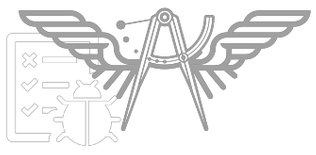
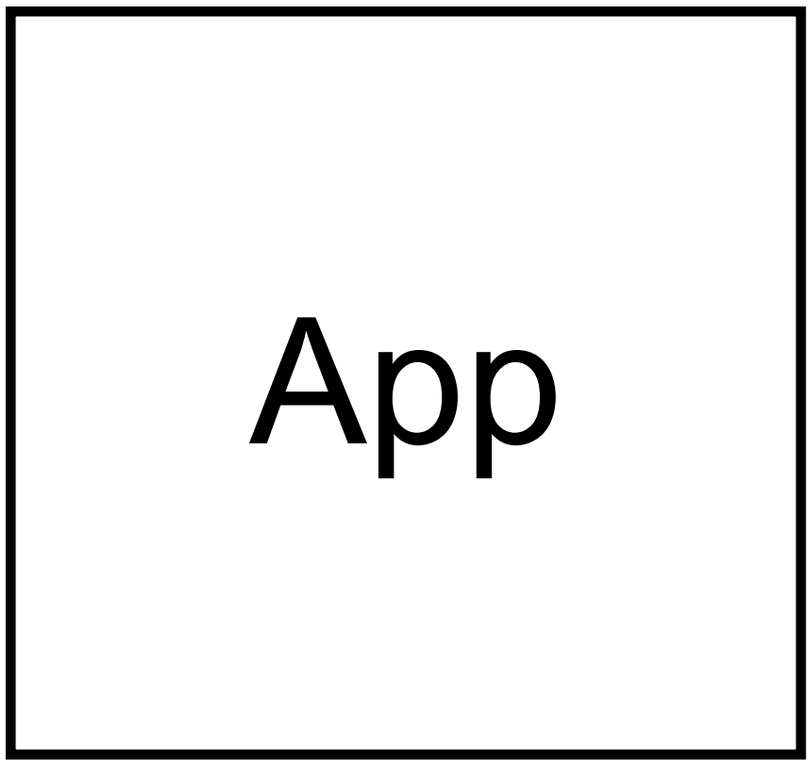
สยามชำนาญกิจ
SIAM CHAMNAN KIT

