What is **Software Architecture**… Architectural Styles

PV260 Software Quality

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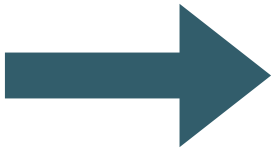
Architectural Styles

Architectural Styles

- Tiered Architecture
- Hexagonal Architecture
- Onion Architecture
- Object Oriented Architecture
- Service Oriented Architecture
- Microservices

Which one is the best one?

- **Consistency**
- **Cohesion**
- **Coupling**
- **Clarity**



Cost of Change

(affected by technical debt)

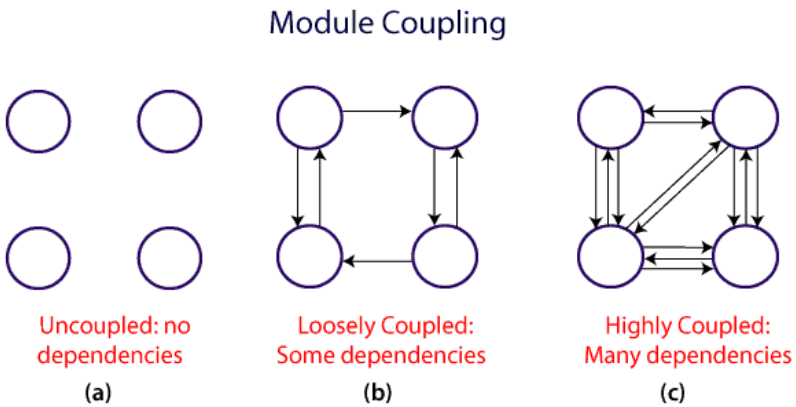
How can we measure technical debt?

Principles over Patterns.

Consistency

Module, Data, Service, Interaction Dependencies.

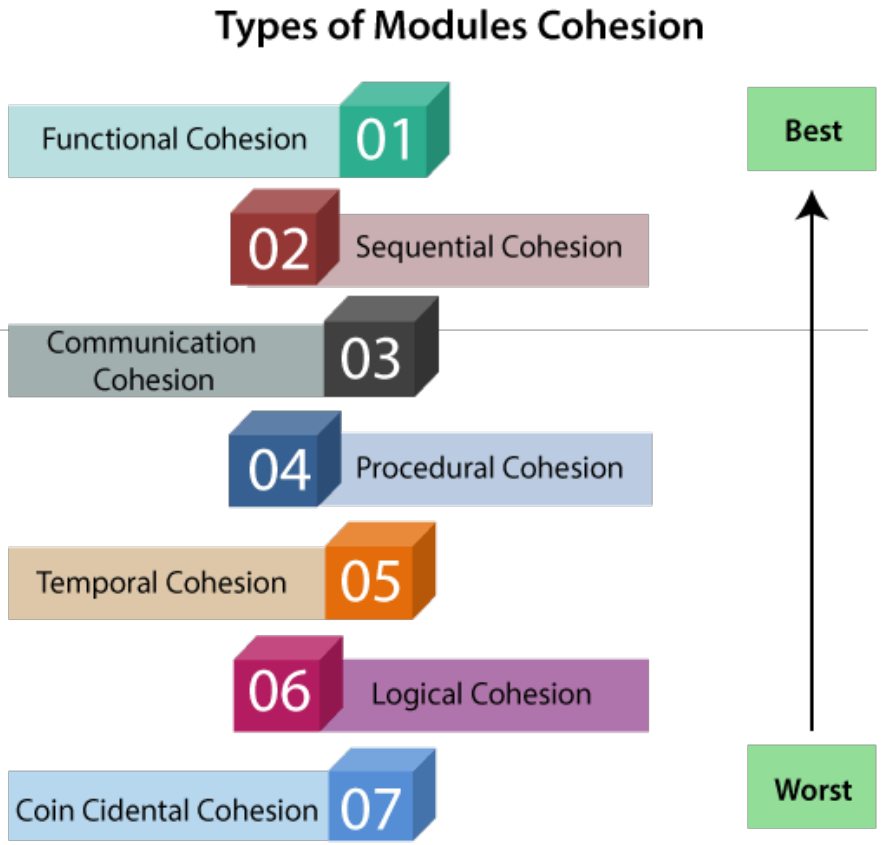
Coupling



https://www.javatpoint.com/software-engineering-coupling-and-cohesion

Well-Designed or Leaking Abstractions.

