Functions with parallel execution and communication channel

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Motivation

- Introduce parallelism in functional language 3:
  - Raising performance of the language.
  - Better use of processing power.
  - Enable sharing of data and resources.
  - Division of work.
  - Allow reuse of services already available.

Motivation

- Developed by Ericsson in 1986.
- Creating and managing processes is a trivial task in Erlang.

Motivation

- Competition happens between lightweight processes.
- There is a data type called PID, the parallel process identifier and in which messages can be sent.

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Erlang - Example 01

```
loop() ->
    receive
        "Hi!" ->
            io:format("Hello world!!!"),
            loop();
        Any ->
            io:format("Received: ~p~n", [Any]),
            loop()
    end.
```

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Erlang - Example 02

```
defmodule Ping do
        def start do
                loop()
        end

        def loop do
                receive do
                        {:pong, from} ->
                                IO.puts "ping ->"
                                :timer.sleep 500
                                send(from, {:ping, self})
                        {:ping, from} ->
                                IO.puts "<- pong"
                                timer.sleep 500
                                send(from, {from, {:pong, self})
                end
                loop()
        end
end
```

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Goals

Extend the functional language 3 to include competition, based on the Erlang programming language.

LF3

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Language - LF3

- Extends Functional Language 2 with list and list comprehension.
- A List is a value.
- A program is an expression.

BNF

ExpUnaria ::= "-" Expressao | "not" Expressao | "length" Expressao
| head(Expressao) | tail(Expressao)
| ExpCompreensaoLista
| **wait(ValorInteiro)**
| **receive(ValorString "," ValorInteiro)**
| **send(ValorString "," ValorString)**

DecProcesso ::= "process" Id ExpDeclaracao "end"

Link repositório:

https://github.com/victorlaerte/cin-plp-project/blob/master/BNF.md

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Sintax - creating a process

```
process idProcess1
    let fun functionExample = wait(3) // This will lock the process by 3 seconds
                send("main", "message string example")
                // This will send message to the 'main' process
        in functionExample()
end
```

Sintax - creating a process

```
process idProcess2
    let fun teste msg1= msg1 in
            receive(idProcess1, 60) // This will wait until process1 response or 60 seconds timeout
end
```

Sintax - ping pong example

```
process main
      let fun teste msg1 msg2 = msg1+msg2 in
                receive(idProcess1, 60) // This will wait until process1 response or 60 seconds timeout
                receive(idProcess2, 60) // This will wait until process2 response or 60 seconds timeout
end

process idProcess1
      let fun ping = wait(3) // This will lock the processe by 3 seconds
                 send("main", "ping") // This will send message 'ping' to the mainProcess
       in ping()
end

process idProcess2
      let fun pong = wait(5) // This will lock the processe by 5 seconds
                 send("main", " pong") // This will send message 'pong' to the mainProcess
      in pong()
end
```

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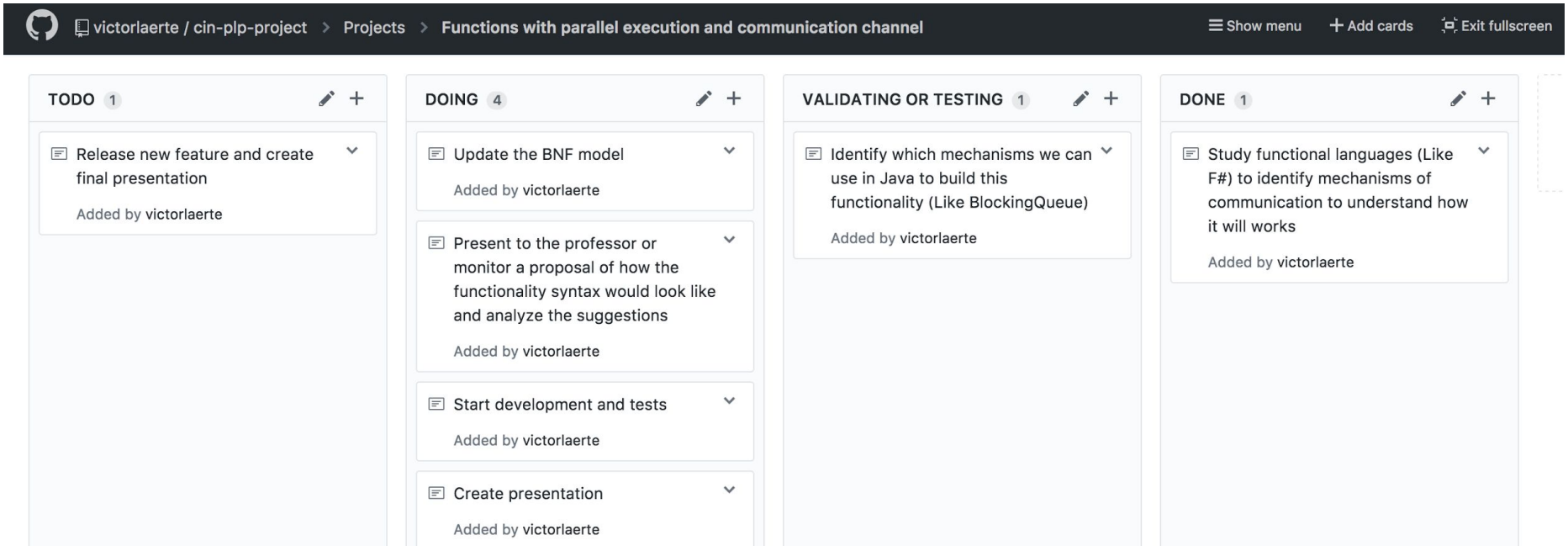
General Task Board



