



PORUGAL GOPHERS | PORTO

# HOW DO YOU STRUCTURE YOUR APPS?

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## QUESTIONS, DECISIONS 🤔

- ▶ Should I put everything in one namespace?
- ▶ Should I start with one and extract other namespaces over time?
- ▶ How do I decide if something should be in its own namespace?
- ▶ Should I just use a framework?
- ▶ Microservices or monolith?
- ▶ How much should be shared?
- ▶ What's the “best way”?

## WHY SHOULD WE CARE?

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BECAUSE IF GO IS GOING TO BE A LANGUAGE THAT COMPANIES INVEST IN FOR THE LONG TERM, THE MAINTENANCE OF GO PROGRAMS, THE EASE OF WHICH THEY CAN CHANGE, WILL BE A KEY FACTOR IN THEIR DECISION.



Dave Cheney. Golang UK 2016 keynote



# GOOD STRUCTURE GOALS

## GOOD STRUCTURE GOALS

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- ▶ Consistent.
- ▶ Easy to understand, navigate and reason about ("makes sense").
- ▶ Easy to change, loosely-coupled.
- ▶ Easy to test.
- ▶ Little to no technical debt.
- ▶ "As simple as possible, but no simpler."
- ▶ Design reflects exactly how the software works.
- ▶ Structure reflects the design exactly.



# How the software works



## Design



## Structure



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# ARCHITECTURE



Maintainability  
Understandability

- ▶ Testability
- ▶ Little technical debt

## A (SIMPLE) BEER REVIEWING SERVICE

- ▶ Users can add a review for a beer.
- ▶ Users can list all beer reviews.
- ▶ Option to store data either in memory or in a JSON file.

# FLAT STRUCTURE

## FLAT STRUCTURE

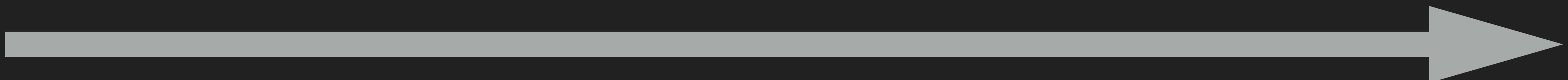
```
/  
├── data.go  
├── handlers.go  
├── main.go  
├── model.go  
├── storage.go  
├── storage_json.go  
└── storage_mem.go
```

# GROUP BY FUNCTION

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## GROUP BY FUNCTION (“LAYERED ARCHITECTURE”)

- ▶ presentation / user interface
- ▶ business logic
- ▶ storage / external dependencies



# GROUP BY FUNCTION

```
.
```

- ├── handlers
  - ├── beers.go
  - └── reviews.go
- ├── main.go
- ├── models
  - ├── beer.go
  - ├── review.go
  - └── storage.go
- └── storage
  - ├── json.go
  - └── memory.go

# GROUP BY MODULE

## GROUP BY MODULE

```
.
```

- ├── beers
  - | ├── beer.go
  - | └── handler.go
- ├── main.go
- ├── reviews
  - | ├── handler.go
  - | └── review.go
- └── storage
  - | ├── data.go
  - | ├── json.go
  - | ├── memory.go
  - | └── storage.go

# GROUP BY CONTEXT



# IMPLEMENTING DOMAIN-DRIVEN DESIGN



VAUGHN VERNON

FOREWORD BY ERIC EVANS

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# DOMAIN DRIVEN DESIGN! (DDD)

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# DOMAIN DRIVEN DESIGN (DDD)

- ▶ Establish your domain and business logic.
- ▶ Define your bounded context(s), the models within each context and the ubiquitous language.
- ▶ Categorising the building blocks of your system:

Entity

Value Object

Domain Event

Aggregate

Service

Repository

Factory

## DEMO PROJECT

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Context: beer tasting

Language: beer, review, storage, ...

Entities: Beer, Review, ...

Value Objects: Brewery, Author, ...

