Decorador (Decorator)

- Problema: anexar responsabilidades en forma dinámica
- Estas funcionalidades deben ejecutar antes o después de la ya existente
- Serie de envoltorios agregan funcionalidades al objeto básico
- Clase abstracta representa clase original y nuevas funciones. En decoradores ubicar llamadas a funciones antes o después

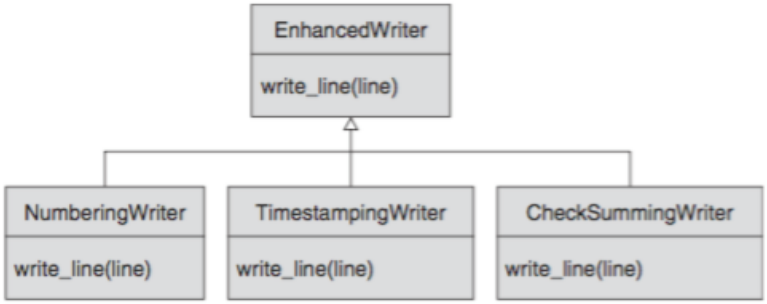
Otro problema que herencia no resuelve satisfactoriamente

- Escribir un cierto texto en un archivo
  - a veces se quiere agregar un número de línea antes de escribirla
  - a veces se quiere poner un time stamp en la línea antes de escribirla
  - a veces se quiere calcular un checksum del texto para asegurar que se escribe lo correcto

Solución naive

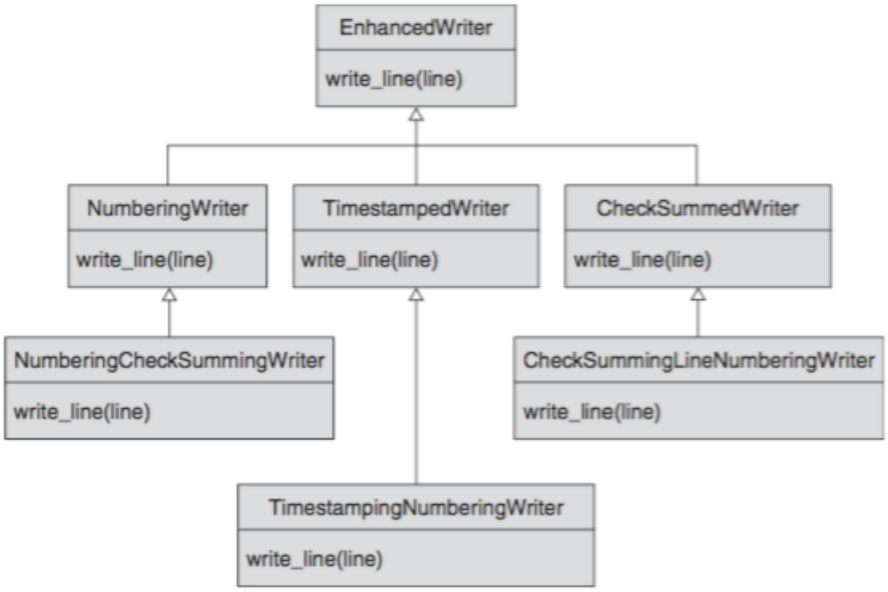
```
class EnhancedWriter
  attr_reader :check_sum
  def initialize(path)
    @file = File.open(path, "w")
    @check_sum = 0
    @line_number = 1
  end
  def write_line(line)
    @file.print(line)
    @file.print("\n")
  end
  def checksumming_write_line(data)
    data.each_byte {|byte| @check_sum = (@check_sum + byte) % 256 }
    @check_sum += "\n"[0] % 256
    write_line(data)
  end
  def timestamping_write_line(data)
    write_line("#{Time.new}: #{data}")
  end
  def numbering_write_line(data)
    write_line("%{@line_number}: #{data}")
    @line_number += 1
  end
  def close
    @file.close
  end
end

writer = EnhancedWriter.new('out.txt')
writer.write_line("A plain line")
writer.checksumming_write_line('A line with checksum')
writer.timestamping_write_line('with time stamp')
writer.numbering_write_line('with line number')
```

¿Por qué herencia no sirve ?



