{Nano|Micro|Mini}-Services?
Modularization for Sustainable Systems

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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

“-ility” problems abound

Scalability has reached its limit

Replacement would be way too expensive

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

«Insert Obligatory Conway Reference Here»

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

Organization ← Architecture

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

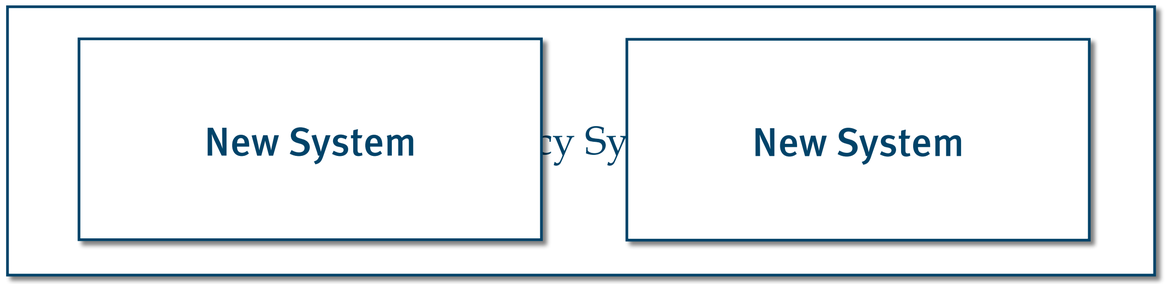
Reversal 2

Organization ← Architecture

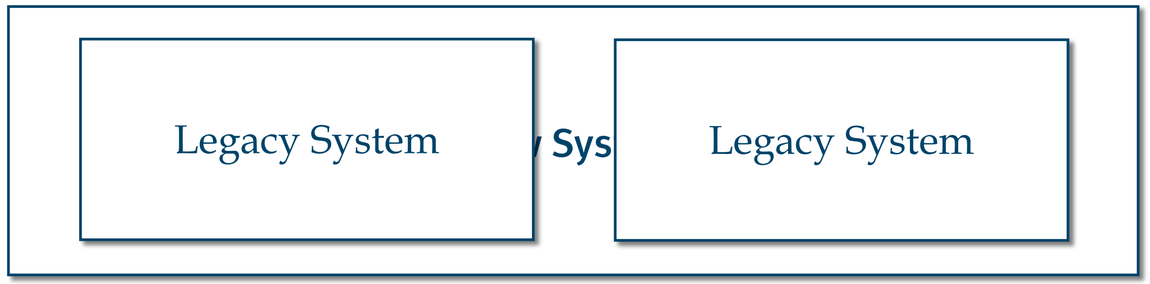
Choosing a particular architecture can be a means of optimizing for a desired organizational structure.

2. System boundaries

Modularization



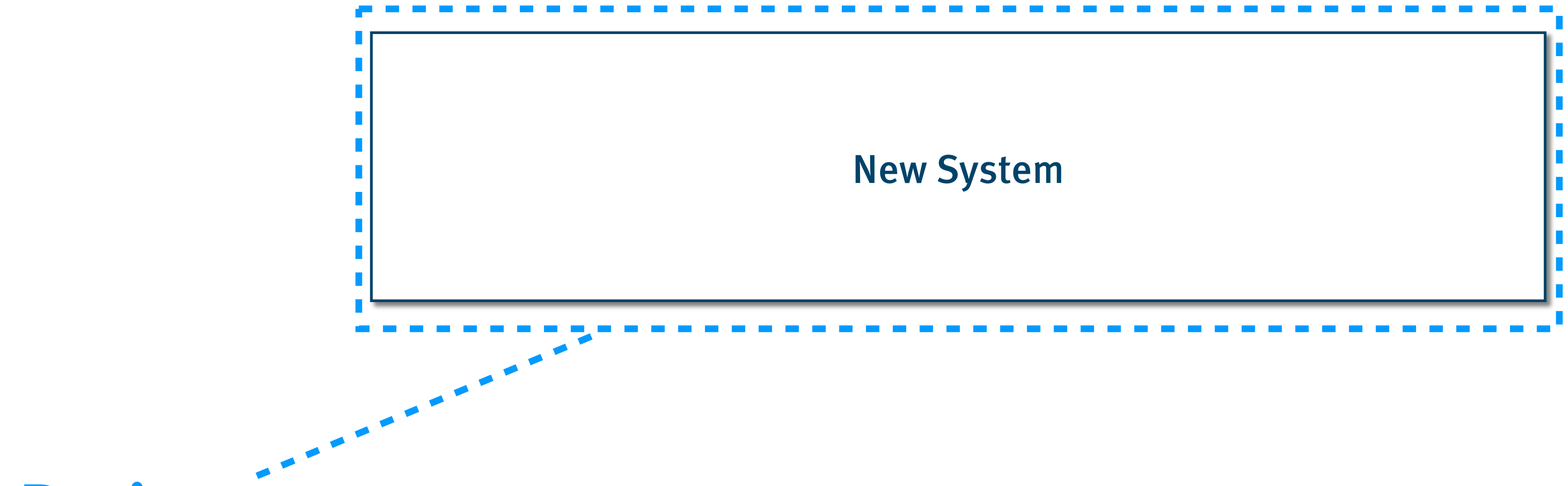
Consolidation



Modernization

Legacy System

Greenfield



1 Project = 1 System?

System Characteristics

Separate (redundant) persistence

Internal, separate logic

Domain models & implementation strategies

Separate UI

Separate development & evolution

Limited interaction with other systems

Autonomous deployment and operations

App characteristics

Separate, runnable process

Accessible via standard ports & protocols

Shared-nothing model

Horizontal scaling

Fast startup & recovery

http://12factor.net

The Twelve-Factor App

I. Codebase
One codebase tracked in revision control, many deploys

II. Dependencies
Explicitly declare and isolate dependencies

III. Config
Store config in the environment

IV. Backing Services
Treat backing services as attached resources

V. Build, release, run
Strictly separate build and run stages

VI. Processes
Execute the app as one or more stateless processes

VII. Port binding
Export services via port binding

VIII. Concurrency
Scale out via the process model

IX. Disposability
Maximize robustness with fast startup and graceful shutdown

X. Dev/prod parity
Keep development, staging, and production as similar as possible

XI. Logs
Treat logs as event streams

XII. Admin processes
Run admin/management tasks as one-off processes

Microservice Characteristics

small

each running in its own process

lightweight communicating mechanisms (often HTTP)