Aggregates: BeerReview

Service: Beer Review adder, Beer Review lister

Events: Beer added, Review added, Duplicate review, ...

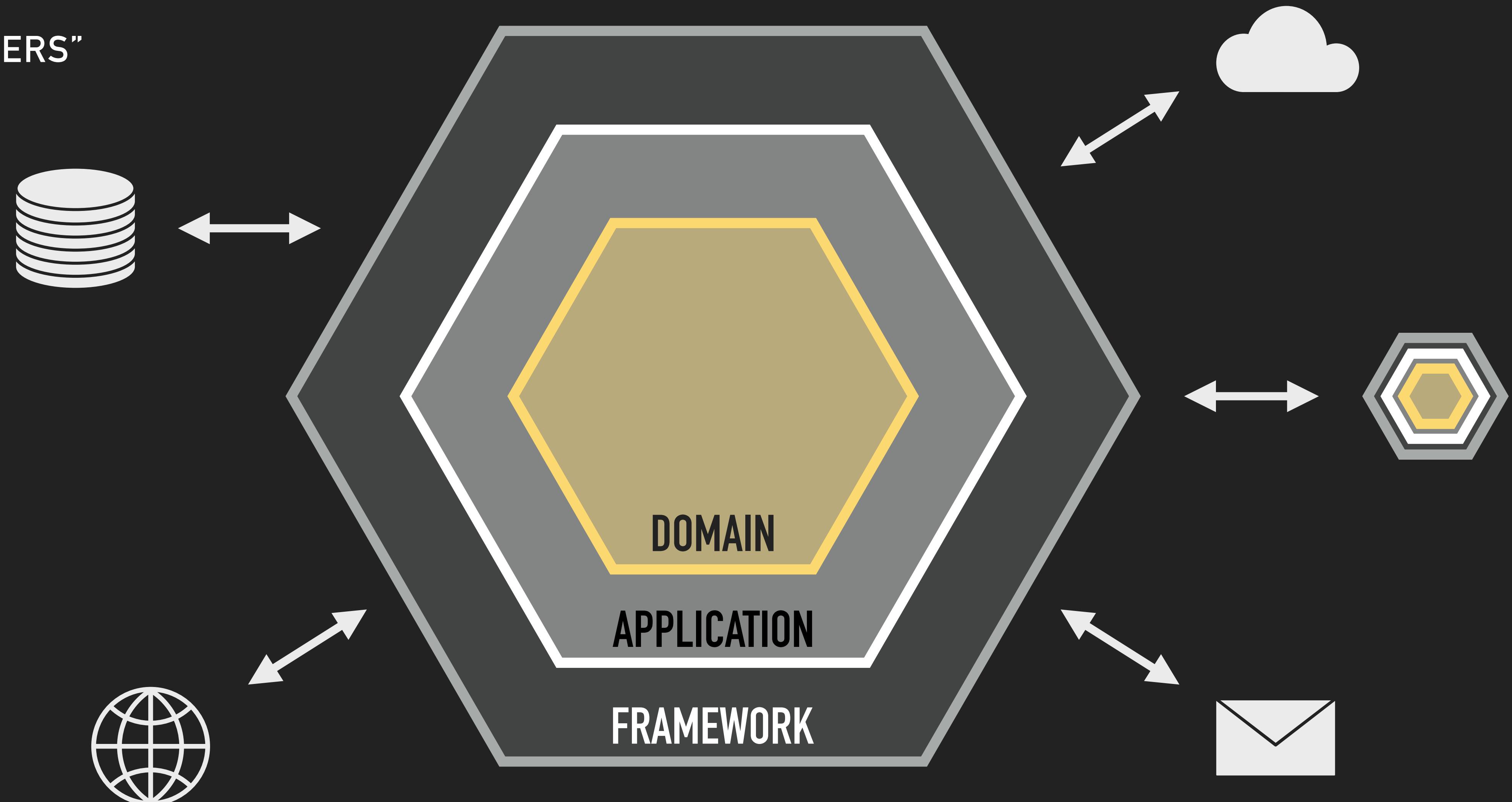
Repository: Beer repository, Review repository