- Cómo lograr un texto numerado con checksum ?
- Cómo lograr uno con timestamp numerado ?
- etc

no va por aquí



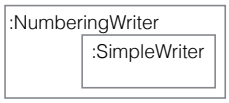
La esencia del decorador

- Poder armar en runtime un objeto con la combinación de features deseada
- SimpleWriter simplemente escribe el texto en el archivo
- NumberingWriter agrega números al texto antes de pasarlo al Simple (decora a SimpleWriter)
- etc

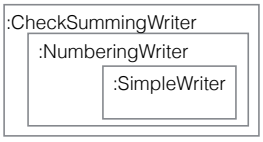
```ruby
class SimpleWriter
  def initialize(path)
    @file = File.open(path, 'w')
  end
  def write_line(line)
    @file.print(line)
    @file.print("\n")
  end
  def pos
    @file.pos
  end
  def rewind
    @file.rewind
  end
  def close
    @file.close
  end
end

class WriterDecorator
  def initialize(real_writer)
    @real_writer = real_writer
  end
  def write_line(line)
    @real_writer.write_line(line)
  end
  def pos
    @real_writer.pos
  end
  def rewind
    @real_writer.rewind
  end
  def close
    @real_writer.close
  end
end
```

```ruby
class NumberingWriter < WriterDecorator
  def initialize(real_writer)
    super(real_writer)
    @line_number = 1
  end
  def write_line(line)
    @real_writer.write_line("#{@line_number}: #{line}")
    @line_number += 1
  end
end

class CheckSummingWriter < WriterDecorator
  attr_reader :check_sum
  def initialize(real_writer)
    @real_writer = real_writer
    @check_sum = 0
  end
  def write_line(line)
    line.each_byte {|byte| @check_sum = (@check_sum + byte) % 256 }
    @check_sum += "\n"[0] % 256
    @real_writer.write_line(line)
  end
end

class TimeStampingWriter < WriterDecorator
  def write_line(line)
    @real_writer.write_line("#{Time.new}: #{line}")
  end
end
```

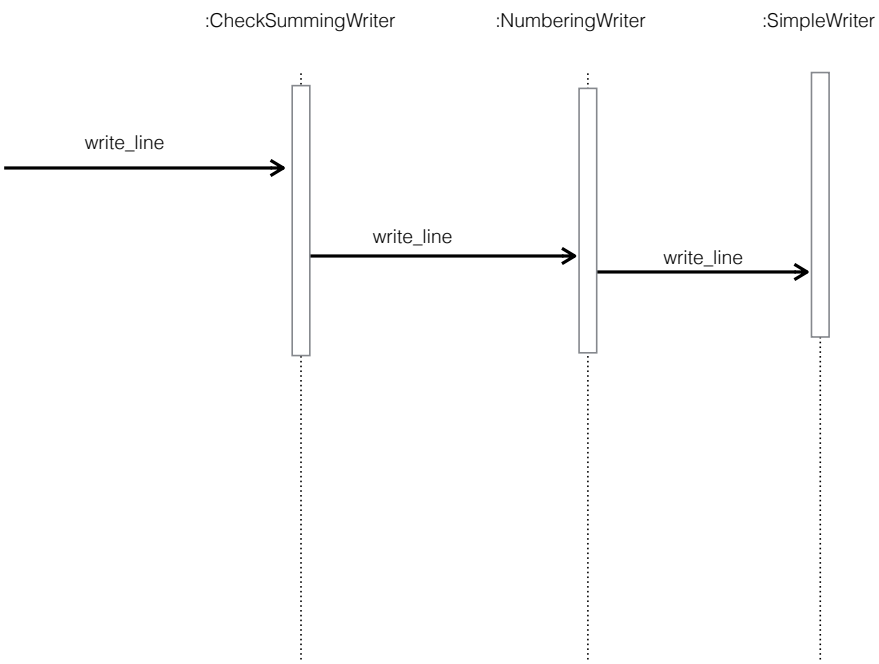
```ruby
writer = NumberingWriter.new(SimpleWriter.new('final.txt'))
```

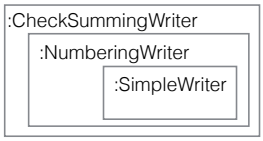



```ruby
writer = CheckSummingWriter.new(TimeStampingWriter.new(
             NumberingWriter.new(
                  SimpleWriter.new('final.txt'))))
```

