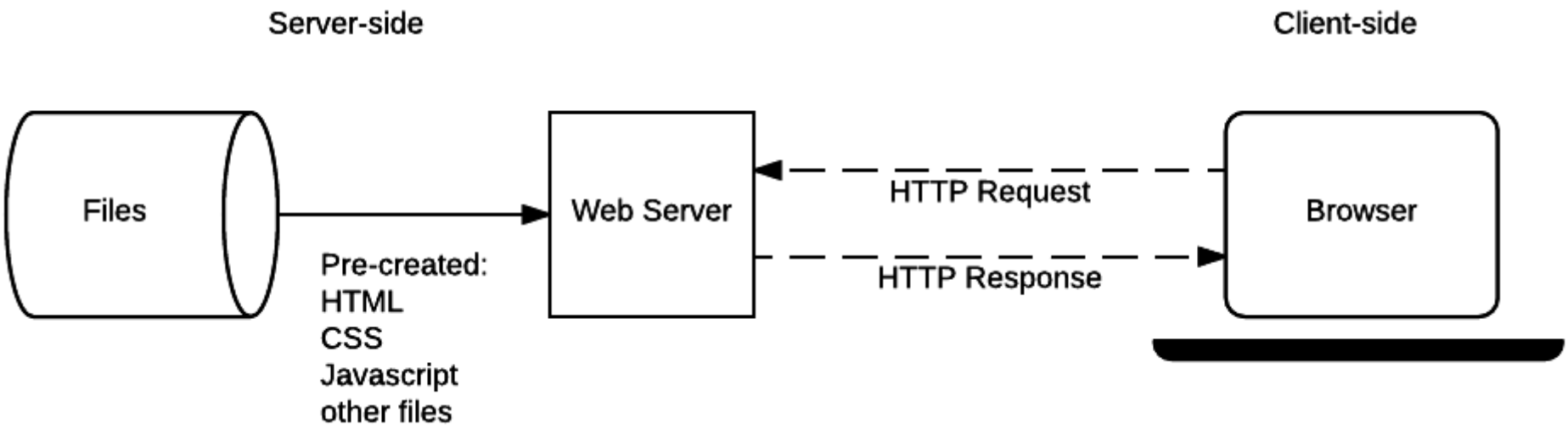
MICROSERVICES

Stefano Bruna

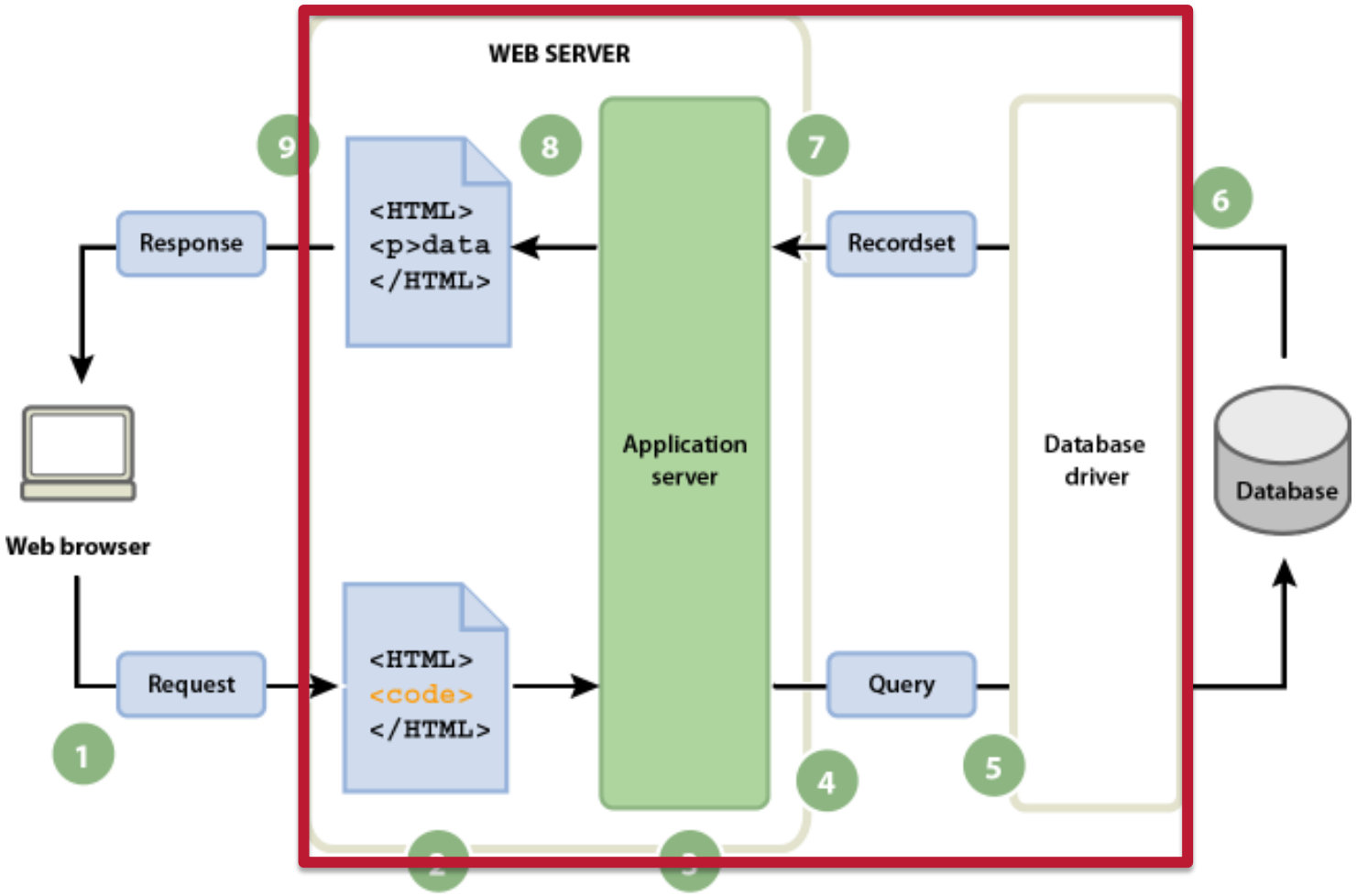
Agenda

- Introduction about web application and architecture
- The monolith architectural approach
- Technical debt
- The microservice paradigm