## GROUP BY CONTEXT

```
.  
  └── listing  
    |   ├── handler.go  
    |   └── review.go  
  └── main.go  
  └── reviewing  
    |   ├── handler.go  
    |   └── beer_review.go  
      └── storage  
        ├── json.go  
        ├── memory.go  
        └── type.go
```

# HEXAGONAL ARCHITECTURE

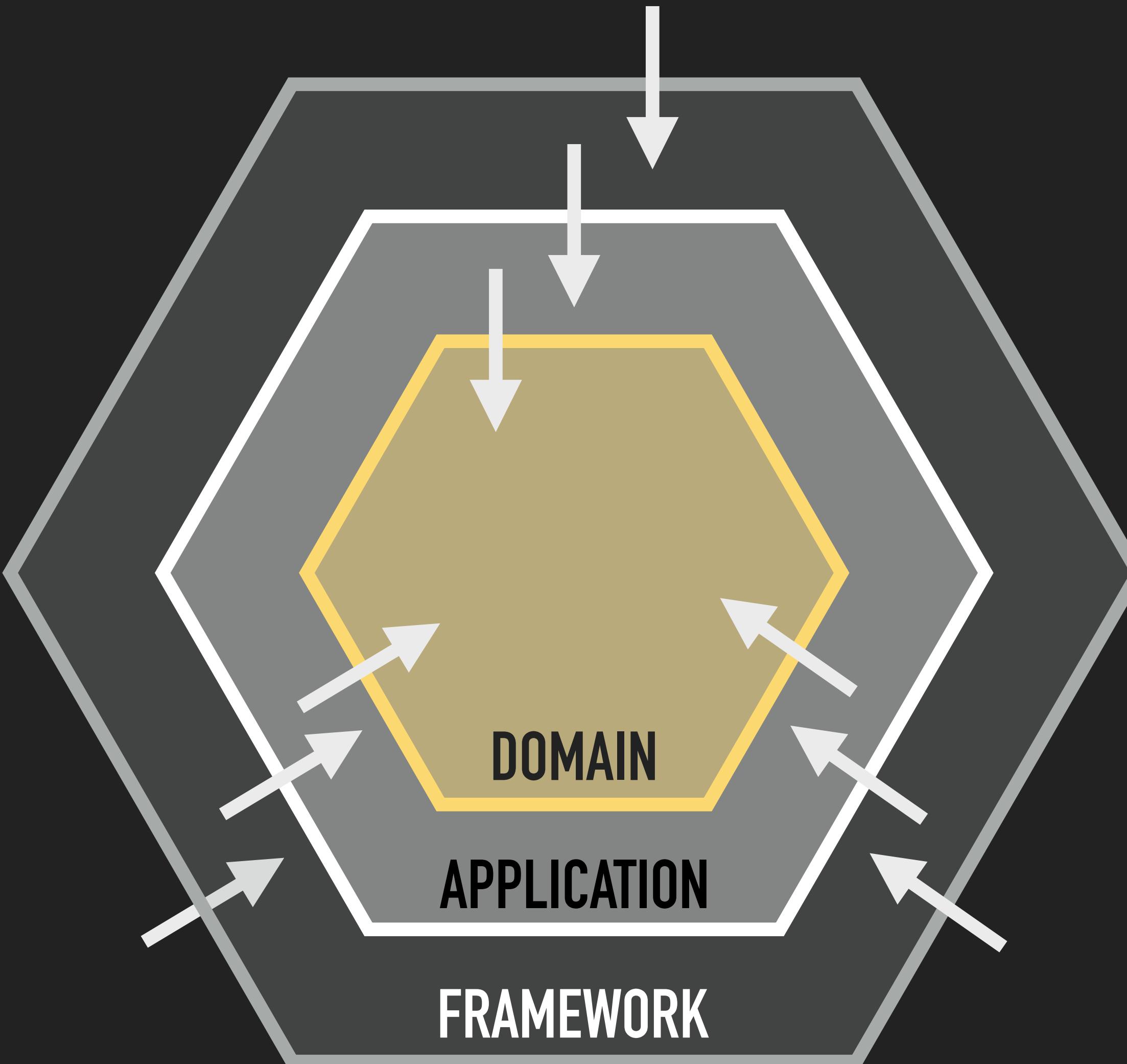
“PORTS AND ADAPTERS”