Microservice in practice

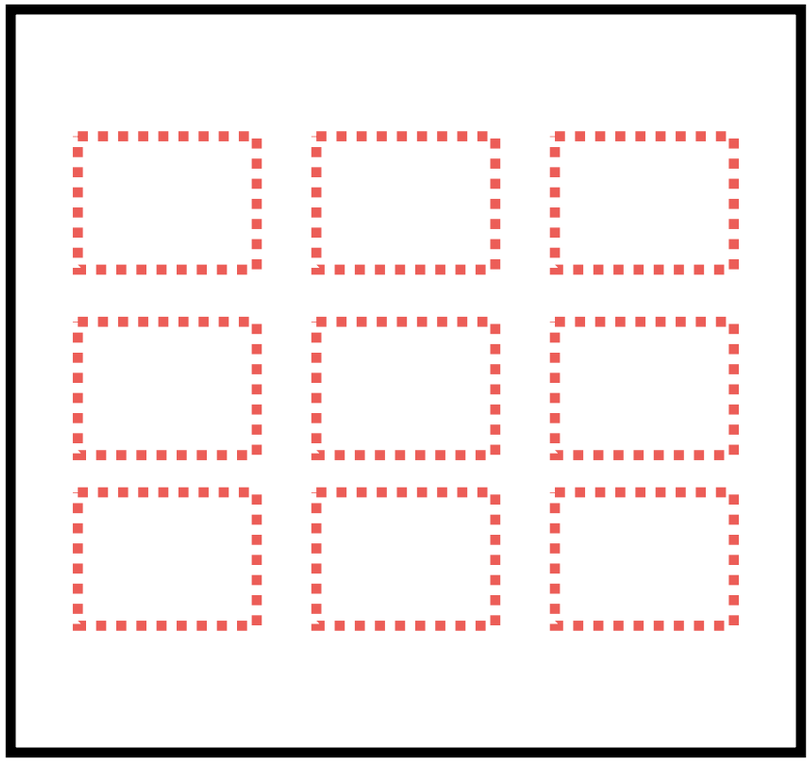


Evolution of Architecture

Monolith

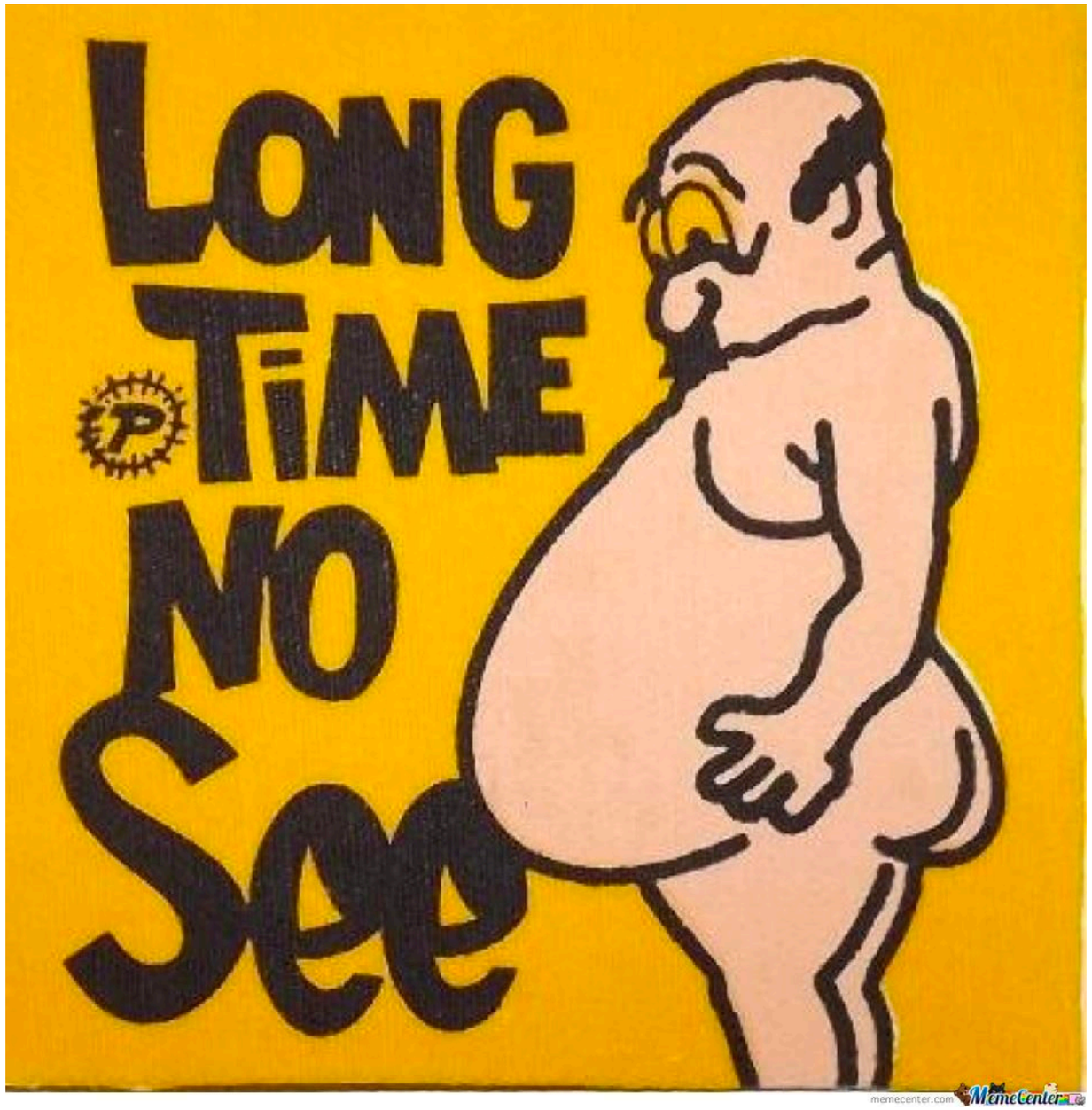


Modules

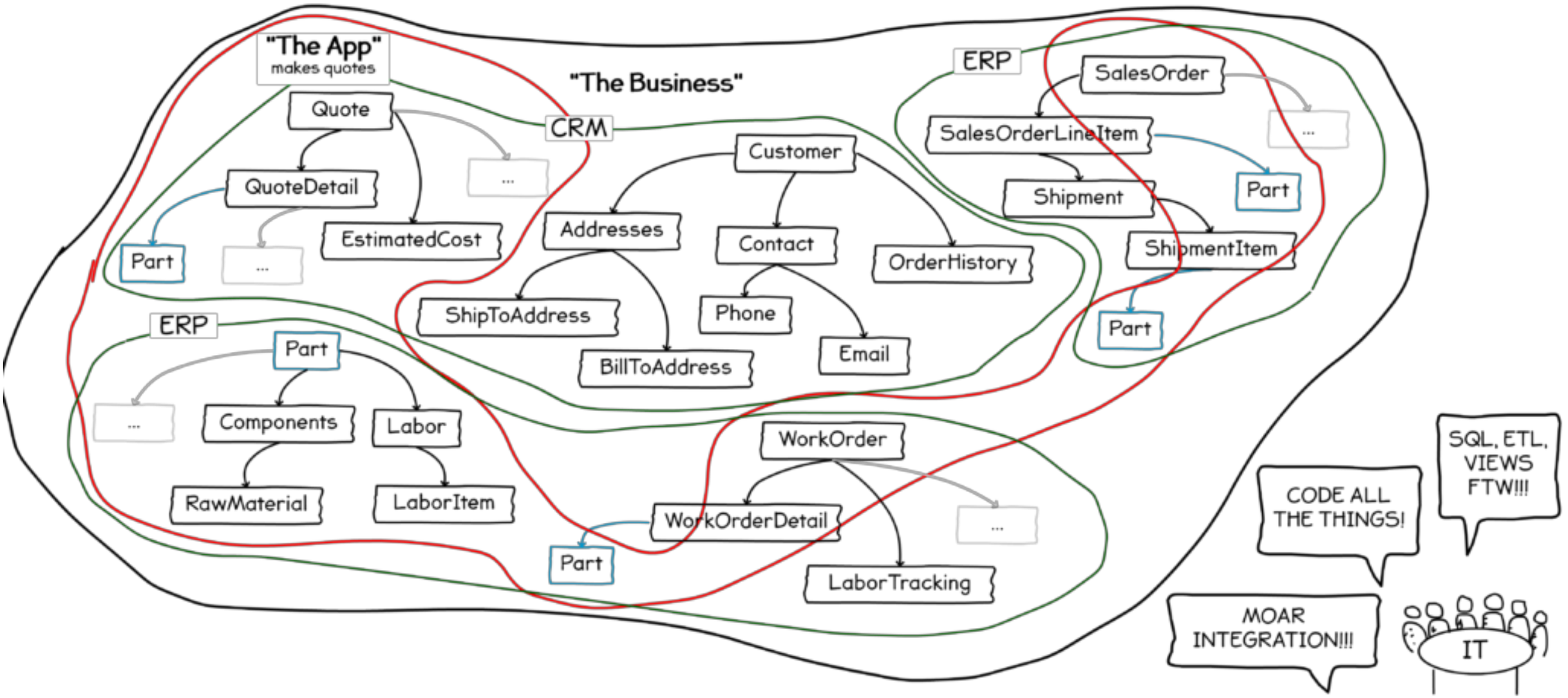


Monolith

Easy to develop
Easy to change
Easy to testing
Easy to deploy
Easy to scale



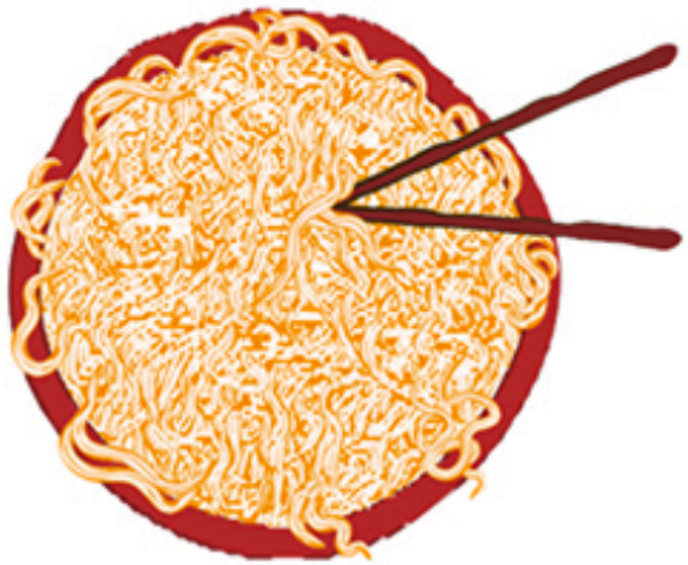
Monolith Hell



1990s and earlier

Pre-SOA (monolithic)

Tight coupling

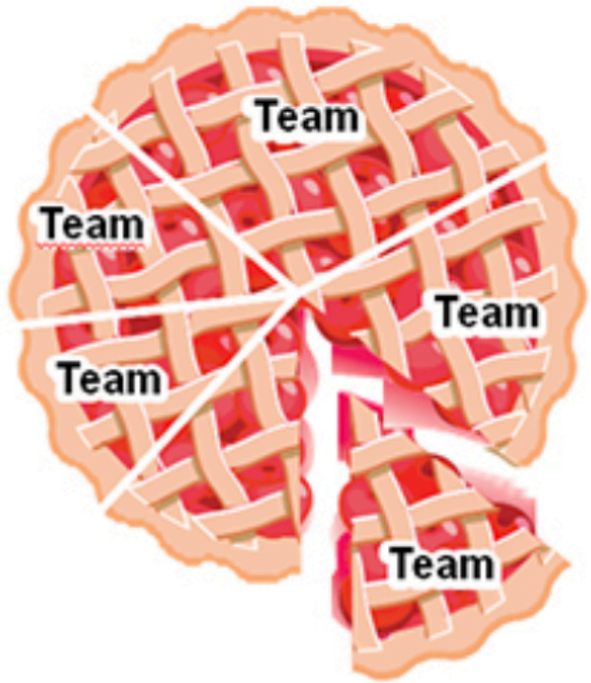


For a monolith to change, all must agree on each change. Each change has unanticipated effects requiring careful testing beforehand.

