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Oliver Wegner • Stefan Tilkov

# From Parts to a Whole: Modular Development of a Large-Scale e-Commerce Site

QCon, London 06/03/2014

innoQ

OTTO

# **1. Reviewing architectures**

# Generic Architecture Review Results

Building features takes too long

Technical debt is well-known and not addressed


Deployment is way too complicated and slow

Architectural quality has degraded

Scalability has reached its limit

“-ility” problems abound

Replacement would be way too expensive



Any architecture's quality is directly proportional to the number of bottlenecks limiting its evolution, development, and operations

# Conway's Law

## Organization → Architecture

“Organizations which design systems are constrained to produce systems which are copies of the communication structures of these organizations.” – M.E. Conway

# Reversal 1

## Architecture → Organization

Any particular architecture approach constraints organizational options – i.e. makes some organizational models simple and others hard to implement.

## Reversal 2

### Architecture → Organization

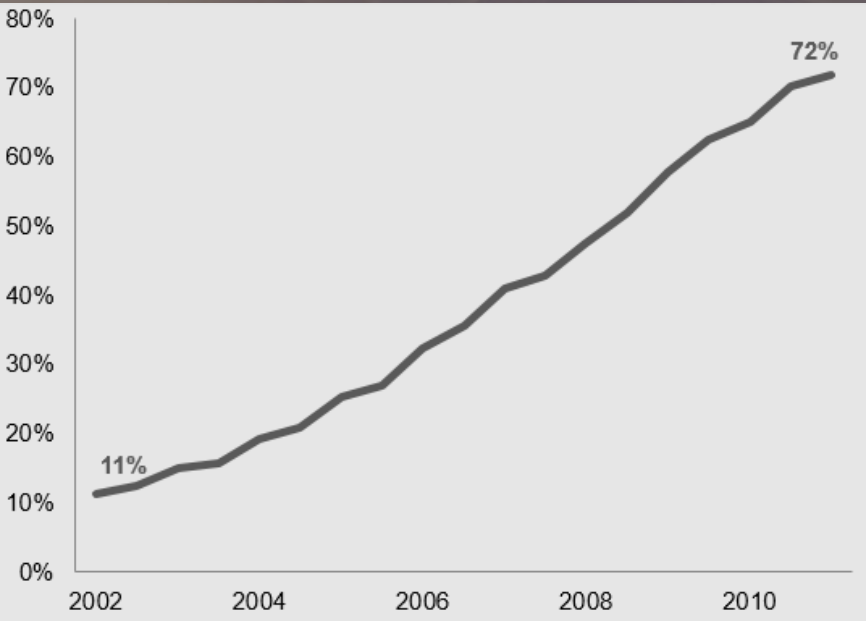
Choosing a particular architecture can be a means of optimizing for a desired organizational structure.



## **2. Rebuilding Otto.de**

**For the last 15 years the E-Commerce business has become more important**

Percentage of turnover



**4.200 Employees**    **> 2.1 Billion € turnover**

**> 2 Million items on Otto.de**

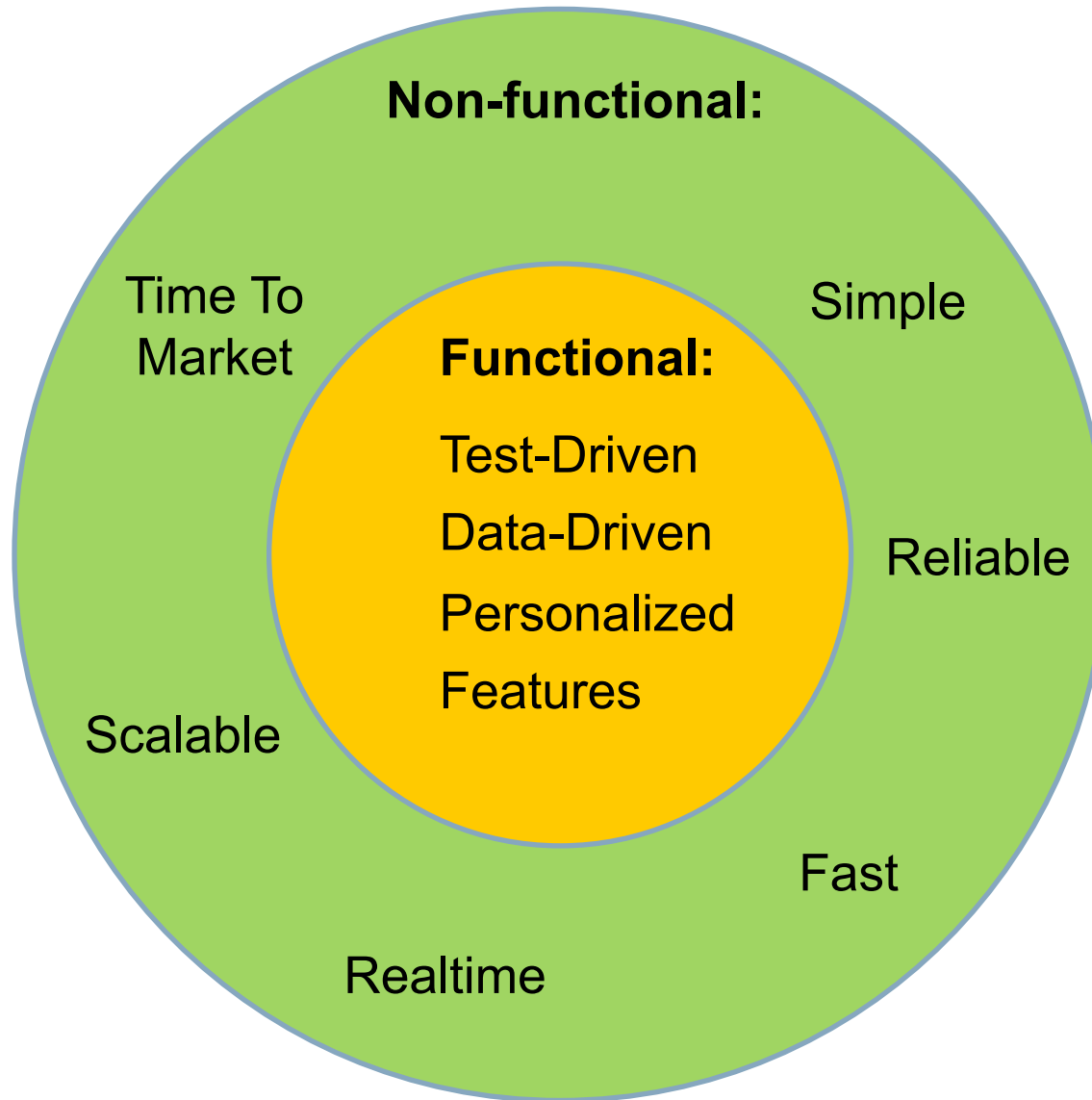
**80% turnover online**

Kleid.  
Gefunden auf **OTTO**.de

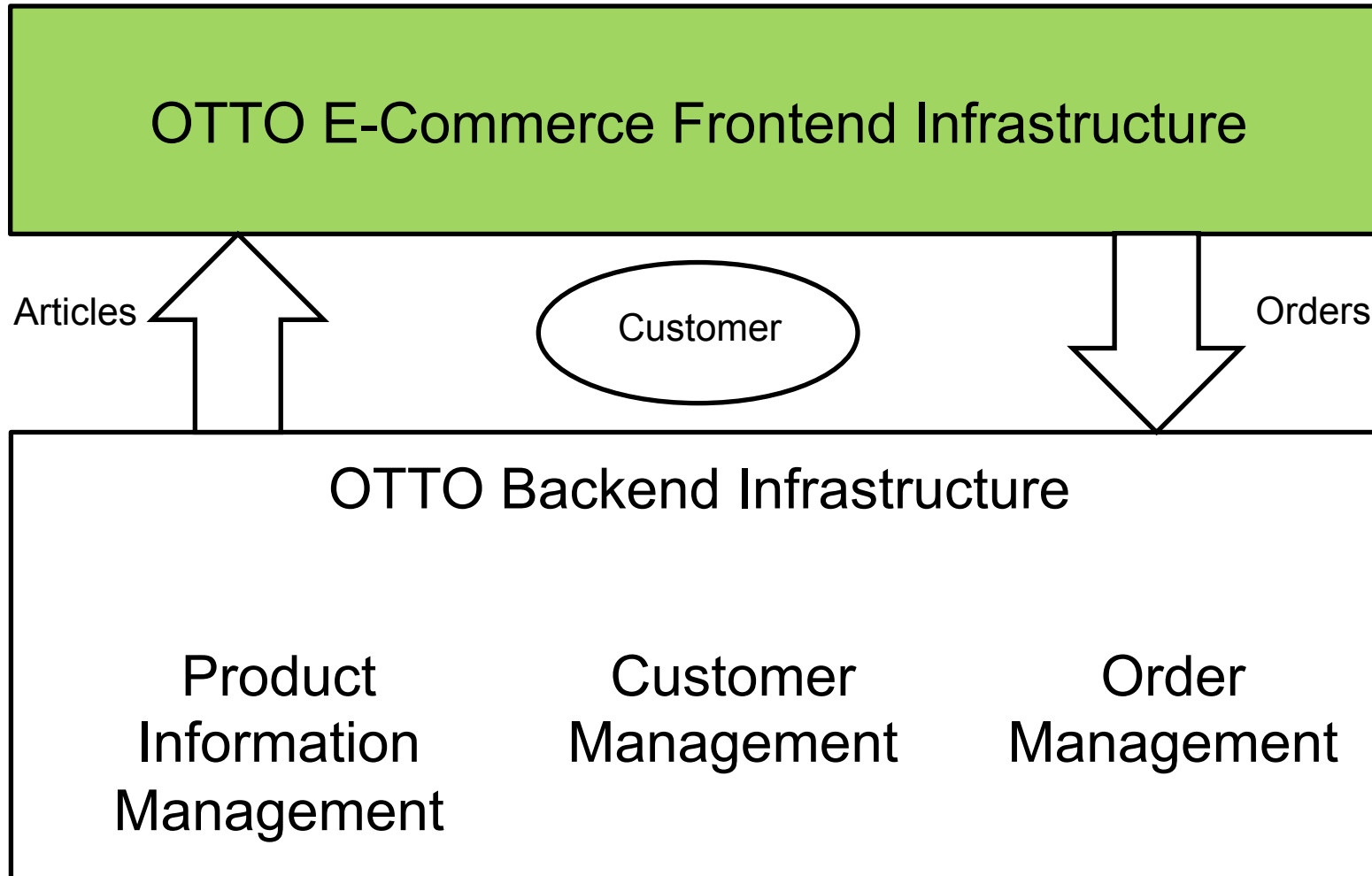


But why rebuild Otto.de?