# HEXAGONAL ARCHITECTURE

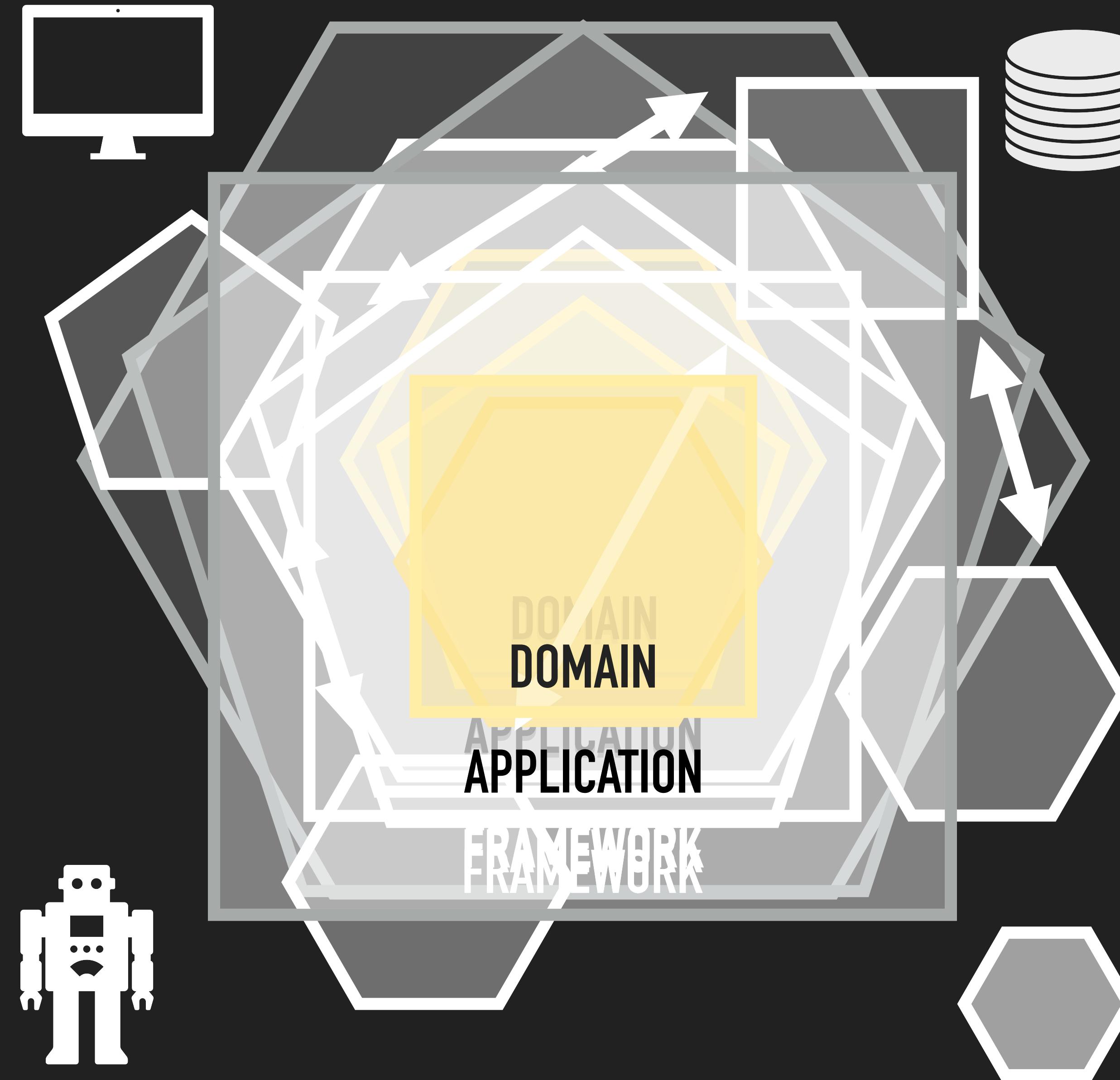
“PORTS AND ADAPTERS”