2000s

Traditional SOA

Looser coupling



Elements in SOA are developed more autonomously but must be coordinated with others to fit into the overall design.

2010s

Microservices

Decoupled

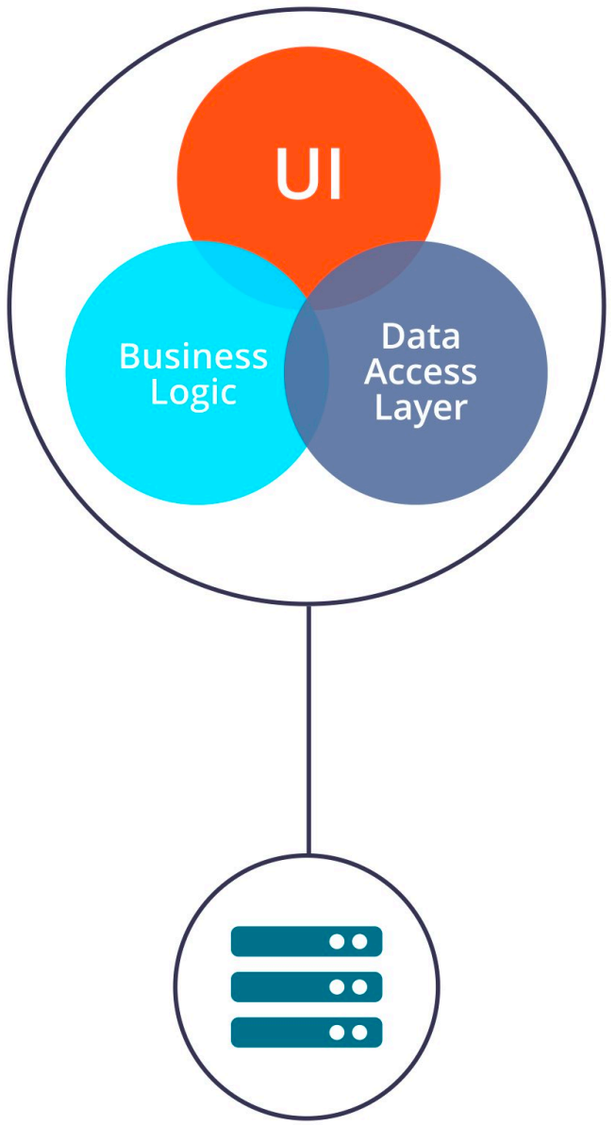
Developers can create and activate new microservices without prior coordination with others. Their adherence to MSA principles makes continuous delivery of new or modified services possible.

Microservice

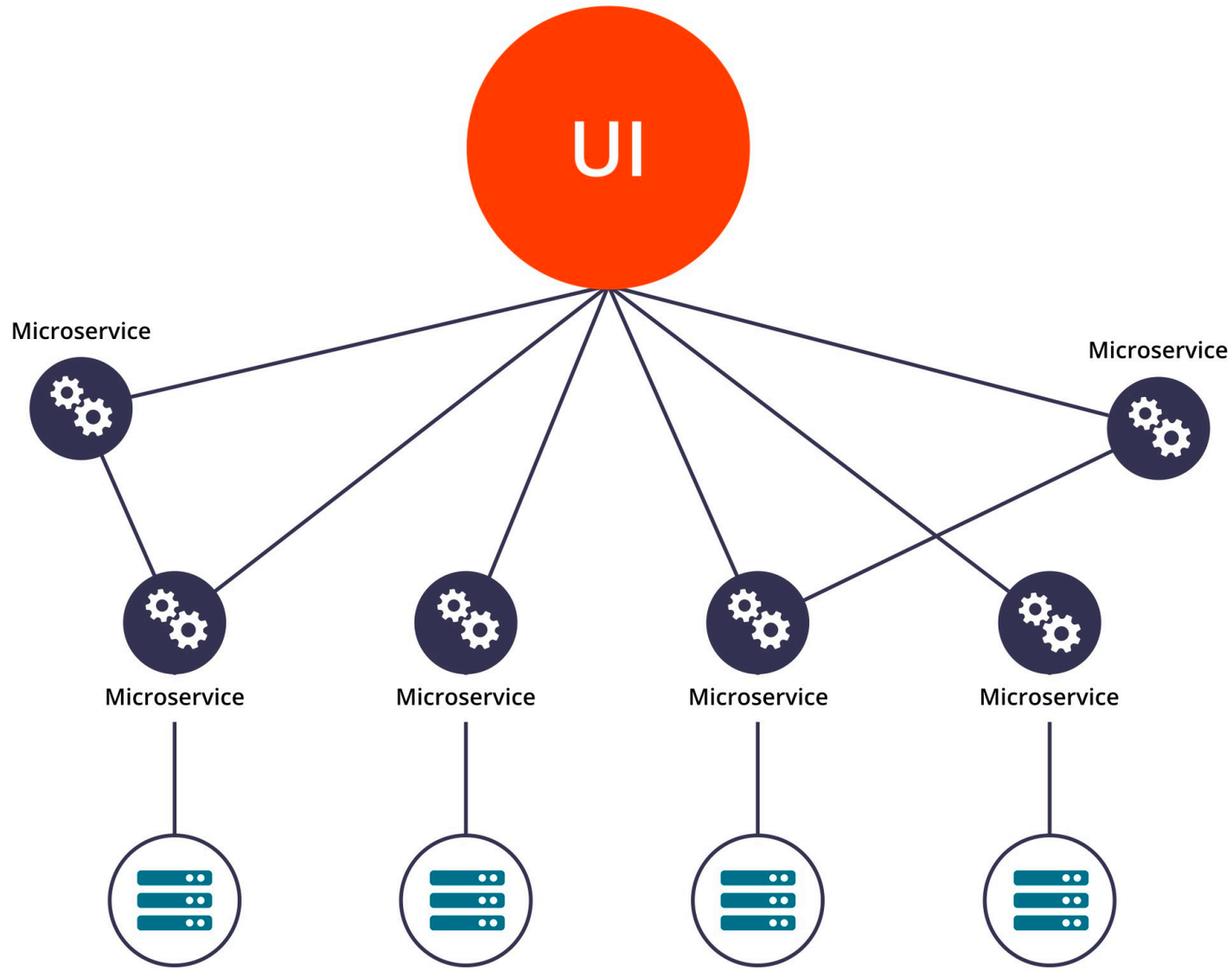
Microservice history

Microservice

Small, Do one thing (Single Responsibility)
Modular
Easy to **understand**
Easy to **develop**
Easy to **deploy**
Easy to **maintain**
Scale independently