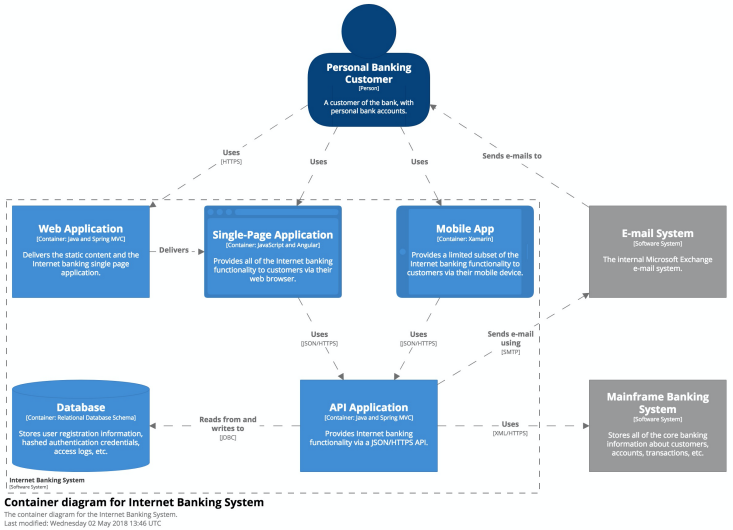
Cohesion



https://www.javatpoint.com/software-engineering-coupling-and-cohesion

Everyone understands why, how and what to do. System deteriorates slower and technical debt does not grow quickly.

Clarity



Replaceable Architecture

Wait, what?

Osaka Castle

Giza Pyramids

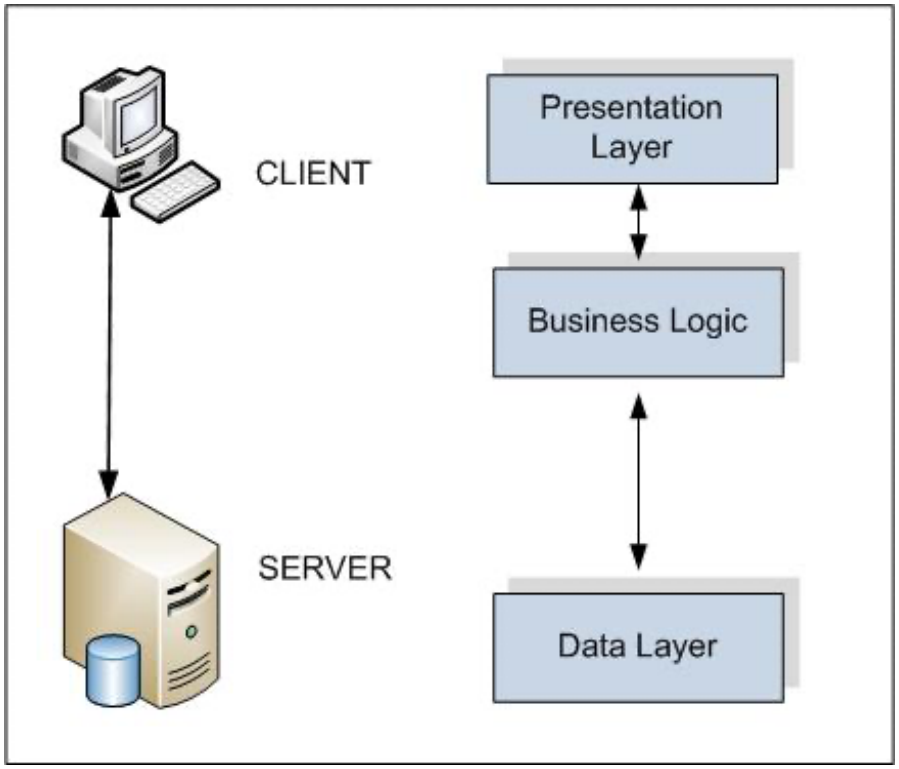
- Built to last: hundreds and thousands of years.
- Built to survive natural disasters, especially earthquakes (shinbashira).
- Both have very different architecture.
- You cannot replace one with the other.
- Why would you?

Replaceable as in ***Having rather low Cost of Change***

How to decrease Cost of Change?