Dependencies  
**only point inwards.**

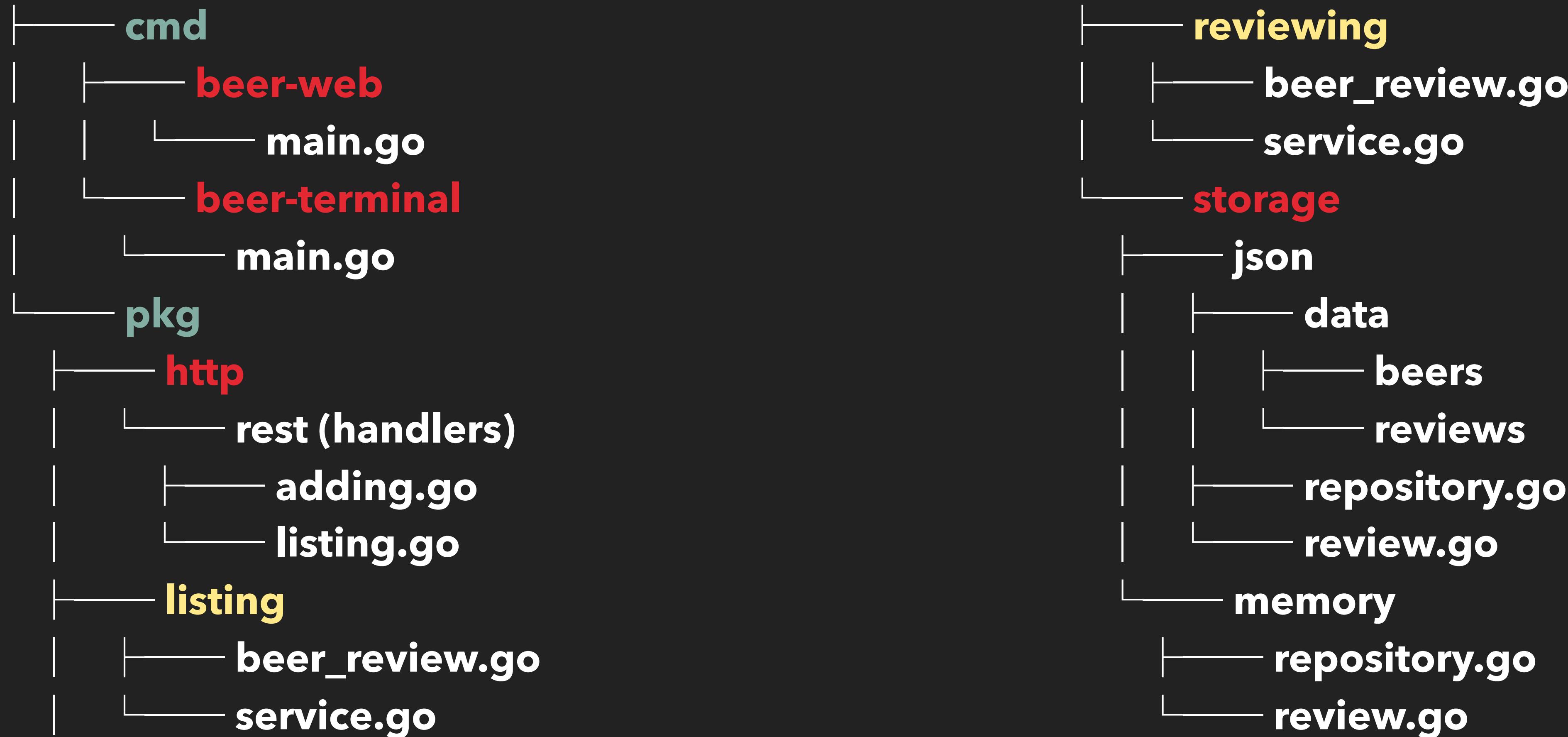