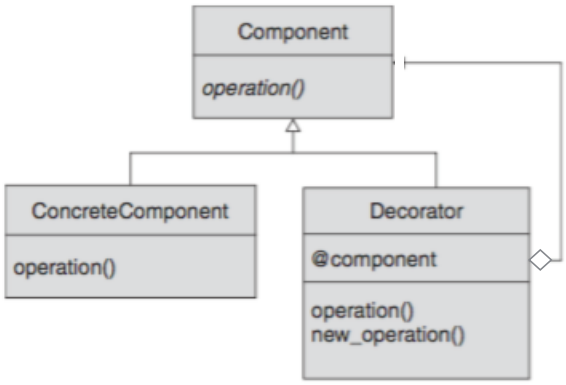


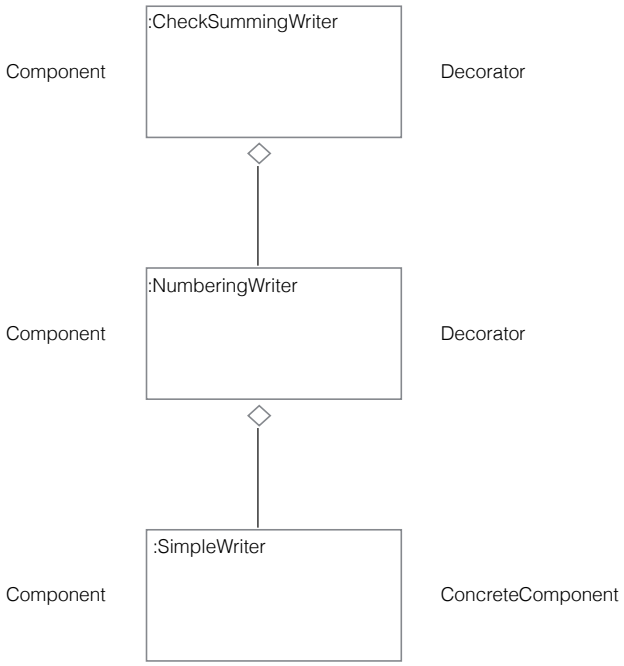
Funcionamiento



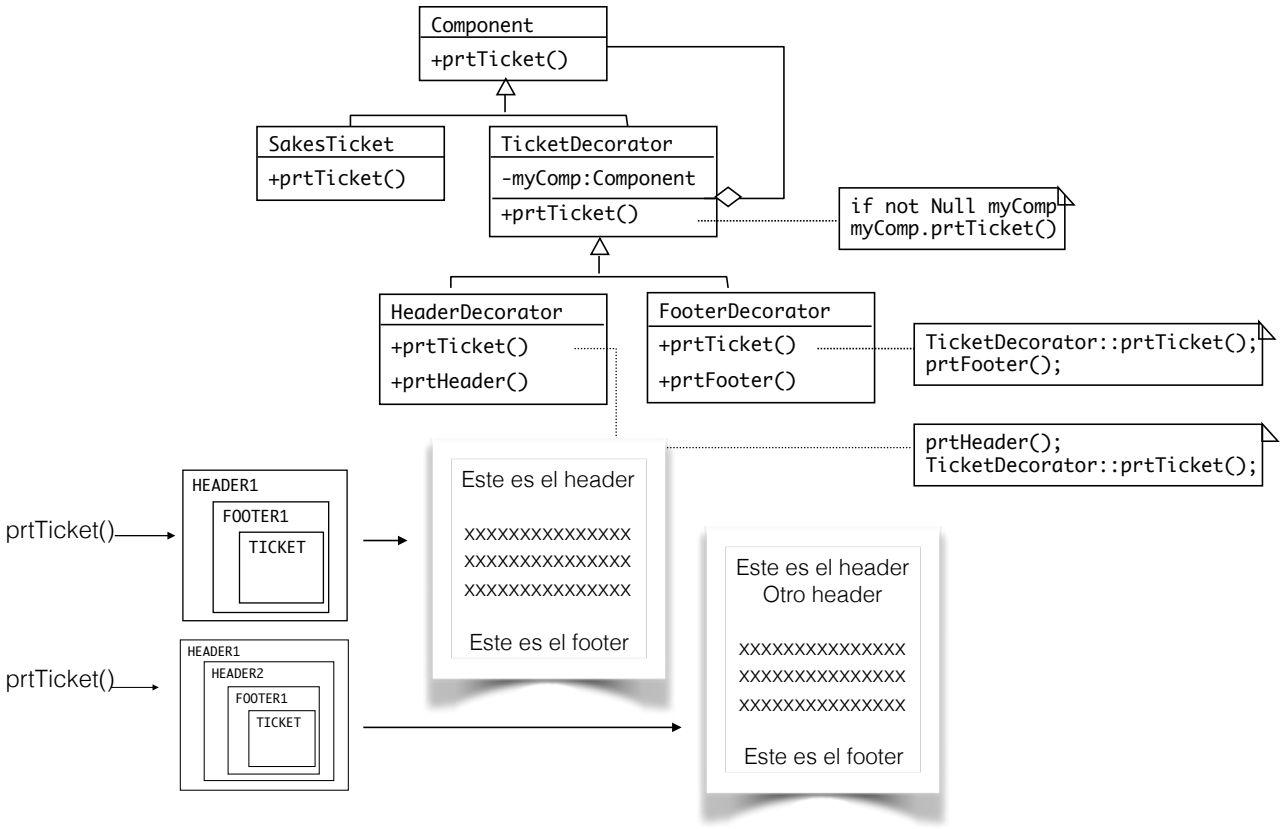


El patrón sintetizado

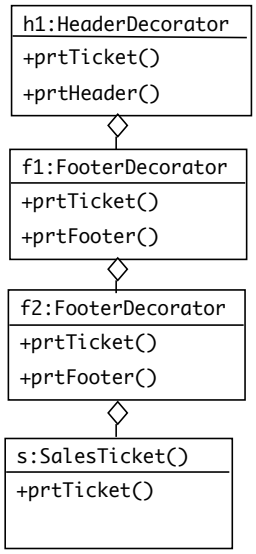


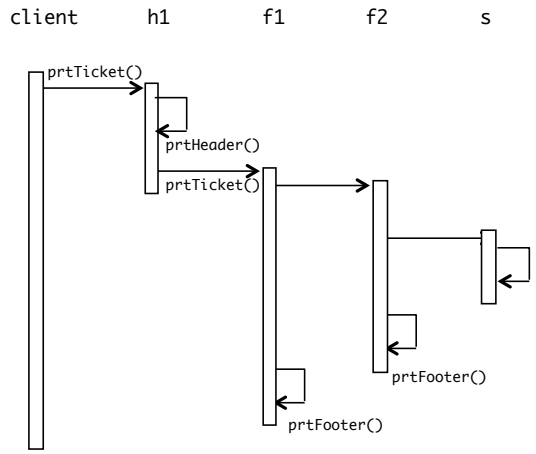


Otro Ejemplo



¿ Como funciona ?