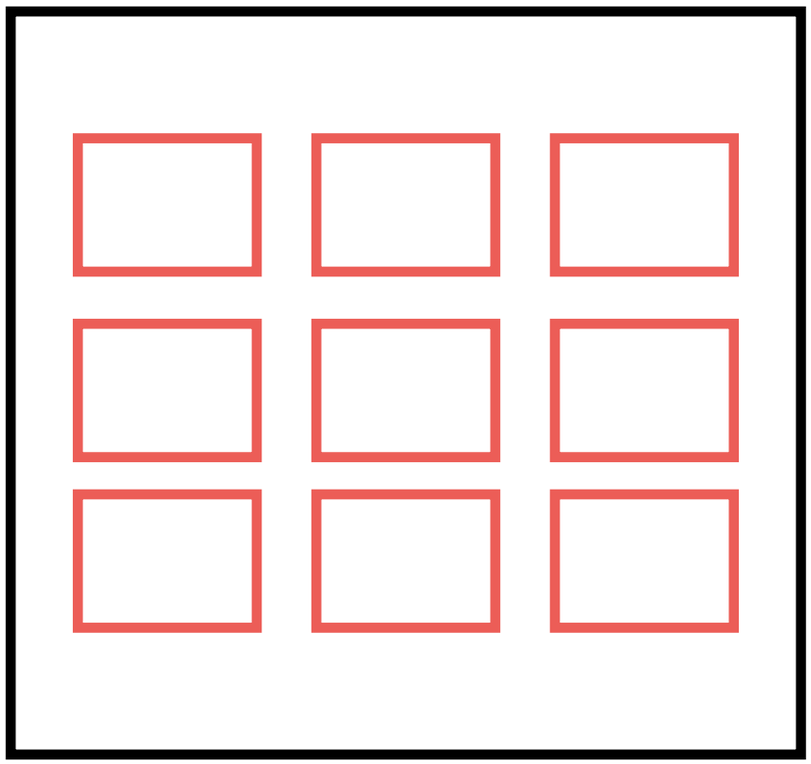


Monolithic Architecture

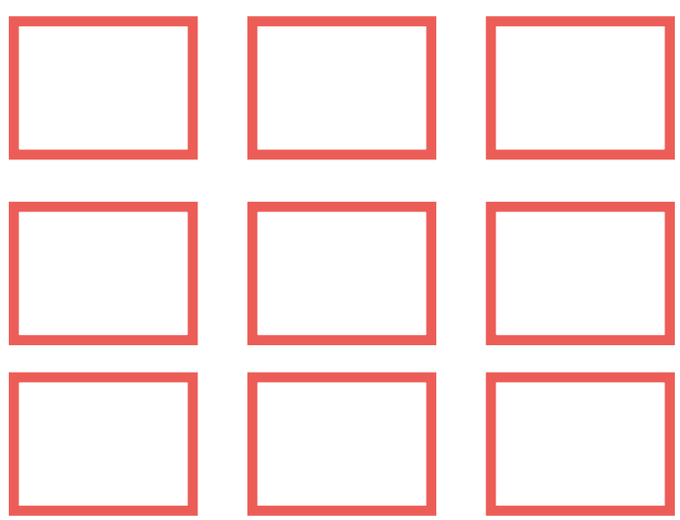


Microservice Architecture

