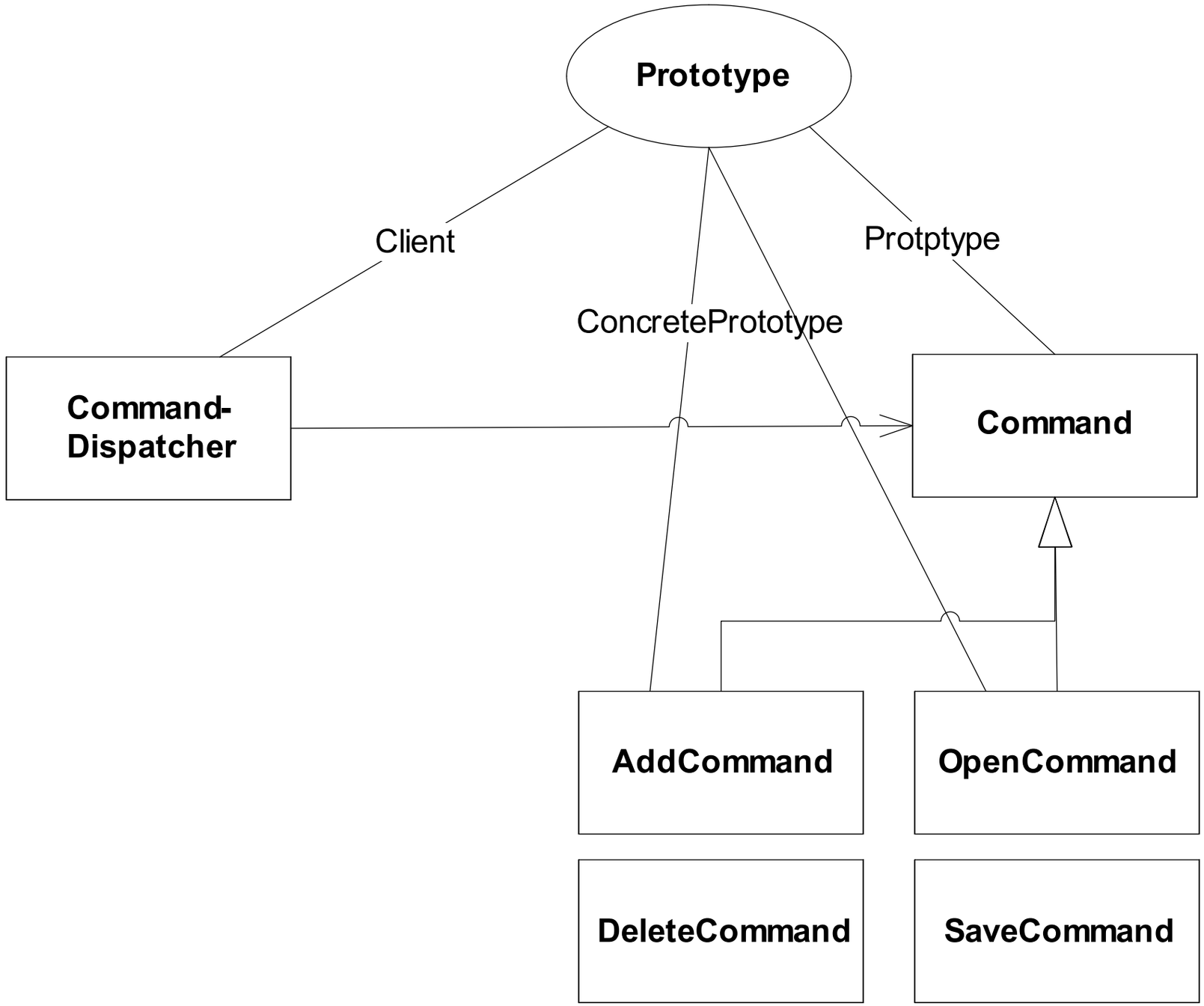
Pacemaker Prototype

Prototype Pattern Structure



Command

```
public abstract class Command
{
  protected PacemakerAPI pacemaker;
  protected Parser       parser;

  public Command()
  {}

  public Command(PacemakerAPI pacemaker, Parser parser)
  {
    this.pacemaker = pacemaker;
    this.parser    = parser;
  }

  public abstract void doCommand(Object[] parameters)
throws Exception;

  public void undoCommand() throws Exception
  {}

  public void redoCommand() throws Exception
  {}

  public Command copy()
  {
    return null;
  }
}
```