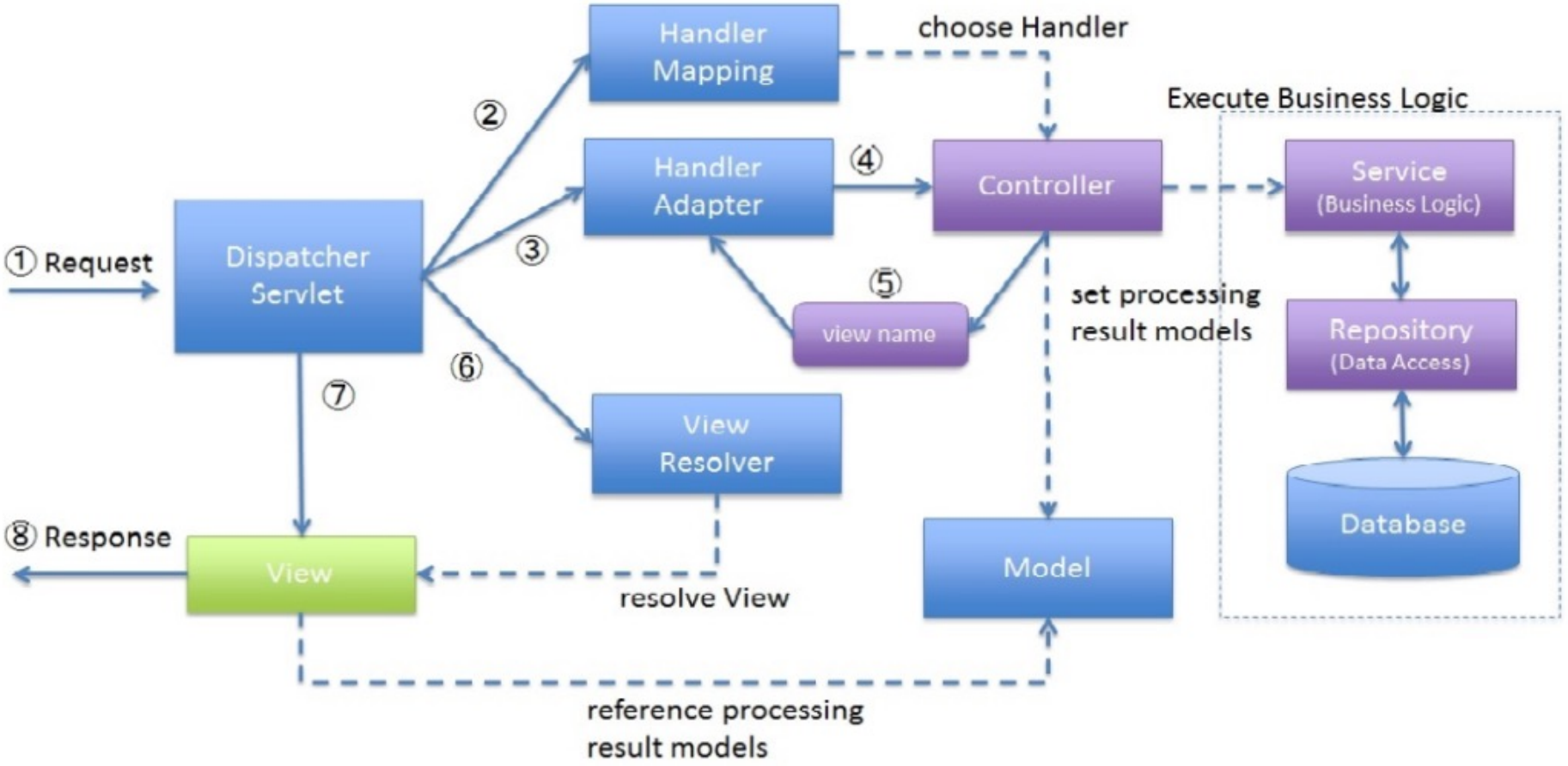
Static Web Sites



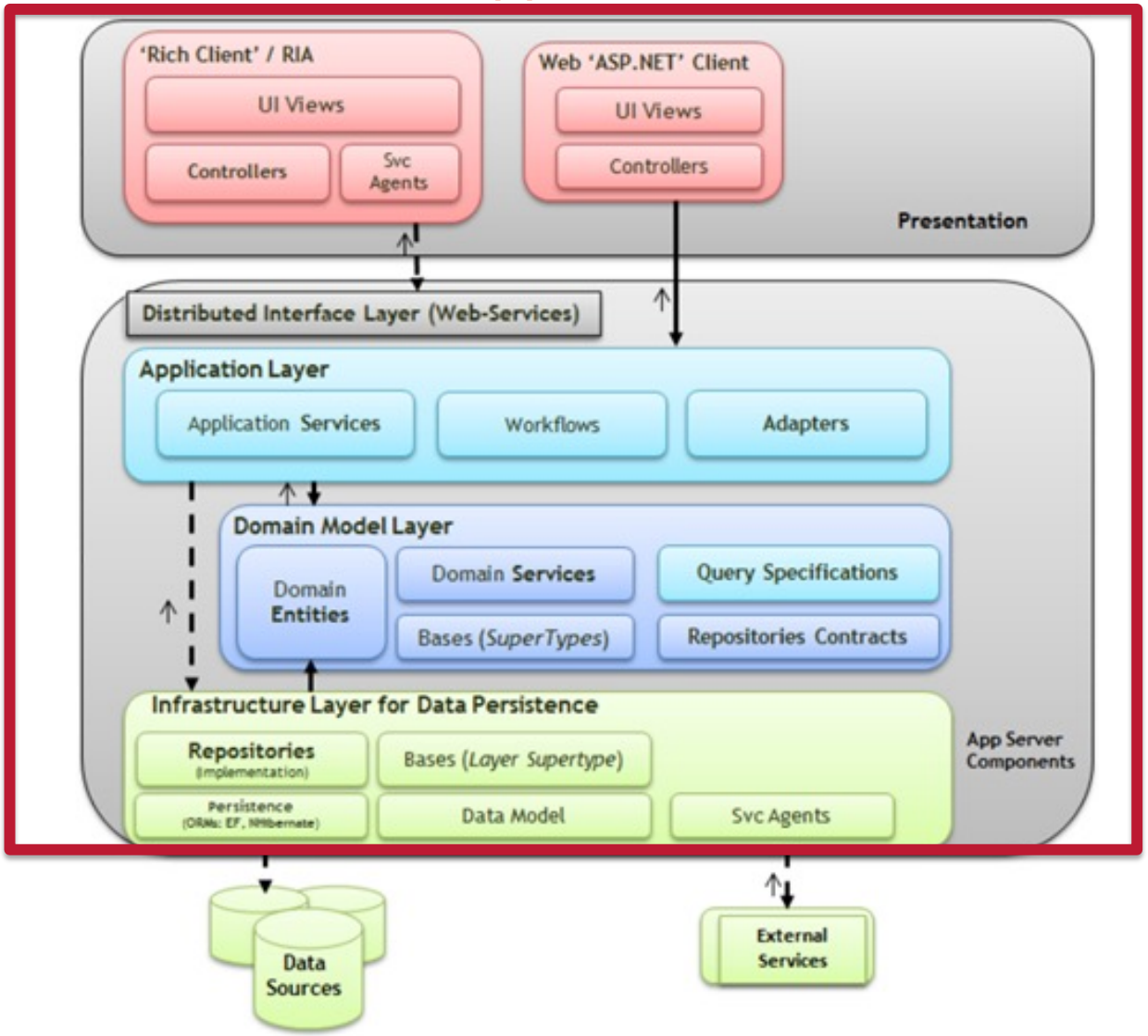
Web Applications



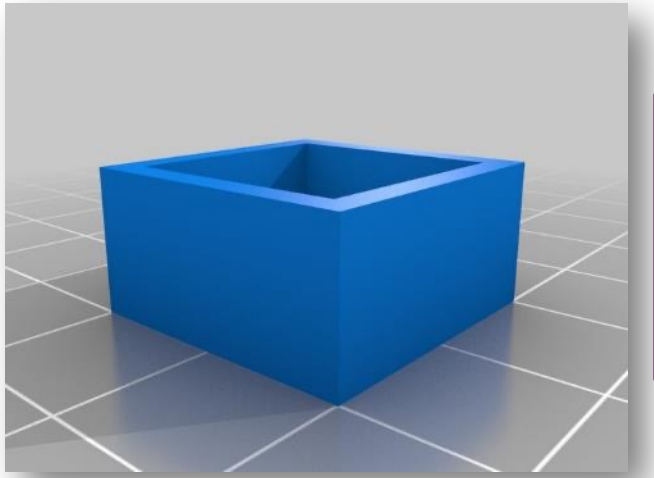
How to manage complexity ?
MVC design pattern



DDD web application architecture



Monolithic architectural paradigm



A single executable macro-component that contains all the application logic

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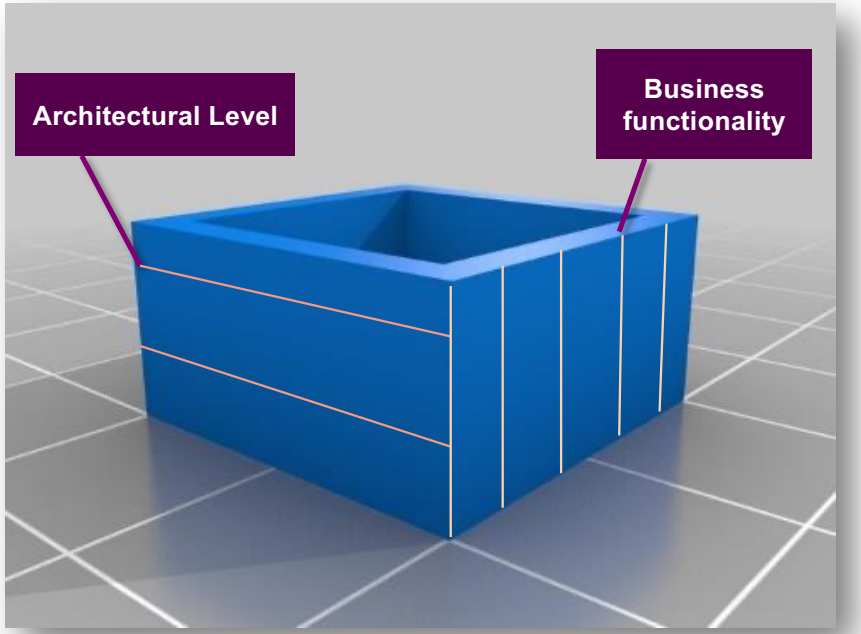
Monolithic architectural paradigm