# Goals



# How green is the green field?



# Start of the project LHOTSE

Open Source as core technologies

One Prototype to define the technology stack

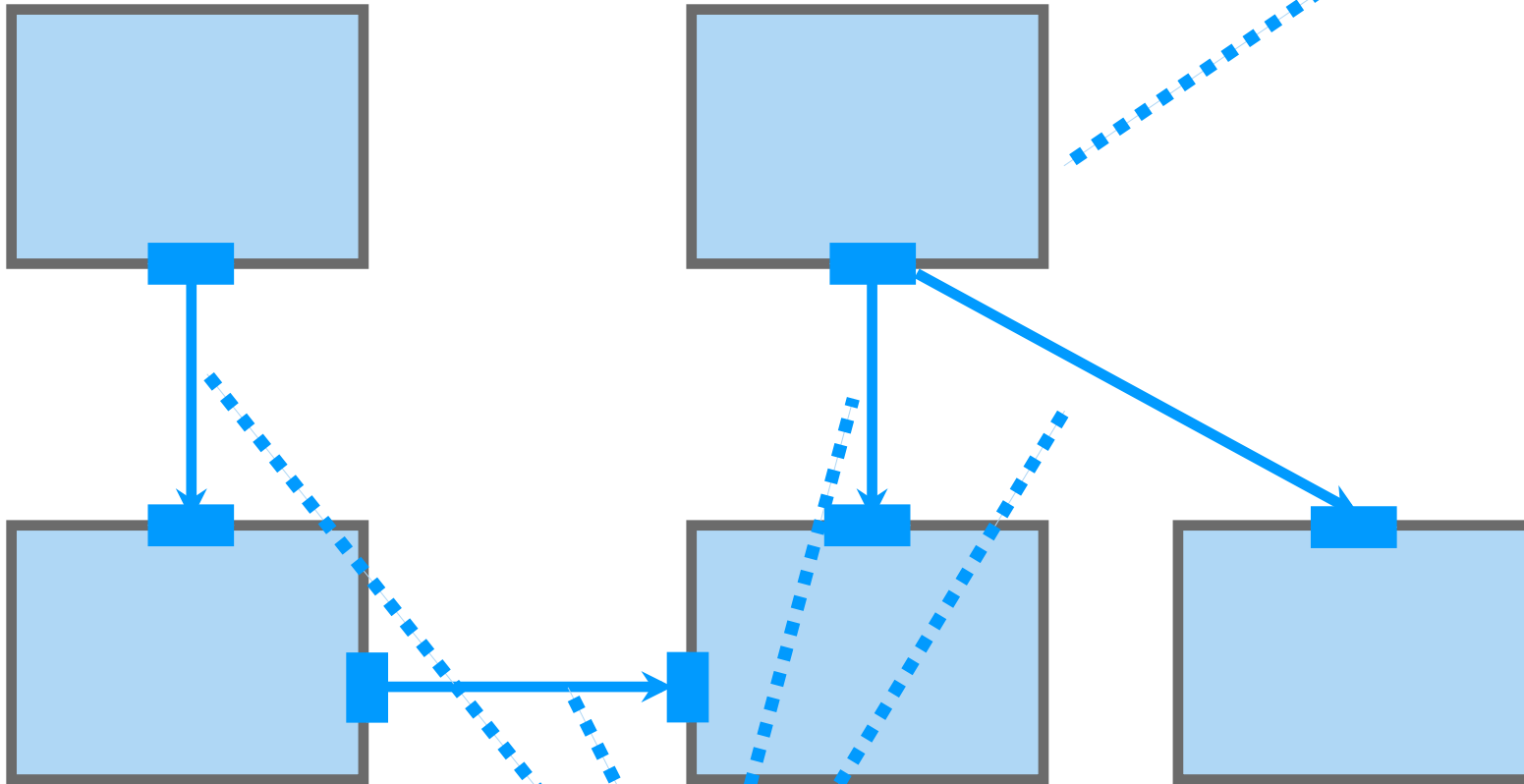
Project organization with autonomous teams