- Prototype method

CreateUserCommand

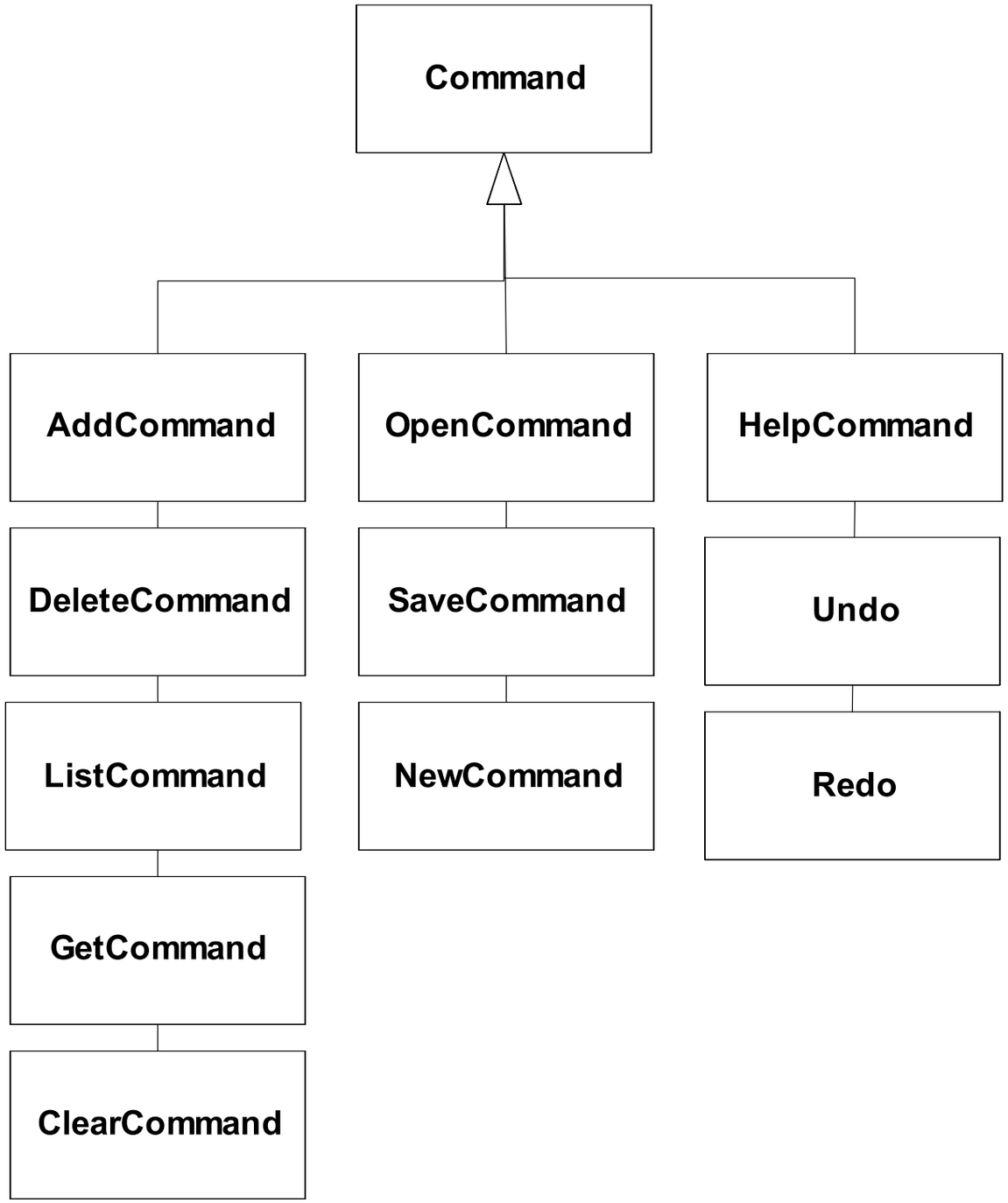
```
public class CreateUserCommand extends Command
{
  User user;

  public CreateUserCommand(PacemakerAPI pacemaker, Parser parser)
  {
    super(pacemaker, parser);
  }

  public void doCommand(Object[] parameters) throws Exception
  {
    Long id = pacemaker.createUser((String)parameters[0], (String)parameters[1],
                                   (String)parameters[2], (String)parameters[3]);
    System.out.println(parser.renderUser(pacemaker.getUser(id)));
    this.user = pacemaker.getUser(id);
  }

  public void undoCommand() throws Exception
  {
    pacemaker.deleteUser(user.id);
  }

  public void redoCommand() throws Exception
  {
    user.id = pacemaker.createUser(user.firstname, user.lastname, user.email, user.password);
  }

  public Command copy()
  {
    CreateUserCommand command = new CreateUserCommand(pacemaker, parser);
    command.user = user;
    return command;
  }
}
```

DeleteUserCommand

```java
package command;

import models.User;
import parsers.Parser;
import controllers.PacemakerAPI;

public class DeleteUserCommand extends Command
{
  private User user;

  public DeleteUserCommand(PacemakerAPI pacemaker, Parser parser)
  {
    super(pacemaker, parser);
  }

  public void doCommand(Object[] parameters) throws Exception
  {
    this.user = pacemaker.getUser((Long)parameters[0]);
    pacemaker.deleteUser((Long)parameters[0]);
  }

  public void undoCommand() throws Exception
  {
    user.id = pacemaker.createUser(user.firstname, user.lastname, user.email, user.password);
  }

  public void redoCommand() throws Exception
  {
    pacemaker.deleteUser(user.id);
  }

  public Command copy()
  {
    DeleteUserCommand command = new DeleteUserCommand(pacemaker, parser);
    command.user = user;
    return command;
  }
}
```