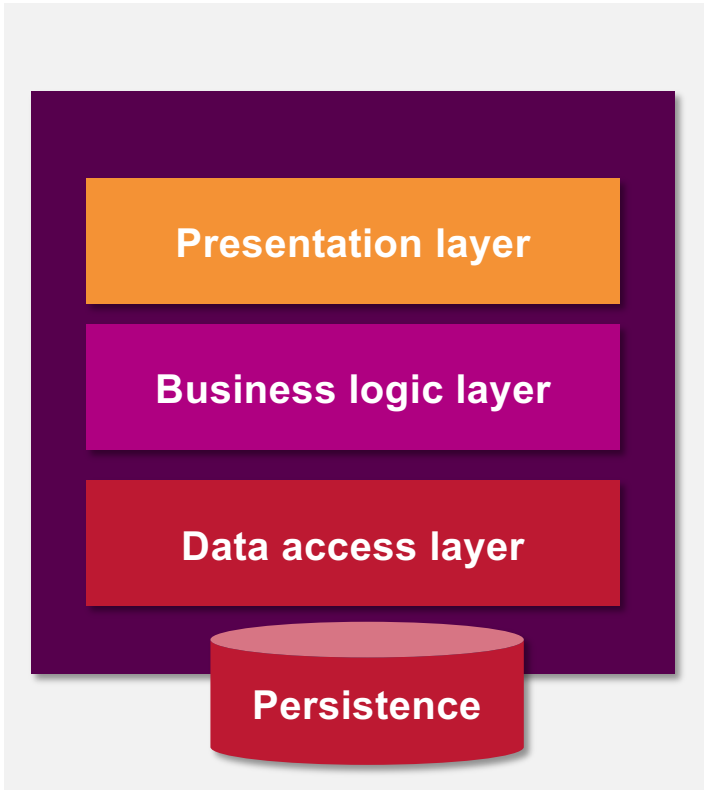
Tipically composed of modules that try to encapsulate the application logics.

Two orthogonal dimensions:

- Architectural level
- Business functionality

Architectural level

The **architectural level** dimension usually consists of three levels (layers)



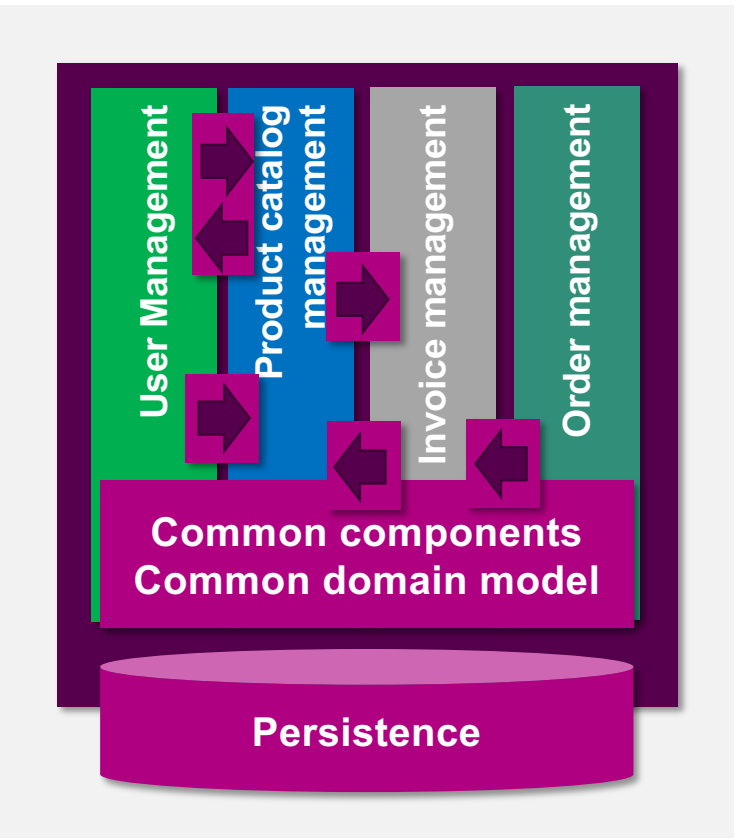
Business functionalities

The size of the **application functionality** includes, for example:

- User Management
- Product catalog management
- Invoice management
- Order management

...

The functionalities are highly coupled to each other



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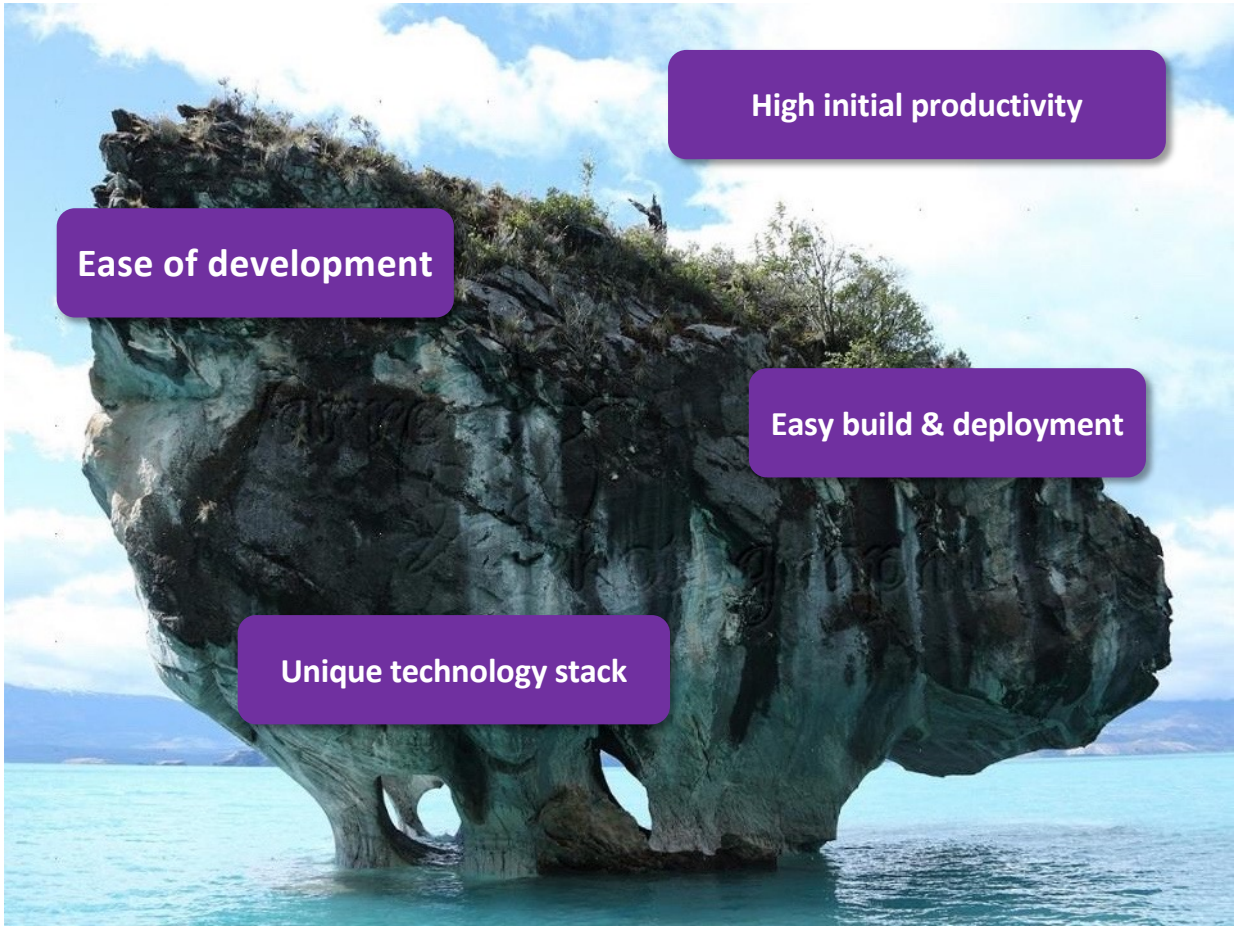
The strengths of monolithic architecture



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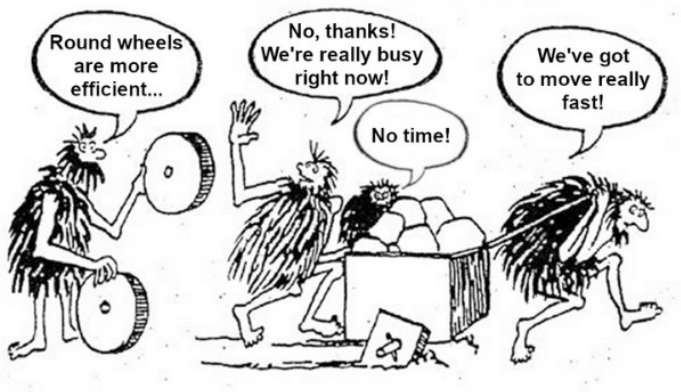
Source: https://inspirezone.tech/what-is-technical-debt/

What is technical debt ?