Scrum as an agile development method

Technical system architecture

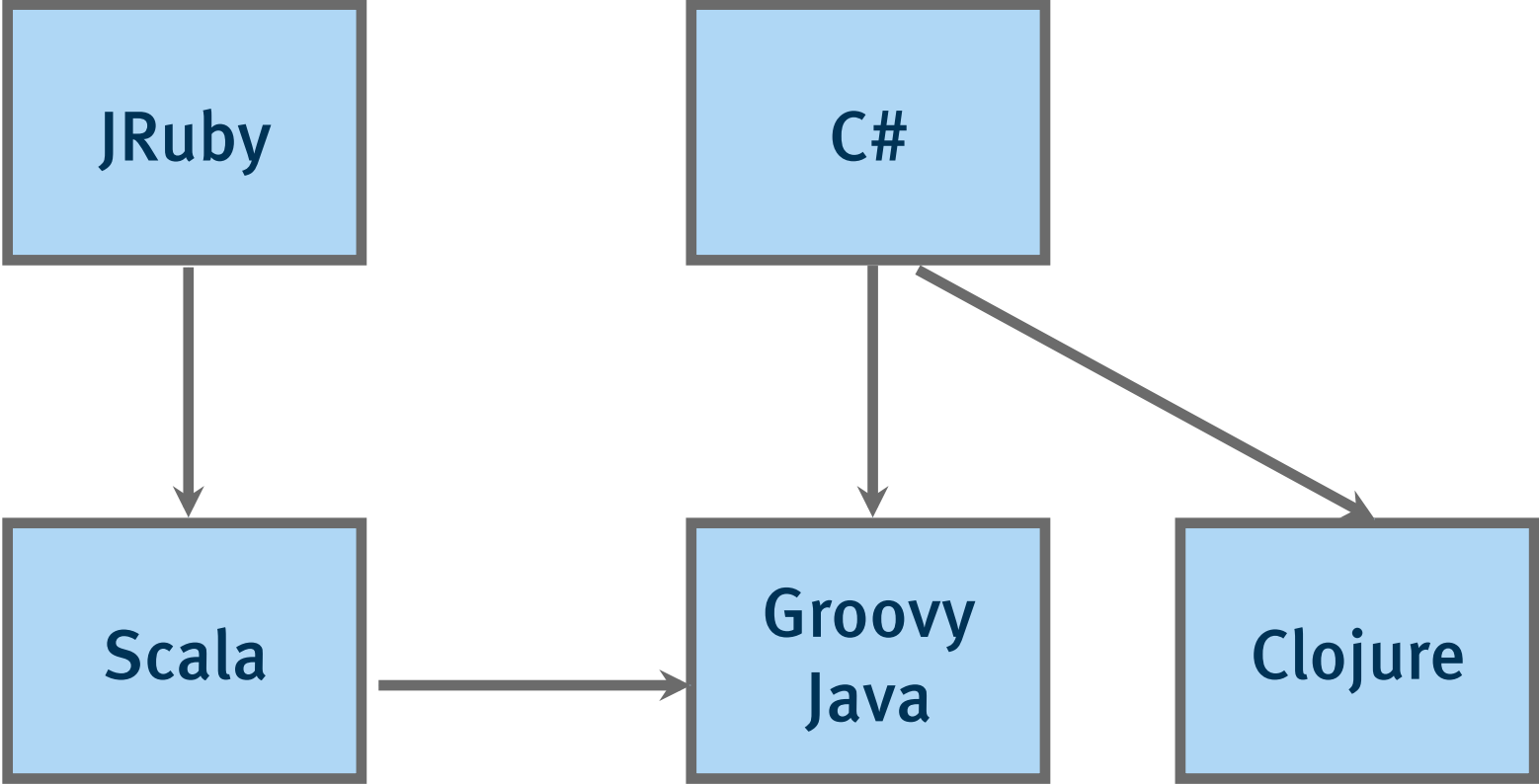
### **3. A system-of-systems approach**

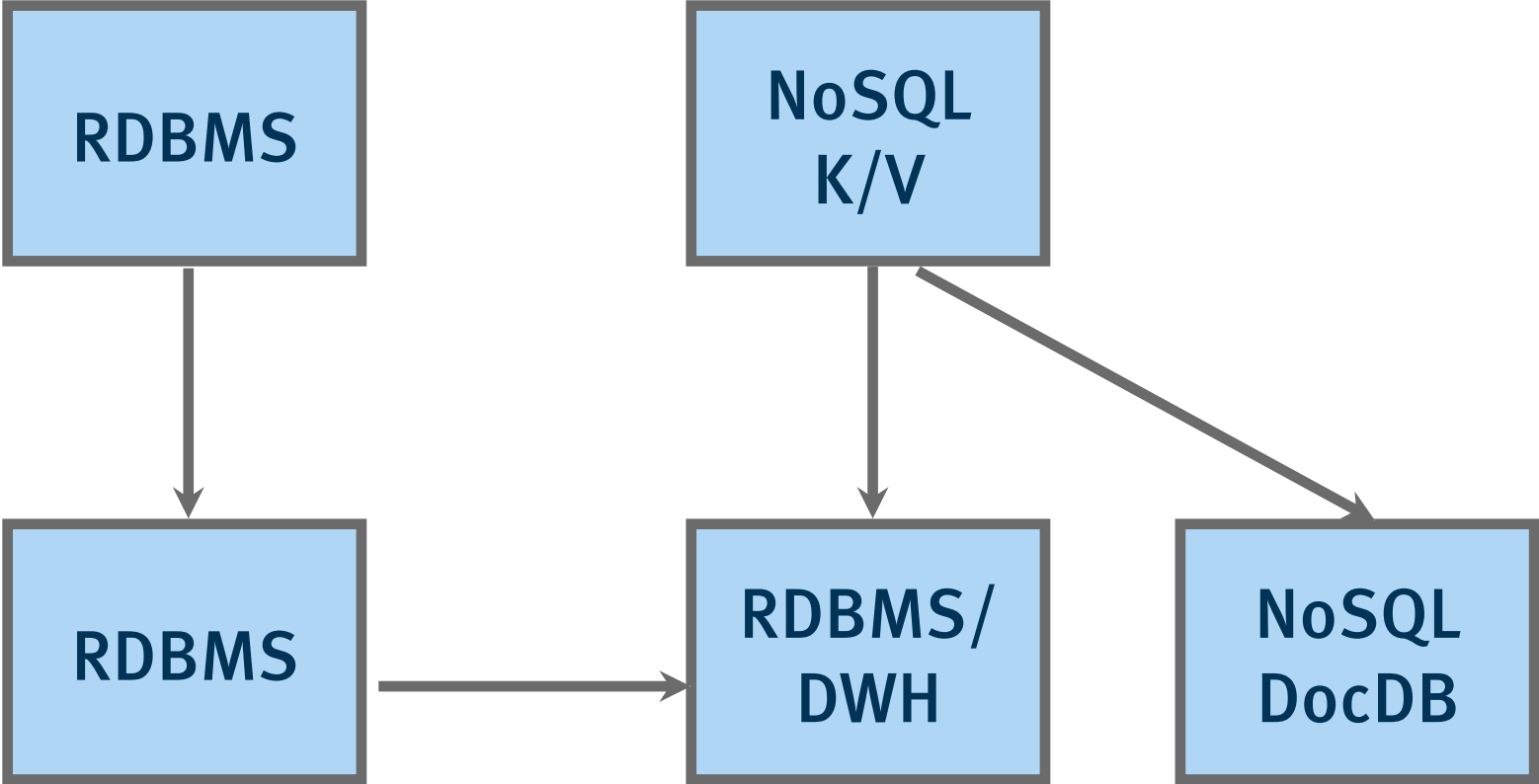
**Domain architecture**

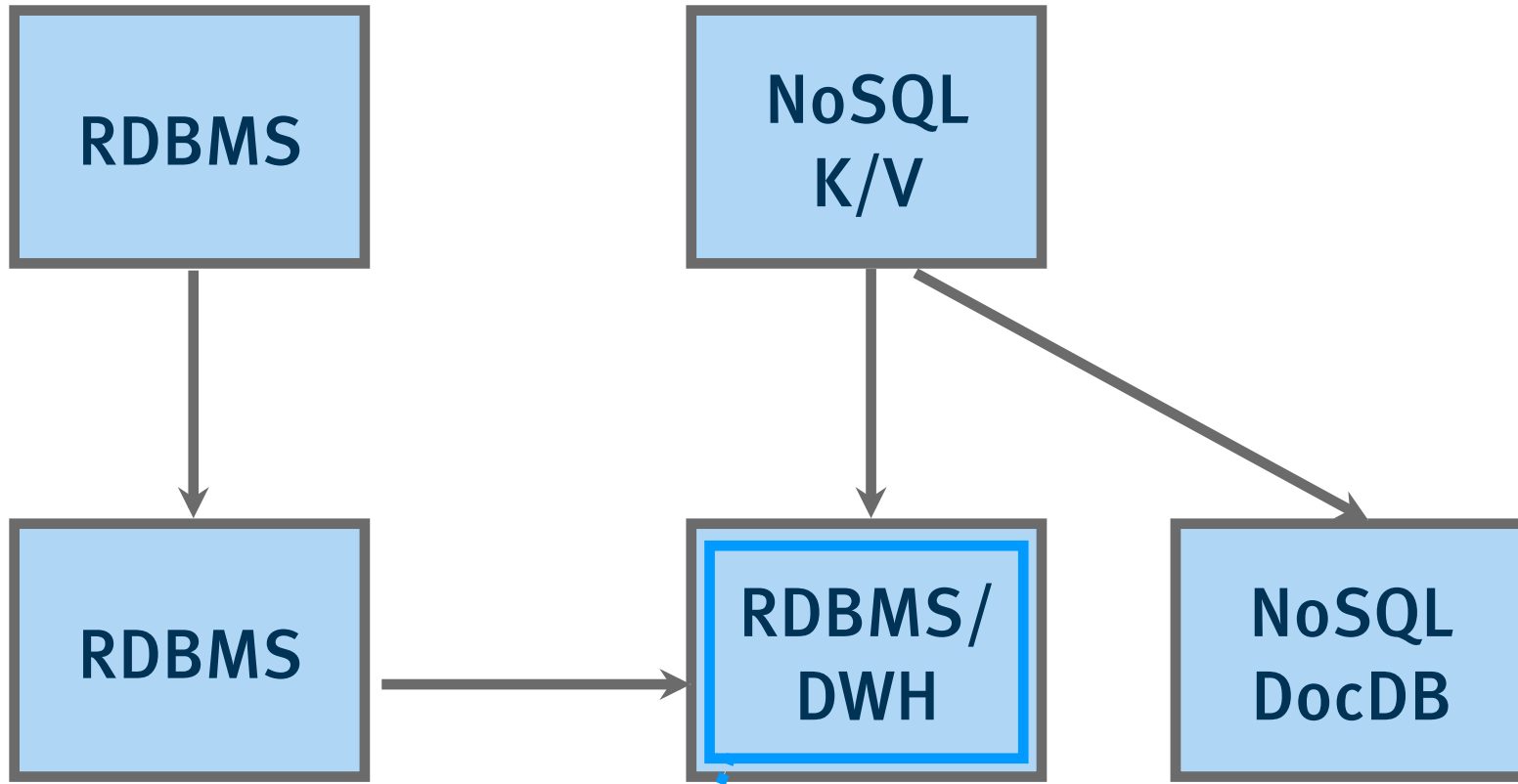


**Macro (technical) architecture**

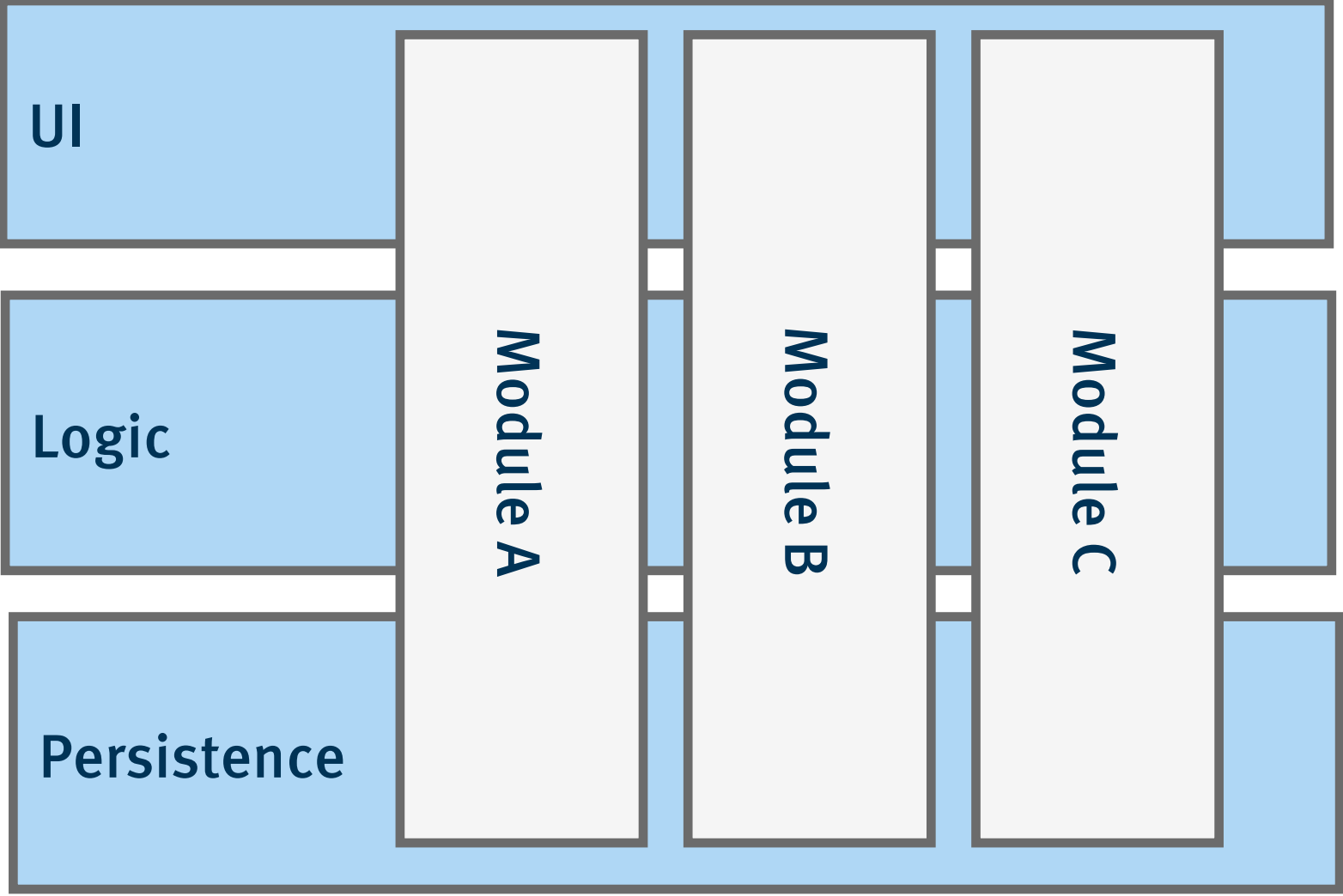


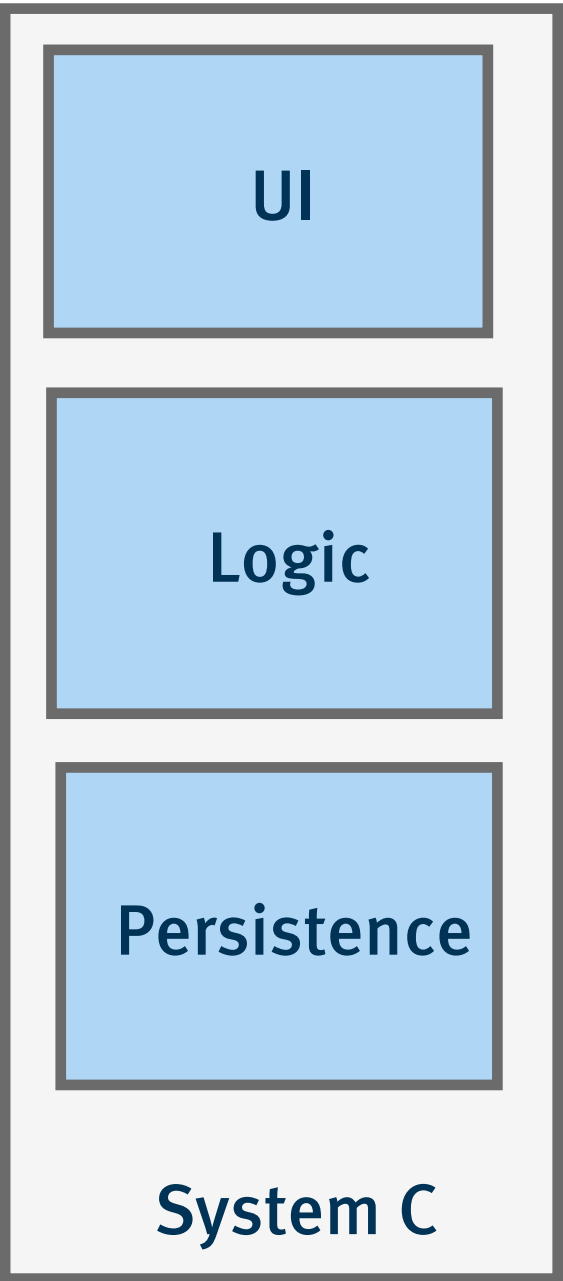