# HEXAGONAL ARCHITECTURE

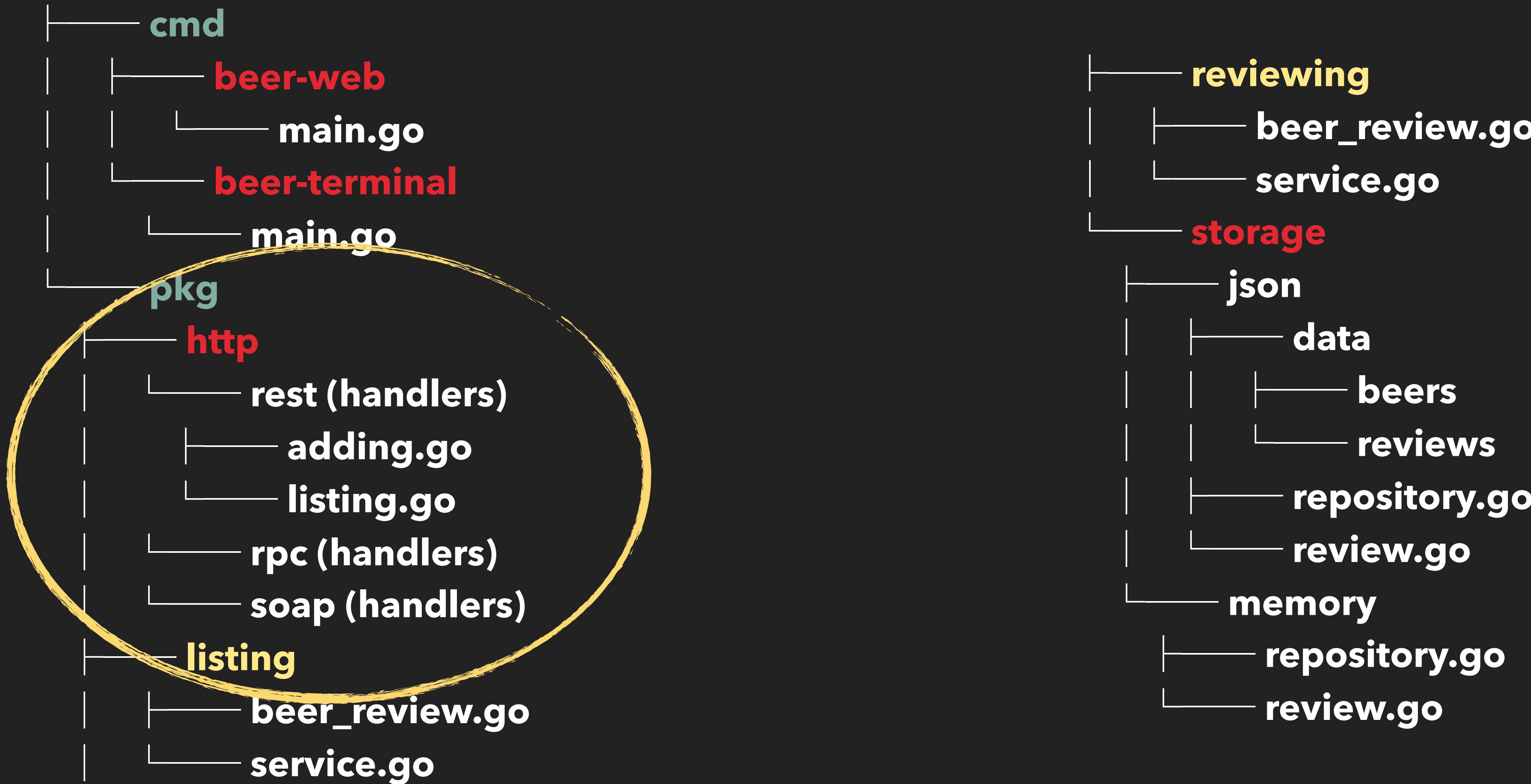
“PORTS AND ADAPTERS”



