Single Responsibility Principle

How much behaviour must a class implement?

Usefulness

Classes need to do the smallest possible useful thing.

```
class Printer
  def print(string)
    puts string
  end
end
```

Do not think ahead

```ruby
class User
  # [...]

  def authenticate(username, password)
    # [...]
    @credentials.first.verify(username, password)
    # [...]
  end
end
```

Easy to extend?

- No side effects
- Small changes in requirements require small changes in code
- Existing code is easy to reuse
- The easiest way to make a change is to add code that is also easy to change itself

Describe it!

One way to know that a class is doing too much is by describing it.

If you are using a lot of *ands* and *ors*, it's probably doing too much.

Let's see an example.

Describe it!

```ruby
require 'digest/sha1'

class User
  # [...]

  def check_password(password)
    Digest::SHA1.hexdigest password == @password
  end
end
```

Describe it!

```ruby
require 'digest/sha1'

class User
  # [...]

  def login_in_facebook(username, password)
    HTTP::Post('http://facebook.com/api,auth', {user: username, password: password})
  end

  def check_password(password)
    return true if Digest::SHA1.hexdigest password == @password
    login_in_facebook(@facebook_username, password)
  end
end
```

Describe it!

```ruby
require 'digest/sha1'

class User
  # [...]

  def login_in_facebook(username, password)
    http_response = HTTP::Post('http://facebook.com/api/auth', {user: username, password:
password})
    http_response == 200
  end

  def login_in_twitter(username, password)
    http_response = HTTP::Get('http://twitter.com/auth', {user: username, password: password})
    http_response.body == 'OK'
  end

  def check_password(password)
    return true if Digest::SHA1.hexdigest password == @password
    return true if login_in_facebook(@facebook_username, password)
    login_in_twitter(@twitter_username)
  end
end
```

If your description is too long or contains some ‘or’ or ‘and’ maybe you need to think twice

Exercise

Create a command line tool. This command line tool will ask you for a username and a password. If it's correct it will ask to enter some text and the program will count the number of words.

Passwords can be hardcoded into the source code.

Anti-patterns / Smells

God objects

A class that seems to know everything about your application.

```ruby
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end

def check_password(password)
  return true if Digest::SHA1.hexdigest password == @password
  return true if login_in_facebook(@facebook_username, password)
  login_in_twitter(@twitter_username)
end

def create_ekements
  blah_blah_blah

end


def login_in_facebook(username, password)
  http_response = HTTP::Post('http://facebook.com/api/auth',
                {user: username, password: password})
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end

def check_password(password)
  return true if Digest::SHA1.hexdigest password == @password
  return true if login_in_facebook(@facebook_username, password)
  login_in_twitter(@twitter_username)
end
```

```ruby
def login_in_facebook(username, password)
  http_response = HTTP::Post('http://facebook.com/api/auth',
                {user: username, password: password})
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end

def check_password(password)
  return true if Digest::SHA1.hexdigest password == @password
  return true if login_in_facebook(@facebook_username, password)
  login_in_twitter(@twitter_username)
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def create_ekements
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end

def login_in_facebook(username, password)
  http_response = HTTP::Post('http://facebook.com/api/auth',
                {user: username, password: password})
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end
```

```ruby
                {user: username, password: password})
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end

def check_password(password)
  return true if Digest::SHA1.hexdigest password == @password
  return true if login_in_facebook(@facebook_username, password)
  login_in_twitter(@twitter_username)
end

def create_ekements
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end


def login_in_facebook(username, password)
  http_response = HTTP::Post('http://facebook.com/api/auth',
                {user: username, password: password})
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end

def check_password(password)
  return true if Digest::SHA1.hexdigest password == @password
  return true if login_in_facebook(@facebook_username, password)
  login_in_twitter(@twitter_username)
end

def create_ekements
  blah_blah_blah

end

def create_ekements
  blah_blah_blah

end

def login_in_facebook(username, password)
  http_response = HTTP::Post('http://facebook.com/api/auth',
                {user: username, password: password})
  http_response == 200
end

def login_in_twitter(username, password)
  http_response = HTTP::Get('http://twitter.com/auth',
                {user: username, password: password})
  http_response.body == 'OK'
end
```

Shotgun surgery

A change is spread among different small changes in different objects.