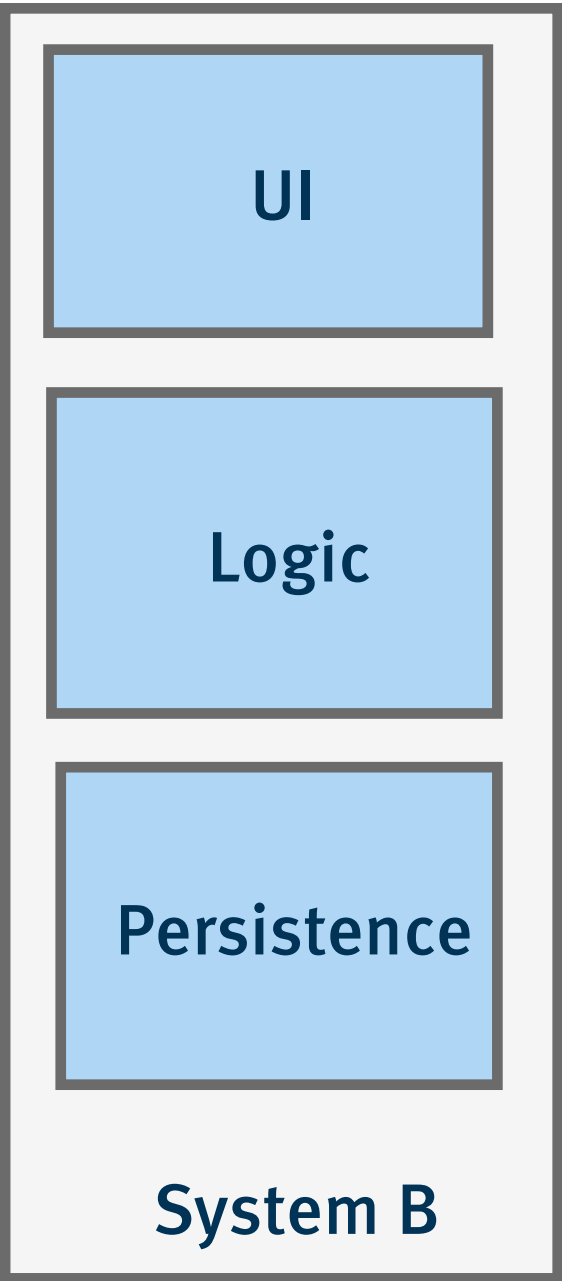
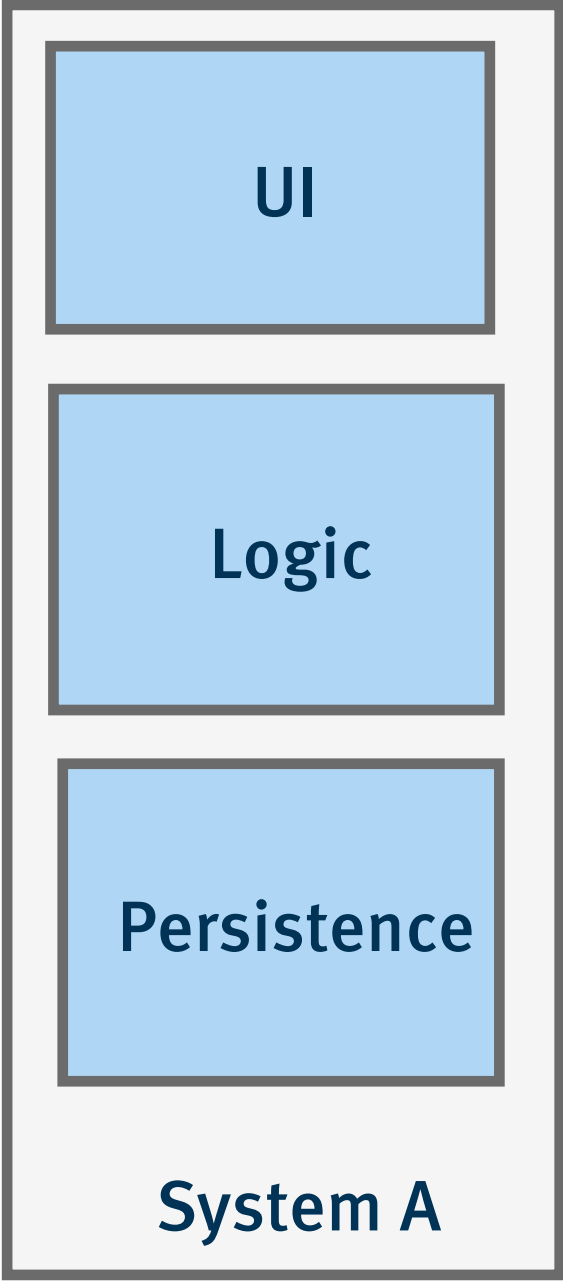






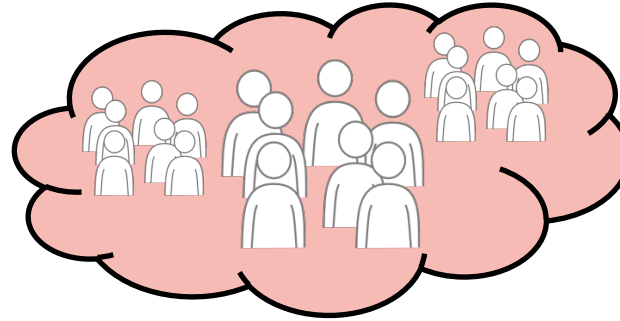
**Micro architecture**



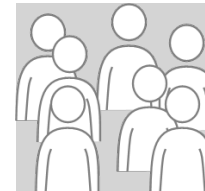
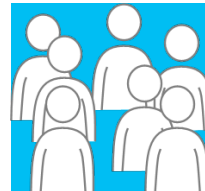


## **4. The Otto architecture**

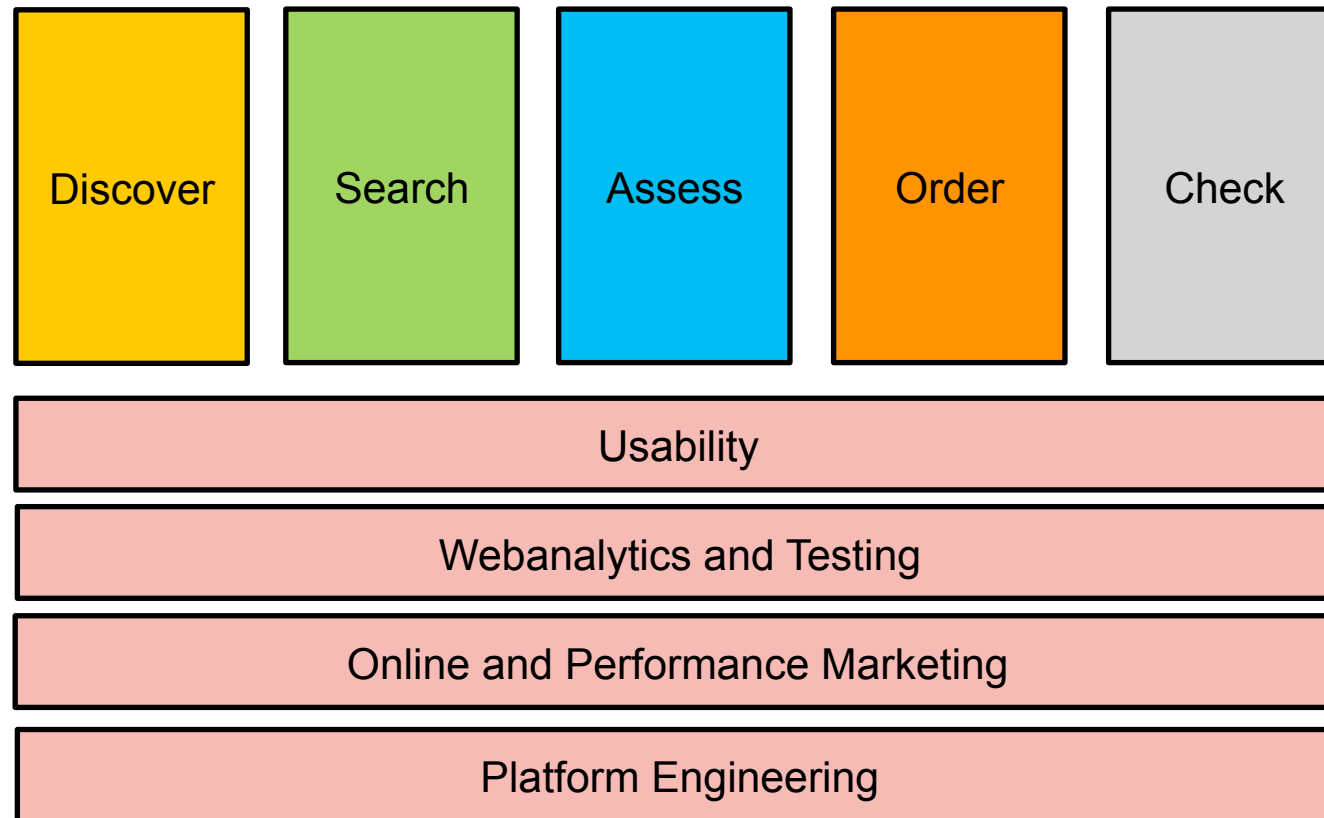
# Buying Process – as you already know it