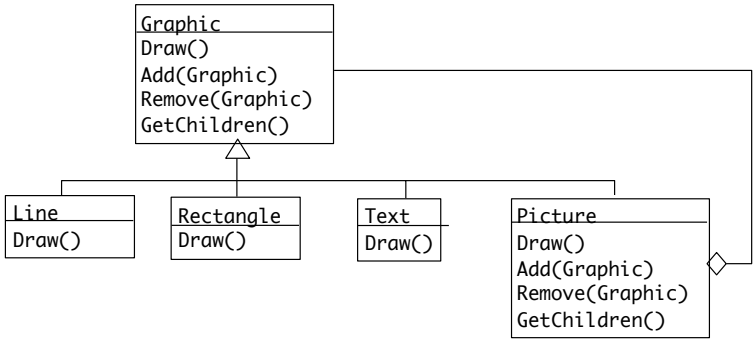


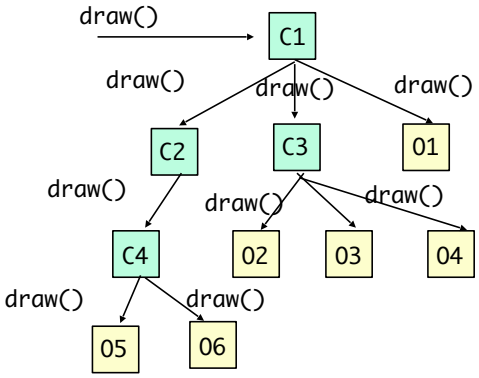


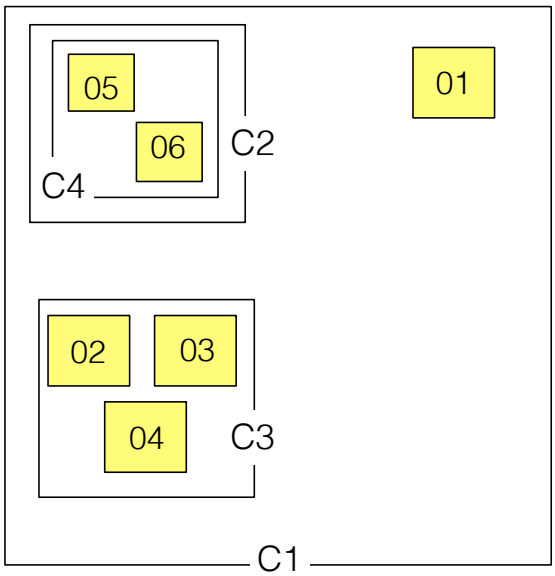
El Patrón Composite

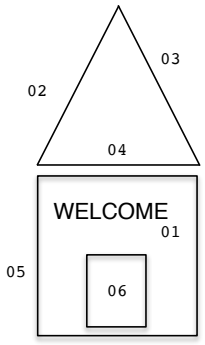
- Manejo de objetos que tienen estructuras jerárquicas de forma que una subestructura (incluso un nodo) se maneje igual que la estructura completa