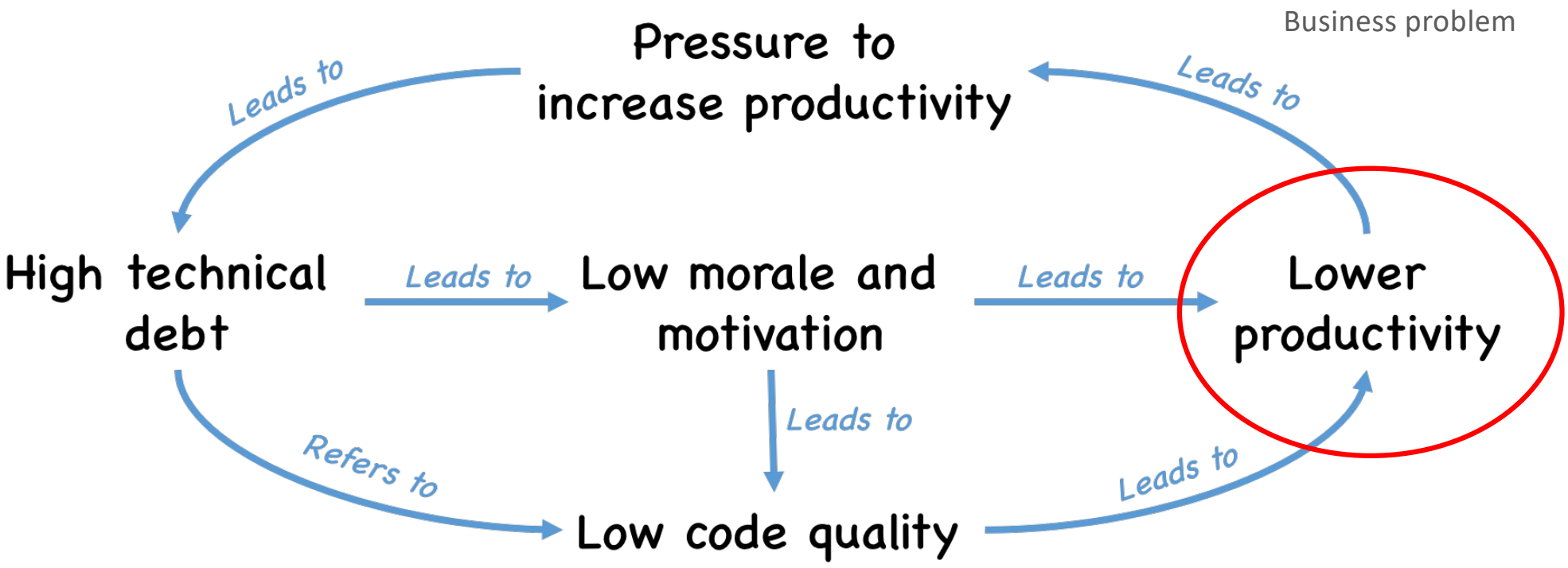


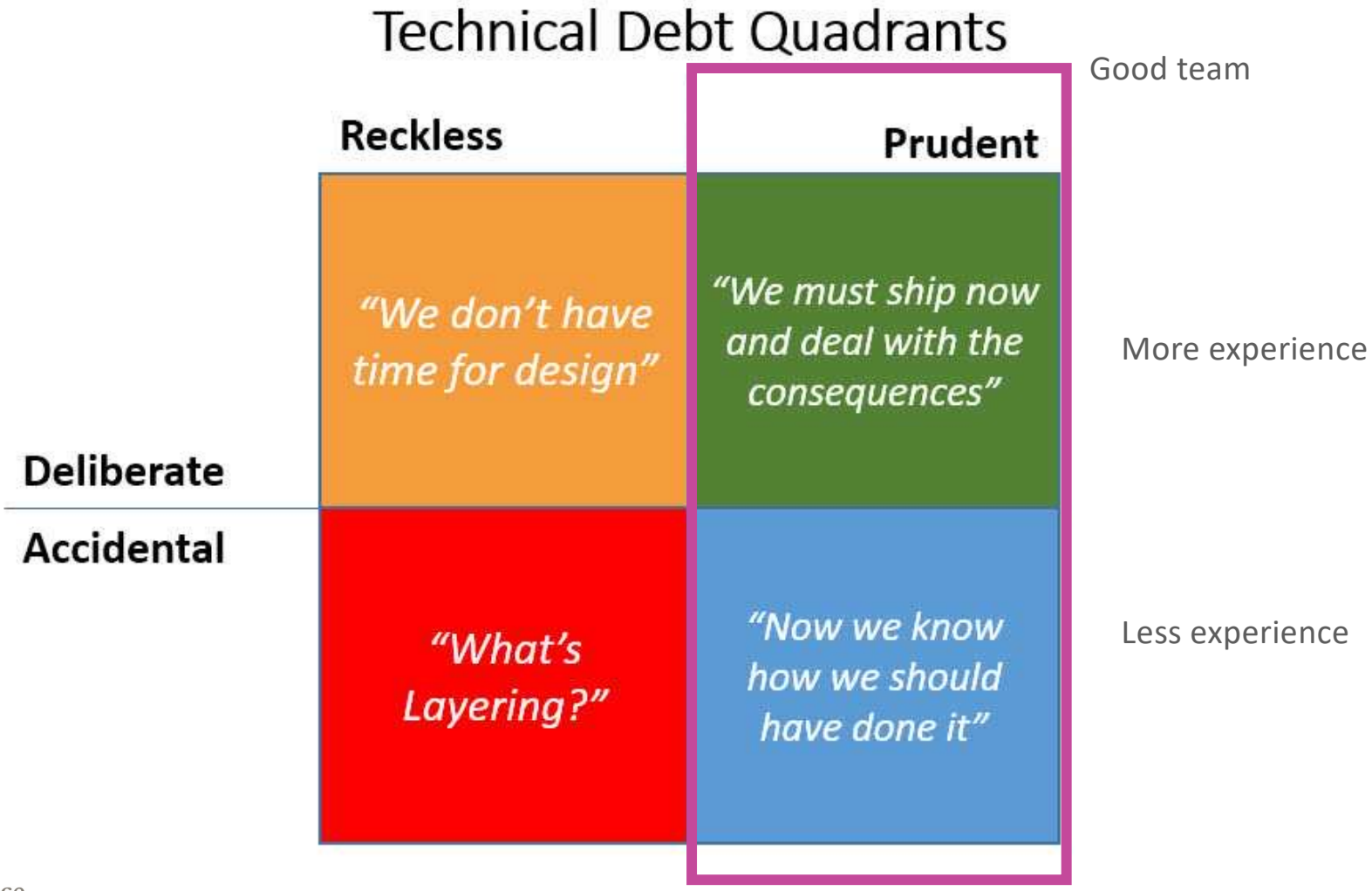
«Technical debt is a term used in software development processes describing trade-off between choosing a **quicker short-term solution** that results in long-term consequences. Like financial debt, technical debt accumulates interest in the form of the **extra effort to overcome problems** that appear in the future»

Different forms:

- **Requirements:** The gap between the captured product requirements and what was actually implemented.
- **Versioning:** Problems that arise with not using a clear versioning system or having a disorganised repository.
- **Build:** Problems with the building process that make it complex or difficult.
- **Test:** Any shortcuts taking in testing or a lack of tests.
- **Defect:** Any bugs or failures found in the software.
- **Design: Technical shortcuts taken during the design stage.**
- **Architectural:** Decisions made that compromise quality and maintainability.
- **Documentation:** Refers to documents on the project that are out-of-date, incomplete or a code base that lacks comments.
- **Code:** Refers to poorly written code that doesn't follow best coding practices.
- **Infrastructure:** Using tools, technologies or configuration that are not optimal for the software solution.