Customer Journey



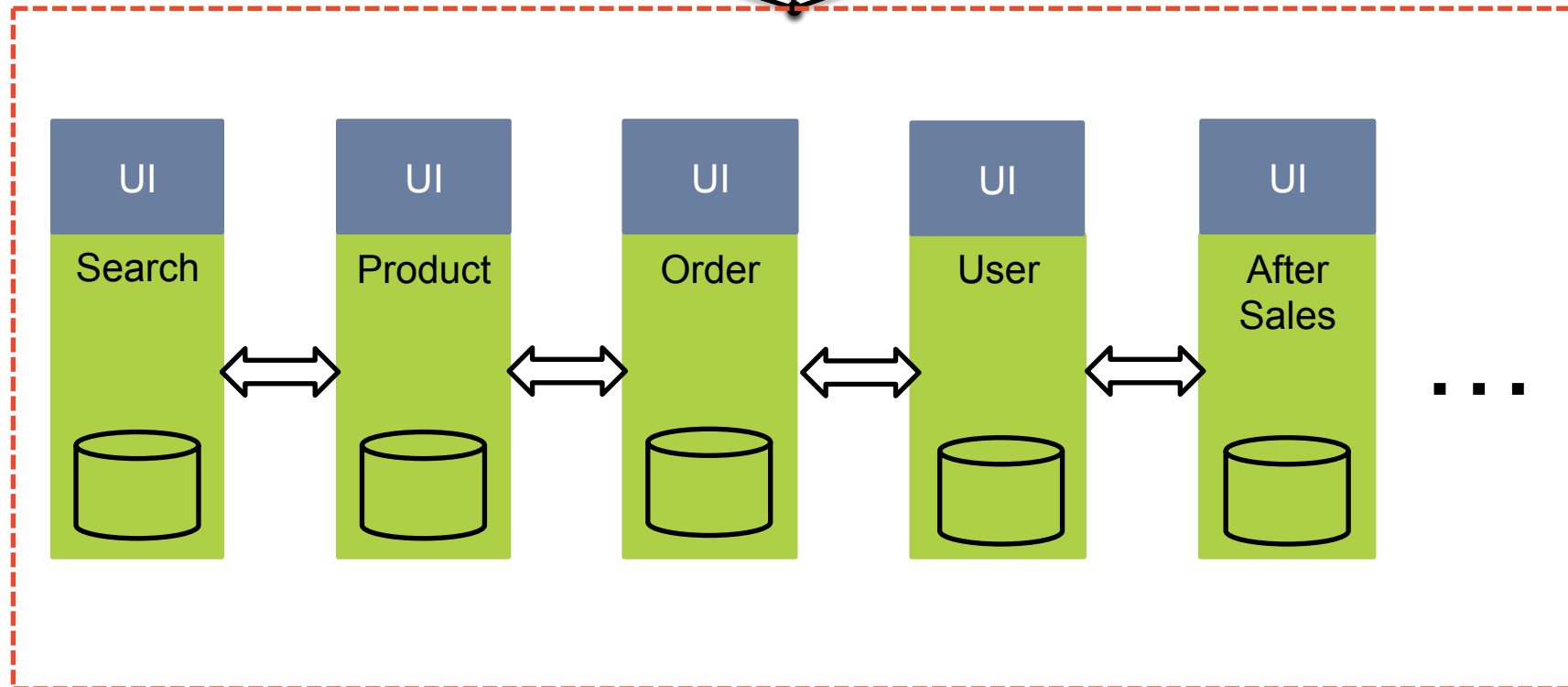
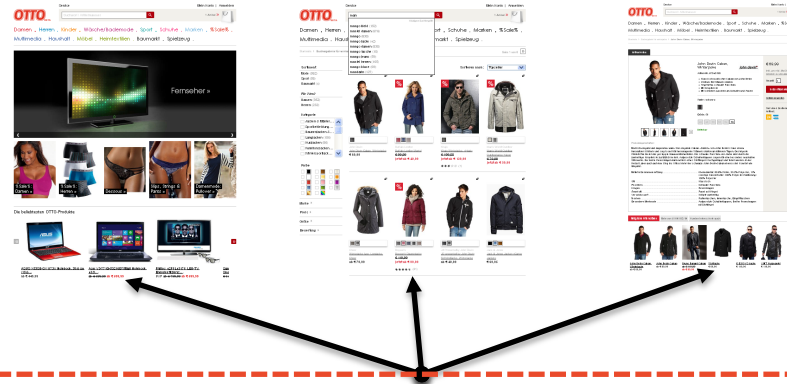
# The E-Commerce Business Architecture – Vertical and Horizontal aspects of the product Otto.de



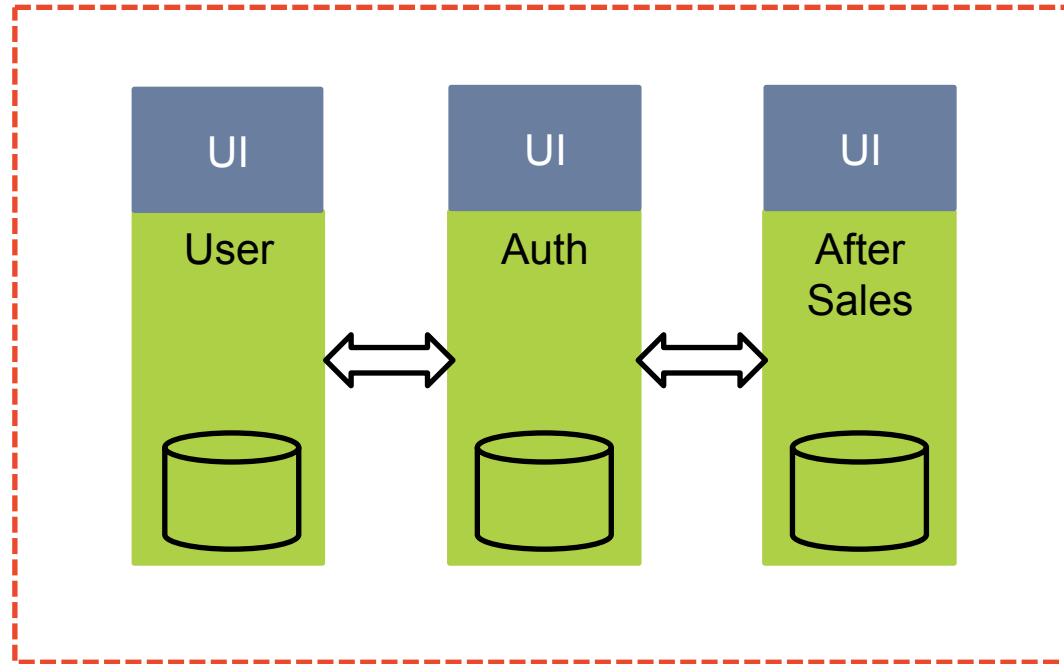
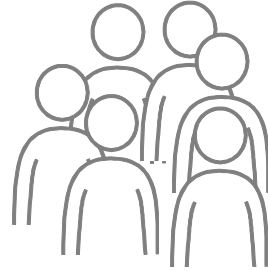
1 Website = 1 Product = 1 System = 1 Engineering Team ?