# HEXAGONAL ARCHITECTURE



# HEXAGONAL ARCHITECTURE





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# FRAMEWORKS?

Revel, Buffalo, Beego, Martini, ...

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# TESTING

- ▶ Unit test `#allthedomain!`
- ▶ Keep the `_test.go` files next to the main files.
- ▶ Use a shared mock subpackage.

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# NAMING

- ▶ Choose package names that suggest well what can be expected inside.
  - ▶ communicate what they provide, as opposed to what they contain
- ▶ Avoid generic names like util, common etc.
- ▶ Follow the usual go conventions (<https://talks.golang.org/2014/names.slide>).
- ▶ Avoid stutter (e.g. strings.Reader not strings.StringReader).
- ▶ Accessibility - choose screenreader-friendly names! (see [Julia's talk](#))

TEXT

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# MAIN



**Mat Ryer @ GopherCon**  
@matryer

Following



No matter what kind of thing I'm building, my  
#golang main function ends up looking like  
this

```
func main() {
    if err := run(); err != nil {
        fmt.Fprintf(os.Stderr, "%v", err)
        os.Exit(1)
    }
}
```

4:13 PM - 13 Aug 2018

34 Retweets 215 Likes



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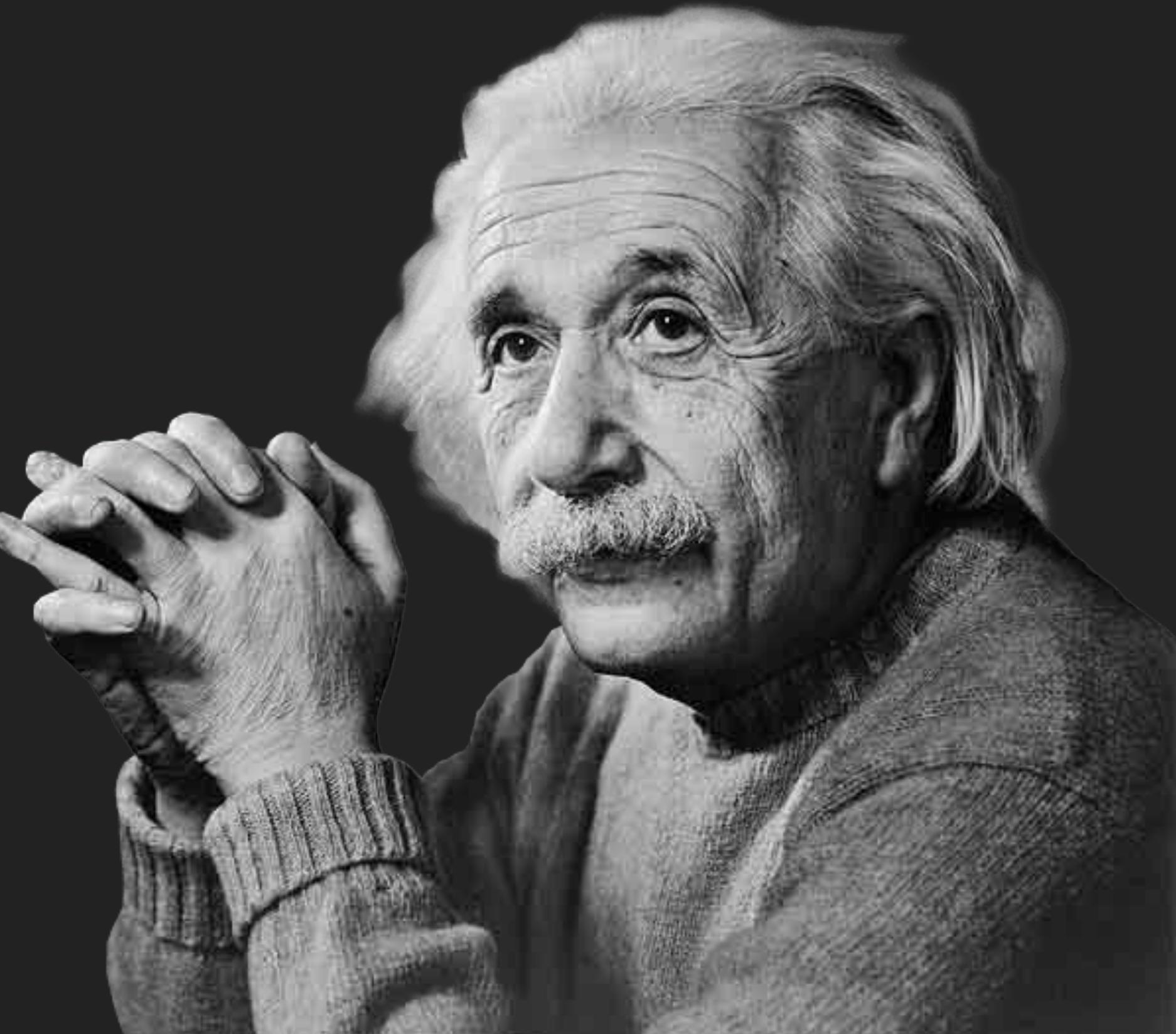
# PUTTING IT ALL TOGETHER IN GO

- ☝ Two top-level directories:  
cmd (for your binaries) and pkg (for your packages).
- ✌ Group by context, not generic functionality.
- 👉 Dependencies: own packages.
- 👉 Mocks: shared subpackage.