built around business capabilities

independently deployable

mininum of centralized management

may be written in different programming languages

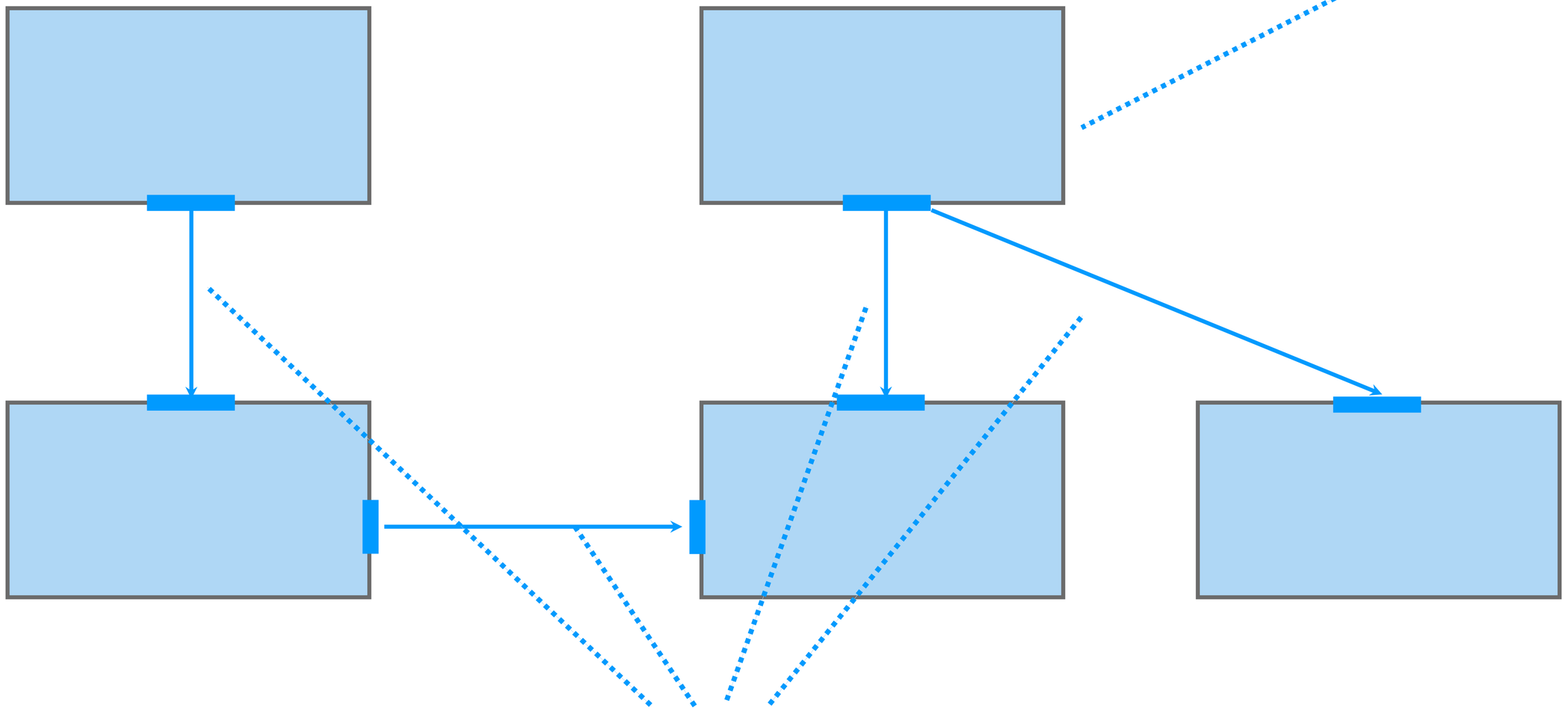
may use different data storage technologies

http://martinfowler.com/articles/microservices.html

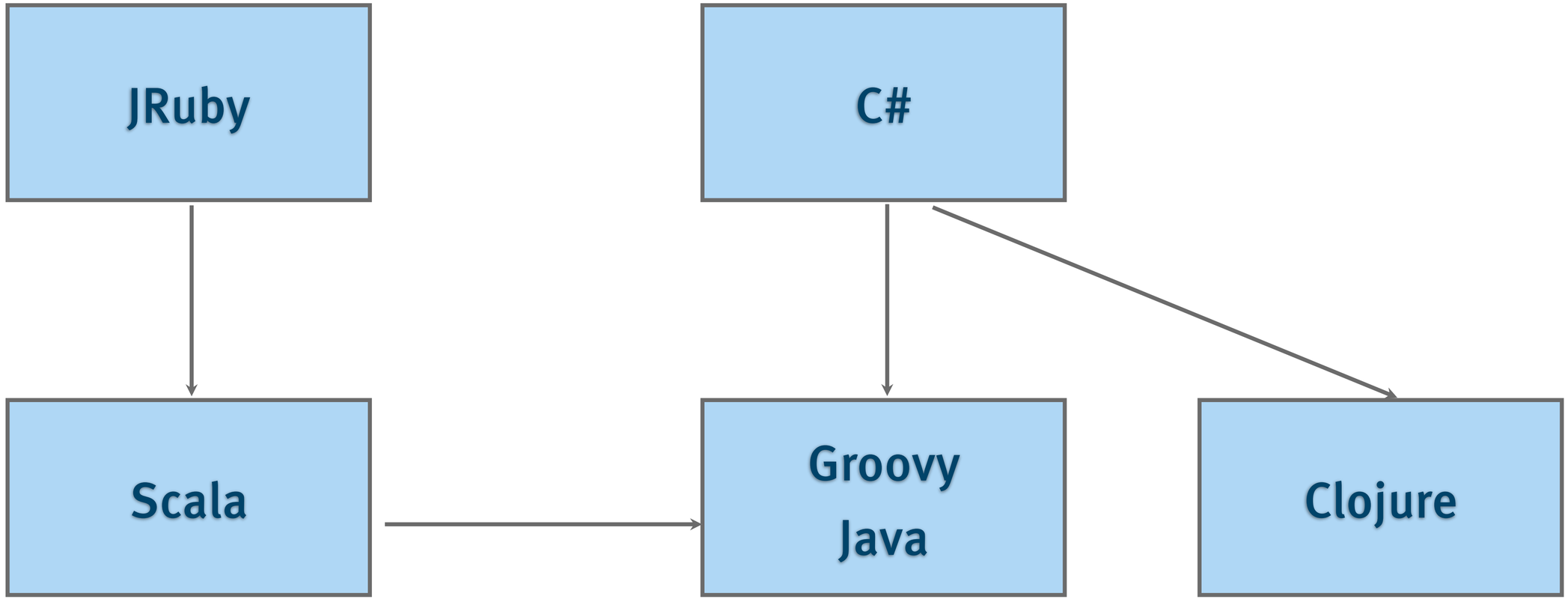
“Sizing things” is one of the hardest architectural tasks

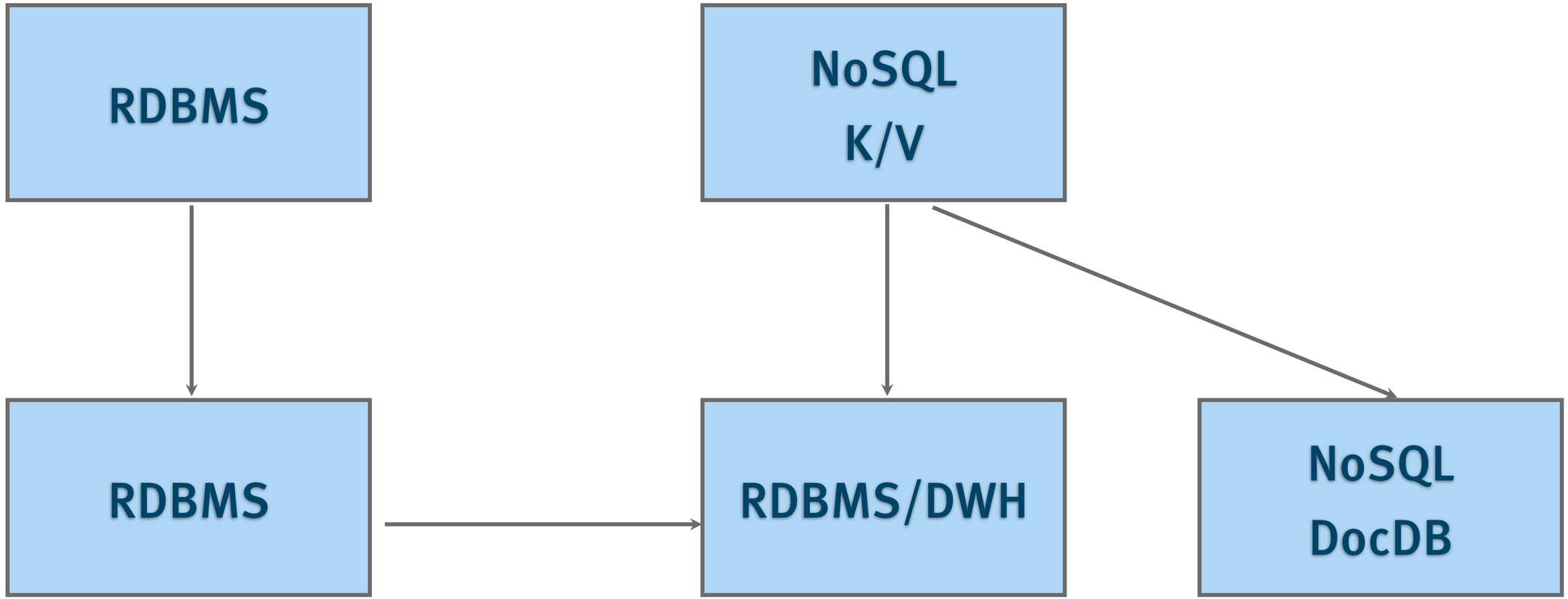
3. Cutting things up ...

