

REFACTORING ELIXIR FOR MAINTAINABILITY

By Dave Lucia

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When I was a beginner...

I wrote modules and functions that leveraged pattern matching

```
defmodule MyModule do  
  def foo(binary) when is_binary(binary), do: String.upcase(binary)  
  
  def foo(%MyStruct{} = struct), do: struct.message  
end
```

But... 🤔

1. When does **Pattern Matching** get in the way of good code? 🤖
2. What patterns can reduce **Code Duplication**? 💻 💻 💻
3. **Protocols** and **Behaviours** - When are they useful? 🔨

What will we do for the next 20 minutes?

1. ⚠️ Consider when to **Pattern Match**
2. ❌ Write some bad **Elixir** Code
3. ✅ Make it better with **Protocols**
4. ✅ Learn a bit about how **Protocols** work
5. ✅ Make the code *even better* with **Behaviours**

Who is this guy??



Currently

- Husband and Dog dad
- **SimpleBet** - Platform Software Architect - **Elixir | Rust**

Formerly

- **The Outline** - Founding team member - **Elixir | JavaScript**
- **Bloomberg** - Senior Developer - *JavaScript / C++*

Pattern matching is

```
defmodule Expng do
  def png_parse(<< 0x89, 0x50, 0x4E, 0x47, 0x0D, 0x0A, 0x1A, 0x0A,
    _length :: size(32),
    "IHDR",
    width :: size(32),
    height :: size(32),
    bit_depth,
    color_type,
    compression_method,
    filter_method,
    interlace_method,
    _crc :: size(32),
    chunks :: binary>>) do
```

Source: <https://zohaib.me/binary-pattern-matching-in-elixir/>

Refactoring Elixir for Maintainability - @davydog187 - <https://simplebet.io>

Pattern matching can be a novelty

```
def foo(%Post{comment: %Comment{author: %Author{favorite_pet: pet}}}, do: pet
```

VS

```
def foo(%Post{} = post), do: post.comment.author.favorite_pet
```


Don't Pattern match in function heads

✗ To extract nested datastructures

✗ To guard against every possible type

```
# This is overly defensive, this should be a programmer error  
def render_post(%Comment{} = _comment), do :error
```

Do Pattern match in function heads when..

- ✓ **It makes API / Context boundaries explicit**
- ✓ **Matching on result types**

```
def foo({:ok, value}), do: value  
def foo({:error, reason}), do: reason
```

- ✓ **Parsing binary values**
- ✓ **You've considered the tradeoffs**

Case Study

Let's build a blog 

using *Phoenix* and *Ecto*

Post Data Model

```
defmodule Blog.Post do
  use Blog.Web, :model

  schema "posts" do
    field :title, :string
    field :author, :string
    field :body, :string
  end
end
```

Post Template

```
<article>
  <header>
    <h1><%= @post.title %></h1>
    <address><%= @post.author %></address>
  </header>
  <section>
    <%= @post.body %>
  </section>
</article>
```

Blog Features

- ✓ Text
- ✗ Titles
- ✗ Paragraphs
- ✗ Links
- ✗ Images
- ✗ Bold / Italics

Let's 🌶️ it up with some Markdown

```
# Markdown time!
```

```
*Hello* **World**!
```

```
[Code BEAM SF](https://codesync.global/conferences/code-beam-sf-2019/)
```

Expose a function to render Markdown in templates

```
defmodule Blog.Web.PostView do
  use Blog.Web, :view

  def render_markdown(binary) do
    Blog.Markdown.to_html(binary)
  end
end
```



```
defmodule Blog.Markdown do

  def to_html(binary) when is_binary(binary) do
    Cmark.to_html(binary)
  end
end
```

Render the body as Markdown

```
<section>
  <%# Convert the Markdown -> HTML %>
  <%= render_markdown @post.body %>
</section>
```

Our HTML is being escaped 😓

First post

Dave

```
<p><em>Hello</em> <strong>World</strong>!</p>
```

Phoenix.render/3 returns a safe tuple? 😱

We can see our escaped HTML

“ The safe tuple annotates that our template is safe and that we don't need to escape its contents because all data has already been encoded. ”

Thanks for keeping us safe, Phoenix



```
# Pseudo typespec  
@spec Phoenix.View.render(module(), binary(), term()) :: {:safe, list()}
```

We need our Markdown rendered HTML to go from

`iodata` ➡ `{:safe, iodata}`

`render_markdown/1` now marks the HTML as safe

```
def render_markdown(binary) do
  binary
  |> Markdown.to_html()
  |> Phoenix.HTML.raw() # Convert to {:safe, iodata} tuple
end
```

First post

Dave

Hello World!