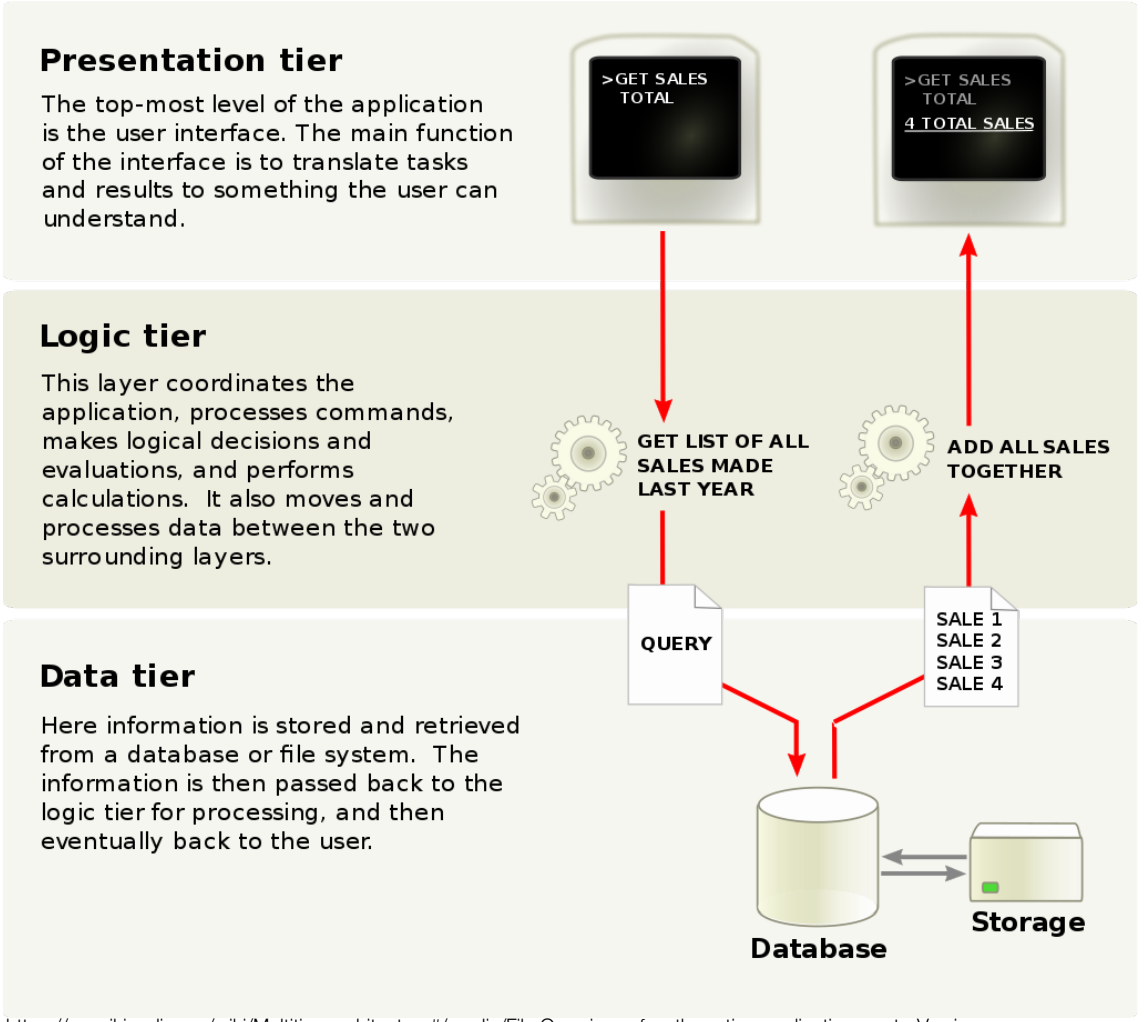
2-Tier Architecture

- Original Client / Server
- Business Logic is implemented on the client, server or both.
- What are the issues?