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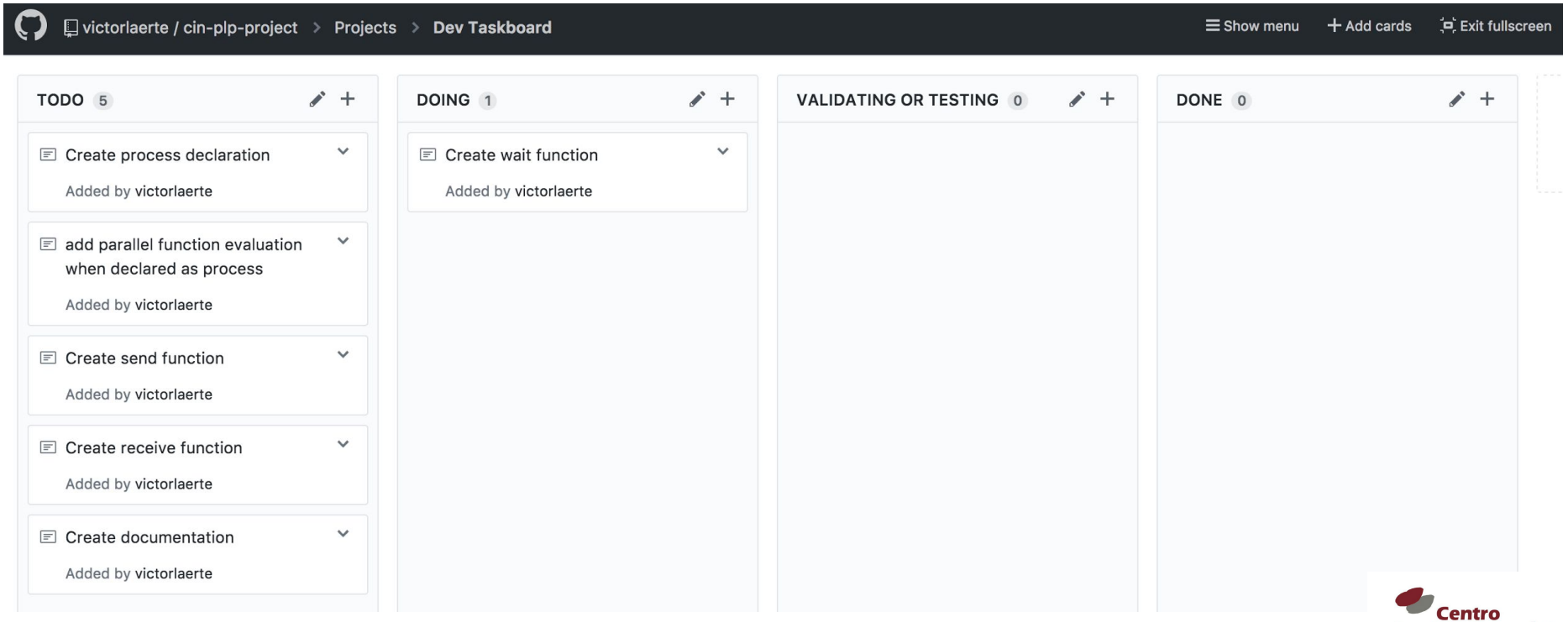
Dev Task Board



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Repository

https://github.com/victorlaerte/cin-plp-project

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References

Martin Brown (10 de maio de 2011). «Introduction to programming in Erlang, Part 1: The basics» (em inglês). IBM Developer Works. Consultado em 01 de maio de 2017

Erlang (linguagem de programação). In: Wikipédia: a enciclopédia livre. Disponível em: <https://pt.wikipedia.org/wiki/Erlang_(linguagem_de_programa%C3%A7%C3%A3o)> Acesso em: 29 abril 2017.