- 👉 All other project files (fixtures, resources, docs, Docker, ...): root dir of your project.
- 👉 Main package initialises and ties everything together.
- 👎 Avoid global scope and init().

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# CONCLUSION

- ▶ No single right answer (sorry...) 🙄
- ▶ "Be like water"
- ▶ "As simple as possible, but no simpler"
- ▶ Maintain consistency
- ▶ Experiment!
- ▶ Share your ideas 🙌



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## (HUGE) CREDIT TO:

Peter Bourgon

[peter.bourgon.org/blog/2017/06/09/theory-of-modern-go.html](https://peter.bourgon.org/blog/2017/06/09/theory-of-modern-go.html)

Ben Johnson

[medium.com/@benbjohnson/standard-package-layout-7cdbc8391fc1](https://medium.com/@benbjohnson/standard-package-layout-7cdbc8391fc1)

Marcus Olsson

[github.com/marcusolsson/goddd](https://github.com/marcusolsson/goddd)

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# QUESTIONS? LINKS!

- ▶ @kasiazien
- ▶ demo code: <https://github.com/katzien/go-structure-examples>
- ▶ references:

[Go and a Package Focused Design](#), Gopher Academy Blog

[Standard Package Layout](#) by Ben Johnson

[Repository structure](#) by Peter Bourgon

[Building an enterprise service in Go](#) by Marcus Olsson

[Go best practices](#) by Brian Ketelsen

[Hexagonal architecture](#) by Chris Fidao

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# THANK YOU!



SLIDES: [HTTPS://TINYURL.COM/Y3448WRN](https://tinyurl.com/y3448wrn)

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