3-Tier Architecture

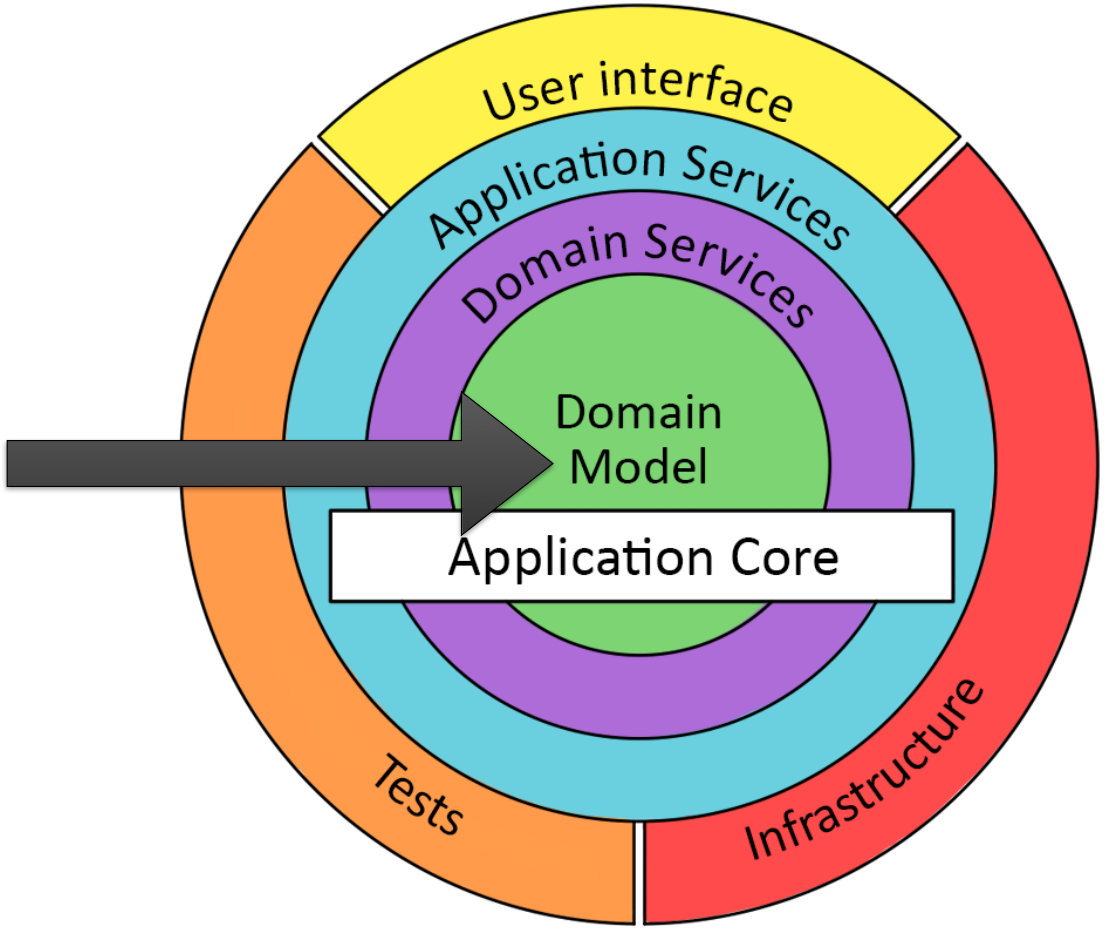
- Decouple presentation from business logic. Business logic is isolated from client and server.
- Business layer often historically hosted in *application* servers with obscure technologies (j2ee, Microsoft ASP, PHP, ColdFusion, etc.).
- How is it different from 2-Tier?



https://en.wikipedia.org/wiki/Multitier_architecture#/media/File:Overview_of_a_three-tier_application_vectorVersion.svg

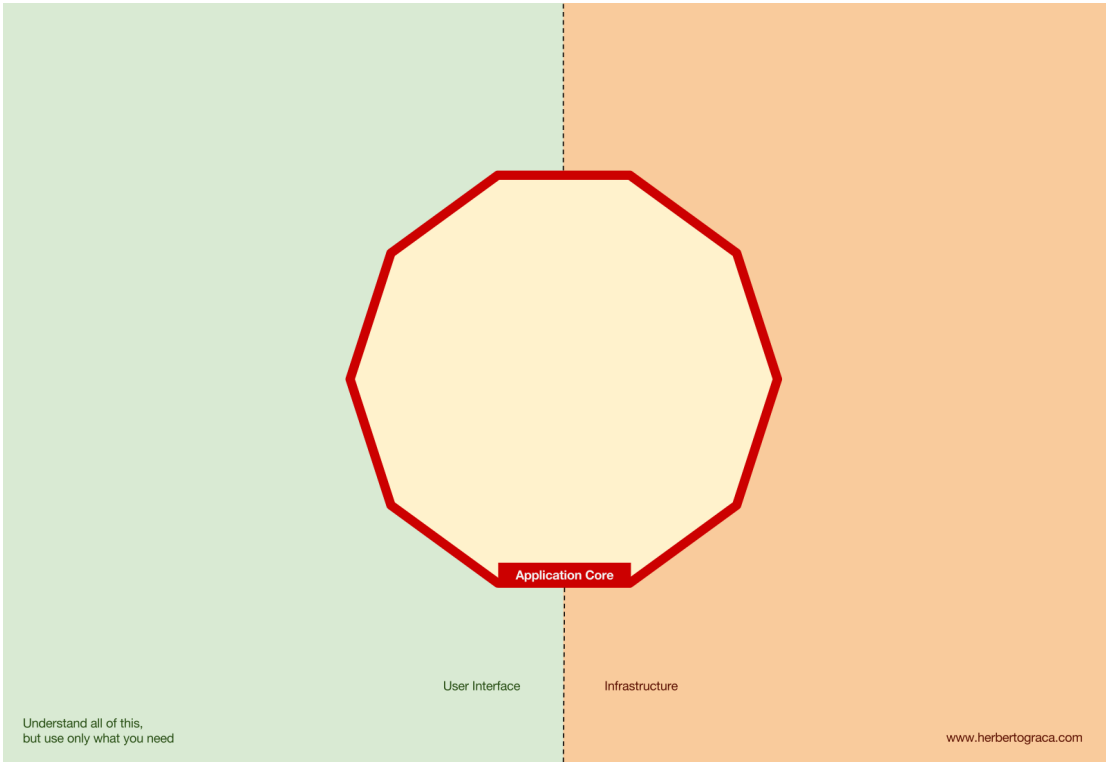
Onion Architecture

- Built on the observation that most / all interfaces are alike.
- Outer layers depend on inner layers.
- Inner layers must not depend on outer layers.
- Enforces Inversion of Control.
- How is it different from N-Tier?