Ejemplo con Objetos Gráficos

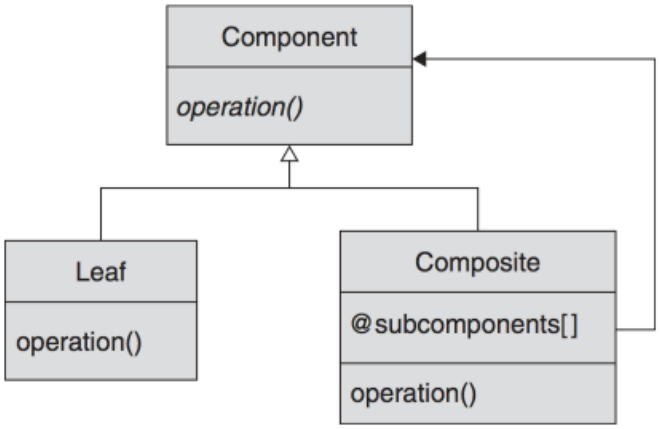








Estructura del Patrón

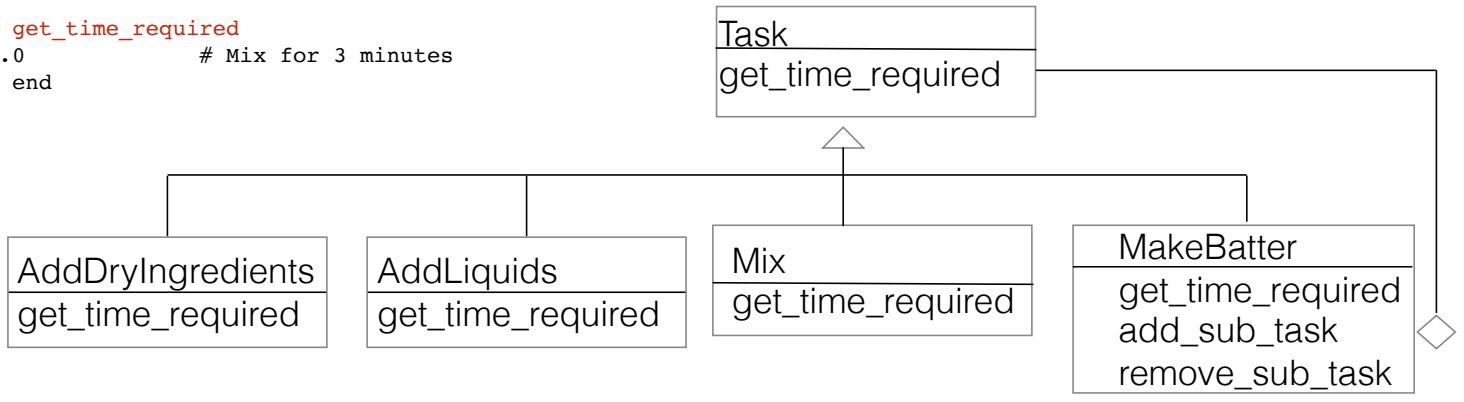


- Component contiene la interfaz base de todos los objetos (qué hay en común entre objetos simples y compuestos)
- Las "hojas" representan los objetos elementales y deben implementar la interfaz de Component
- Composite es también una componente pero contiene subcomponentes

Haciendo una torta

```
class Task
  attr_reader :name
  def initialize(name)
    @name = name
end
  def get_time_required
    0.0
  end
end
class AddDryIngredients < Task
  def initialize
    super('Add dry ingredients')
  end
  def get_time_required
    1.0             # 1 minute to add flour and sugar
  end
end
class AddLiquids < Task
.  def initialize
    super('Add liquids')
  end
  def get_time_required
    2.0             # 2 minutes to add milk
  end
end
class Mix < Task
  def initialize
    super('Mix that batter up!')
  end
  def get_time_required
    3.0             # Mix for 3 minutes
  end end
```

```
class MakeBatter < Task
  def initialize
    super('Make batter')
    @sub_tasks = []
    add_sub_task( AddDryIngredients.new )
    add_sub_task( AddLiquids.new )
    add_sub_task( Mix.new )
  end
  def add_sub_task(task)
    @sub_tasks << task
  end
  def remove_sub_task(task)
