Software Architecture in Practice

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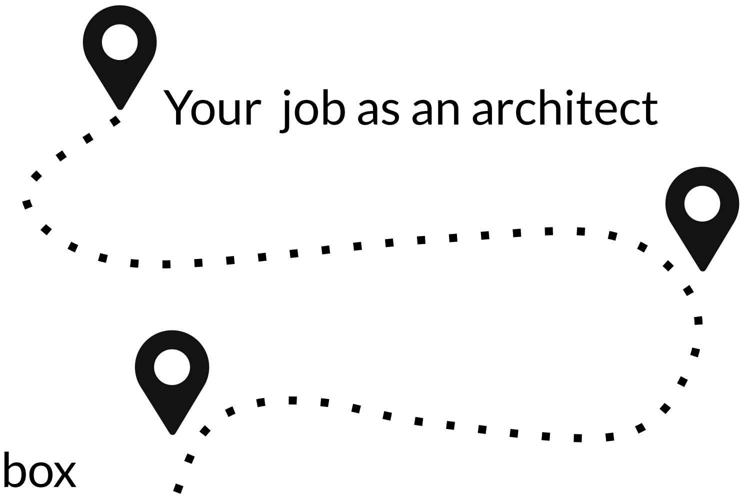
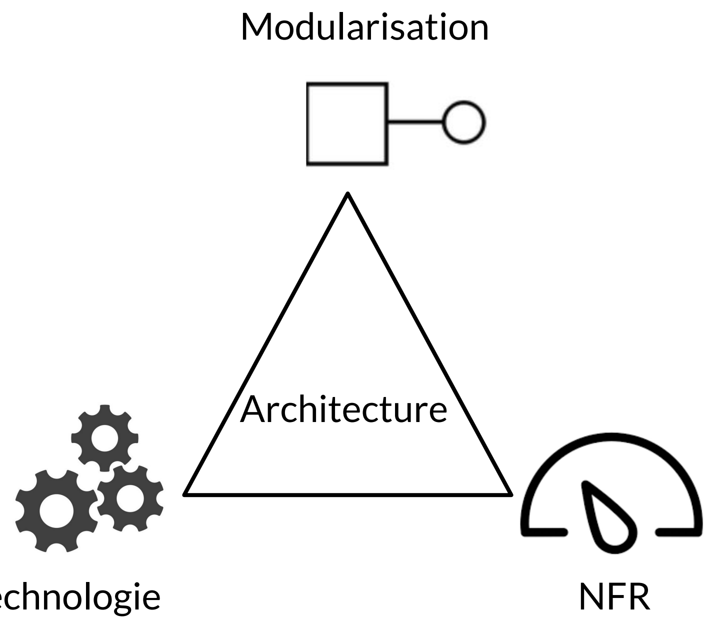
Agenda


Your job as an architect
Architecture and organisation
Your toolbox

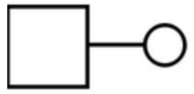
Your job as an architect



Levels of architecture

- Enterprise
- Application
- Component

Modularisation

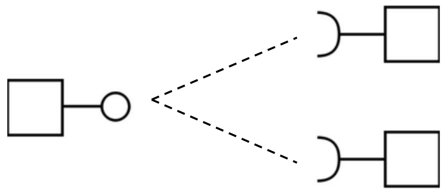


The system is decomposed in components

Each component has a *lifecycle*

Components provide and require *interfaces*

Two components connected form a *dependency*



Your job

- Group things that have the same lifecycle together ("What change together goes together")
- Expose interfaces that provide capabilities and hide internal details
- Manage dependencies
- Manage cross-cutting concerns
- (!) Several decompositions that are possible!