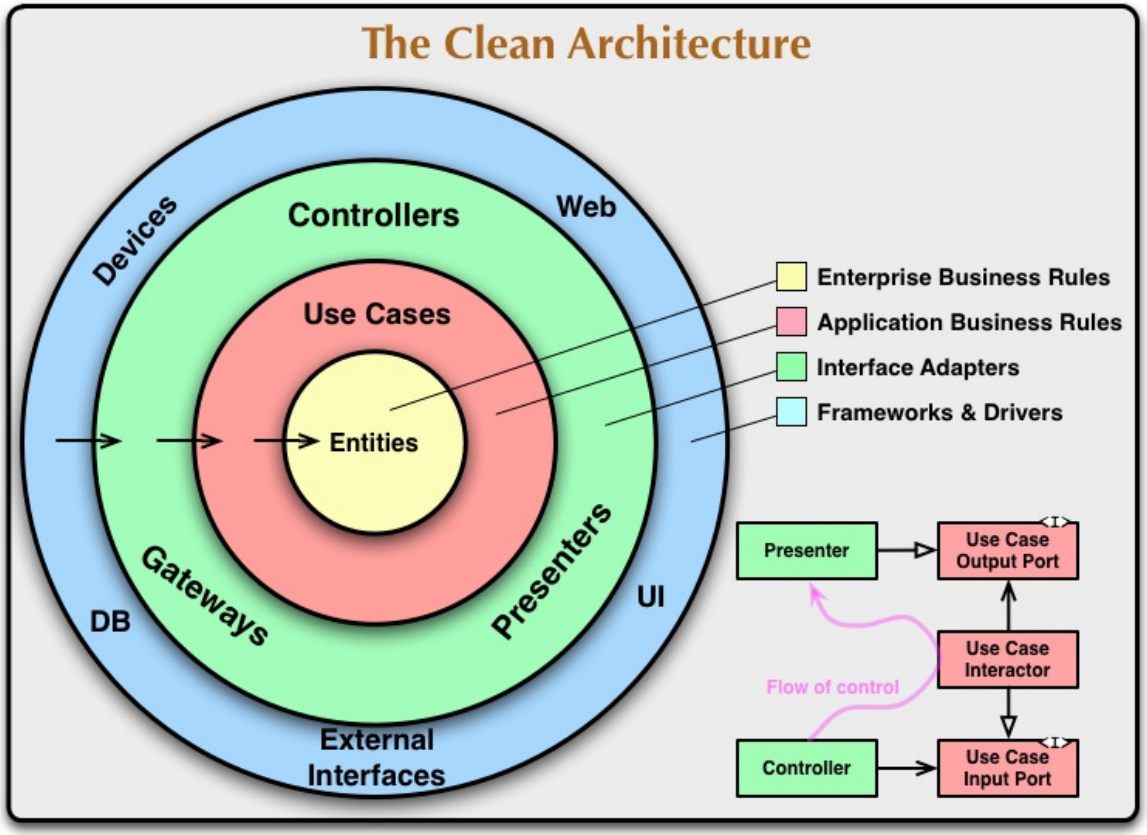
Hexagonal Architecture

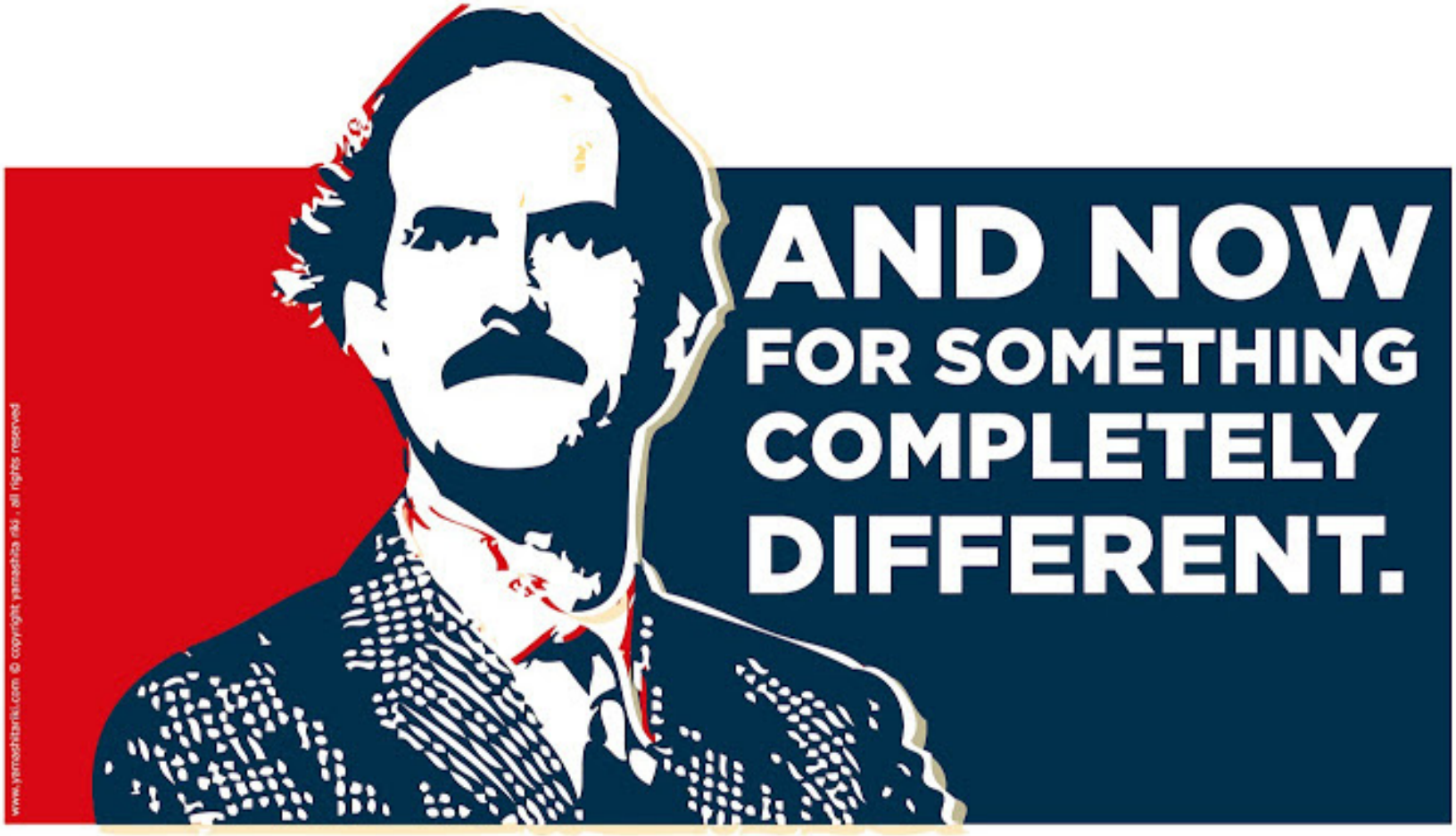
- Ports and Adapters Architecture
- Sometimes Onion and Hexagonal are viewed as the same.
- Hexagonal Architecture is more explicit and structured.
- Recommended reading: https://herbertograca.com/2017/11/16/explicit-architecture-01-ddd-hexagonal-onion-clean-cqrs-how-i-put-it-all-together/



The Clean Architecture

- Onion + Screaming Architecture.
- Independent of Frameworks.
- Testable: all parts and as a whole.
- Independent of Interfaces.
- Independent of the data store / database / object persistence.
- Independent of any external impact.