    @sub_tasks.delete(task)
  end
  def get_time_required
    time=0.0
    @sub_tasks.each {|task| time += task.get_time_required}
    time
  end
end
```



Transformando Acciones en Objetos

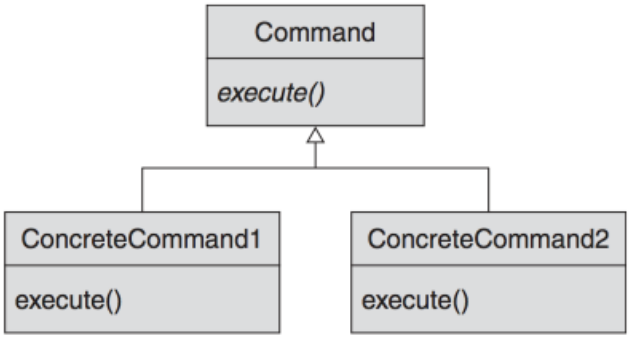
- Imagina la implementación de "undo" de una aplicación en que se editan objetos gráficos
- Hay acciones como agrandar, rotar, trasladar, etc.
- La idea del patrón comando es encapsular esas acciones como objetos
- Undo consiste simplemente en aplicar los objetos en el orden inverso

Muchos botones distintos ...

```
class SlickButton
  #
  # Lots of button drawing and management
  # code omitted...
  #
  def on_button_push
    #
    # Do something when the button is pushed
    #
  end
end

class SaveButton < SlickButton
  def on_button_push
    #
    # Save the current document...
    #
  end
end

class NewDocumentButton < SlickButton
  def on_button_push
    #
    # Create a new document...
    #
  end
end
```

Comando (command)

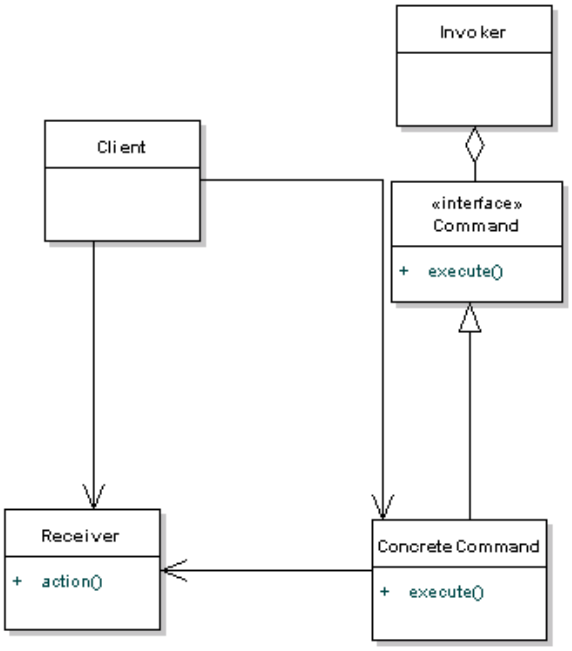
```
class SlickButton
  attr_accessor :command
  def initialize(command)
    @command = command
  end

  def on_button_push
    @command.execute if @command
    end
  end

class SaveCommand
  def execute
    #
    # Save the current document...
    #
  end
end

save_button = SlickButton.new( SaveCommand.new )
```