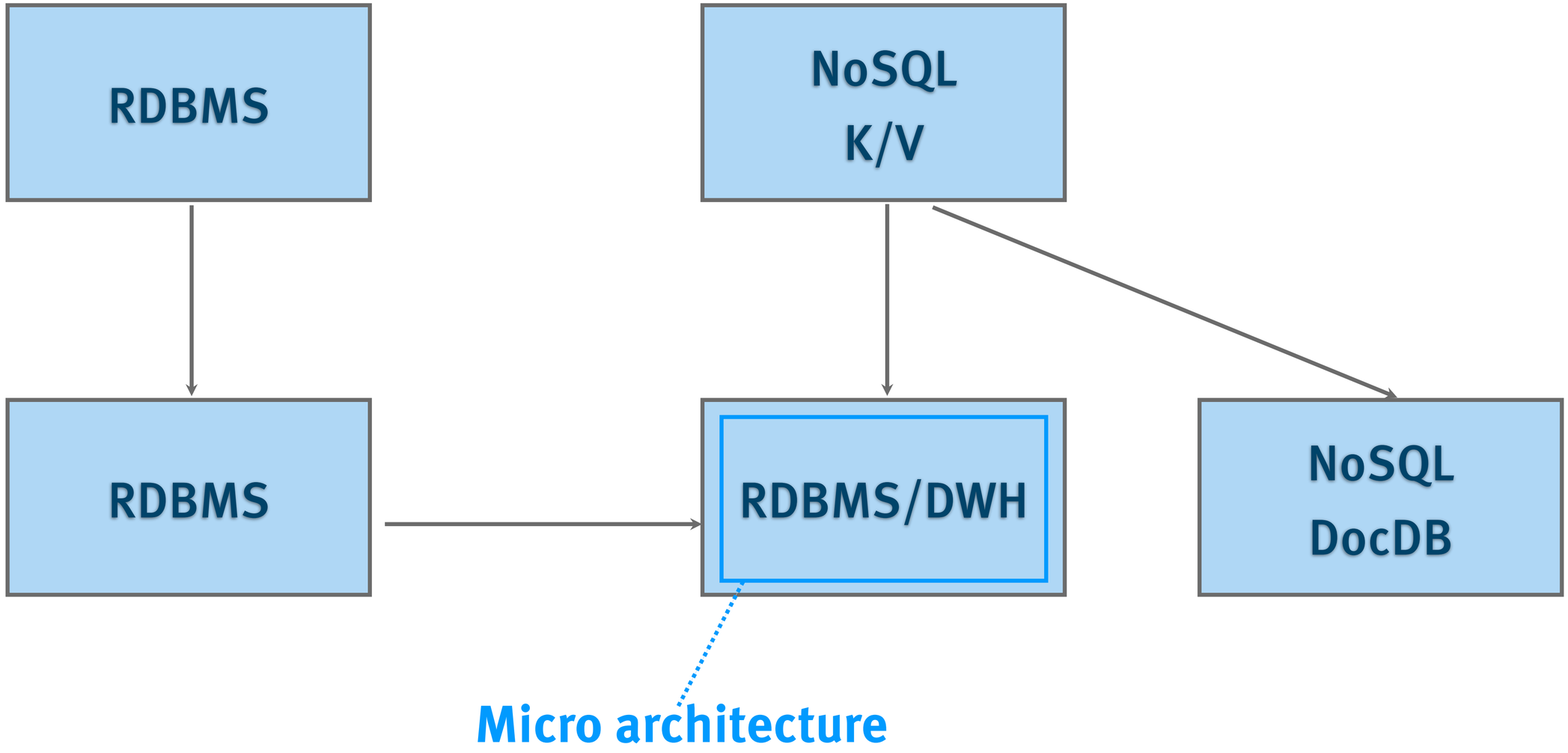
Domain architecture



Macro (technical) architecture


JRuby
C#
Scala
Groovy
Java
Clojure


RDBMS
RDBMS
NoSQL
K/V
RDBMS/DWH
NoSQL
DocDB


RDBMS
NoSQL
K/V
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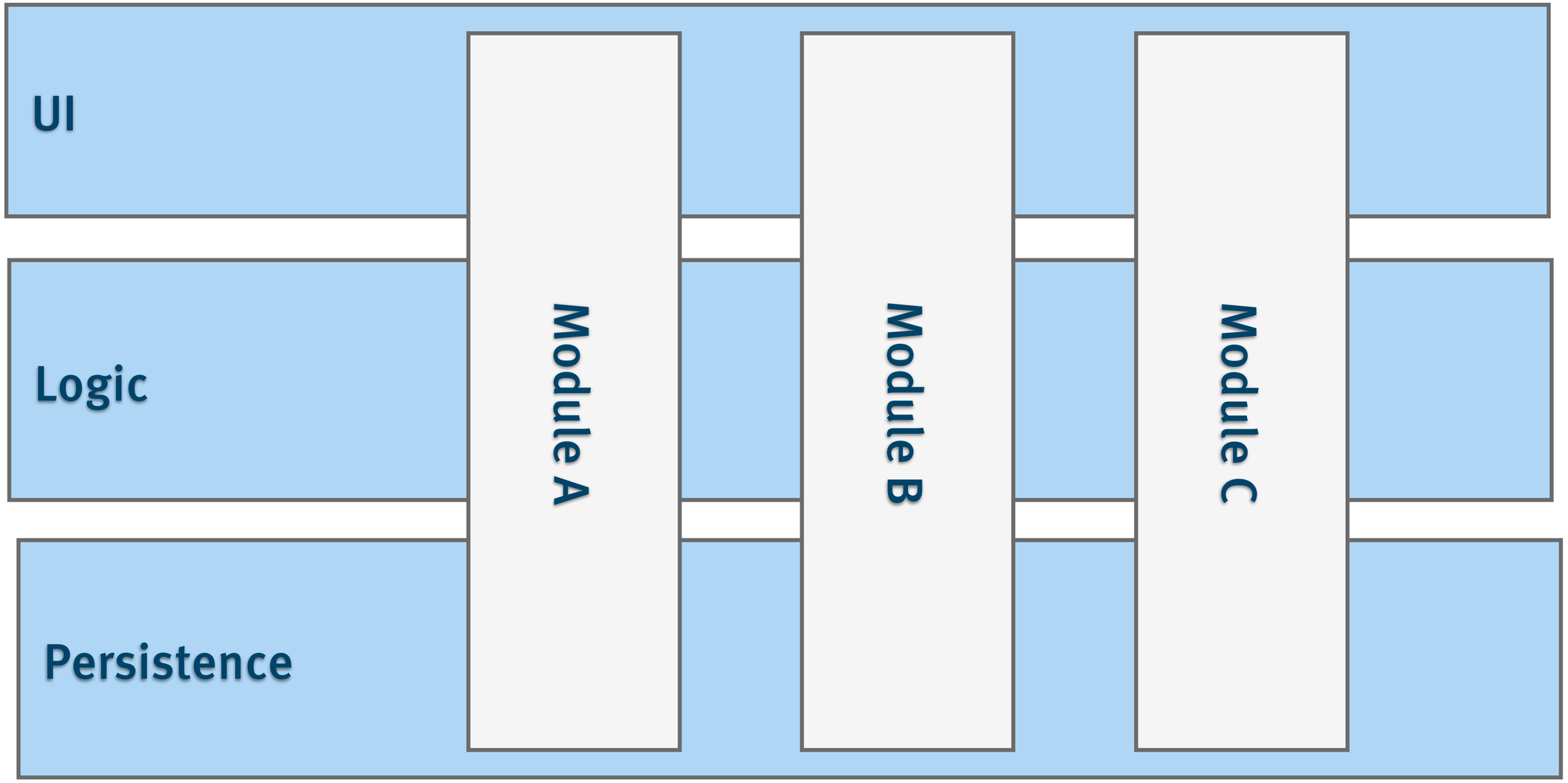
NoSQL
DocDB
Micro architecture


UI
Logic
Persistence
Module A
Module B
Module C

UI

Logic

Persistence

System A

UI

Logic

Persistence

System B

UI

Logic

Persistence

System C

Afraid of chaos?