Technical debt dynamic





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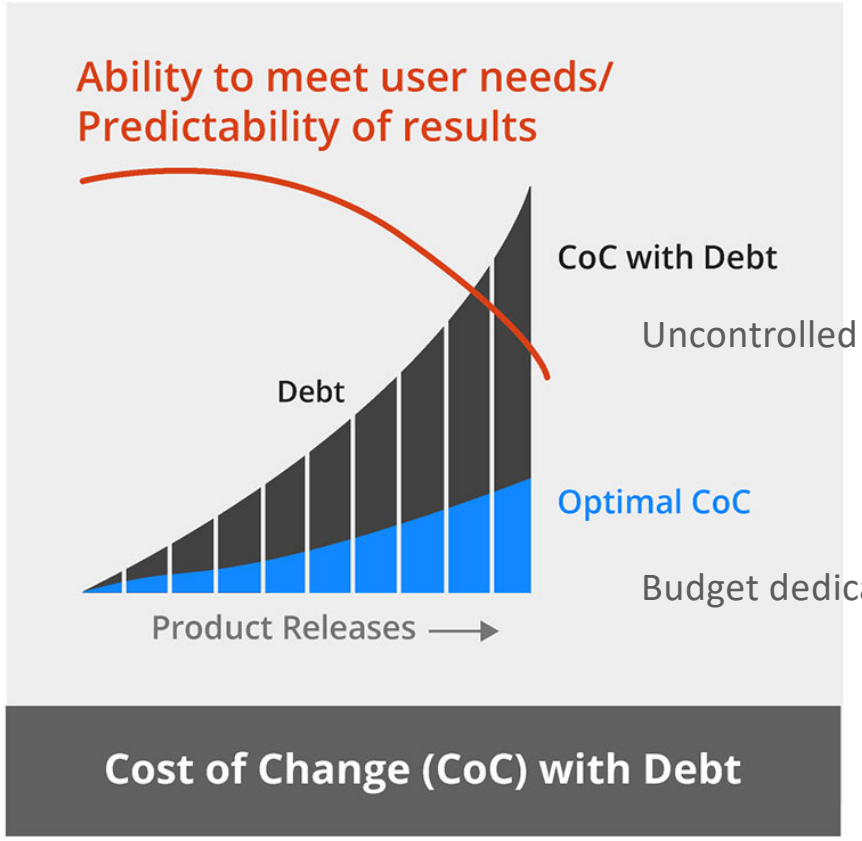
Technical debt in complex system



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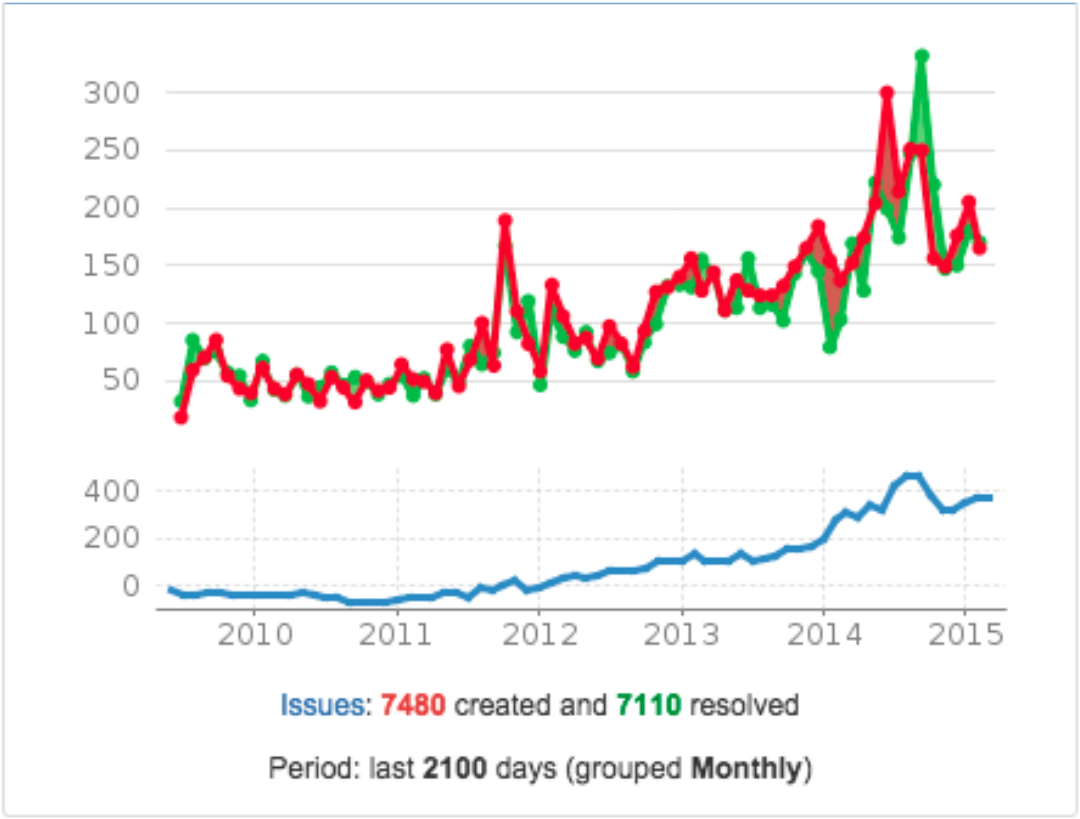
Application maintenance



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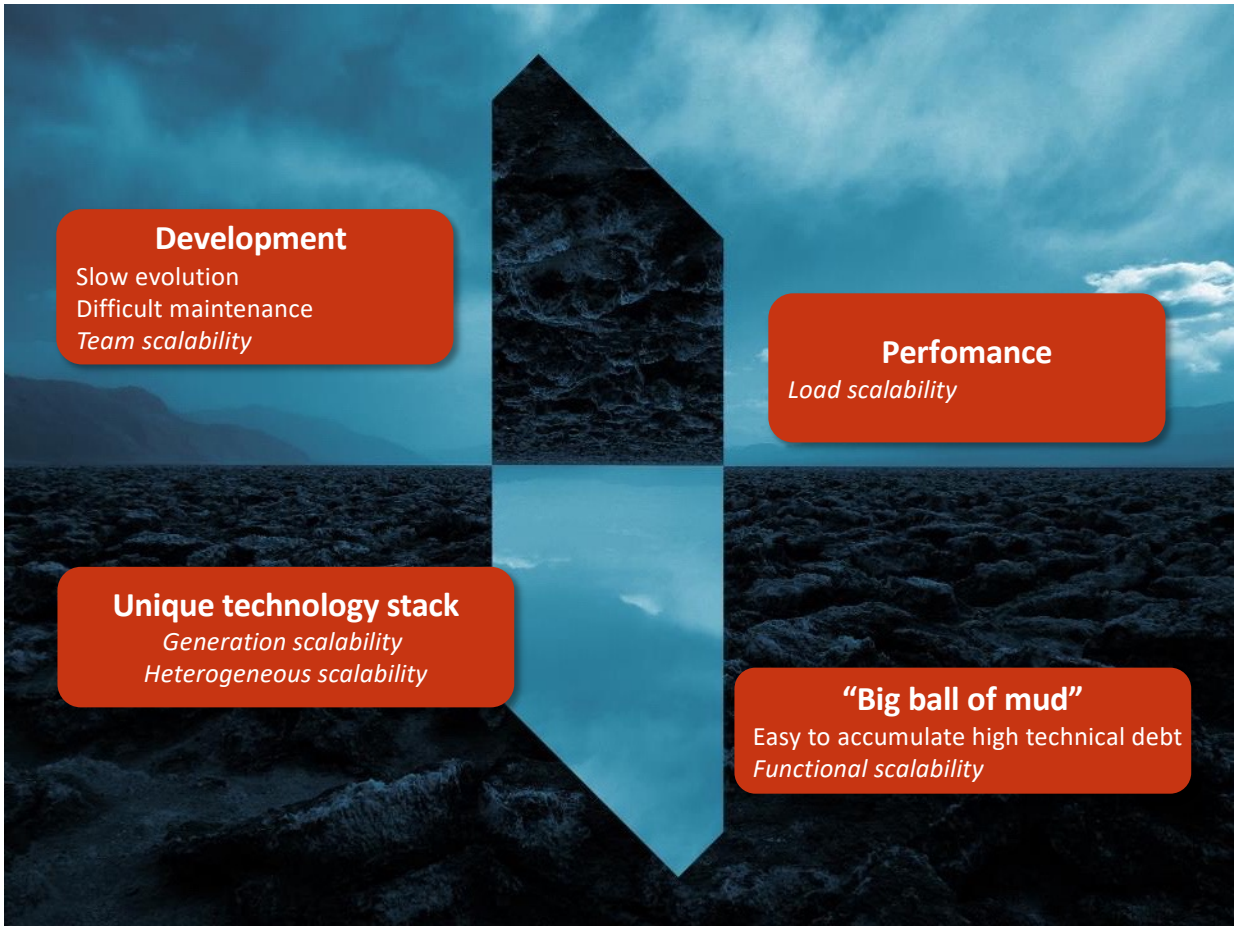
The weaknesses of monolithic architecture