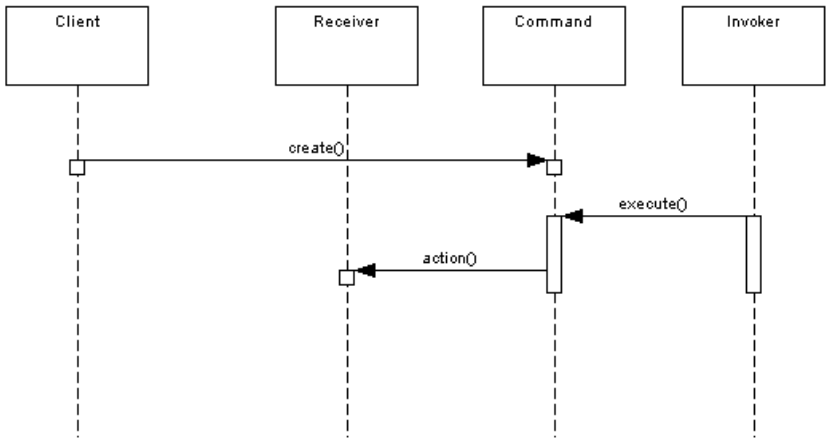


Esencia del Patrón *Command*

- se representa una acción como un objeto
- cliente que requiere ejecutar el comando se desacopla de detalles y dependencias de la lógica del comando
- permite ejecución no inmediata (cola)
- pueden guardarse acciones en caso de un restart
- permite implementar undo

El Comando en GoF





En Ruby pueden usarse blocks

```
class SlickButton
  attr_accessor :command
  def initialize(&block)
    @command = block
  end
  #
  # Lots of button drawing and management
  # code omitted...
  #
  def on_button_push
    @command.call if @command
  end
end

new_button = SlickButton.new do
  #
  # Create a new document...
  #
end
```

Ejemplo: Comandos para Manejo de Archivos

```
class Command
  attr_reader :description
  def initialize(description)
    @description = description
  end
 def execute
 end
end
```

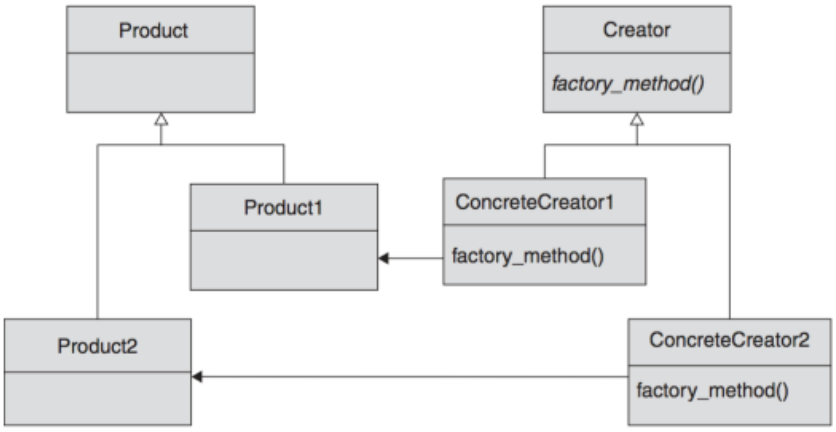
```
class CreateFile < Command
  def initialize(path, contents)
    super("Create file: #{path}")
    @path = path
    @contents = contents
  end
  def execute
    f = File.open(@path, "w")
    f.write(@contents)
    f.close
  end
end
```

```
class DeleteFile < Command
  def initialize(path)
    super("Delete file: #{path}")
    @path = path
  end
  def execute
    File.delete(@path)
  end
end
```

```
class CopyFile < Command
  def initialize(source, target)
    super("Copy file: #{source} to #{target}")
    @source = source
    @target = target
  end
  def execute
    FileUtils.copy(@source, @target)
  end
end
```