Well-known principles

- Single-responsibility principle
- Separation of concerns
- Information hiding
- Cohesion/coupling

Examples

Enterprise	● Interfaces between IT domains ● Customer Information - Logistics
Application	● Interfaces between applications ● Shopping Cart App - Product Catalog app
Component	● Interfaces between classes ● e.g. Data access layer - Business Logic ● e.g. Layering

Technology

You realize software systems with various technologies

- Platform technologies, e.g. AWS EC2
- Application technologies, e.g Spring, HTTP
- Development technologies, e.g. IntelliJ, git, Jenkins

Technologies enable various architectural patterns:

- Eventual consistency vs. Strong consistency
- Synchronous vs Event-driven architecture
- …

Your job

- Define architectural patterns
- Select technologies for your architecture
- Balance “cost of ownership” vs “benefit”
- Balance standardisation vs specialisation of technologies

Examples

Enterprise	● Cloud providers, e.g. AWS vs Azure ● Central services, e.g. APIM, IAM ● Java vs C#
Application	● Synchronous vs Asynchronous API ● NoSQL vs Transactional DB ● SPA vs. Server-side Rendering ● Monitoring technology
Component	● Spring Webflux (reactive) vs Spring Function ● Caching

NFR

Every application has non-functional requirements, sometimes implicitly:

- Performance
- Availability,
- Maintainability,
- …

Having 10 customers is not the same as 1 mio. Storing bank transactions is not the same as storing to-do lists.

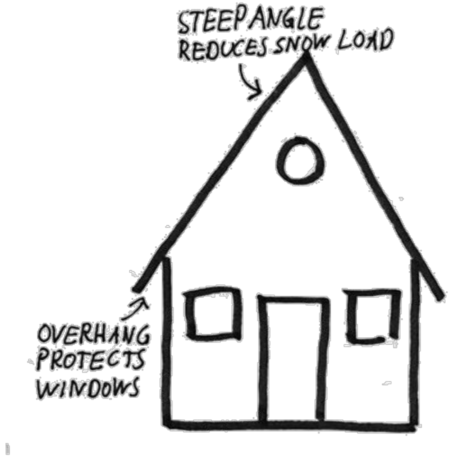
Your job

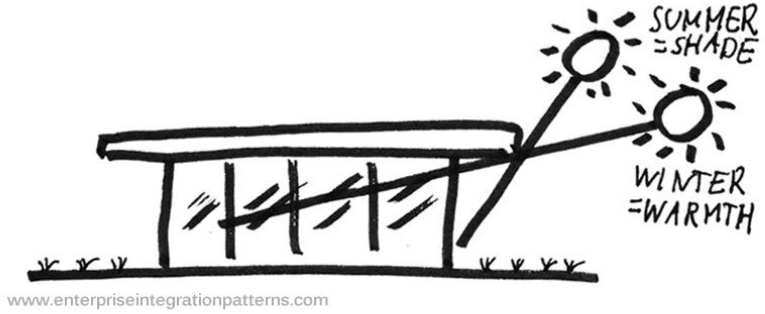
- Figure out how to decompose the system (modularity) and use technologies to meet the NFRs.
- Balance NFR and costs of development / operations.
- Make the NFR and trade-off explicit

Examples

Enterprise	● Security strategy ● Multi-cloud strategy
Application	● 99.8 availability of application X ● Processing time of operation X < 50ms
Component	● Memory need of algorithm X

Fit for purpose





https://www.enterpriseintegrationpatterns.com/ramblings/86_isthisarchitecture.html

Fit for purpose

	Architecture 1	Architecture 2
Modularity	Webapp with product search and shopping cart combined	Product search and shopping cart as microfrontend
Technology	LAMP (Linux/Apache/Mysql/PHP)	Java, Spring, Postgres, Docker, Kafka
NFR	Everybody work in the same codebase (Maintainability) Single database for search and shopping cart (Scalability)	Two codebases (Maintainability) Read model for product search can scale independently of write model for shopping cart (Scalability)

Architecture and Teamwork

If development is collaborative, managing collective knowledge is a challenge.