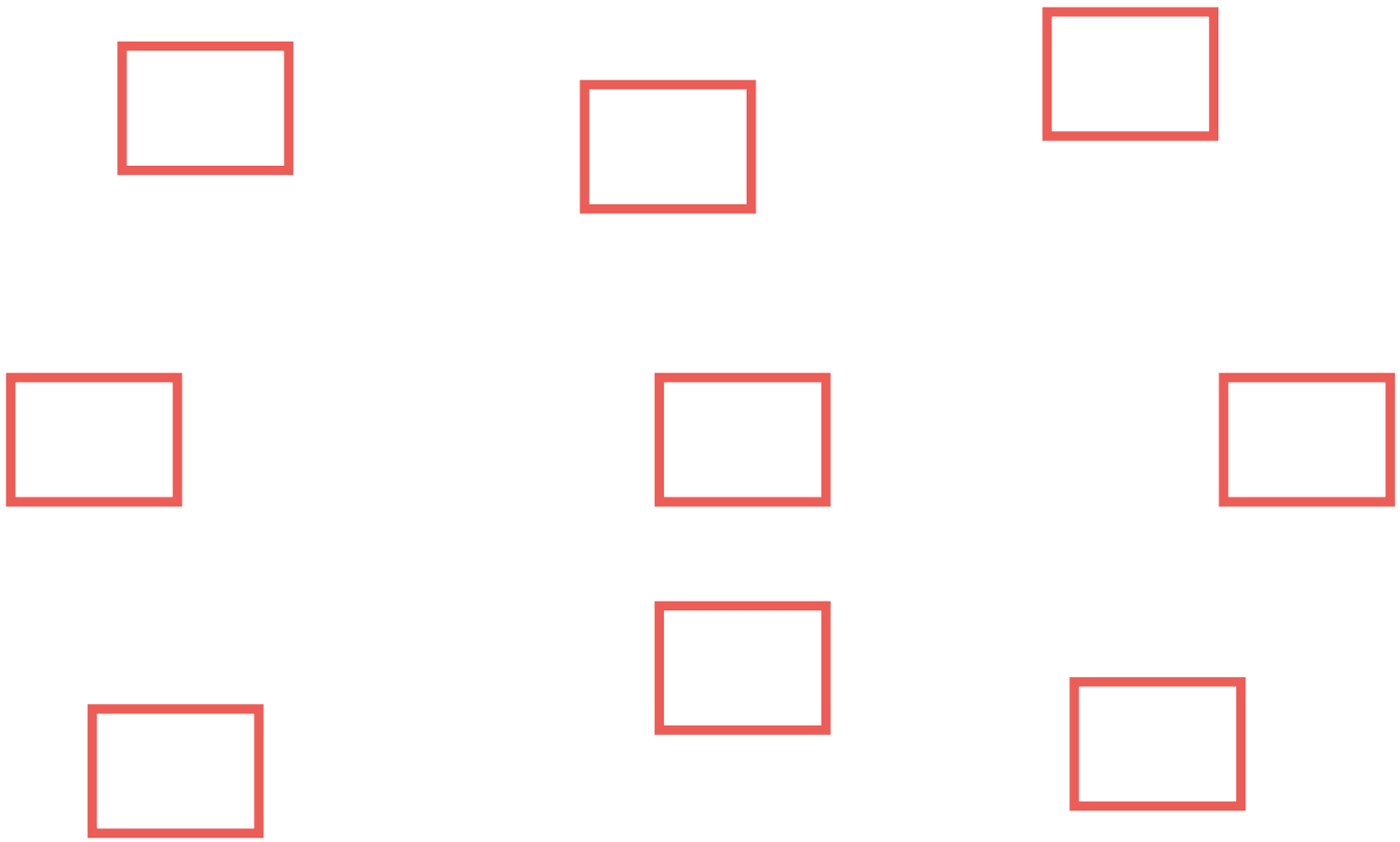
Microservice



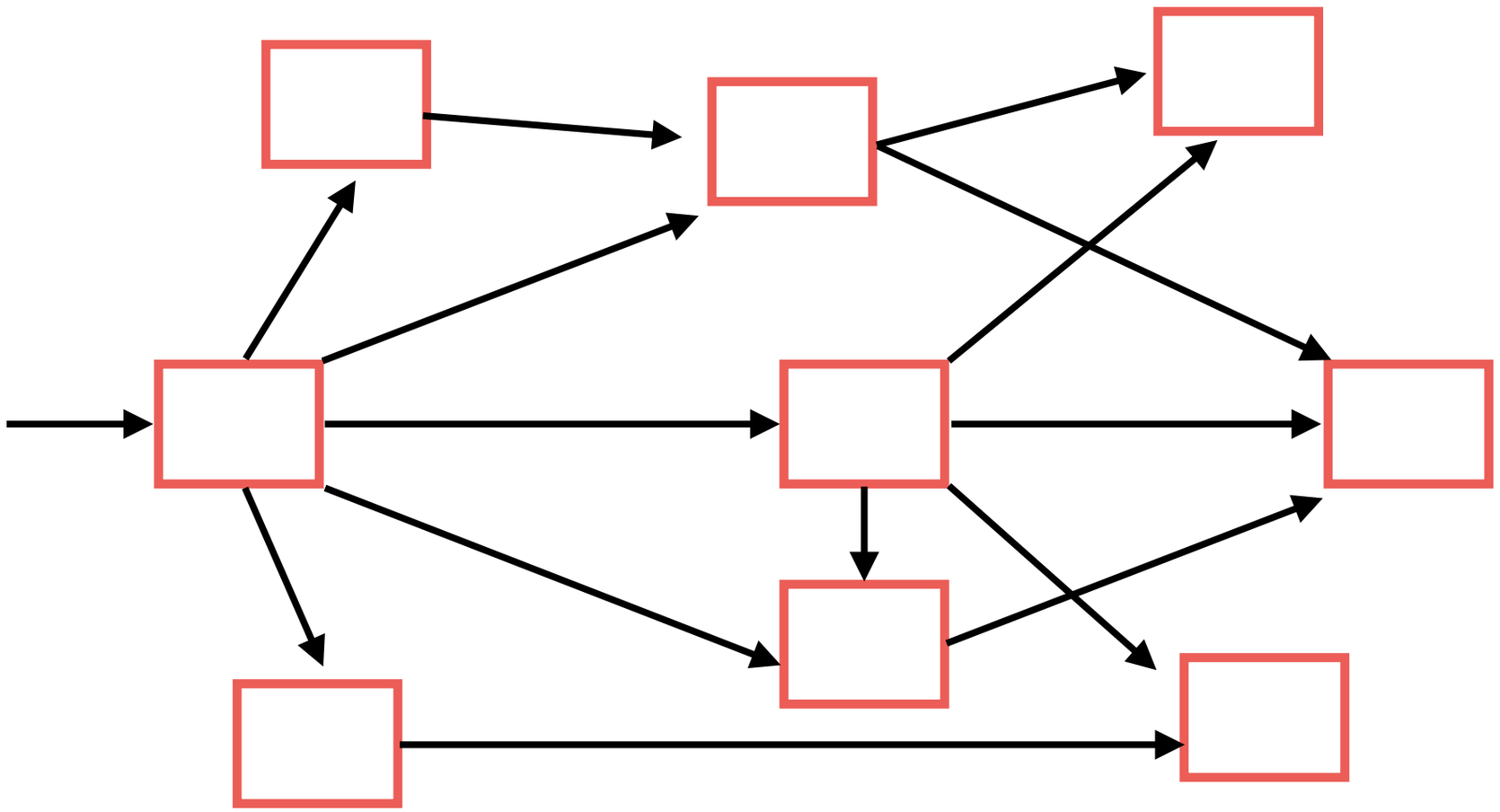
Microservice