Necessary Rules & Guidelines

Cross-system

Responsibilities

UI integration

Communication protocols

Data formats

Redundant data

BI interfaces

Logging, Monitoring

System-internal

Programming languages

Development tools

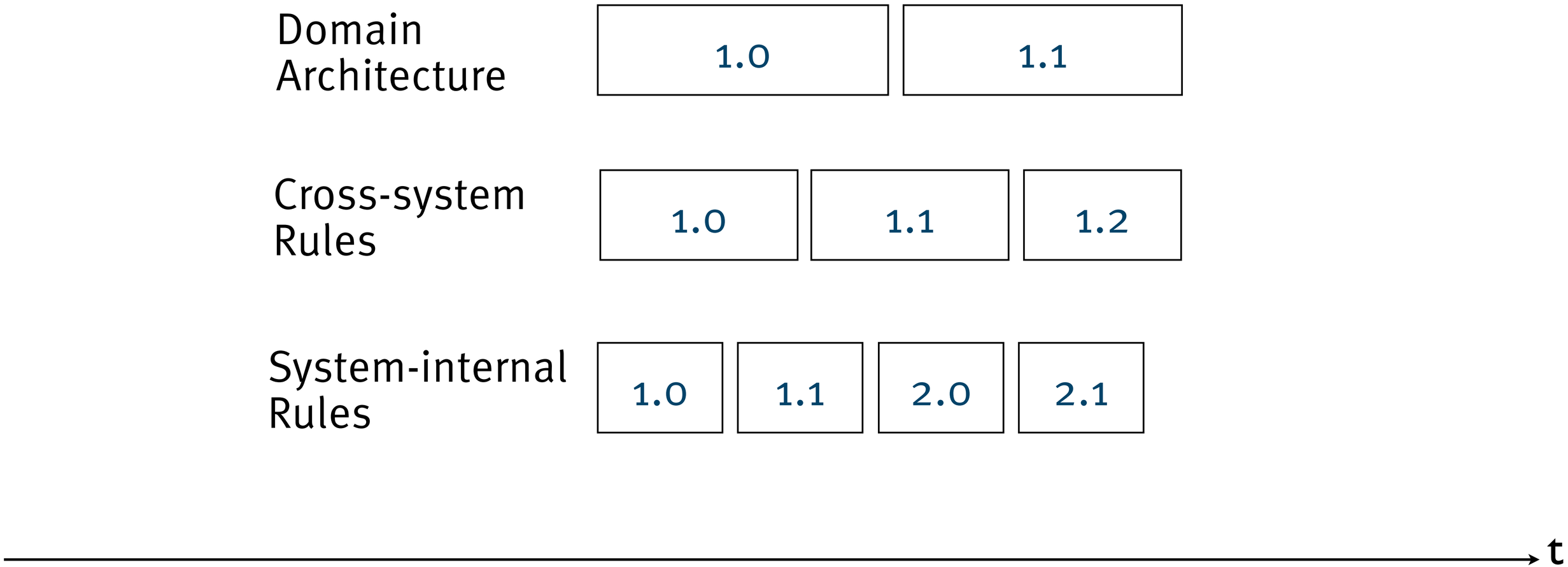
Frameworks

Process/Workflow control

Persistence

Design patterns

Coding guidelines


Domain Architecture
1.0
1.1
Cross-system Rules
1.0
1.1
1.2
System-internal Rules
1.0
1.1
2.0
2.1
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Initial goals