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Microservices architecture, an alternative paradigm

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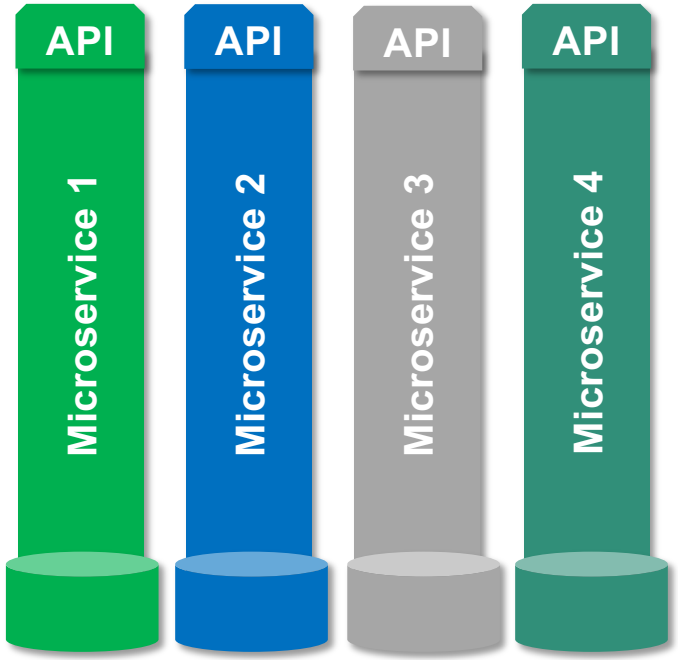
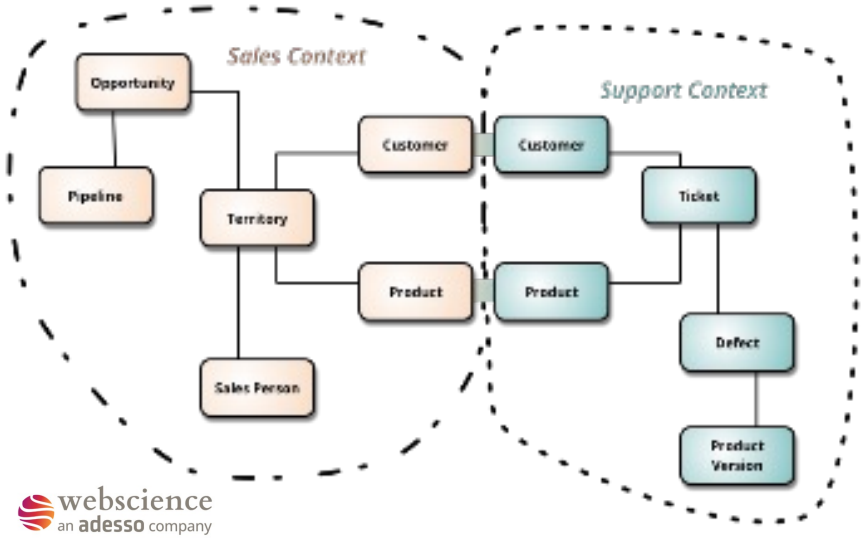
Logical architecture

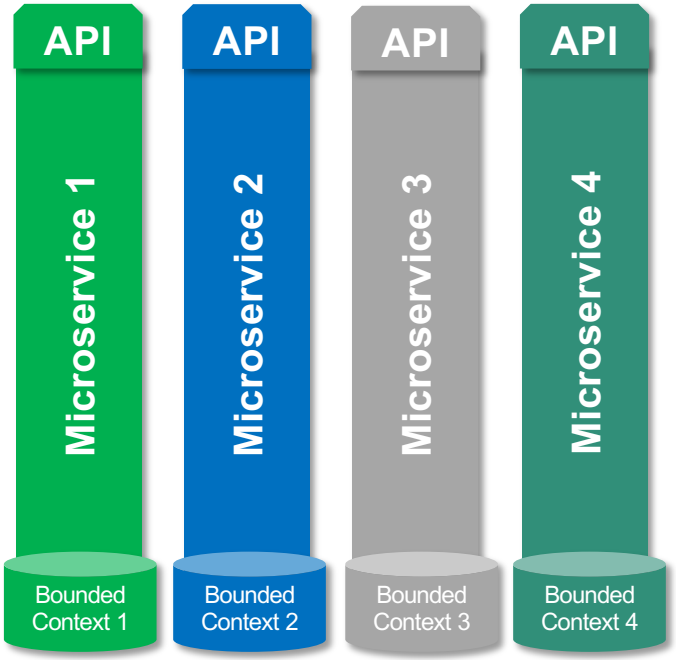
- **Application developed as:**
  - suite of small executable units (microservices)
  - who publish business oriented API
- Philosophy : **“Do one thing and do it well”**



Logical architecture: bounded context

- Each microservice manages a consistent subset of functionalities (processes and entities) belonging to the global application domain.
- Each microservice manages a "bounded context": a piece of the global domain that is sufficiently atomic and independent from the rest of the application domain





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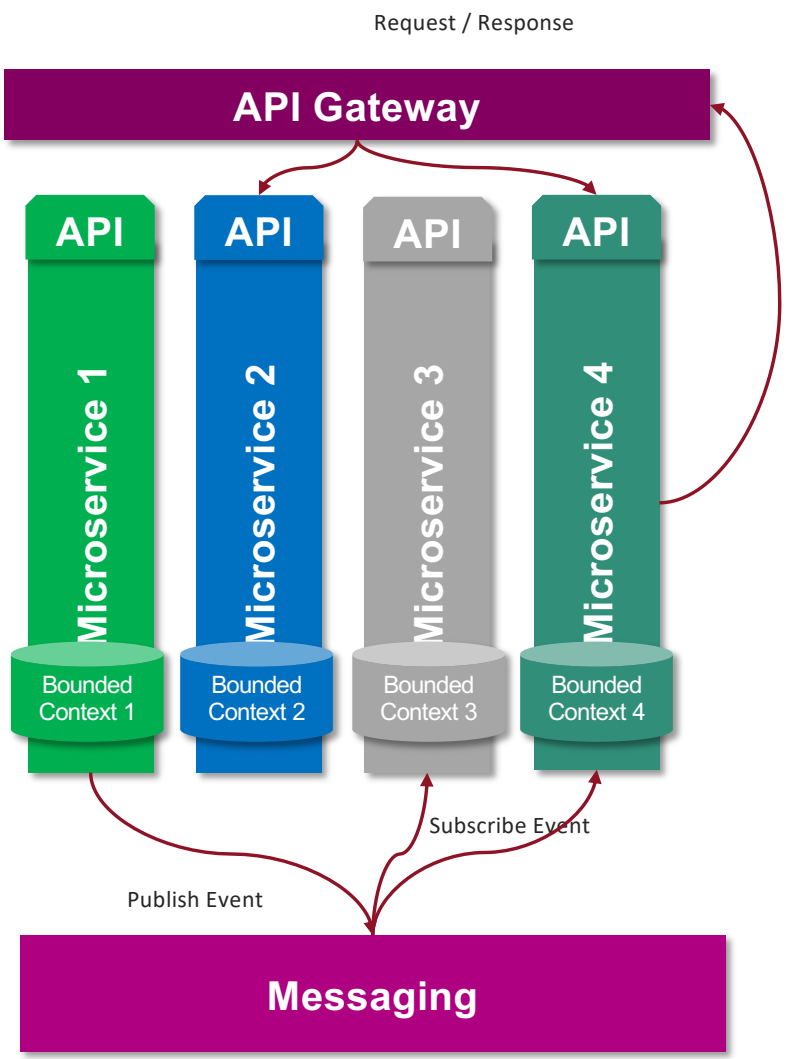
Logical architecture: collaboration