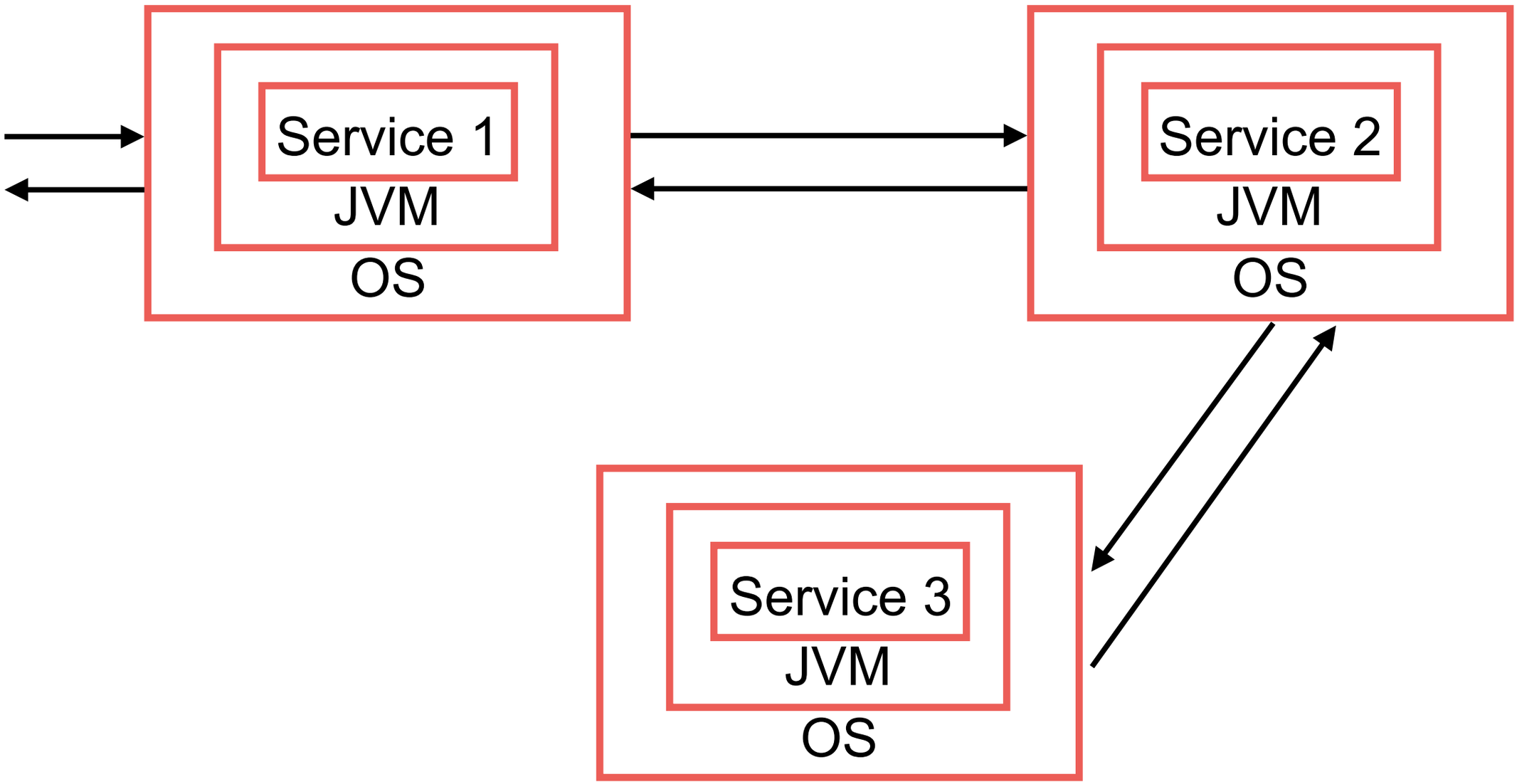
Microservice



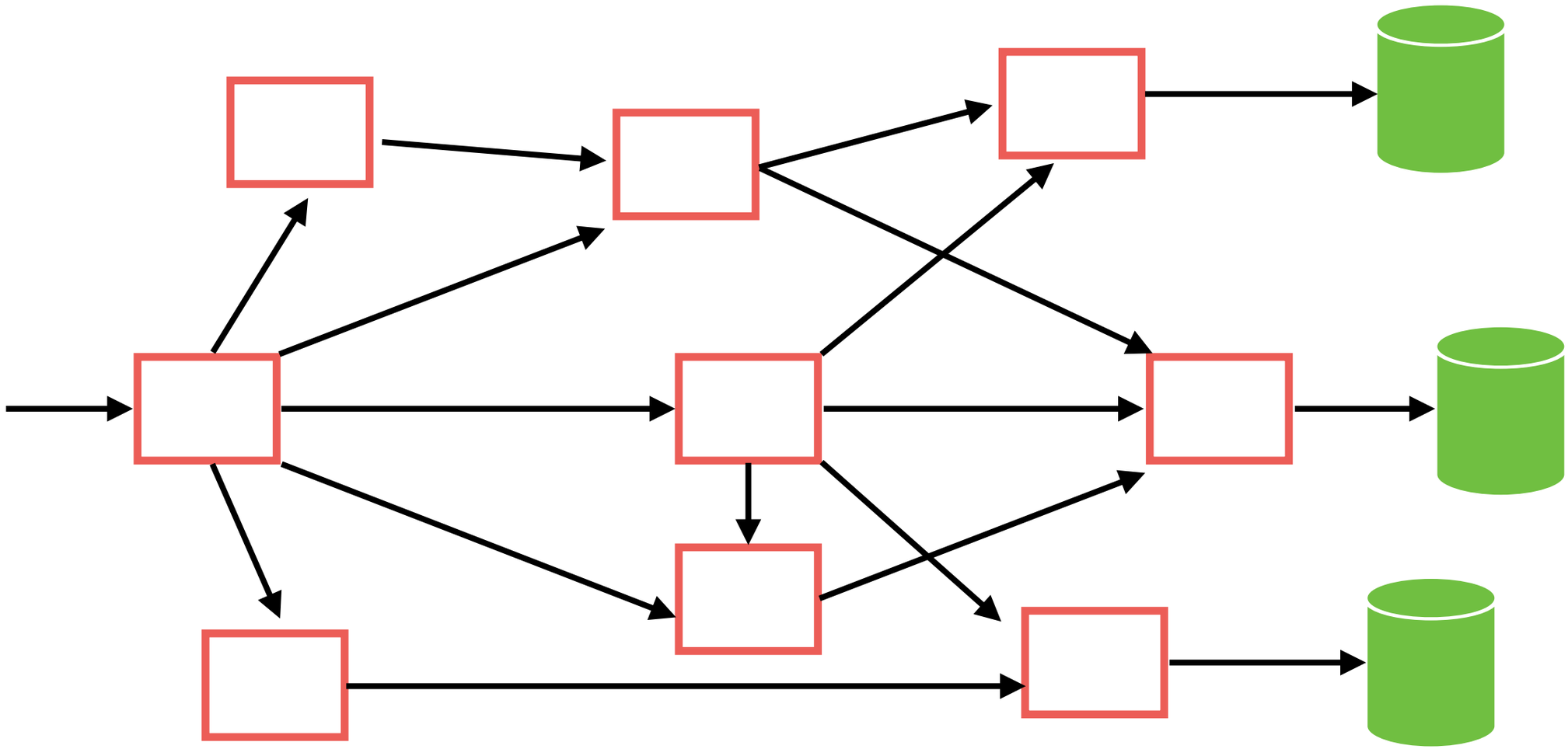
Microservice == Distributed



