Gleam on Beam: Elixir's safe escape hatch

Briefly about me:

- Diploma degree in Sociology, Economics & Psychology.
- Full Stack Dev since 1997/2001.
- Contributor to Gleam's stdlib: https://github.com/gleam-lang/stdlib
 and a bit to Gleam Playground.
- When looking for new tech, I have tried a bunch of technologies, which included picking Phoenix and Flutter for creating mobile apps for iOS/Android.

Story/1 PICKING NEW TECHNOLOGIES

- For the mobile app I picked Dart/Flutter as the frontend technology.
 - Nowadays one could try https://github.com/elixir-desktop/desktop (Elixir-Desktop), which lets you run Elixir code on iOS/Android as well as Mac, Linux and Windows.
- For the backend I picked Elixir/Phoenix.
- I had a great time learning both, but I really missed the typing in Elixir/Phoenix while onboarding.

Story/2 FIRST EXPERIENCES

- The first iterations of the backend/API (Phoenix) some runtime match errors sneaking into staging.
- Errors were due to using pattern matching and not enough `with` or change-sets for validation.
- I simply happen to "let it crash" unreasonably though.

Story/3 DART/FLUTTER

- The Dart/Flutter experience was different.
- Bugs existed as well, but the overall onboarding was awesome.
- Reasons:
 - Flutter was mostly declarative and DOM-like.
 - Flutter/Dart tooling made it rewarding to *not* use `dynamic`, but almost always use static typing.
 - ∘ Why? →

Story/4

DX BENEFITS OF STATIC TYPING

- The IDE (vscode) showed type hints right away.
- Without any delay (like in Elixir with ElixirLS, type specs and Dialiyzer).
- The IDE offered options to pick and function documentation alongside when moving through the vast amounts of Flutter build-in types/components to compose the application of.
- → Dart has its culprits but I clearly missed that kind of type safety and DX in Elixir/Phoenix.

Story/5 "LET IT CRASH!"

- 1. 'Bad crashes': Application errors happen at runtime and we just do not handle them.
 - When taking over larger Phoenix projects I have for instance seen a lot of `(MatchError) no match of right hand side value` in Sentry.io logs.
- 2. 'Good crashes': A failing process does not need to kill the system. This also allows for self healing where certain networked resources are not available briefly.
 - On the BEAM without global state and objects we can more or less safely just crash and restart processes.

Disclaimer: Obviously crashes are NEVER good!

Story/6

"LESSONS LEARNED!"

Erlang and Elixir help a lot on following happy paths:

- When resources, an application requires, are set to be available under usual circumstances, it runs.
- When such resources are temporarily unavailable, some processes crash and restart.
- → The `good crashes` are handled by well written Beam/OTP apps.

What about the `bad crashes`?

- A lot of runtime errors can occur that have nothing to do at all with unexpected errors.
- Change-sets or other forms of input validation help.
- Type specs, and schemata such as Json-Schema, XML-Schema/XSD, GraphQL help.
- Unit tests help.
- → Static typing can help to avoid many of these bad crashes

Story/7 TYPES TO THE RESCUE

- Erlang community has tried to fix this within and outside of Erlang, see https://github.com/stars/michallepicki/lists/erlang-and-static-types.
- Reason for tools like Dialzyer and to some degree Credo.
- Reason for numerous attempts to bring typing to Erlang, the last one being `erlt` by the WhatsApp-team, released into
 the public in spring 2021: https://github.com/WhatsApp/erlt.
- Reason for numerous to bring typing to Erlang or write typed languages against the Beam VM such as: Lisp-Flavoured-Erlang, Alpaca, Purerl, Elchemy, Hamler, Caramel and Gleam.

Gleam/1 WHAT GLEAM AVOIDS

Great care around simplicity and DX:

- Many of the attempts to bring typing to the Beam make it hard to pick up for developers not familiar with say Lisp,
 Haskell, PureScript, Elchemy or OCaml.
- And let's be honest: Compared to say JavaScript these are ultra-niche.
- Why? Next to immutability, recursion and strict typing developers are also forced to know these and/or understand these
 niche technologies and be willing to read their syntax and live with their abstractions.