# System architecture is vertical



# Organizational aspects



1 Team → N Systems

1 System → 1 Team

# Architecture rules

## Macro-Architecture

RESTful Architecture

Shared Nothing

Vertical Design

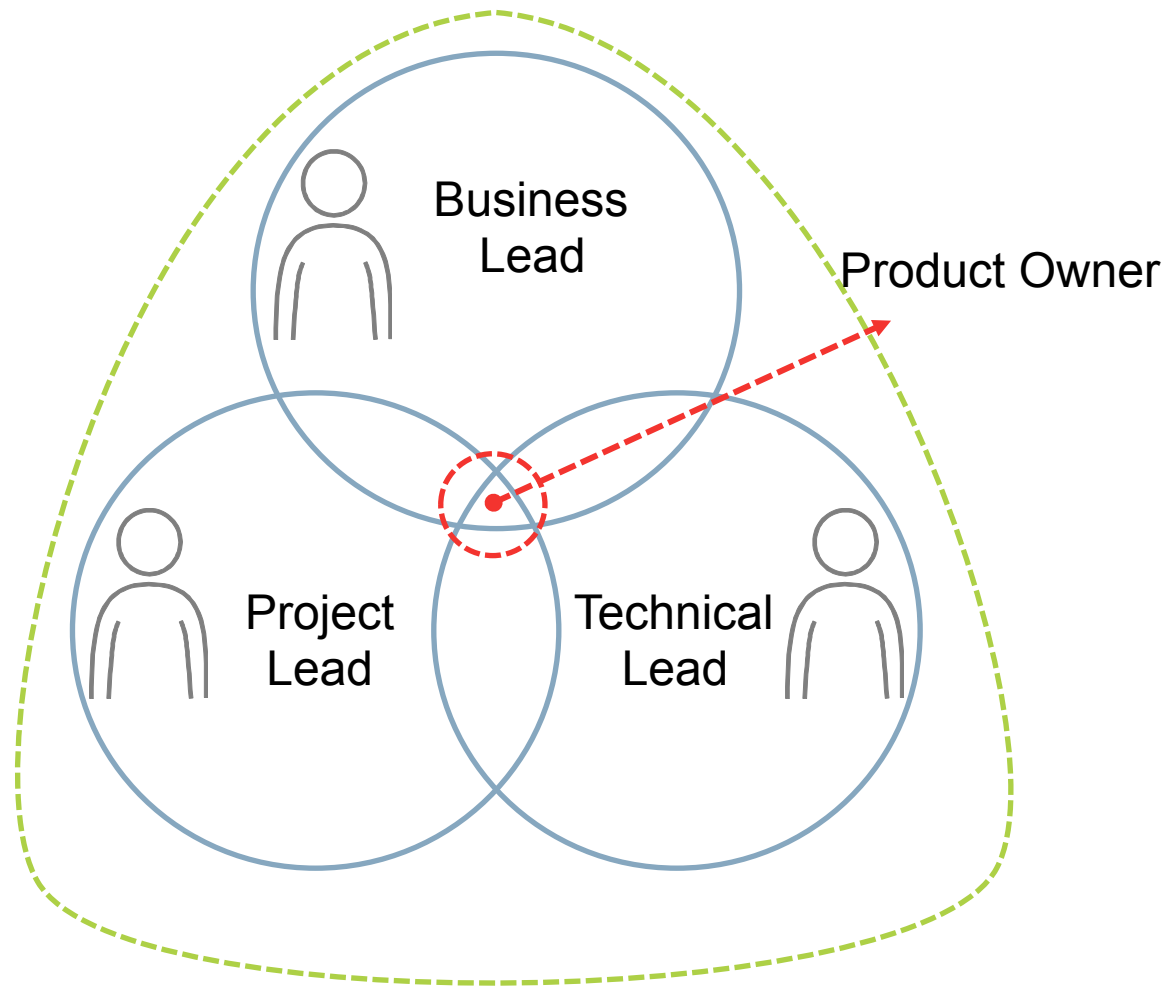
Data Governance

## Micro-Architecture

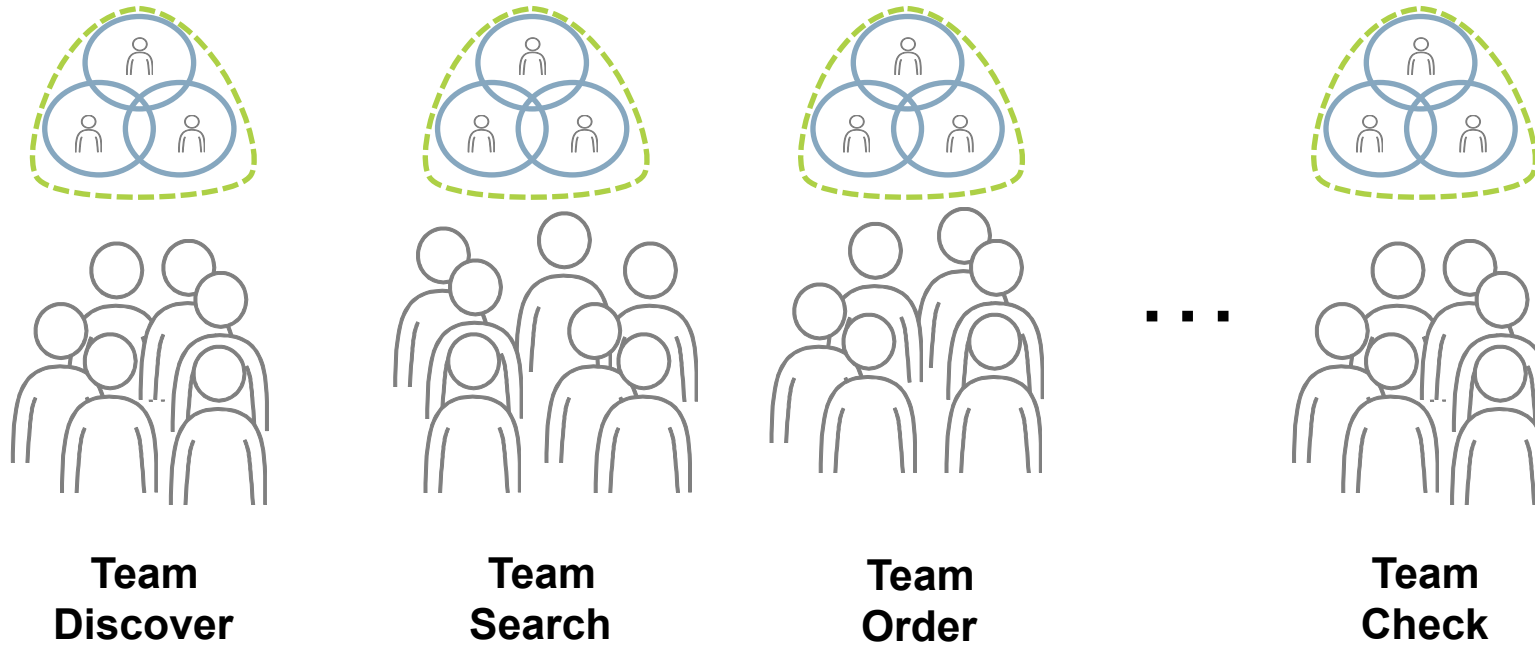
Buy when non core

Common Technologies

# The 3 Faces of Product Ownership



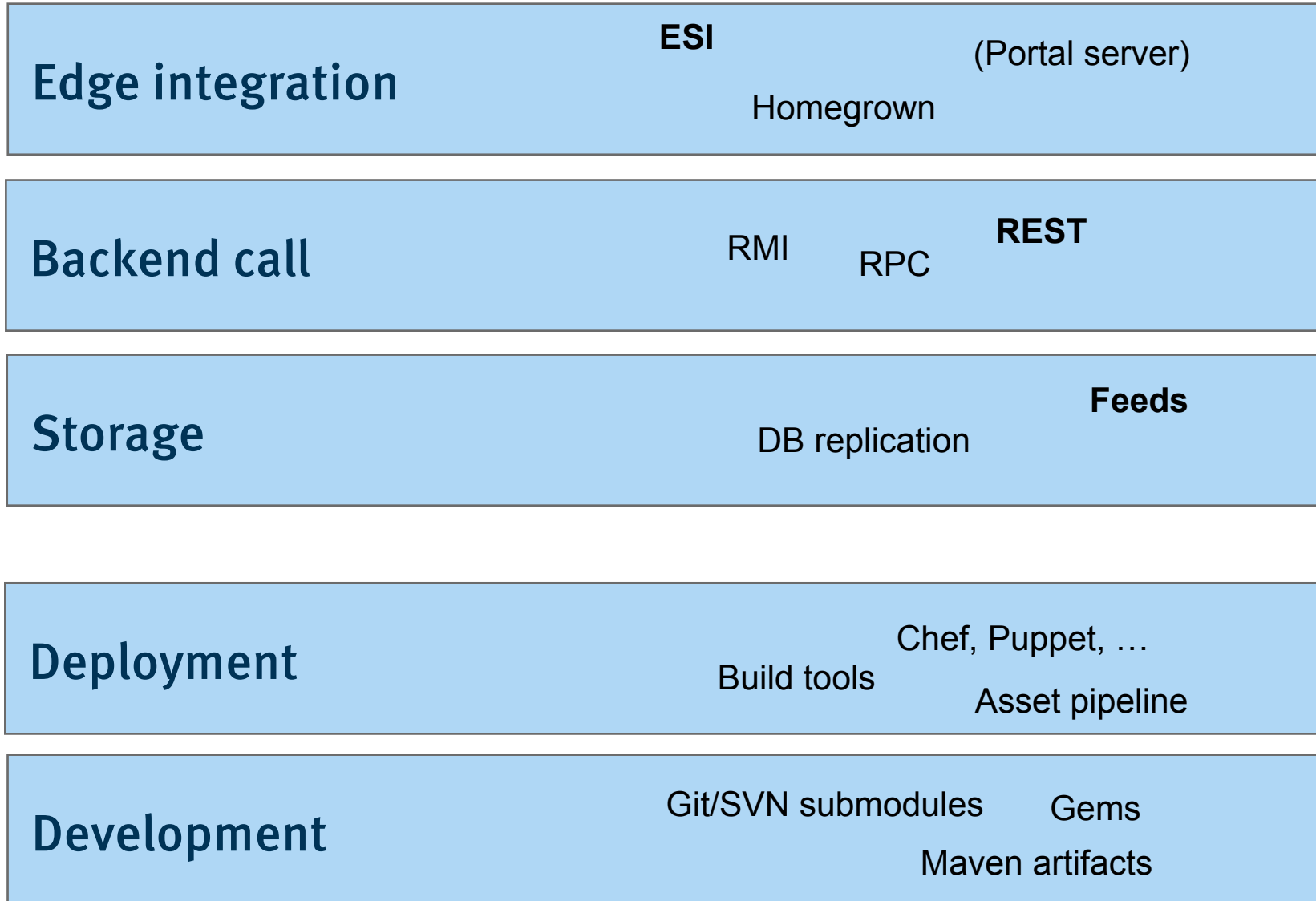
# Project start with distributed teams



But how to deal with frontend integration?

# **5. Frontend Integration**

# Server-side integration options



# Client-side integration options

**Client call**

SPA-style

**Replaced link**

Unobtrusive JS

oEmbed

ROCA-style

**Link**

Magical integration concept



# Otto.de – detail view


Service | Sitemap | **Oliver Wegner** (Sie sind nicht Oliver Wegner?) | Mein Konto | Mein Merkzettel (55) | Anmel

**OTTO**   1 Artikel

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> Siemens Bodenstaubsauger synchropower bag&bagless VS06G2545, beutellos, 2500 Watt

Artikel | Details | Kundenbewertungen (52)



**%**


Siemens  
Bodenstaubsauger  
synchropower  
bag&bagless VS06G2545,  
beutellos, 2500 Watt

**SIEMENS**

★★★★★ (52)

- Starker 2500 Watt Motor für besonders gründliche Reinigung
- DualFiltration: Saugt mit Staubcontainer oder Staubbeutel
- Praktisches Set mit Tierhaardüse und Hartbodendüse
- 10m Aktionsradius reduziert Steckdosenwechsel
- Ultra HEPA Hygienefilter. Für Allergiker geeignet [mehr Details...](#)

Farbe: **dunkel lila transparent**



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> Zahlpause ohne Aufpreis  
> Sicherer Kauf auf Rechnung  
> Bequeme Ratenzahlung  
> PaketShop-Lieferung möglich

[Artikel bewerten](#)

# Otto.de - Basket



Service | Sitemap **Oliver Wegner** (Sie sind nicht Oliver Wegner?) | Mein Konto | Mein Merkzettel (55) | Anmel

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> Online-Bestellschein

Artikel von OTTO	Anzahl	Gesamtpreis (€)	Löschen
 <p><b>Siemens Bodenstaubsauger synchropower bag&amp;bagless VS06G2545, beutellos, 2500 Watt</b> dunkel lila transluzent   <a href="#">ändern</a> (1 Stk. = € 99,99) <b>lieferbar in 2-3 Werktagen</b></p>	1 ▼	99,99	x
		<b>Zwischensumme</b>	99,99
		<u>Versandkosten</u>	5,95
		<b>Gesamtsumme</b>	<b>105,94</b>
alle Angaben in Euro, inkl. MwSt.			