Architecture tends to reflect the organisation (and not the way around)

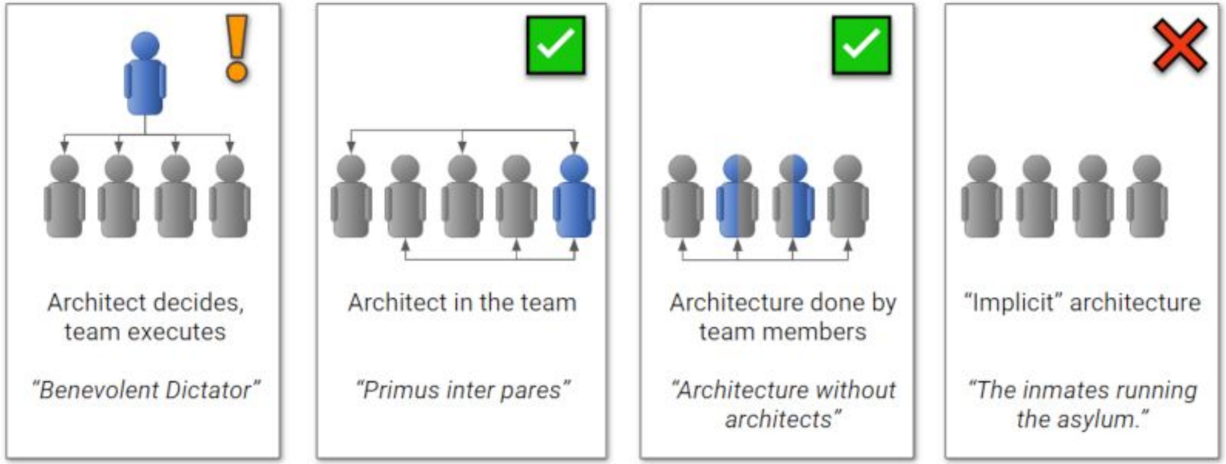
Knows Component A
Knows Component B

https://en.wikipedia.org/wiki/Conway%27s_law

Your job

- Communicate the architecture
- Define guidelines
- Share knowledge
- Align people
- Decentralize decision making
- Co-evolve architecture and organisation

Who's the architect?



Architect decides, team executes
"Benevolent Dictator"
Architect in the team
"Primus inter pares"
Architecture done by team members
"Architecture without architects"
"Implicit" architecture
"The inmates running the asylum."

https://architectelevator.com/transformation/agile_architecture/

Approaches to architecture

Retired: ivory tower architect

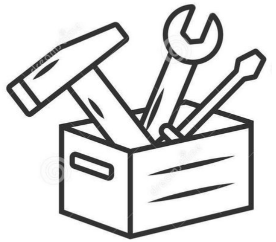
Tired: hands-on architect

Wired: architect as change agent

Static
Cost-optimization mentality

Dynamic
Business enabling mentality

Your toolbox



Tools

- Architecture styles
- Architecture patterns
- Architecture frameworks *
- Architecture templates **
- UML
- …

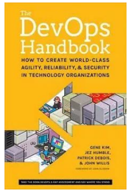
Methods

- Modell visually
- Use architecture viewpoints
- Domain-Driven Design
- Record architecture decisions
- Automate architecture checks***
- …

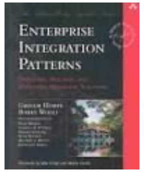
* e.g. AWS Well-architected Framework
** e.g. Arc42, 4+1
*** e.g. ArchUnit

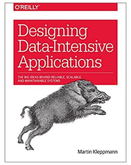
~~Your~~ My bookshelf

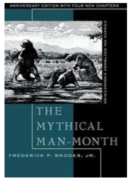
Enterprise


The DevOps Handbook
HOW TO CREATE WORLD-CLASS AGILITY, RELIABILITY, & SECURITY IN TECHNOLOGY ORGANIZATIONS
GENE KIM, JEZ HUMBLE, PATRICK DEBOIS, & JOHN WILLIS

Application

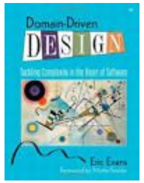


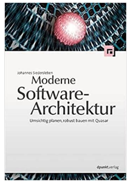


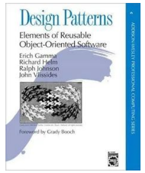


(and more)

Component







Inspired from : https://architectelevator.com/architecture/architect-bookshelf/

Summary

- There are three main facets to architecture: modularisation, technology, and NFR
- Architecture and organisation go hand-in-hand in a modern organisation
- There's a vast body of knowledge around architecture - use it!