Gleam/2

WHAT SETS GLEAM APART

- 1. Average developer happiness matters:
 - The Gleam language is developed with great care limiting the languages' strangeness-budget.
 - Syntax appears to be familiar to JavaScript.
 - Not every feature one could think of or desire is implemented.
 - The language interface/surface is being kept small for this reason (Chess vs Go).
 - It should be easy to pick up.
 - Expressive and clear error messages.
 - Powerful type inference to get started or for the lazy (appears if types are optional or dynamic).
- 2. Compiles to targets Erlang and JavaScript.
 - Once there is more financial support the main developer would like to add C/native as a compile target.
- 3. The compiler is written in Rust:
 - Compiling Gleam is ultra snappy and at the same time yields compile time guarantuees.
 - Can be compiled via WASM within the browser Gleam' playground uses this.
- 4. Interacts with Erlang/OTP, Browser-Javascript, NodeJS and possibly Deno.

Gleam/3

Gleam/4

With all that being said, let's dive in a bit!

Gleam/5 DEMO TIME

Demo and this talk in available here: https://github.com/inoas/gleam-elixir-phoenix-liveview-counter.

Run at home? Make you have got Erlang, Elixir, Gleam and Rebar installed. See below for some instructions.

Run demo app via:

```
asdf install erlang 26.0
asdf install elixir 1.14.5-otp-26
asdf install nodejs 18.16.0
asdf install gleam 0.29.0
# Make sure to run following outside of your gleam project dir and with the elixir version your gleam up requires by `.tool-mix archive.install hex mix_gleam
bin/dev/run && open http://localhost:4000
```

Run the slides via:

bin/dev/slides && open http://localhost:3030

DEMO LINK

→ http://localhost:4000

Gleam/6 HOW TO INSTALL GLEAM

1. Install ASDF https://asdf-vm.com/guide/getting-started.html

```
brew install asdf # Mac OS only, other instructions above
```

2. Install Erlang, NodeJS, Gleam

```
asdf install erlang latest
asdf install elixir latest
asdf install nodejs latest
asdf install gleam latest
```

3. Create a Gleam dummy app, run tests on both targets:

```
gleam new my_app
cd my_app
gleam test --target erlang; gleam test --target javascript
```

If you want to use Gleam inside an Elixir project, see: https://github.com/gleam-lang/mix_gleam.

Gleam/7 PLAYTIME

- Toying around together on https://johndoneth.github.io/gleam-playground.
- Caveat: Only one module, no dependencies except gleam's included prelude and `gleam_stdlib`.
- Going through some examples found here: https://gleam.run/book/tour.

Gleam/8 PLAYGROUND EXAMPLES

- Strings attached
 - Strings and StringBuilder, there is also BitStrings
- Very expressive
 - Keywords: Expressions everywhere: Functions, anonymous functions, case statements, expression blocks
- Lovely patterns
 - Keywords: Discards ands spreads
- Pipe and capture
 - Keywords: Piping, capture symbol, complete functions assumed to return functions to push the pipe value into
- ∘ Bonus: Racing without safety belts 🔼
 - Keywords: assert, pipelines

Closing words/1 IS GLEAM PRODUCTION READY?

To my knowledge the main author certainly thinks so. People are using it in production. In the end Gleam generated rather readable Erlang (or JavaScript).

ANYTHING BAD?

- Complete exhaustiveness checks on `case` statements.
- The compiler, to be able to deal with broken/partial ASTs and still offer good help
 - Thus that we can have autosuggestions/completion and better IDE tooling.
- To my knowledge, these features are on the core developer's lists.

Closing words/2 THE STATE OF MATTER

- The language is pretty stable:
 - The main author has stated that they intend to not break any language syntax or core language interfaces.
 - Syntax high-lightning and the first LSP is available.
 - Github officially supports the language.
- The eco-system needs help, libraries, more developers, and more users:
 - A lot of things already exist: HTTP1/2 servers, HTTP clients, JSON decoders, Protocol-Buffers, PostgreSQL client,
 Mustache and Matcha templating and many more.
 - For more see https://github.com/gleam-lang/awesome-gleam.

Closing words/3 THANKS & SHOUT-OUTS

- Joe & Team for creating Erlang!
- José & Chris for creating Elixir, Phoenix & LiveView!
- Louis for creating Gleam!
- The Gleam community and especially *michallepicki*, *rattard* and *HarryET* for helping out!

Closing words/4 BECOME SHINY

The Gleam community is very friendly, not snobbish at all, and welcomes developers of all trades and levels!

😊 Gleam needs you - Gleam wants you! You want Gleam - you need Gleam! 😄

... and no, it is not going to replace Elixir anytime soon!

- Discord: https://discord.gg/twY7ZhKTM3
- GitHub Discussions: https://github.com/gleam-lang/gleam/discussions
- Gleam on the web: https://gleam.run