Undo & Redo implementation

- Implement undo & redo as command objects
- Maintain 2 stacks
  - Undo stack
  - Redo stack
- Undo command pops undo stack, executes command.undo() and pushes command onto redo stack
- Redo command pops redo stack, executes command.redo() and pushes onto undo stack



Command & Prototype

- Same classes participate in multiple patterns.
- AddUserCommand is:
  - ConcreteCommand in Command pattern implementation
  - ConcretePrototype in Prototype pattern implementation

Dispatcher

```
public boolean dispatchCommand(String commandName, Object [] parameters) throws Exception
{
  boolean dispatched = false;
  Command command = commands.get(commandName);

  if (command != null)
  {
    dispatched = true;
    command.doCommand(parameters);
    Command copy = command.copy();
    if (copy != null)
    {
      undoBuffer.push(copy);
    }
  }
  return dispatched;
}
```

- If command is ‘undoable’ (i.e. it implements copy), then we copy it and push the copy onto the undo stack

- undo and redo commands work as before

```java
public class UndoCommand extends Command
{
  private Stack<Command> undoBuffer;
  private Stack<Command> redoBuffer;

  public UndoCommand(Stack<Command> undoBuffer, Stack<Command> redoBuffer)
  {
    this.undoBuffer = undoBuffer;
    this.redoBuffer = redoBuffer;
  }

  public void doCommand(Object[] parameters) throws Exception
  {
    if (undoBuffer.size() > 0)
    {
      Command command = undoBuffer.pop();
      command.undoCommand();
      redoBuffer.push(command);
    }
  }
}
```

```java
public class RedoCommand extends Command
{
  private Stack<Command> undoBuffer;
  private Stack<Command> redoBuffer;

  public RedoCommand(Stack<Command> undoBuffer, Stack<Command> redoBuffer)
  {
    this.undoBuffer = undoBuffer;
    this.redoBuffer = redoBuffer;
  }

  public void doCommand(Object[] parameters) throws Exception
  {
    if (redoBuffer.size() > 0)
    {
      Command command = redoBuffer.pop();
      command.redoCommand();
      undoBuffer.push(command);
    }
  }
}
```

Clear the redo Stack?

- Redo stack should have been cleared.
- When?
  - When performing a command other than redo/undo

```
public boolean dispatchCommand(String commandName, Object [] parameters)
{
  boolean dispatched = false;
  Command command = commands.get(commandName);

  if (command != null)
  {
    dispatched = true;
    command.doCommand(parameters);
        clear redo stack ?
  }
  return dispatched;
}
```

```java
public boolean dispatchCommand(String commandName, Object [] parameters)
{
  boolean dispatched = false;
  Command command = commands.get(commandName);

  if (command != null)
  {
    dispatched = true;
    command.doCommand(parameters);
    Command copy = command.copy();
    if (copy != null)
    {
      undoBuffer.push(copy);
      redoBuffer.clear();
    }
  }
  return dispatched;
}
```

```
Welcome to pacemaker-console - ?help for instructions
pm> cu a a a a
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
+----+-----------+----------+-------+----------+
pm> cu b b b b
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  2 |         b |        b |     b |        b |
+----+-----------+----------+-------+----------+
pm> undo
pm> cu v v v v
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm> lu
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm> redo
pm> lu
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
|  3 |         v |        v |     v |        v |
|  4 |         b |        b |     b |        b |
+----+-----------+----------+-------+----------+
pm>
```

```
Welcome to pacemaker-console - ?help for instructions
pm> cu a a a a
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
+----+-----------+----------+-------+----------+
pm> cu b b b b
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  2 |         b |        b |     b |        b |
+----+-----------+----------+-------+----------+
pm> undo
pm> cu v v v v
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm> lu
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm> redo
pm> lu
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm>
```

Redo Revised

```java
public class RedoCommand extends Command
{
  private Stack<Command> undoBuffer;
  private Stack<Command> redoBuffer;

  public RedoCommand(Stack<Command> undoBuffer, Stack<Command> redoBuffer)
  {
    this.undoBuffer = undoBuffer;
    this.redoBuffer = redoBuffer;
  }

  public void doCommand(Object[] parameters) throws Exception
  {
    if (redoBuffer.size() > 0)
    {
      Command command = redoBuffer.pop();
      command.redoCommand();
      undoBuffer.push(command);
    }
    else
    {
      System.out.println("Nothing to redo");
    }
  }
}
```

```
Welcome to pacemaker-console - ?help for instructions
pm> cu a a a a
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
+----+-----------+----------+-------+----------+
pm> cu b b b b
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  2 |         b |        b |     b |        b |
+----+-----------+----------+-------+----------+
pm> undo
pm> cu v v v v
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm> lu
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm> redo
Nothing to redo
pm> lu
+----+-----------+----------+-------+----------+
| ID | FIRSTNAME | LASTNAME | EMAIL | PASSWORD |
+----+-----------+----------+-------+----------+
|  1 |         a |        a |     a |        a |
|  3 |         v |        v |     v |        v |
+----+-----------+----------+-------+----------+
pm>
```