Simplicity

Speed

Easy development

Maximum productivity

Long-term goals

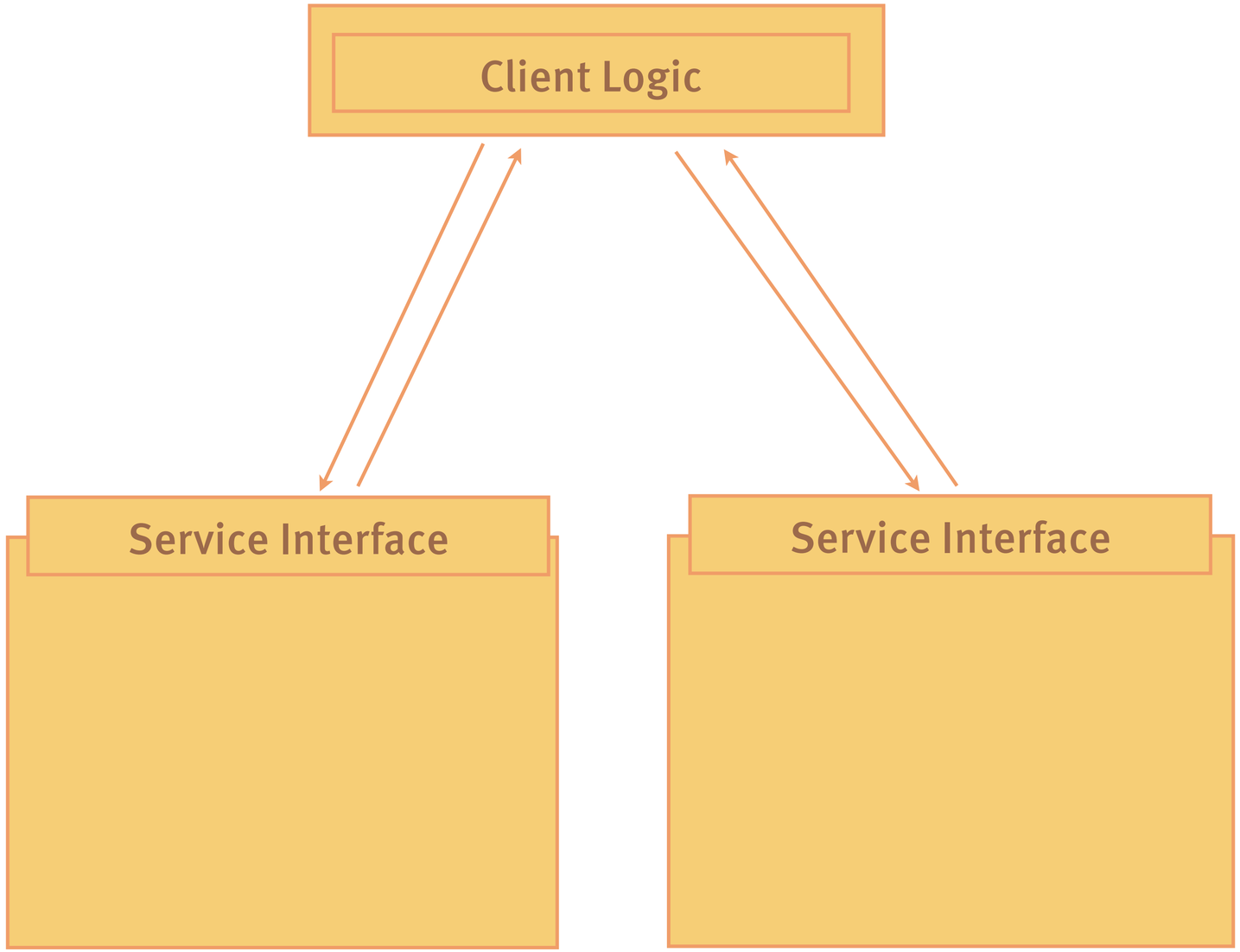
Stability

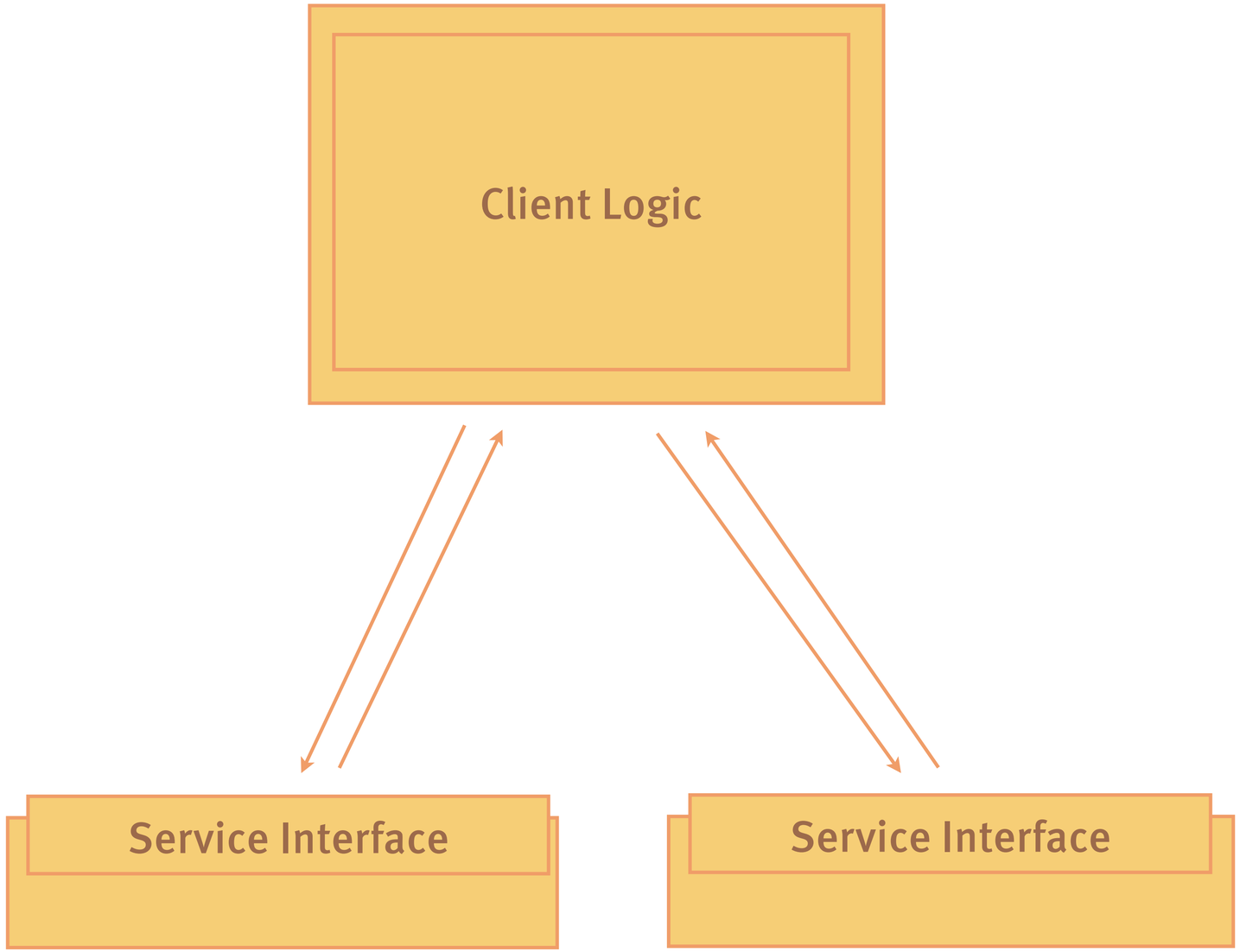
Scalability

Maintainability

Decoupling

4. … putting pieces together


Client Logic
Service Interface