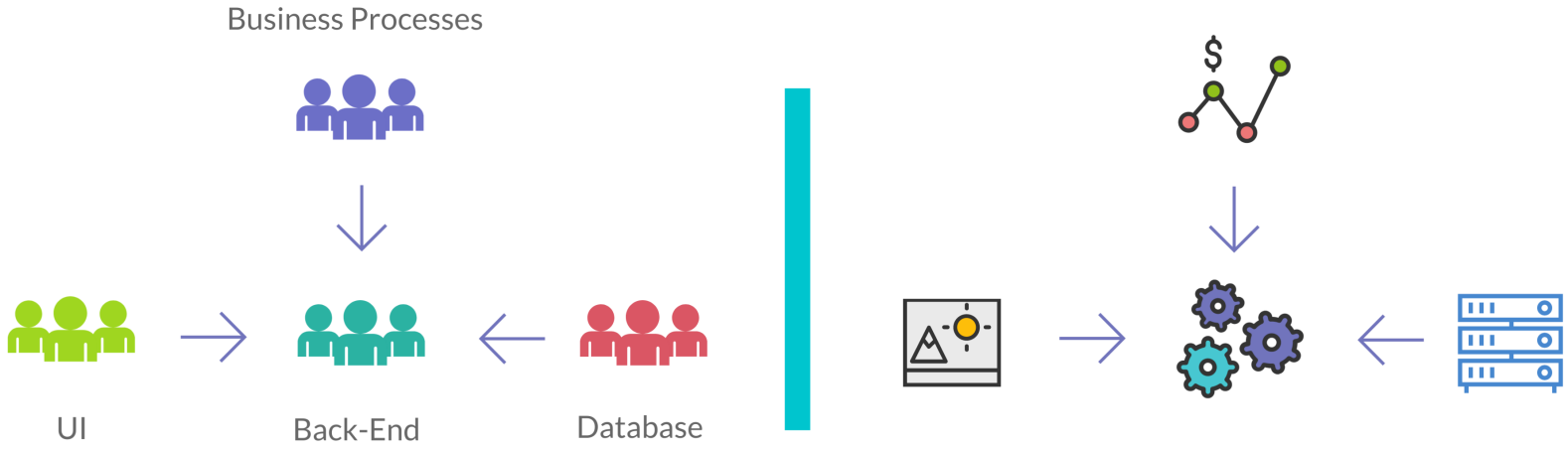


Microservices

also known as the *current silver bullet*.

https://www.cgl.ucsf.edu/Outreach/pc204/NoSilverBullet.html

Conway's Law



LEARN stuff IO

Organization structure determines system architecture / design.

https://medium.com/@learnstuff.io/conways-law-in-software-dev-3aa6324ead52

As the systems get larger, complexity grows quickly and systems become unmanageable.

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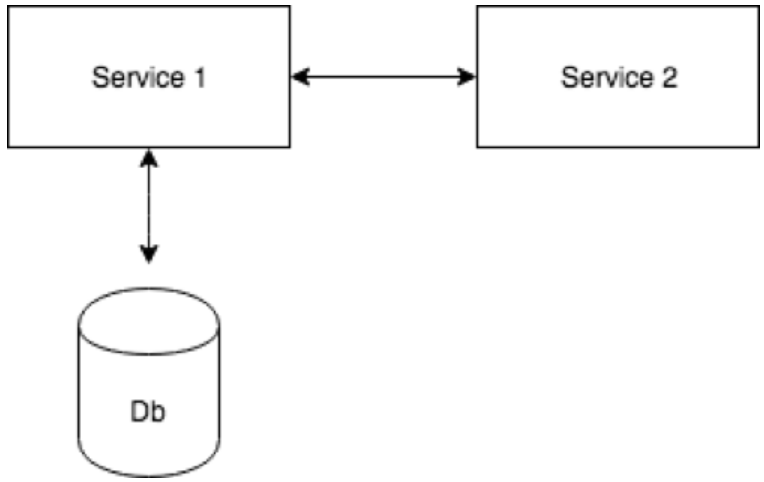
http://www.laputan.org/mud/mud.html#BigBallOfMud

https://medium.com/raa-labs/part-1-domain-driven-design-like-a-pro-f9e78d081f10

- Split system in a set of loosely coupled, cohesive services.
- Each service does only one thing and does it well.
- Each service is represented only by its API.
- Each service has its own data.