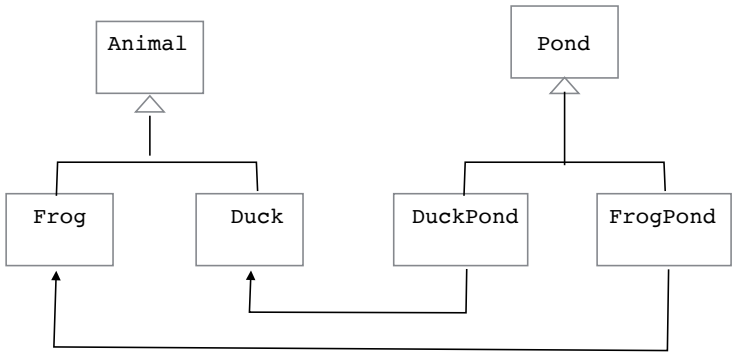
Factory Method

Este patrón es en realidad el patrón template method aplicado al problema de creación de objetos



La laguna de patos

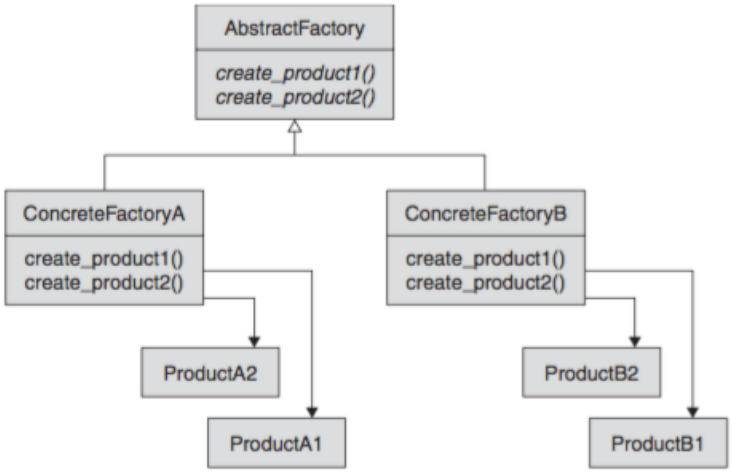
```
class Pond
  def initialize(number_animals)
    @animals = []
    number_animals.times do |i|
      animal = new_animal("Animal#{i}")
      @animals << animal
    end
  end
  def simulate_one_day
    @animals.each {|animal| animal.speak}
    @animals.each {|animal| animal.eat}
    @animals.each {|animal| animal.sleep}
  end
end


class DuckPond < Pond
  def new_animal(name)
    Duck.new(name)
  end
end

class FrogPond < Pond
  def new_animal(name)
    Frog.new(name)
  end
end


pond = FrogPond.new(3)
pond.simulate_one_day
```



La Fábrica Abstracta

- Dos factories concretas, cada una capaz de crear su propio set de productos

- Es la misma idea del patrón Estrategy pero aplicado al problea de crear objetos



El Habitat se inicializa con la fábrica de objetos apropiada

```
class PondOrganismFactory
  def new_animal(name)
    Frog.new(name)
  end
  def new_plant(name)
    Algae.new(name)
end end


class JungleOrganismFactory
  def new_animal(name)
    Tiger.new(name)
  end
  def new_plant(name)
    Tree.new(name)
  end
end


class Habitat
  def initialize(number_animals, number_plants, organism_factory)
    @organism_factory = organism_factory
    @animals = []
    number_animals.times do |i|
      animal = @organism_factory.new_animal("Animal#{i}")
      @animals << animal
    end
    @plants = []
    number_plants.times do |i|
      plant = @organism_factory.new_plant("Plant#{i}")
      @plants << plant
    end
  end
  # Rest of the class...
```

```
jungle = Habitat.new(1, 4, JungleOrganismFactory.new)
jungle.simulate_one_day
pond = Habitat.new( 2, 4, PondOrganismFactory.new)
pond.simulate_one_day
```