Service Interface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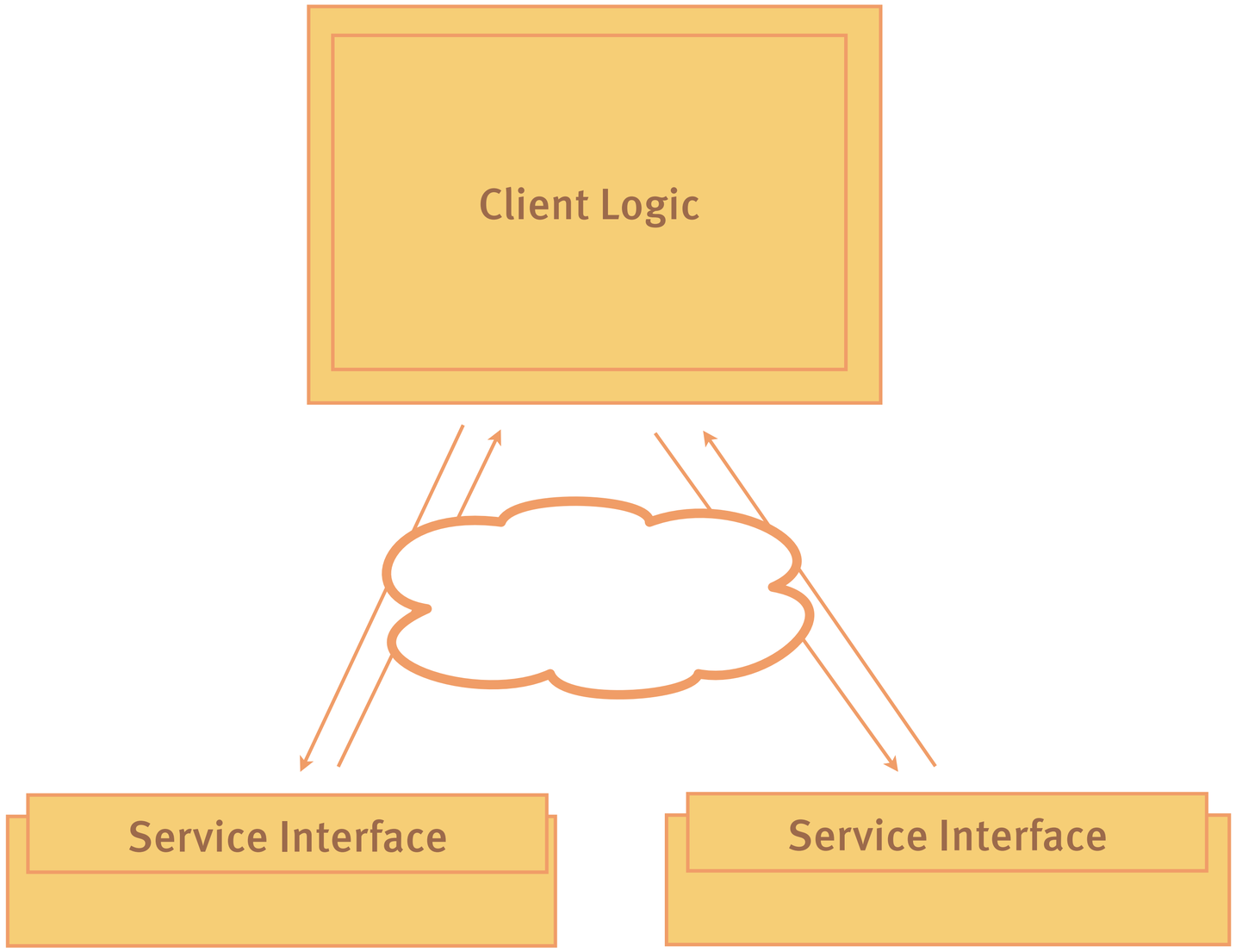
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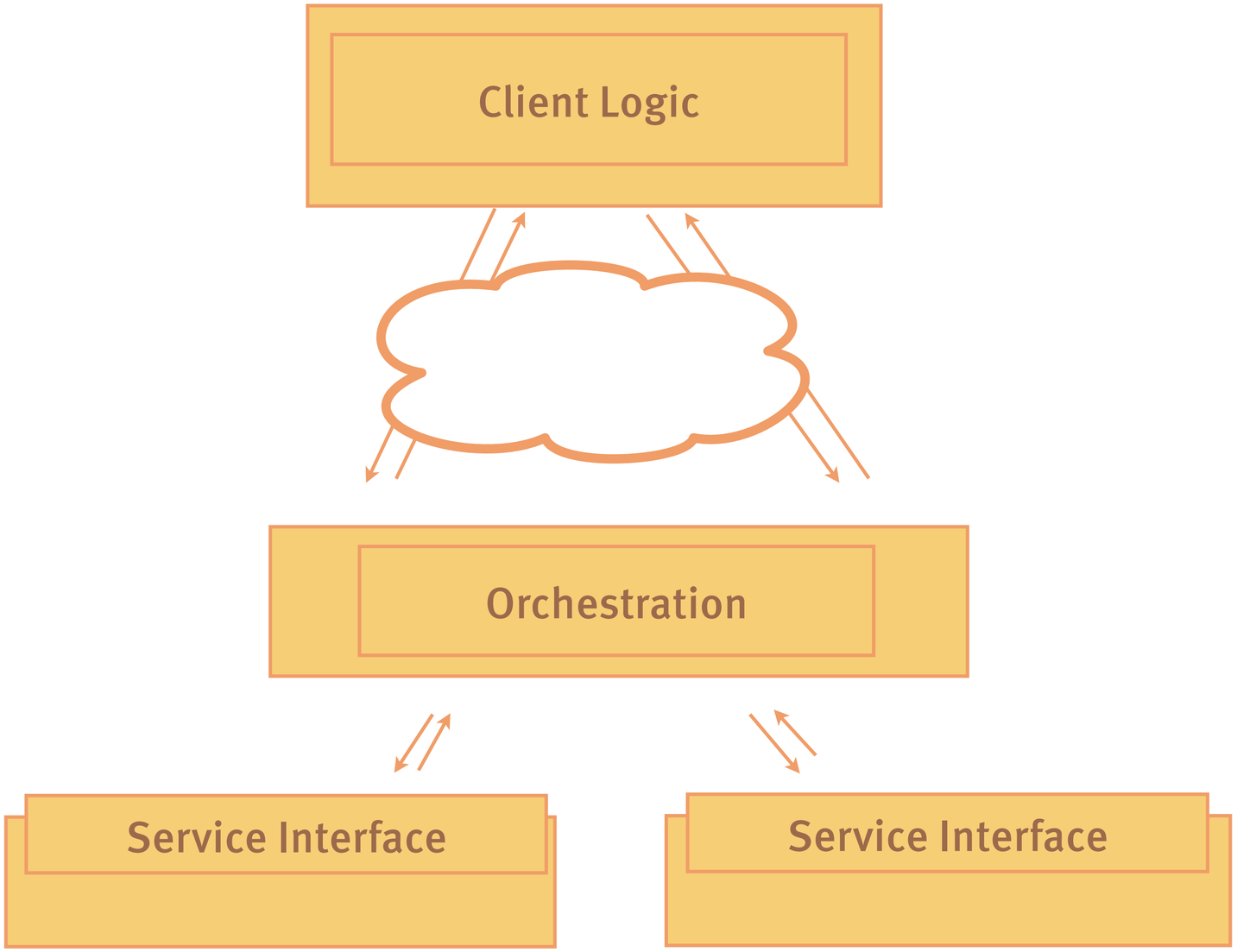
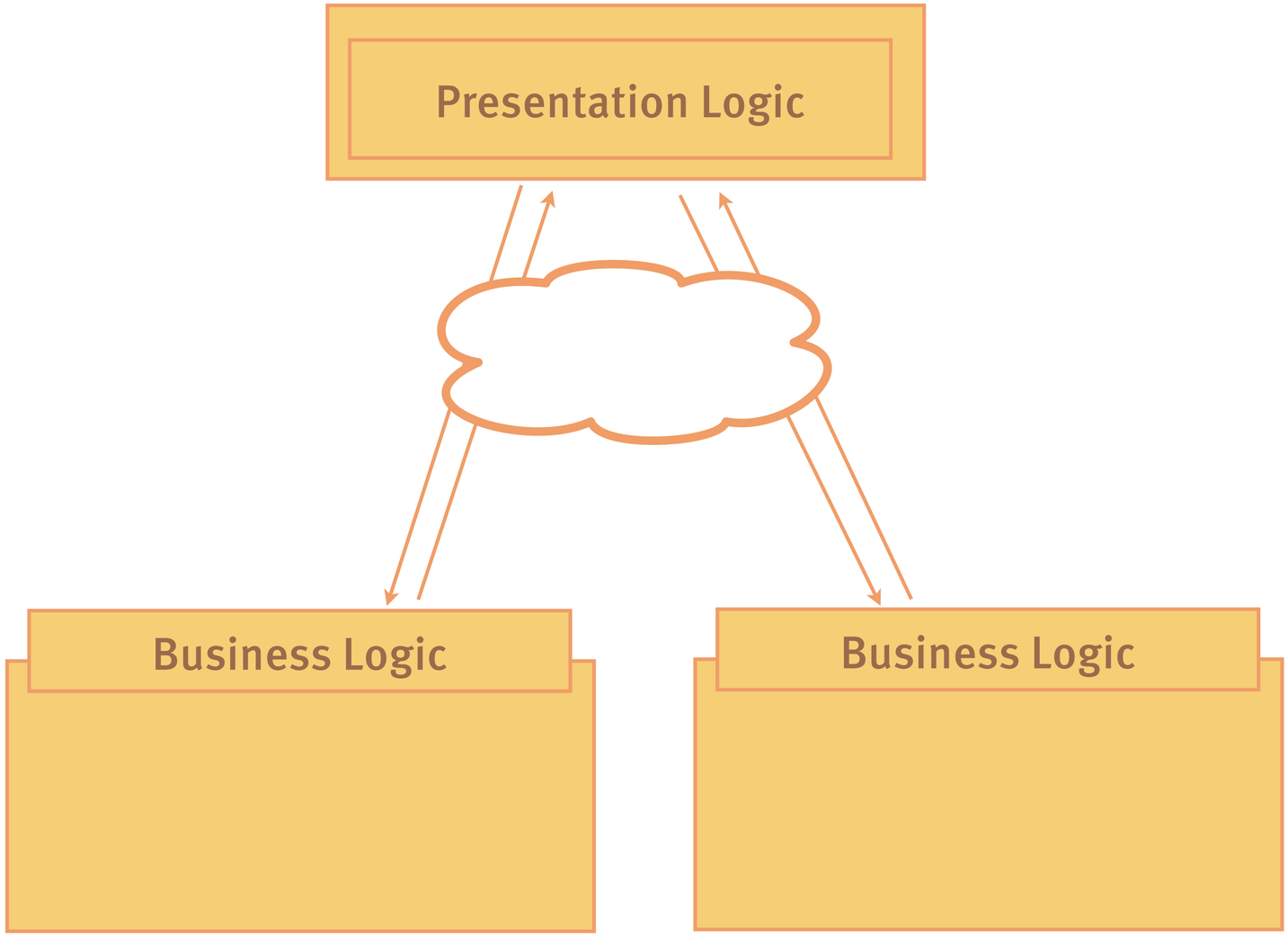
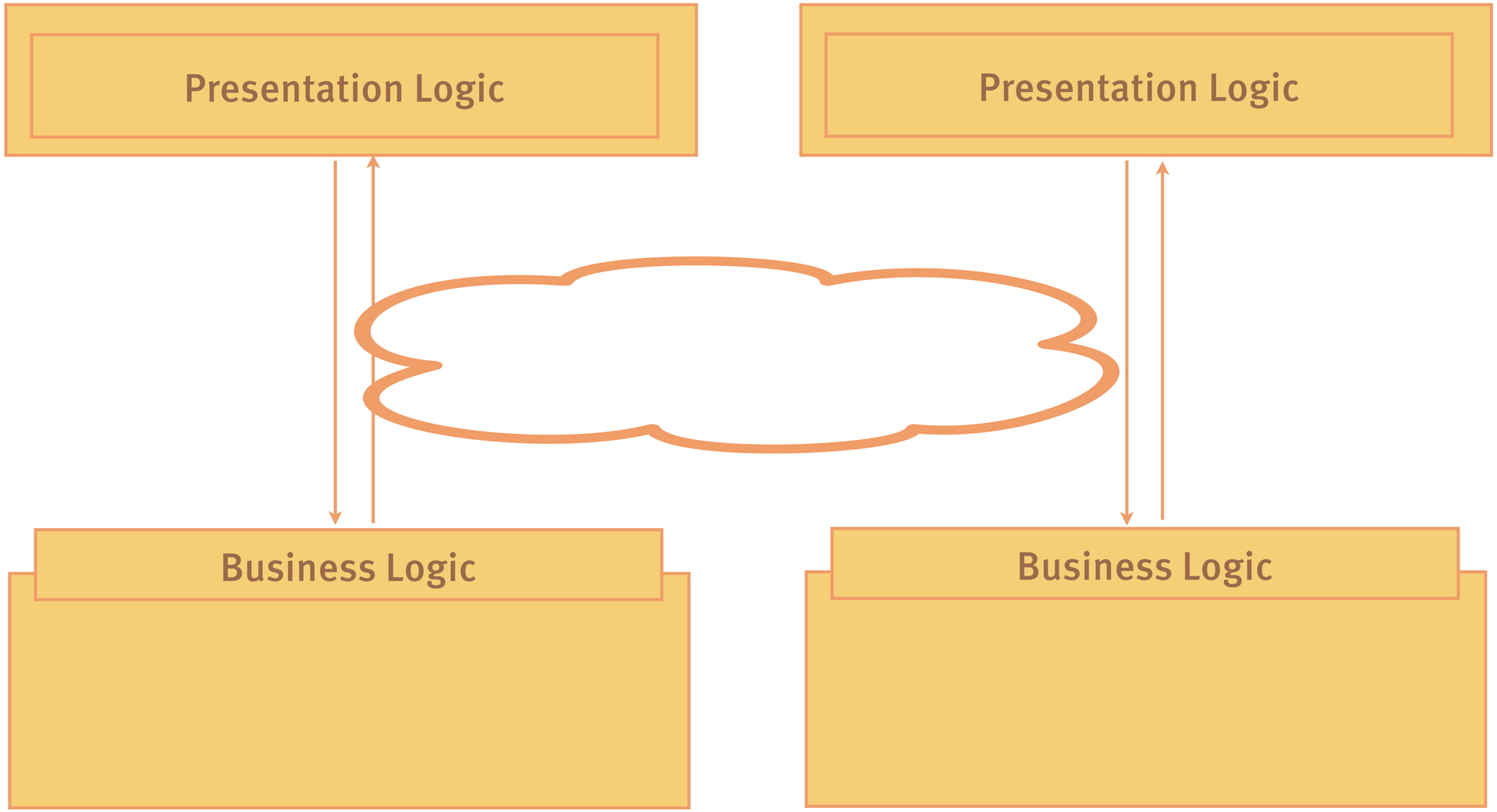
Service Interface
Service Interface