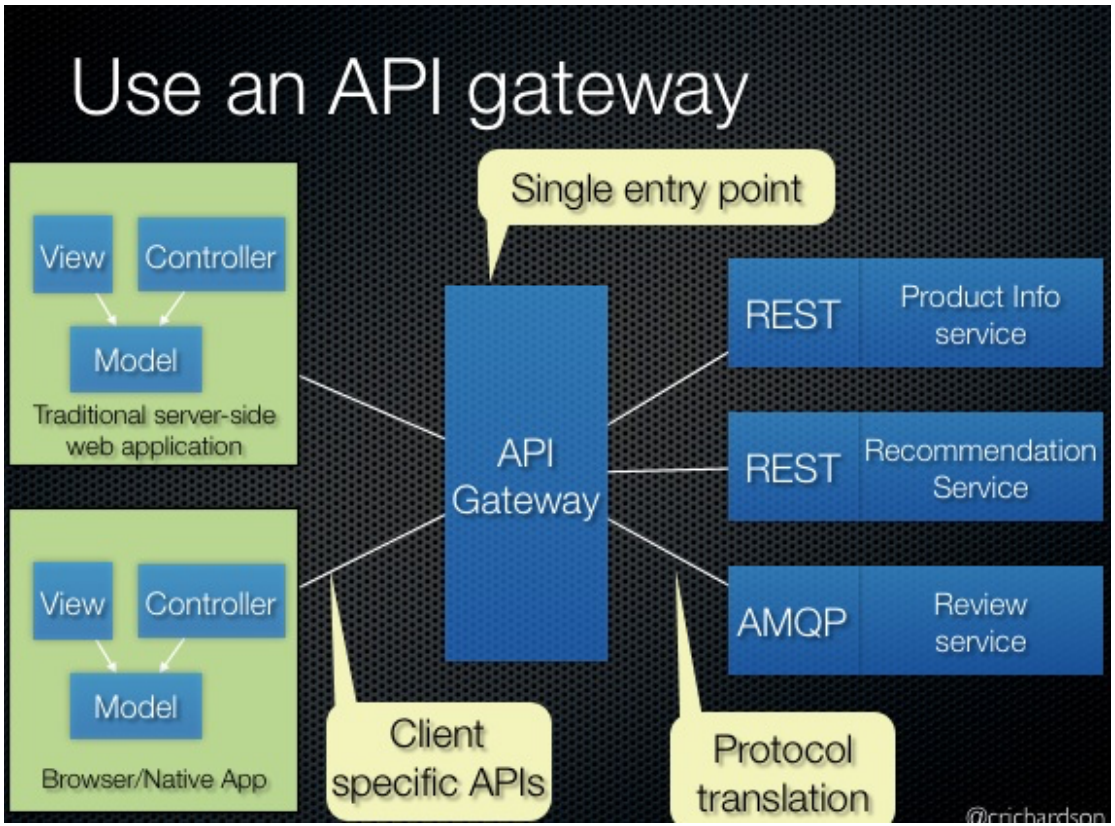
Microservices

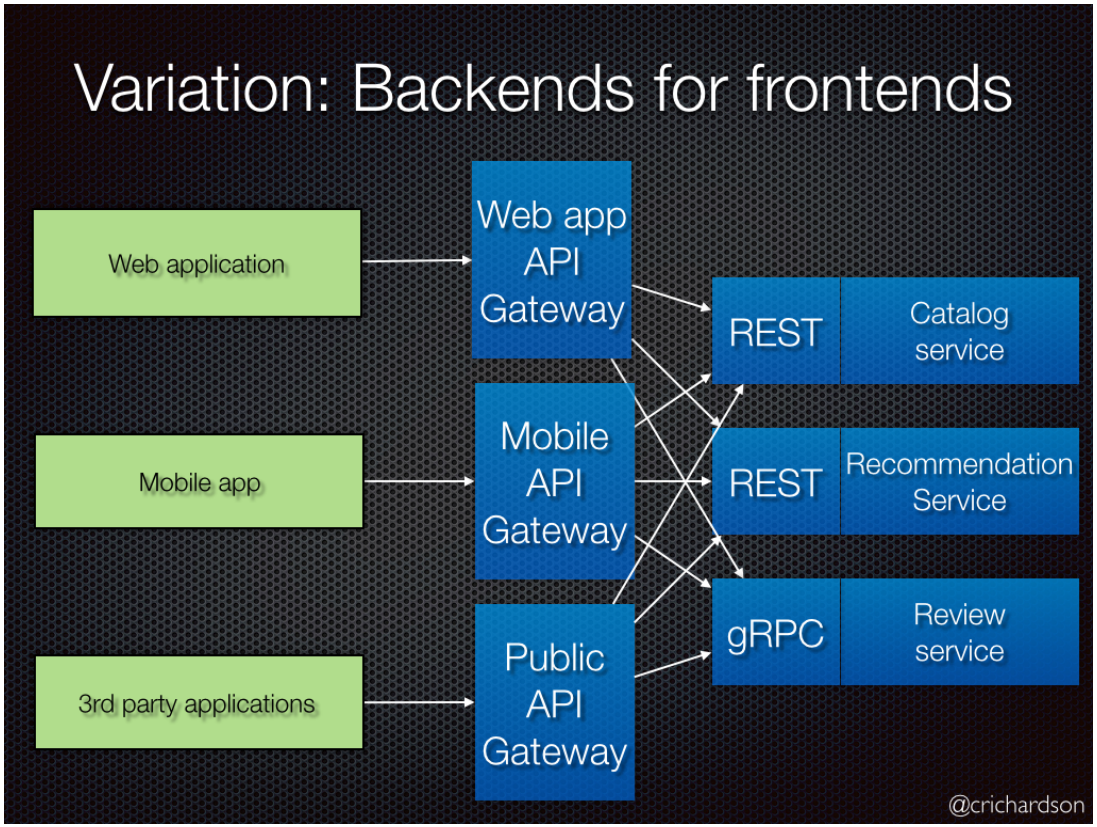


https://medium.com/hashmapinc/the-what-why-and-how-of-a-microservices-architecture-4179579423a9

What are the challenges of Microservices?

Compensating for high decentralisation. Patterns are emerging.





https://microservices.io/patterns/apigateway.html

API Gateway Pattern

Thank you NETFLIX!

Key Takeaways

Architectural style is a choice driven by stakeholder values.

Everyone talks about microservices, yet that does not make it the silver bullet.