- Microservices are **loosely coupled** to each other
- Microservices **collaborate** with each other using "lightweight" protocols:
  - Request / Response Http
  - Publish / Subscribe Messaging



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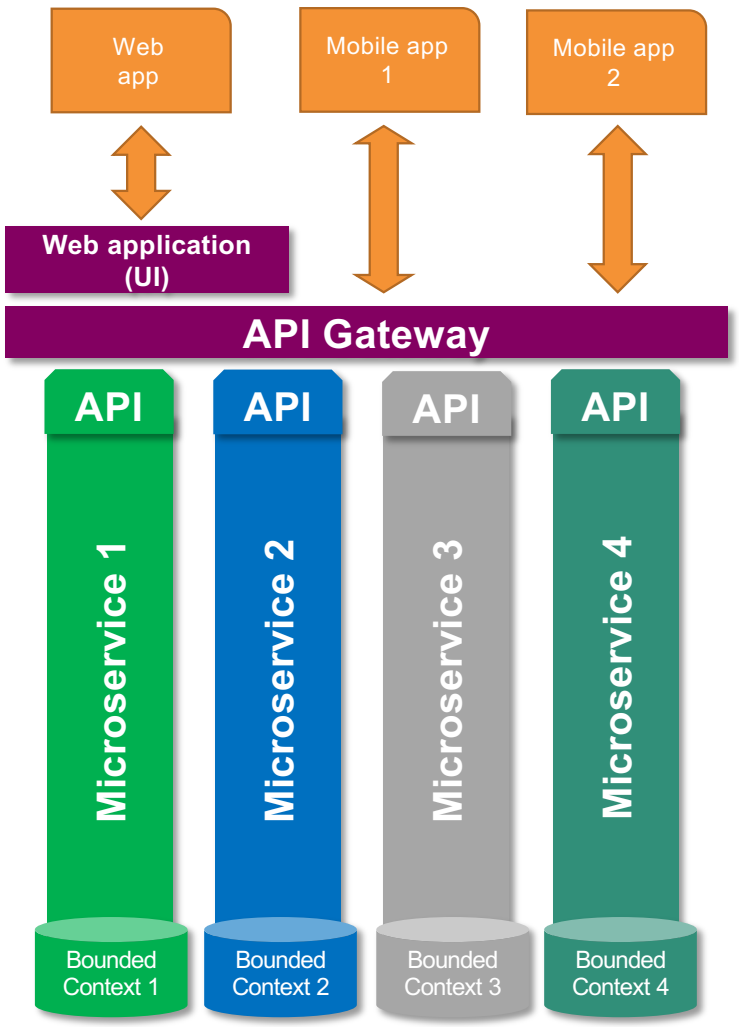
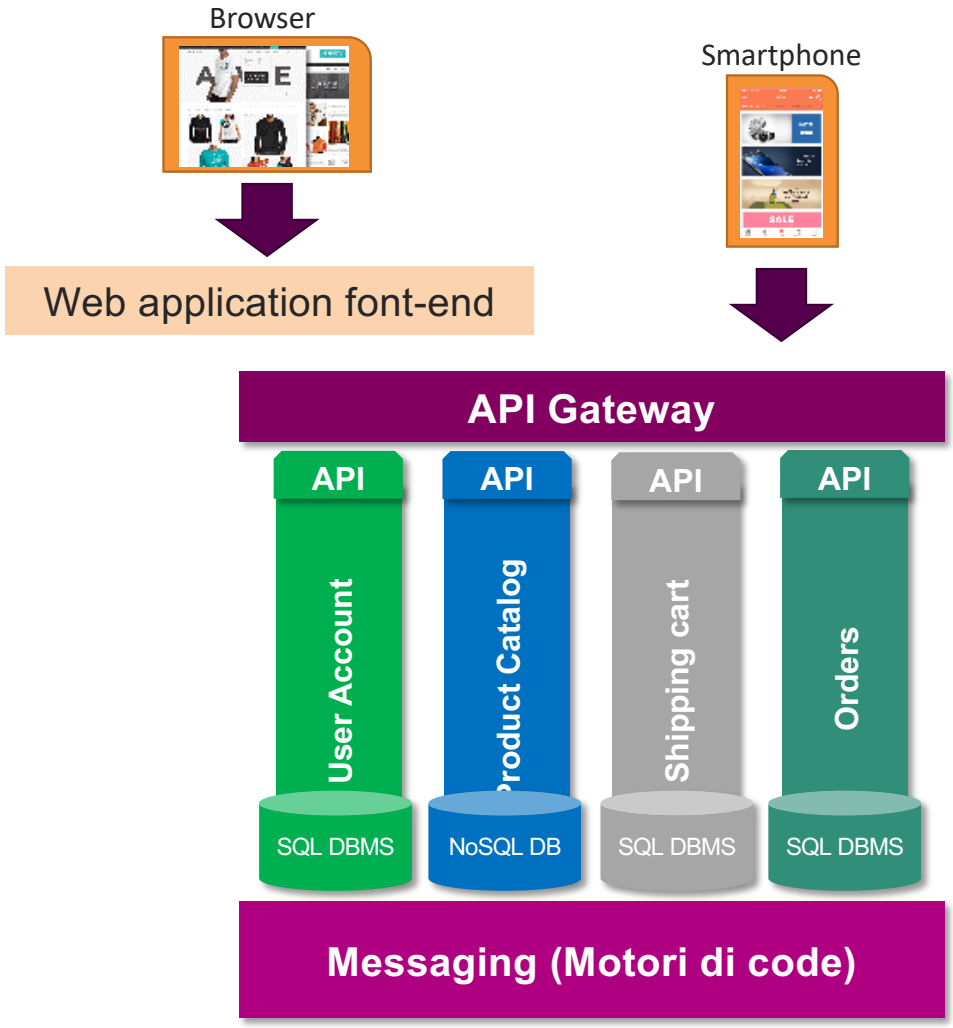
Logical architecture: multichannel

