Deumbrellization

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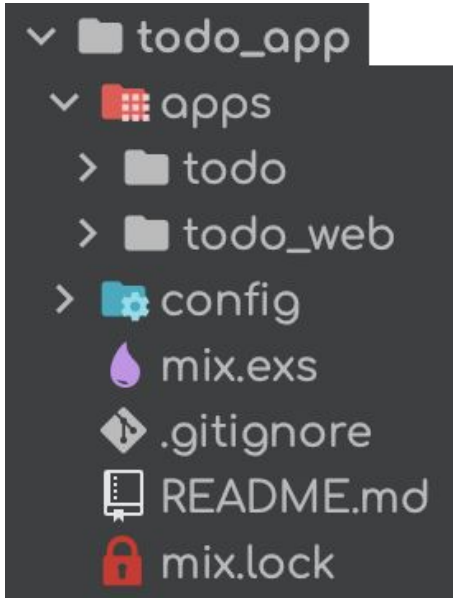
Why?

- Independent applications
- Scalability
- Faster compile time
- Local development
- Less effort than e.g. gRPC

Umbrella

- Subapps
- One config
- Deps




```
# apps/todo_web/mix.exs
defp deps do
  [
    {:todo, in_umbrella: true},
    # ...
  ]
end
```

Splitting

- Remove `in_umbrella` dependencies
- Separate configs
- Adjust `mix.exs`
- Set up communication

Communication

```
defmodule TodoWeb.TaskController do
  use TodoWeb, :controller
  alias Todo.TodoLists

  def index(conn, _params) do
    tasks = TodoLists.list_tasks()
    render(conn, "index.html", tasks: tasks)
  end
```

We can't just invoke this code,
because it's no longer available locally.

Nodes

- A **node** is an instance of the Erlang Virtual Machine.
- Nodes can communicate between each other.
- Together they form distributed system.

```
todo > iex --sname tomato  -S mix
iex(tomato@MacBook-Pro-8)1> Node.list
[]
iex(tomato@MacBook-Pro-8)2> Node.connect(:"cucumber@MacBook-Pro-8")
true
iex(tomato@MacBook-Pro-8)3> Node.list
[:"cucumber@MacBook-Pro-8"]
```

```
todo_web > iex --sname cucumber -S mix
iex(cucumber@MacBook-Pro-8)1> Node.list
[]
iex(cucumber@MacBook-Pro-8)2> Node.list
[:"tomato@MacBook-Pro-8"]
```

libcluster

A library that provides a mechanism for automatically forming clusters of nodes.

```
def start(_type, _args) do
  topologies = [
    local_epmd: [
      strategy: Cluster.Strategy.LocalEpmd
    ]
  ]

  children = [
    {Cluster.Supervisor, [topologies, [name: TodoWeb.ClusterSupervisor]]}
    # ...
  ]

  opts = [strategy: :one_for_one, name: TodoWeb.Supervisor]
  Supervisor.start_link(children, opts)
end
```

:rpc

Erlang has a built-in library `:rpc` for remote calls.

```
iex(todo_web@MacBook-Pro-8)10> :rpc.call(:"deumbrellization-todo@MacBook-Pro-8",
Todo.TodoLists, :list_tasks, [])
[debug] QUERY OK source="tasks" db=0.7ms idle=542.5ms
SELECT t0."id", t0."description", t0."inserted_at", t0."updated_at" FROM "tasks"
AS t0 []
↳ :erpc.execute_call/4, at: erpc.erl:589
[
  %{
    __meta__: #Ecto.Schema.Metadata<:loaded, "tasks">,
    __struct__: Todo.TodoLists.Task,
    description: "Fix tap",
    id: 24,
    inserted_at: ~N[2023-02-21 23:41:20],
    updated_at: ~N[2023-02-21 23:41:20]
  }
]
```

```
  defmodule TodoWeb.TaskController do
    use TodoWeb, :controller

-   alias Todo.TodoLists
+   @node :"todo@MacBook-Pro-3"

    def index(conn, _params) do
-     tasks = TodoLists.list_tasks()
+     tasks = :rpc.call(@node, Todo.TodoLists, :list_tasks, [])
+
      render(conn, "index.html", tasks: tasks)
    end
```

Syntactic sugar

```elixir
defmodule RemoteCallMacro do
  defmacro remote(node_name, do: ast) do
    # {{:., [line: 10], [{:__aliases__, [line: 10], [:Todo, :TodoLists]}, :list_tasks]}, [line: 10], []}
    {{:., _, [{_, _, aliases}, function_name]}, _, args} = ast
    module = Module.concat(aliases)

    quote do
      :rpc.call(unquote(node_name), unquote(module), unquote(function_name), unquote(args))
    end
  end
end
```

```elixir
import RemoteCallMacro
@node Application.compile_env!(:todo_web, [:nodes, :todo, :name])

def index(conn, _params) do
  tasks =
    remote(@node) do
      Todo.TodoLists.list_tasks()
    end

  render(conn, "index.html", tasks: tasks)
end
```

```elixir
defmodule RemoteCallMacro do
  defmacro remote(node_short_name, do: ast) do
    {{:., _, [{_, _, aliases}, function_name]}, _, args} = ast
    module = Module.concat(aliases)

    quote do
      node_name =
        Enum.find(Node.list(), fn node ->
          node |> Atom.to_string() |> String.split("@") |> hd() == unquote(node_short_name)
        end)

      node_name || raise "Error node not found: #{inspect(unquote(node_short_name))}"
      response = :rpc.call(node_name, unquote(module), unquote(function_name), unquote(args))

      case response do
        {:badrpc, _} ->
          raise "Error calling node #{inspect(node_name)} via rpc: #{inspect(response)}"

        response ->
          response
      end
    end
  end
end
```

Tests

- Running nodes
- Dummy implementation
- Extend macro
- `{:app, in_umbrella: true, only: [:test]}`

Why not?

- No isolation
- Elixir/Erlang only

Resources

- Anton Mishchuk: https://medium.com/matic-insurance/designing-scalable-application-with-elixir-from-umbrella-project-to-distributed-system-42f28c7e62f1
- Karol Słuszniak: https://heyplay.io/blog/building-multiplayer-gaming-gamedev-platform-with-elixir-phoenix-liveview-and-rust
- libcluster: https://github.com/bitwalker/libcluster