< Weiter einkaufen

Zur Kasse >

# Management of JS and CSS from each team

Service **Peter Palme** (Sie sind nicht Peter Palme?): Mein Konto | Mein Merkzettel (0) | Anmelden

**OTTO** beta

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**€ 679,99**

Bauknecht Waschmaschine Super Eco 6413, A+++...  
Energieeffizienz: A+++  
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**ab € 24,99**

Umschlag-Bikini-Hose "Country", Venice Beach  
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Triangel-Bikini, JETTE  
**ab € 54,00**

Asus F75VC-TY08BH Notebook, 17,3 Zoll (433...  
~~ab € 549,00~~ **ab € 440,00**

## System View

Order

0 Artikel

User

**Peter Palme** (Sie sind nicht Peter Palme?): Mein Konto | Mein Merkzettel (0) | Anmelden

Personalization

Empfehlungen für Sie

Samsung Galaxy S4 Smartphone, Touchscreen...  
**€ 679,99**

Bauknecht Waschmaschine Super Eco 6413, A+++...  
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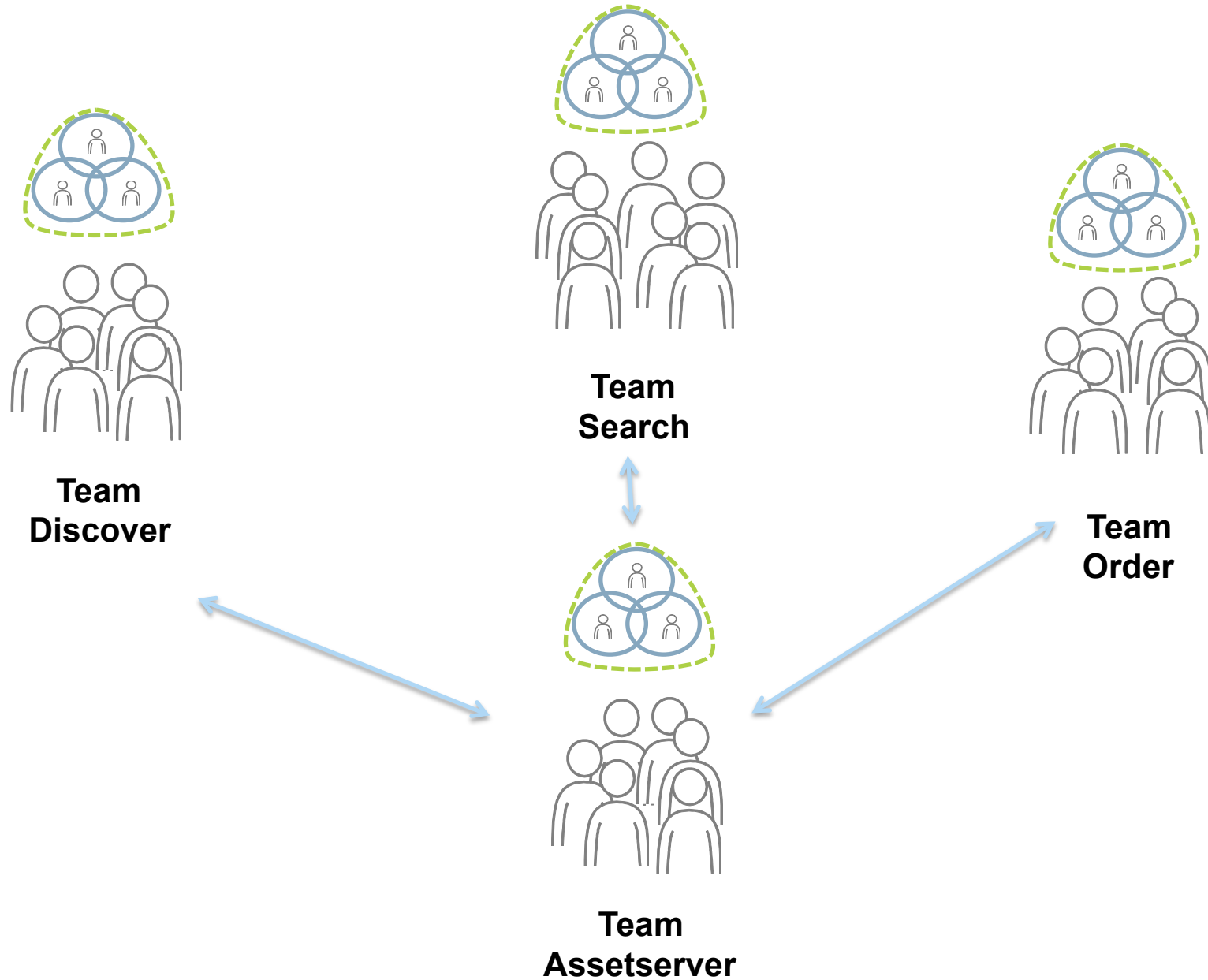
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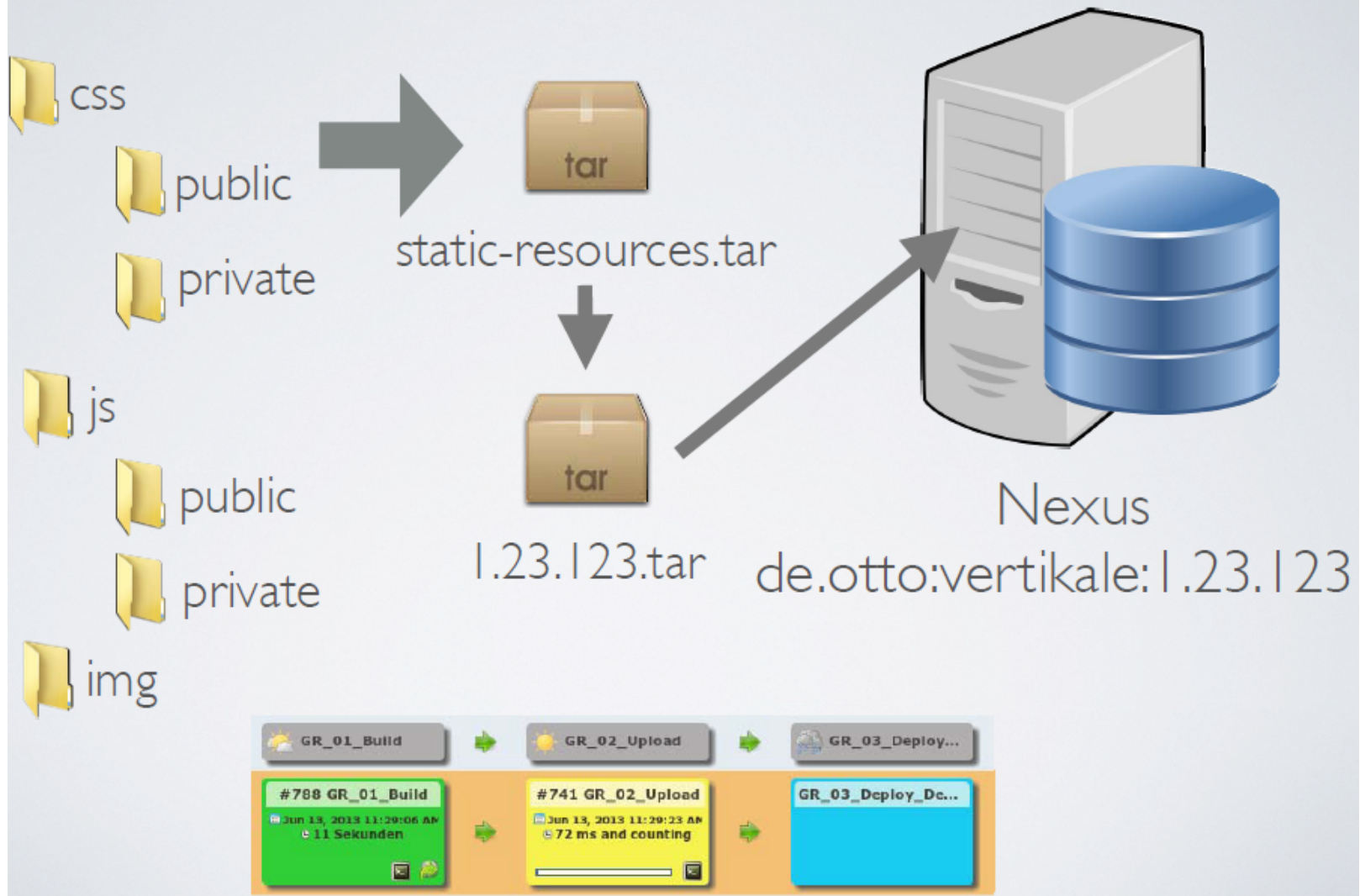
Triangel-Bikini, JETTE  
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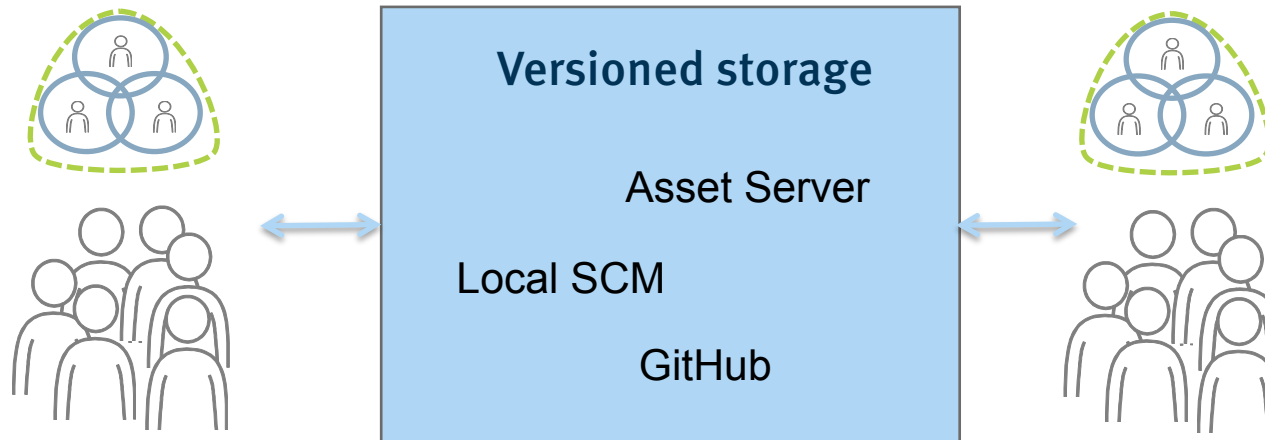
# Separate teams for horizontal aspects



# DEPLOYMENT



# Decoupling



## **6. A/B-Testing**

# AB-Testing in a distributed environment – What is an AB-Test

Service | Sitemap | Oliver Wegner (Sie sind nicht Oliver Wegner?) | Mein Konto | Mein Merkzettel (00) | Anmelden

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Startseite > Herrenmode > Marken > Jack & Jones (1.978)