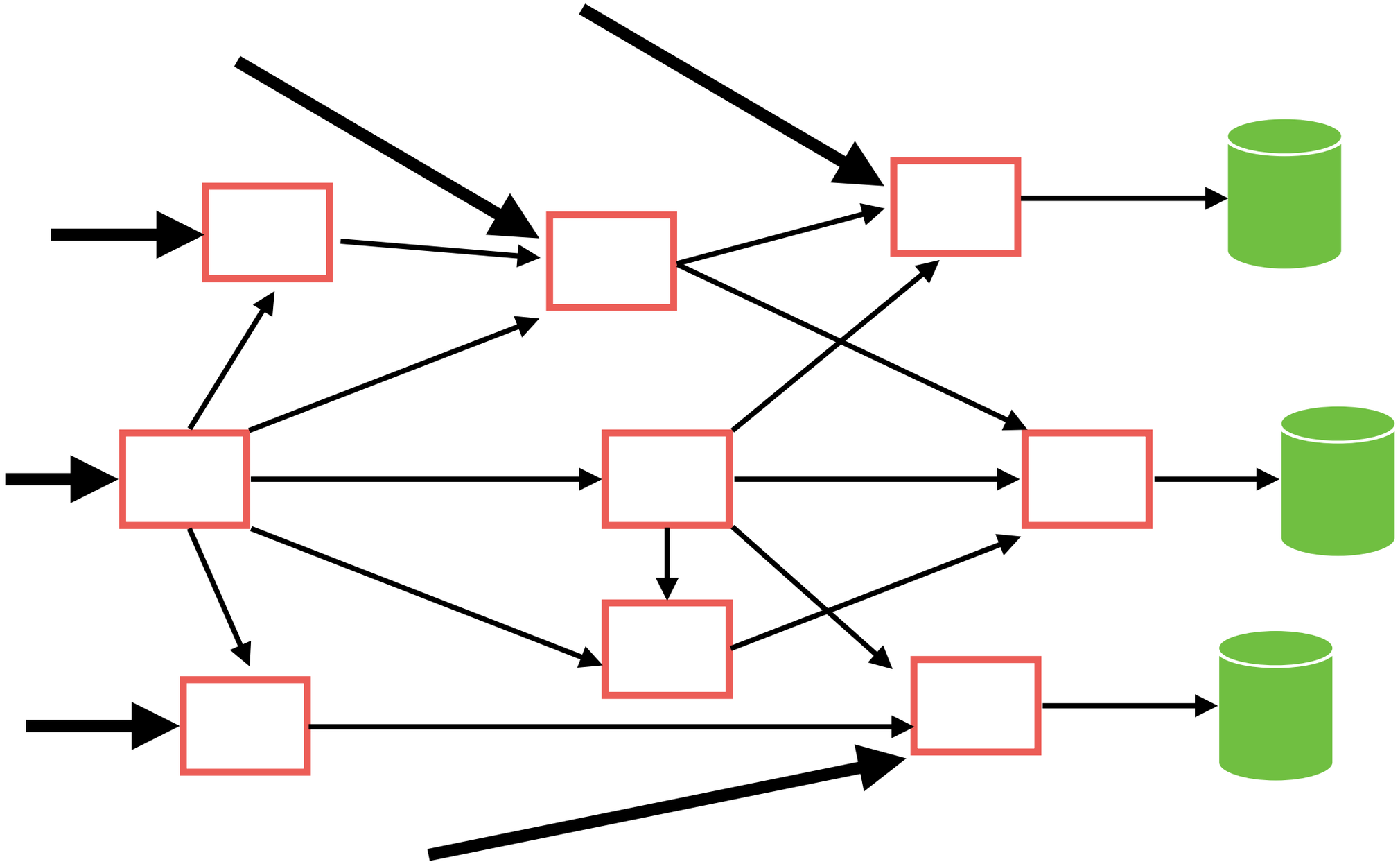
Network of services



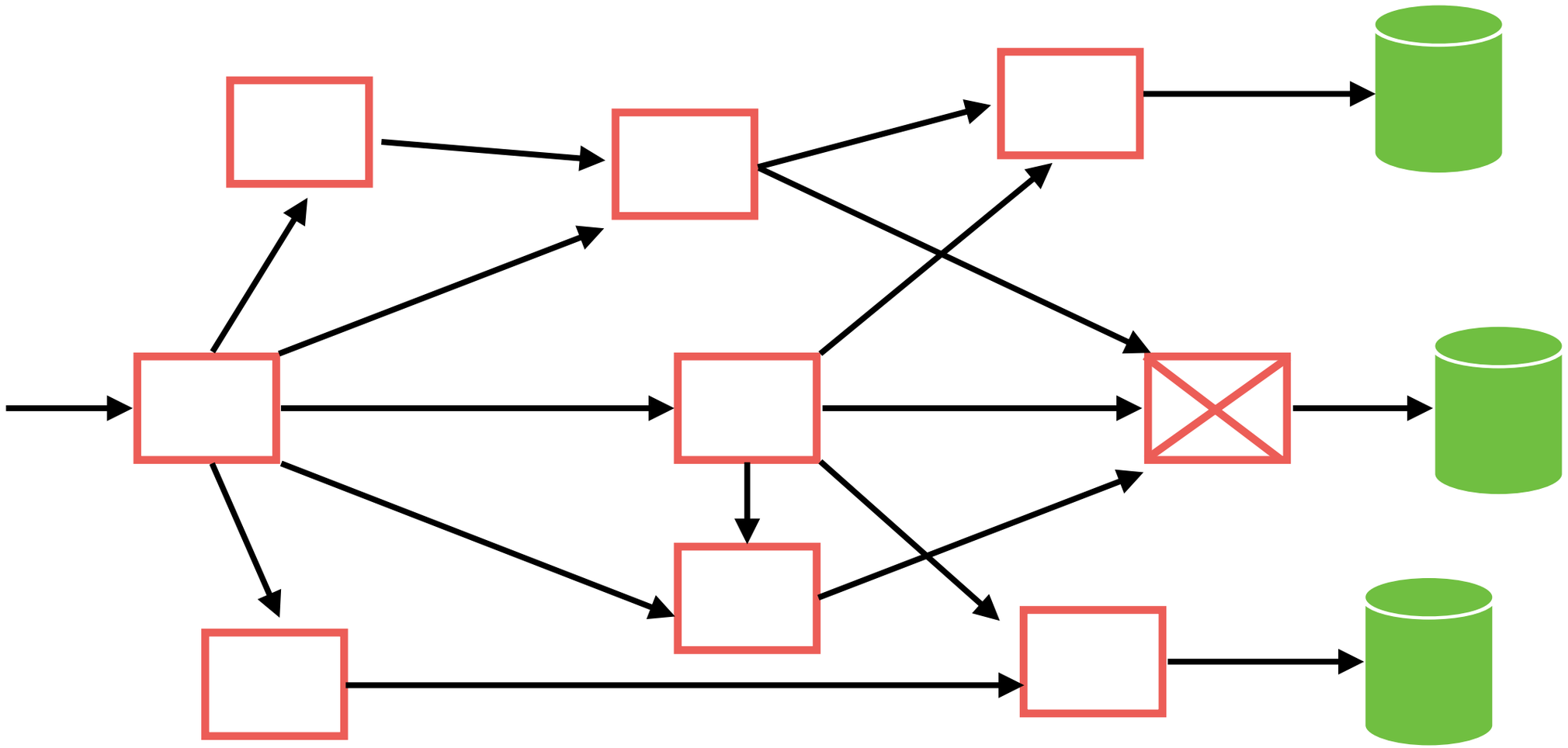
Own data



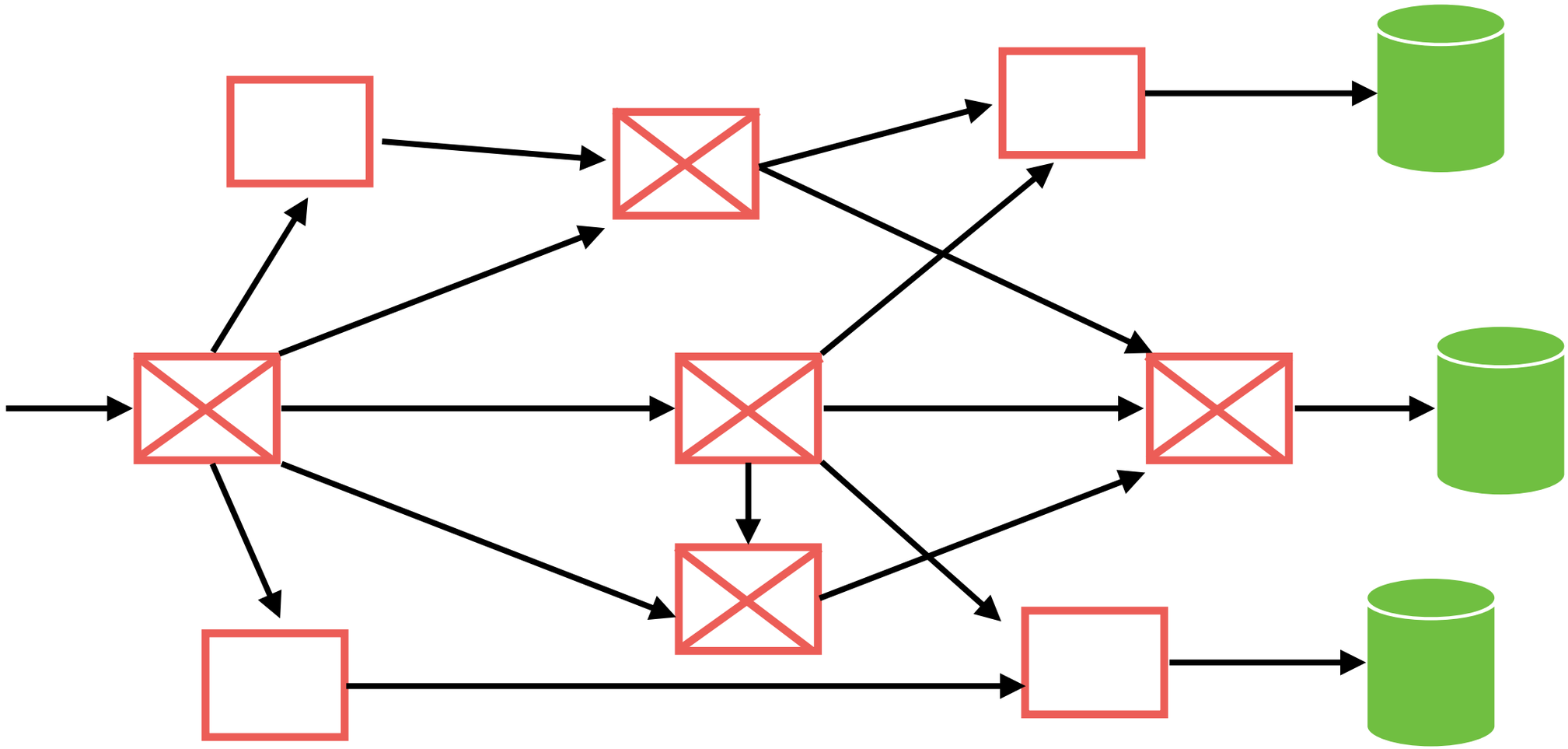