The Good

- ✓ We've built the world's simplest blog
- ✓ We can render Markdown in templates

The Bad

- ✗ We need have to remember to use the `render_markdown/1` function for any field we want to support Markdown


```
<article>
  <header>
    <h1><%= render_markdown(@post.title) %></h1>
    <h2><%= render_markdown(@post.dek) %></h2>
    <address><%= @post.author %></address>
    <date><%= @post.published_at %></date>
  </header>
  <section>
    <%= render_markdown(@post.body) %>
  </section>
  <footer><%= render_markdown(@post.footer)</footer>
</article>
```

We're here to Refactor for Maintainability TM

Let's refactor by leveraging Protocols

Protocols help you achieve the Open/Closed Principle in Elixir

- ✓ Open for extension
- ✗ Closed for modification

“ Protocols are a mechanism to achieve polymorphism in Elixir. Dispatching on a protocol is available to any data type as long as it implements the protocol. - [Elixir Protocol Guide](#) ”

```
defprotocol Size do
  @doc "Calculates the size (and not the length!) of a data structure"
  def size(data)
end

defimpl Size, for: BitString do
  def size(string), do: byte_size(string)
end

defimpl Size, for: Map do
  def size(map), do: map_size(map)
end

defimpl Size, for: Tuple do
  def size(tuple), do: tuple_size(tuple)
end
```

```
defprotocol Size do
  @doc "Calculates the size (and not the length!) of a data structure"

  def size(string) when is_binary(string), do: byte_size(string)
  def size(map) when is_map(map), do: map_size(map)
  def size(tuple) when is_tuple(tuple), do: tuple_size(tuple)
end
```

We can extend the rendering power of Phoenix by leveraging its `Phoenix.HTML.Safe` Protocol

```
defmodule Blog.Markdown do
  defstruct text: ""

  def to_html(%__MODULE__ {text: text}) when is_binary(text) do
    Cmark.to_html(binary)
  end

  defimpl Phoenix.HTML.Safe do
    # Implement the protocol
    def to_iodata(%Blog.Markdown{} = markdown) do
      Blog.Markdown.to_html(markdown)
    end
  end
end
```

```
post = put_in(post.body, Markdown.new(post.body))
```

```
Phoenix.View.render(  
  Blog.Web.PostView,  
  "show.html",  
  post: post  
)
```

```
<article>  
  <header>  
    <h1><%= @post.title %></h1>  
    <address><%= @post.author %></address>  
  </header>  
  <section>  
    <%# render_markdown(@post.body) %>  
    <%= @post.body %>  
  </section>  
</article>
```


But wait, we can do better

We still need to remember to wrap in a **Markdown** struct

```
post = put_in(post.body, Markdown.new(post.body))
```

How can we refactor further? 🤔

Behaviours 🕶️

Behaviours are interfaces

```
def Food do
  @callback is_hotdog?(any()) :: boolean()
end

def Hotdog do
  defstruct [:val]

  @behaviour Food

  def is_hotdog?(%Hotdog{}), do: true
end
```

Lets make `%Markdown{ }` implement the
`Ecto.Type` Behaviour 

```
defmodule Blog.Post do
  use Blog.Web, :model

  schema "posts" do
    field :title, :string
    field :author, :string
    field :body, Blog.Markdown # The custom Ecto.Type
  end
end
```

```
defmodule Blog.Markdown do
  @behaviour Ecto.Type

  def type, do: :string

  def cast(binary) when is_binary(binary) do
    {:ok, %Markdown{text: binary}}
  end

  def load(binary) when is_binary(binary) do
    {:ok, %Markdown{text: binary}}
  end

  def dump(%Markdown{text: binary}) when is_binary(binary) do
    {:ok, binary}
  end
end
```

Now `Post.body` is always a `%Markdown{ }`

```
post = Repo.get!(Post, 1)

true = match?(%Markdown{}, post.body)

# No longer needed
# post = put_in(post.body, Markdown.new(post.body))

Phoenix.View.render(
  Blog.Web.PostView,
  "show.html",
  post: post
)
```


Now we have

- ✓ Built a basic blog with Markdown support
- ✓ Simplified our templates by leveraging the Phoenix.HTML.Safe Protocol
- ✓ Automatically casted Markdown fields at the database level with Behaviours

For more info, read my blog post:

Beyond functions in Elixir:

Refactoring for Maintainability

Presentation written in the **Marp framework** by Yuki Hattori, a Markdown based presentation framework.

Marp - <https://yhatt.github.io/marp/>

Presentation -

https://github.com/davydog187/code_beam_presentation

Thanks!

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