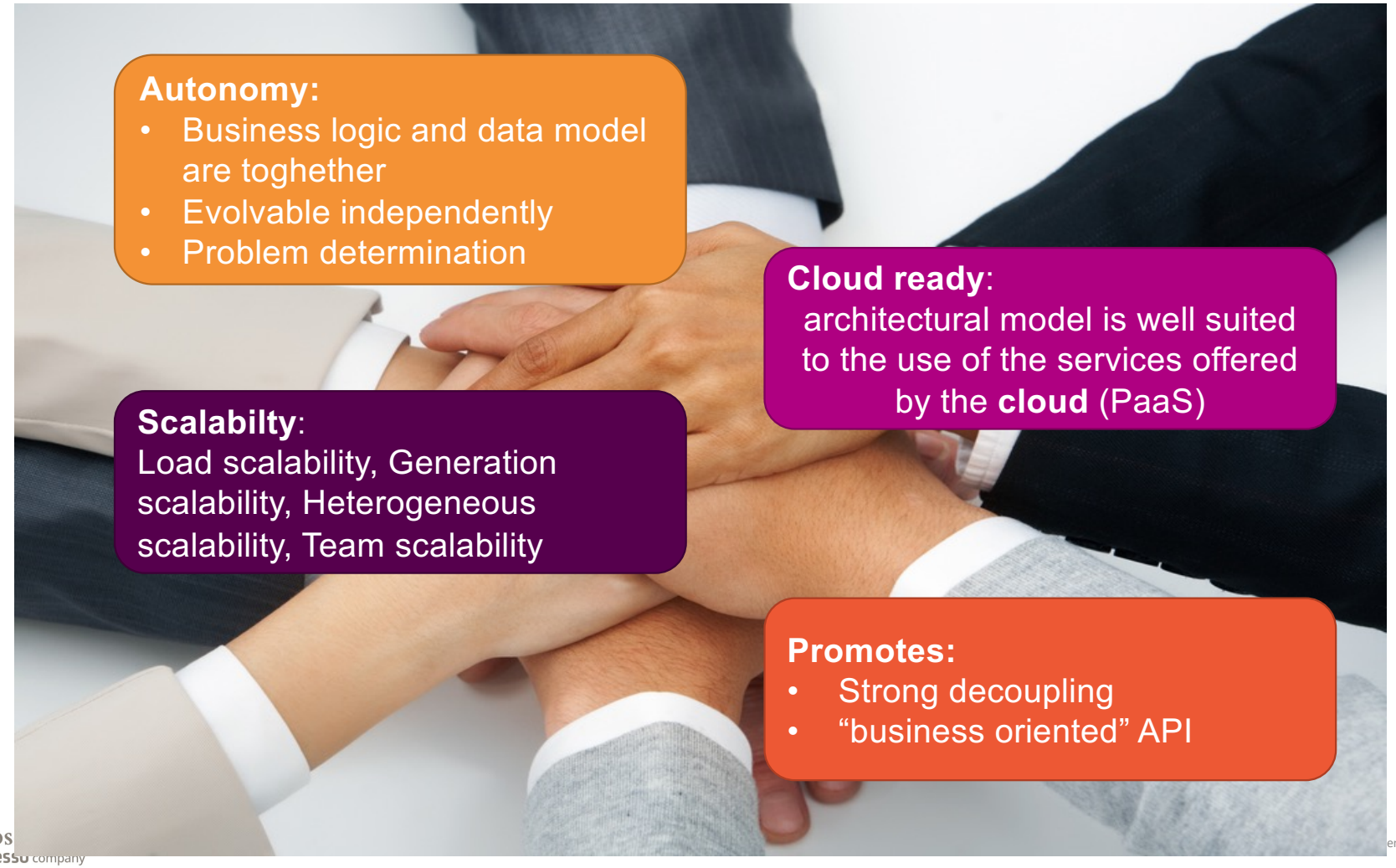
- The focus on the development of business oriented APIs enables the **reuse** of microservices in different application contexts
- The development of different **multichannel** applications is simplified



Logical architecture: multichannel - example



The strengths of microservices architecture



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The points of attention of microservices architecture

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Microservices architecture: when and how?

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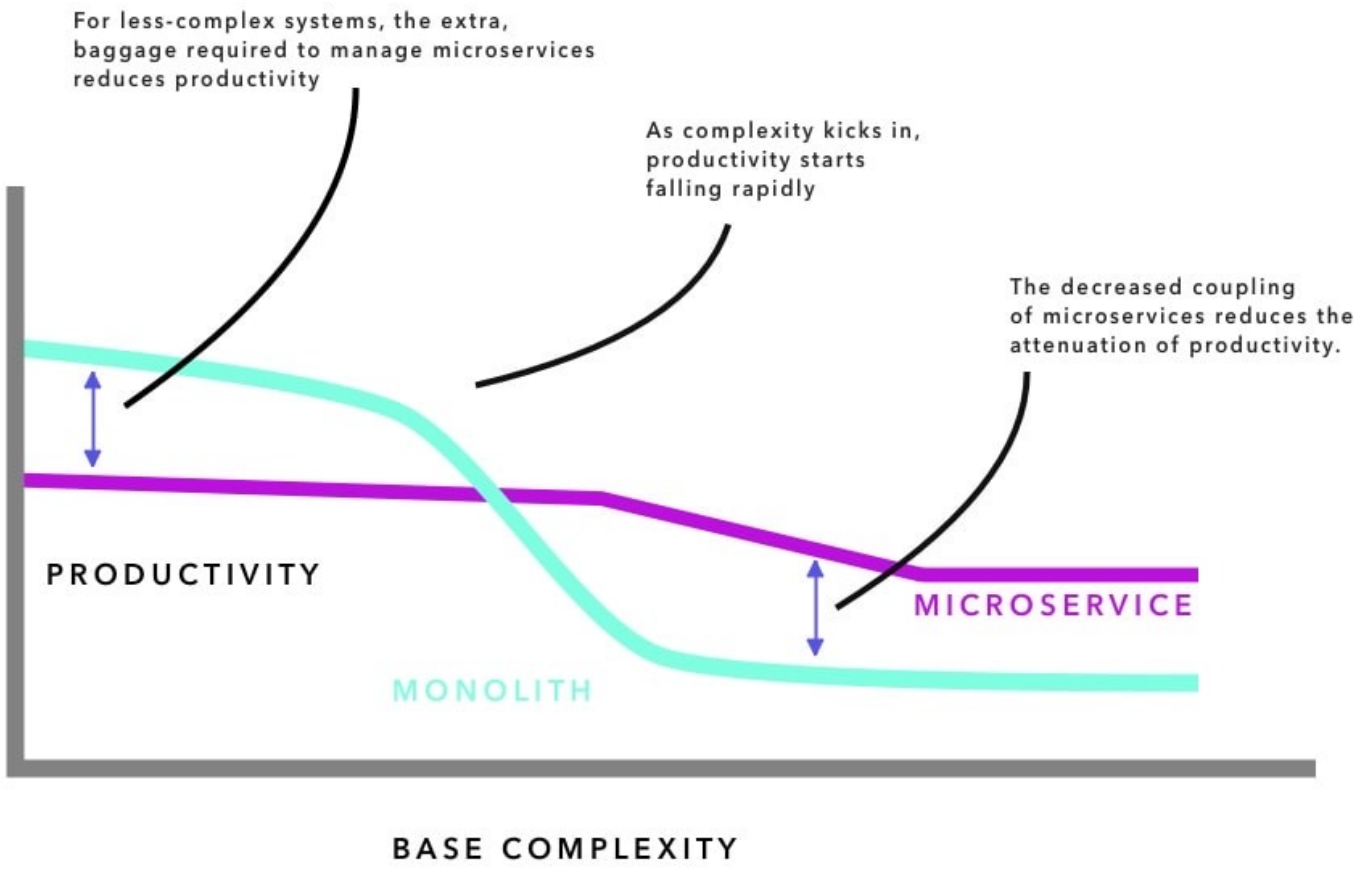
Monolith vs Microservices



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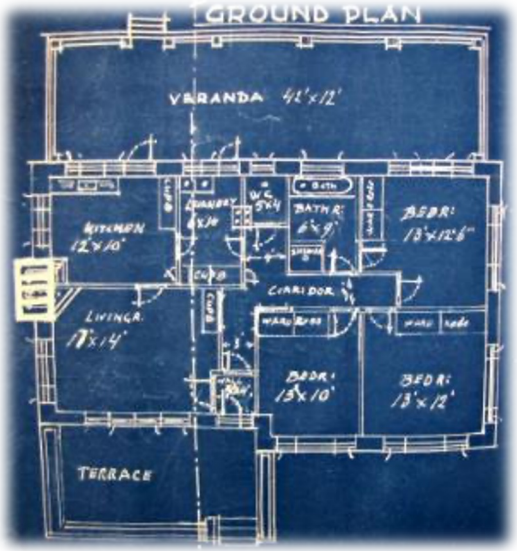
When ?

Is the monolith showing its limits ?



Do you need a better way to manage the change ?

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Preconditions

Organizational:

- Are there sufficient modeling and design skills?
- Are there enough dev-ops skills?
- Is it possible to take advantage of the opportunity of PaaS products?
- Have the teams developed a sufficient culture of collaboration?
- Do the teams have sufficient experience on practices and methodologies?

Functional:

- Is the application domain (processes / entities) clear?
- Is it possible to divide the application domain into smaller functional units?
- Is it acceptable that the data model distributed among the functional units is eventual consistent?