Often, this means duplication that should be extracted into its own class

Shotgun surgery

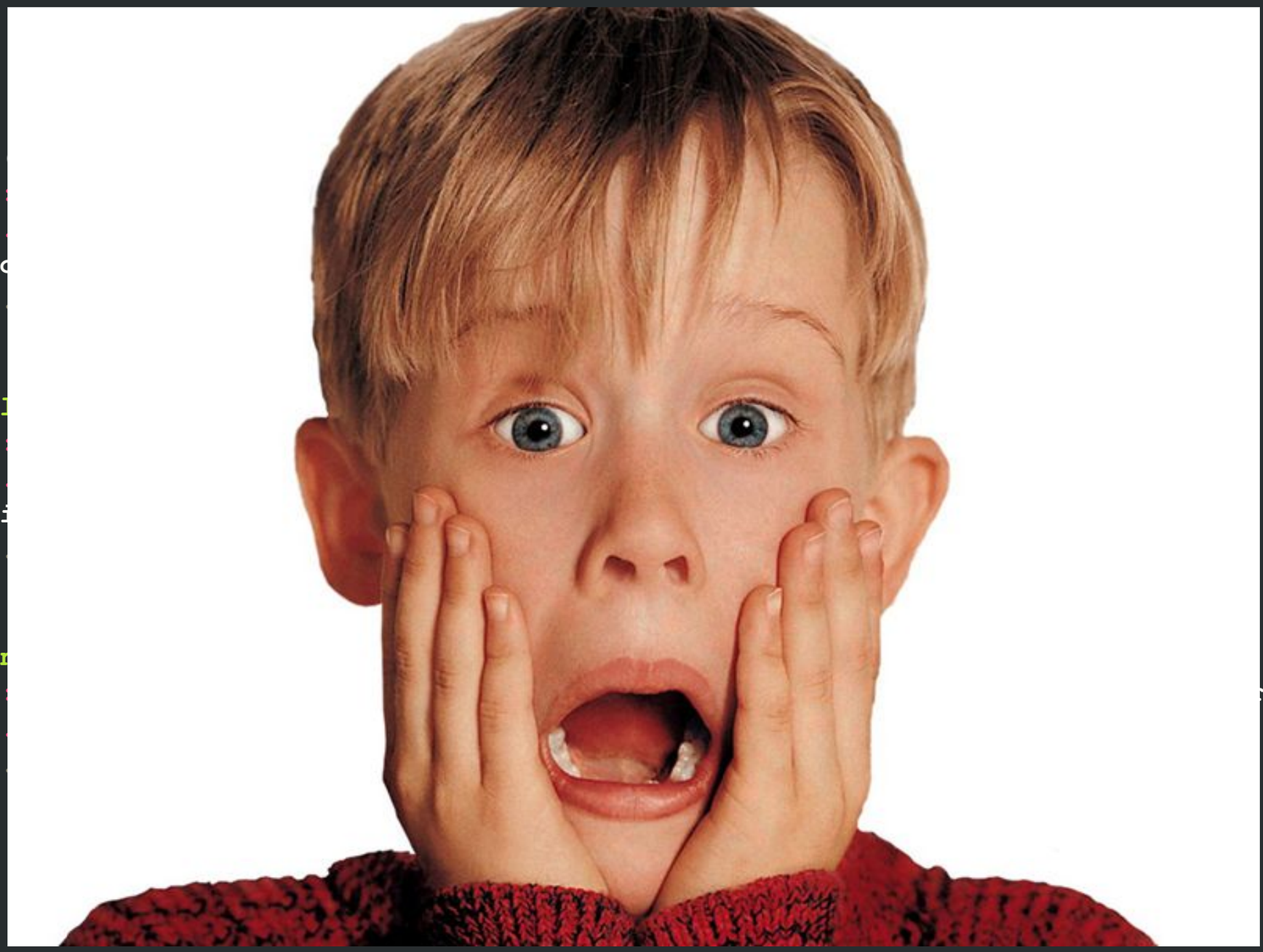
```
# [...]


def buy
  HTTP::
  Stock.
  Cash.c
  # [...
end

def sell
  HTTP::
  Stock.
  Cash.i
  # [...
end

def char
  HTTP::                                                    rice}")
  Price.
  # [...
end


# [...]
```



```ruby
# [...]


def buy(item)
  HTTP::Post("http://twitter.com/api/new_tweet", "I just bought a #{item}")
  Stock.for(item).increment
  Cash.decrease
  # [...]
end

def sell(item)
  HTTP::Post("http://twitter.com/api/new_tweet", "I just sold a #{item}")
  Stock.for(item).decrement
  Cash.increase
  # [...]
end

def change_price(item, price)
  HTTP::Post("http://twitter.com/api/new_tweet", "The price for #{item} is #{price}")
  Price.for(item) = price
  # [...]
end


# [...]
```

```ruby
# [...]

def buy(item)
  Tweet.new("I just bought a #{item}").publish
  Stock.for(item).increment
  Cash.decrease
  # [...]
end

def sell(item)
  Tweet.new("I just sold a #{item}").publish
  Stock.for(item).decrement
  Cash.increase
  # [...]
end

def change_price(item, price)
  Tweet.new("The price for #{item} is #{price}").publish
  Price.for(item) = price
  # [...]
end


# [...]

class Tweet
  def initialize(text)
    @text = text
  end

  def publish
    HTTP::Post("http://twitter.com/api/new_tweet", text)
  end
end
```