Client Logic
Orchestration
Service Interface
Service Interface


Presentation Logic
Business Logic
Business Logic


Presentation Logic
Presentation Logic
Business Logic
Business Logic

Self-Contained System (SCS)

SCS Characteristics

Autonomous web application

Owned by one team

No sync remote calls

Service API optional

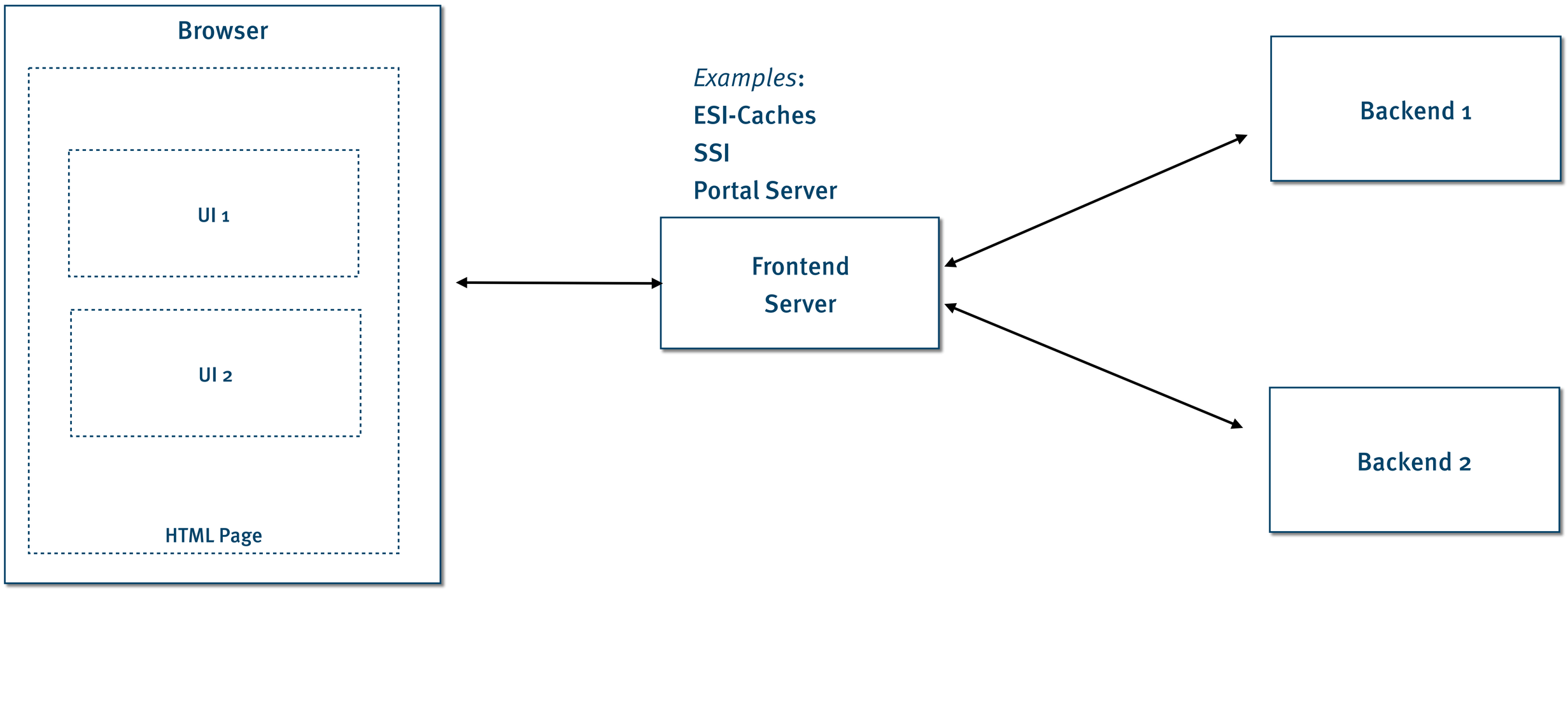
Includes data and logic

No shared UI

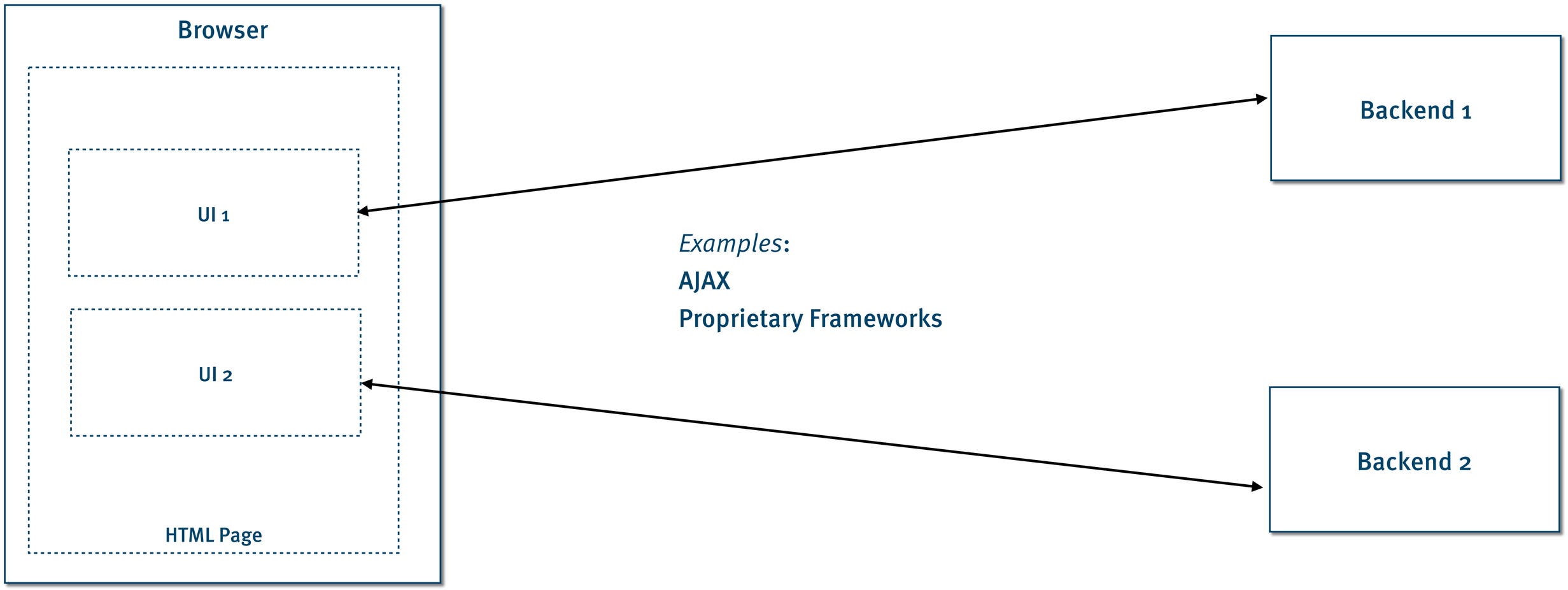
No or pull-based code sharing only

Web-native front-end integration

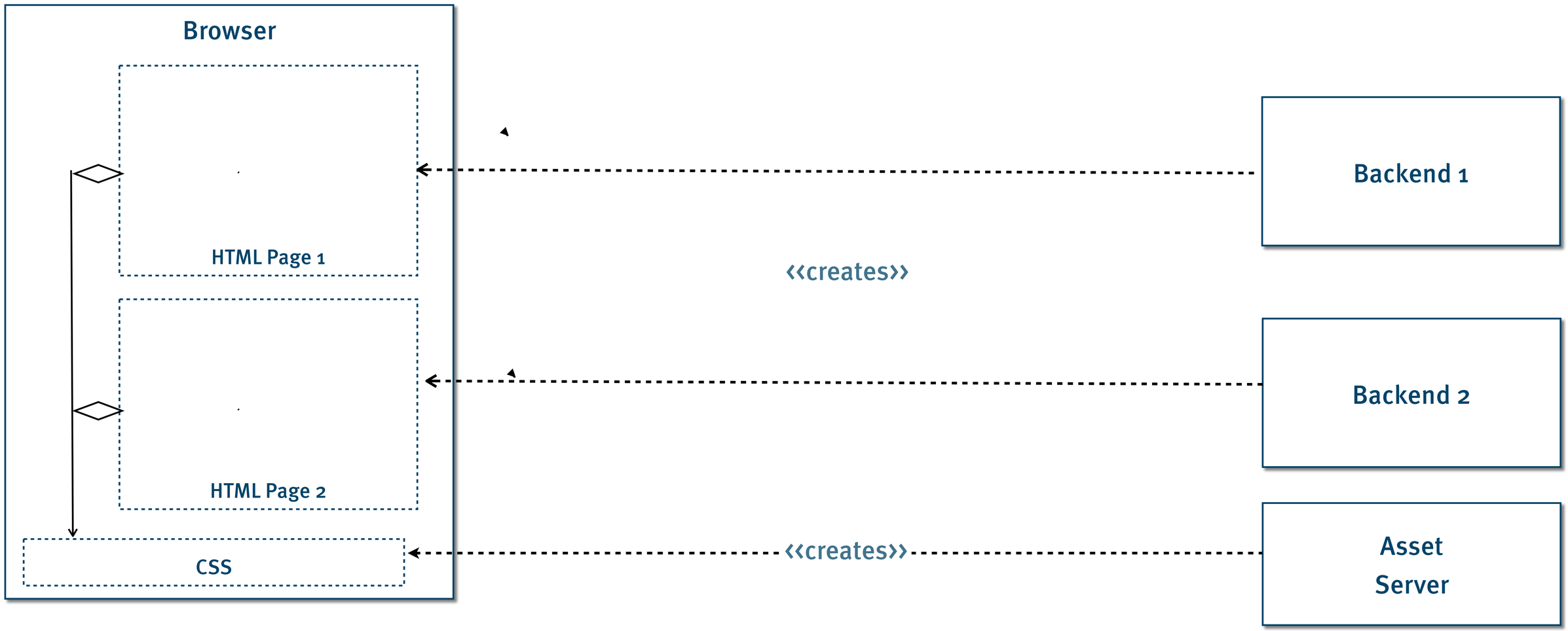
Server-side integration



Client-side integration



Links


Browser
HTML Page 1
HTML Page 2
CSS
Backend 1
Backend 2
Asset
Server
«creates»
«creates»

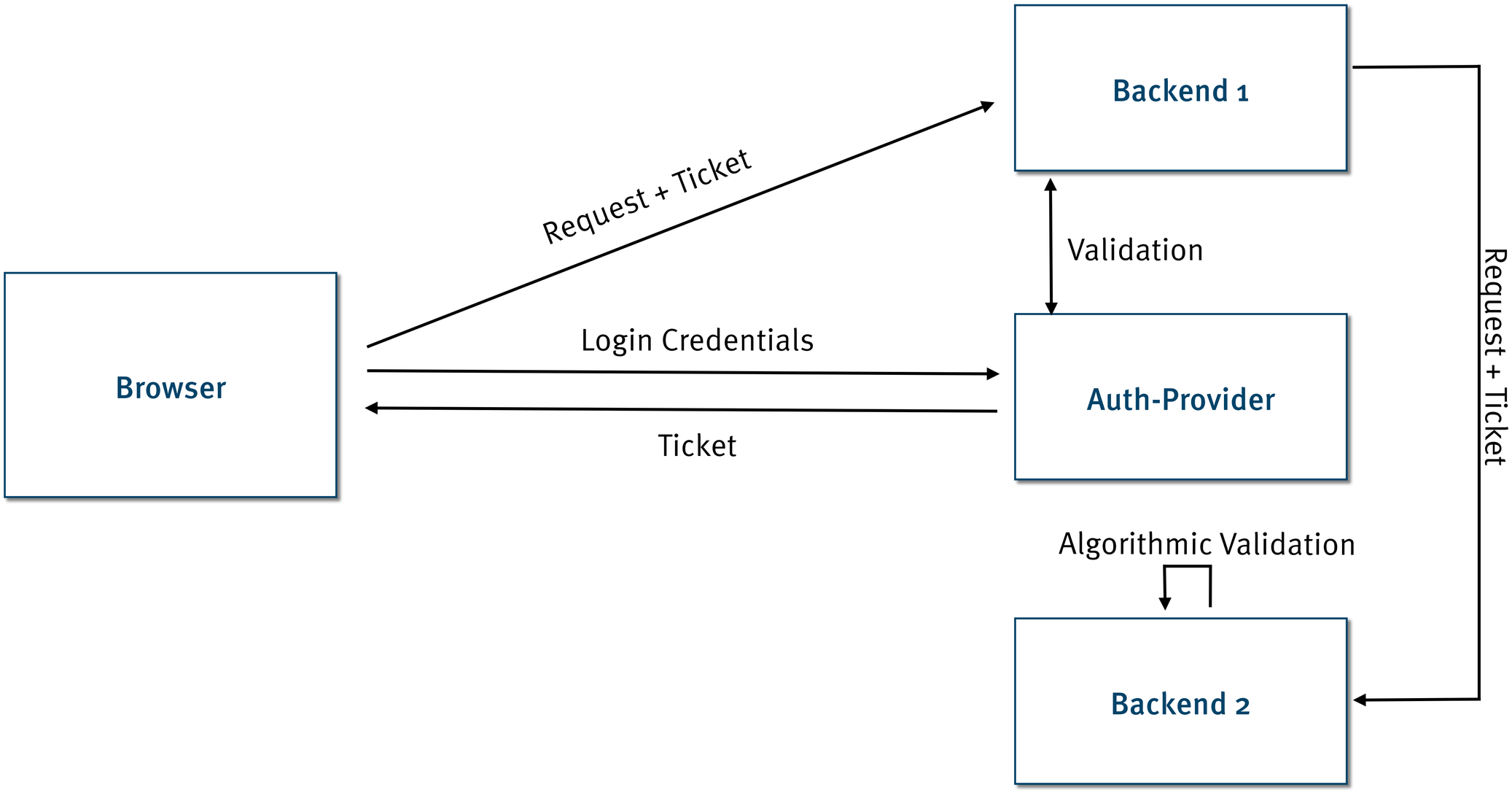
Server-side integration options

Edge integration	ESI (Portal server) Homegrown
Backend call	RMI RPC REST WS-*
Storage	Feeds DB replication
Deployment	Chef, Puppet, ... Build tools Asset pipeline
Development	Git/SVN submodules Gems Maven artifacts

Client-side integration options

Client call	SPA-style JS Widgets
Replaced link	Unobtrusive JS oEmbed ROCA-style
Link	Magical integration concept

Single Sign-On


Backend 1
Request + Ticket
Validation
Browser
Login Credentials
Auth-Provider
Ticket
Request + Ticket
Algorithmic Validation
Backend 2

5. Questions

SCS ≡ Microservice?

SCS ⟶ Microservice?

SCS 1------* Microservice?

SCS ◇—* Microservice?

SCS ◆—* Microservice?

Summary

Explicitly design system boundaries

Modularize into independent, self-contained systems

Separate micro and macro architectures

Be aware of changing quality goals

Strike a balance between control and decentralization

Thank you!
Questions?
Comments?

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