**Jack & Jones**

Accessoires (88)  
Anzüge (41)  
Hemden (266)  
Hosen (70)  
Jacken (116)  
Jeans (167)  
Krawatten (9)  
Mantel (19)  
Polo Shirts (66)  
Pullover (142)  
Sakkos (46)  
Schuhe (104)  
Shirts (509)  
Shorts & Bermudas (87)  
Sonnenbrillen (6)  
Sportbekleidung (101)  
Strickjacken (43)  
Sweatshirts & -jacken (209)  
Taschen & Reisegepäck (8)  
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**JACK & JONES**  
Zu Pullover & Strick >

**OTTO entdecken**

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Damenbademode: Strandbekleidung >  
Damenmode: Shirts >  
Damenbademode: Bikinis >  
TV & Audio: Fernseher >

**OTTO entdecken**

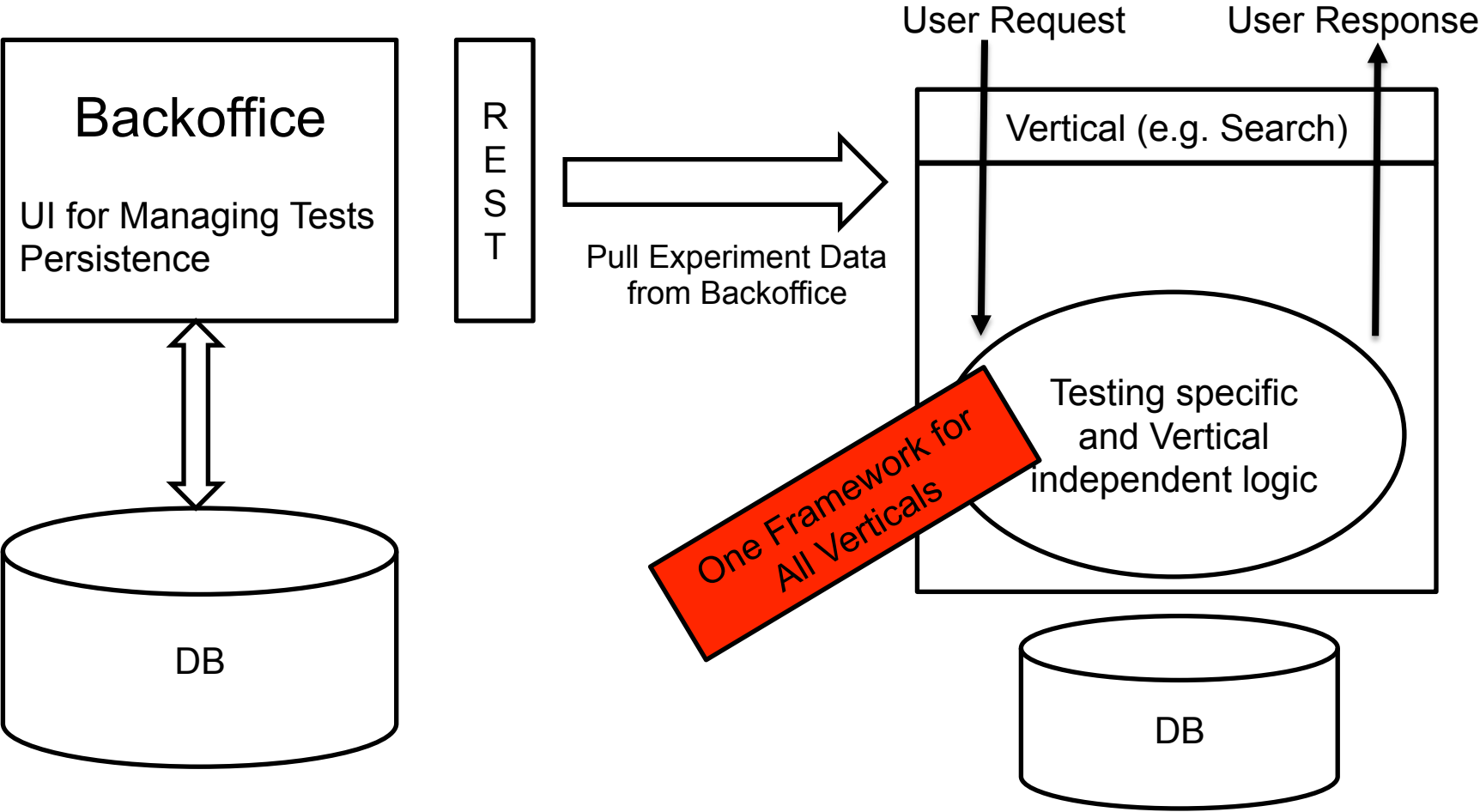
Jeans >  
Jacken >  
Shorts & Bermudas >  
Sportbekleidung >

1%

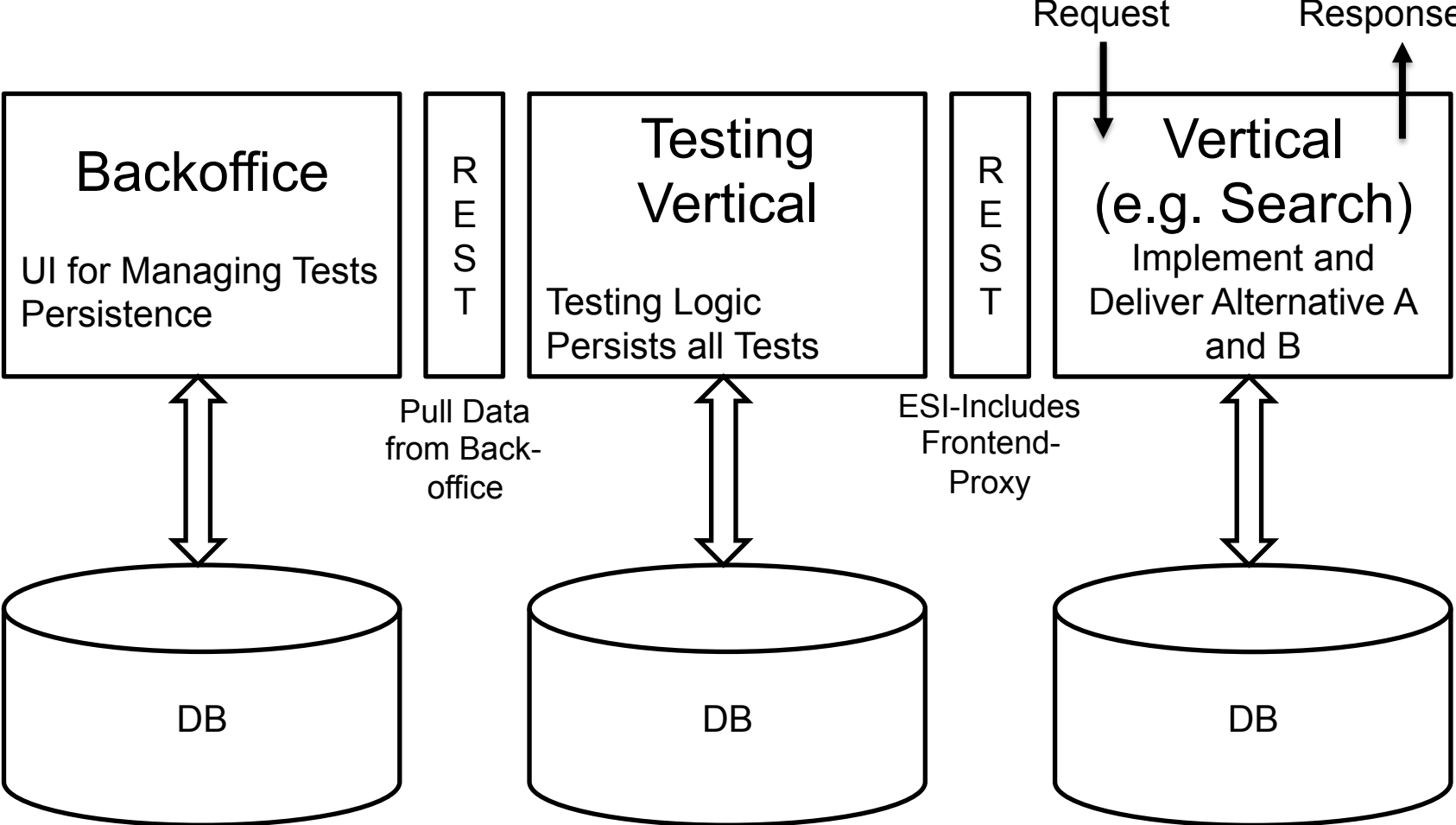
99%



# Solution with a centralized framework every team has to include in their repository



# Solution with a dedicated Vertical and loose coupling



# **7. Conclusion**

# Results of the project LHOTSE

2 years in total

Scaled to >100 people

Finished in budget

Finished in quality

Finished before schedule: October, 24th → 4 months earlier

Minimum Viable Product

# Lessons learned in applying a system-of-systems approach

Independent,  
autonomous systems for  
maximum decoupling

Prefer “pull” to  
“push” sharing

Strict macro  
architecture rules

Minimize cross-  
functional concerns

Address cross-  
functional concerns

Minimize need  
for coordination

Be skeptical of  
“easy” solutions

Teams with  
their own  
decisions

@olliwegner  
@stilkov



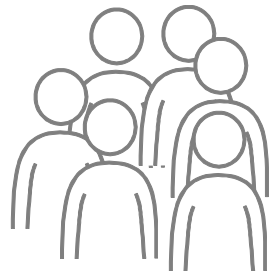
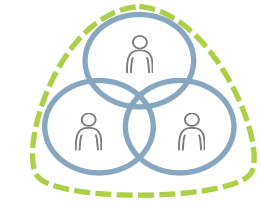
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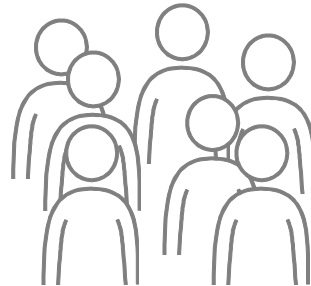
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**BACKUP**

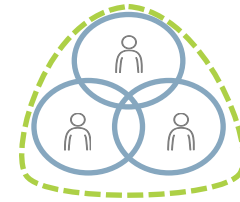
# Platform Engineering delivers the basic infrastructure for all verticals



**Team Discover**



**Team Search**



**Team Order**

...



**Team Platform Engineering**

Monitoring

Logging

Deployment

Provisioning

Network

Infrastructure Components



# Microservices?

## Microservices Approach

- Very small
- 100s
- Does one thing only
- Separate client (?)

## Vertical Systems Approach

- Medium-sized
- 10s
- Small # of related things
- Includes UI