Feature envy

Feature envy reveals a method (or method-to-be) that would work better on a different class.

We often find it with repeated calls to a different class.

Feature envy

```ruby
class SellableItem
  #[...]

  def price
    @price
  end
end
```

```ruby
class Cost
  #[...]

  def price
    @sellable_item.price
  end

  def summer_price
    @sellable_item.price * 0.9
  end

  def christmas_price
    @sellable_item.price * 1.1
  end
end
```


```ruby
class SellableItem
  #[...]

  def price
    @price
  end

  def summer_price
    @price * 0.9
  end

  def christmas_price
    @price * 1.1
  end
end

class Cost
  #[...]
end
```

IRON HACK

Duplicated code

It is often the root of all evil

Your code should be DRY

Weapons of our warfare

Extract a method

```
class Passenger
  def enter_country
    control_list_hit = ConstrolList.find(@document_number)
    if control_list_hit
      if control_list_hit.most_wanted
        NotificationForAgent.new("Most Wanted criminal found!", self).save
      else
        NotificationForAgent.new("Person found!", self).save
      end
    end

    verification = VerificationResult.new
    verification.document_number = passenger.document_number
    if @documentation.verify
      verification.correct = true
    else
      verification.correct = false
    end
    verification.save

    Transit.for_passenger(self).save
  end
end
```

Extract a method

```
class Passenger
  def enter_country
    control_list_hit = ConstrolList.find(@document_number)
    if control_list_hit
      if control_list_hit.most_wanted
        NotificationForAgent.new("Most Wanted criminal found!", self).save
      else
        NotificationForAgent.new("Person found!", self).save
      end
    end

    verification = VerificationResult.new
    verification.document_number = passenger.document_number
    if @documentation.verify
      verification.correct = true
    else
      verification.correct = false
    end
    verification.save

    Transit.for_passenger(self).save
  end
end
```

```ruby
class Passenger
  def enter_country
    control_list_check

    verification = VerificationResult.new
    verification.document_number = passenger.document_number
    if @documentation.verify
      verification.correct = true
    else
      verification.correct = false
    end
    verification.save

    Transit.for_passenger(self).save
  end

  private
  def control_list_check
    control_list_hit = ConstrolList.find(@document_number)
    if control_list_hit
      if control_list_hit.most_wanted
        NotificationForAgent.new("Most Wanted criminal found!", self).save
      else
        NotificationForAgent.new("Person found!", self).save
      end
    end
  end
end
```

```ruby
class Passenger
  def enter_country
    control_list_check

    verification = VerificationResult.new
    verification.document_number = passenger.document_number
    if @documentation.verify
      verification.correct = true
    else
      verification.correct = false
    end
    verification.save

    Transit.for_passenger(self).save
  end


  private
  def control_list_check
    control_list_hit = ConstrolList.find(@document_number)
    if control_list_hit
      if control_list_hit.most_wanted
        NotificationForAgent.new("Most Wanted criminal found!", self).save
      else
        NotificationForAgent.new("Person found!", self).save
      end
    end
  end
end
```

```ruby
class Passenger
  def enter_country
    control_list_check
    verify_document
    Transit.for_passenger(self).save
  end

  private
  def control_list_check
    control_list_hit = ConstrolList.find(@document_number)
    if control_list_hit
      if control_list_hit.most_wanted
        NotificationForAgent.new("Most Wanted criminal found!", self).save
      else
        NotificationForAgent.new("Person found!", self).save
      end
    end
  end

  def verify_document
    verification = VerificationResult.new
    verification.document_number = passenger.document_number
    if @documentation.verify
      verification.correct = true
    else
      verification.correct = false
    end
    verification.save
  end
end
```

```ruby
class Passenger
  def enter_country
    control_list_check()
    verify_document()
    Transit.for_passenger(self).save
  end

  private
  def control_list_check
    control_list_hit = ConstrolList.find(@document_number)
    if control_list_hit
      if control_list_hit.most_wanted
        NotificationForAgent.new("Most Wanted criminal found!", self).save
      else
        NotificationForAgent.new("Person found!", self).save
      end
    end
  end

  def verify_document
    verification = VerificationResult.new
    verification.document_number = passenger.document_number
    if @documentation.verify
      verification.correct = true
    else
      verification.correct = false
    end
    verification.save
  end
end
```

Extract a class

```
class Passenger
  def enter_country
    AgentNotificator.new.create_for_passenger(self)
    DocumentVerificator.new.verify(@documentation)

    Transit.for_passenger(self).save
  end
end
```

Extract ’til you drop

- Extract until you can’t extract any more
- Then extract a little bit more
- Then you are done...
- Then extract a little bit more
- Now you are really done

Replace conditional with polymorphism

```
class Passenger
  def enter_country
    # [...]
    case @type
       when :minor
         check_documentation(tutor)
       when :dependant
         check_documentation(self)
         check_can_be_dependant_of(tutor)
         save_biometrics
         control_list_check
       when :regular
         check_documentation(self)
         save_biometrics
         control_list_check
       End
    save_transit
  end
end
```

Replace conditional with polymorphism

```ruby
class Passenger
  def enter_country
    save_transit
  end
end
```

```ruby
class Minor < Passenger
  def enter_country
    check_documentation(tutor)
    super
  end
end

class Dependant < Passenger
  def enter_country
    check_documentation(self)
    check_can_be_dependant_of(tutor)
    save_biometrics
    control_list_check
    super
  end
end

class RegularPassenger < Passenger
  def enter_country
    check_documentation(self)
    save_biometrics
    control_list_check
    super
  end
end
```

Refactor

Refactoring is the process of changing a software system in such a way that it does not alter the external behaviour of the code yet improves its internal structure.

Example code

```ruby
if output == :screen
  puts text
elsif output == :logfile
  IO.write("log.log", text)
elsif output == :message_queue
  Queue.put(text)
end
```

The next programmer will often be a lazy dog

The next programmer will often be you

IRON HACK

Example code

```ruby
if output == :screen
  puts text
elsif output == :logfile
  IO.write("log.log", text)
elsif output == :message_queue
  Queue.put(text)
elsif output == :json_endpoint
  HTTP.post(text)
elsif output == :logstash
  Logstash.add(text)
elsif output == :logwatcher
  LogWatch.new.post(text)
elsif output == :logfile
  IO.write("log.log", text)
elsif output == :message_queue
  Queue.put(text)
elsif output == :json_endpoint
  HTTP.post(text)
elsif output == :logstash
```

IRON HACK

Refactor this!

```
if output == :screen
  puts text
elsif output == :logfile
  IO.write("log.log", text)
elsif output == :message_queue
  Queue.put(text)
elsif output == :json_endpoint
  HTTP.post(text)
elsif output == :logstash
  Logstash.add(text)
elsif output == :logwatcher
  LogWatch.new.post(text)
elsif output == :logfile
  IO.write("log.log", text)
elsif output == :message_queue
  Queue.put(text)
elsif output == :json_endpoint
  HTTP.post(text)
elsif output == :logstash
  Logstash.add(text)
elsif output == :logwatcher
```

Exercise

Alter your program before so instead of just an option of counting words you are shown a menu where you can count words, count letters, reverse the text, convert the text to uppercase or convert the text to lowercase.