Multiple entry points



Failure !!



Cascading Failure !!

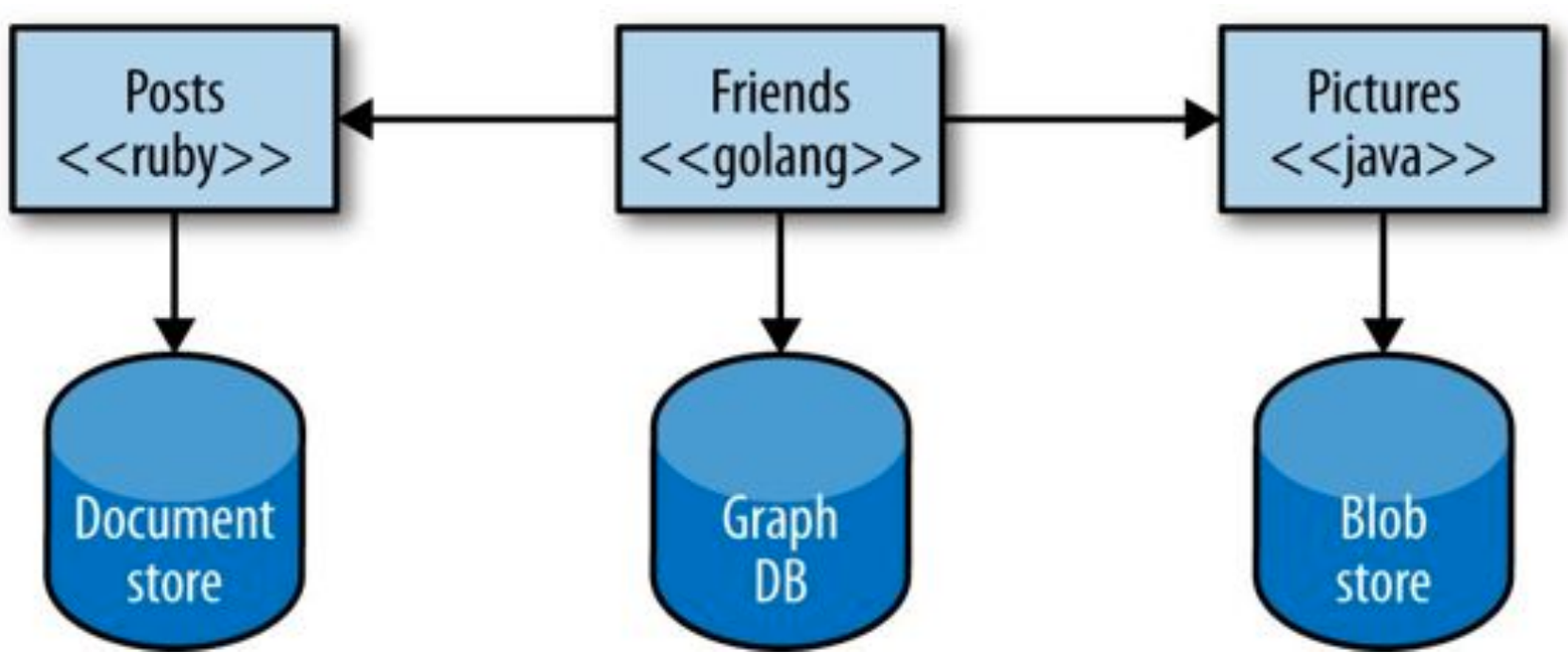


Key Benefits

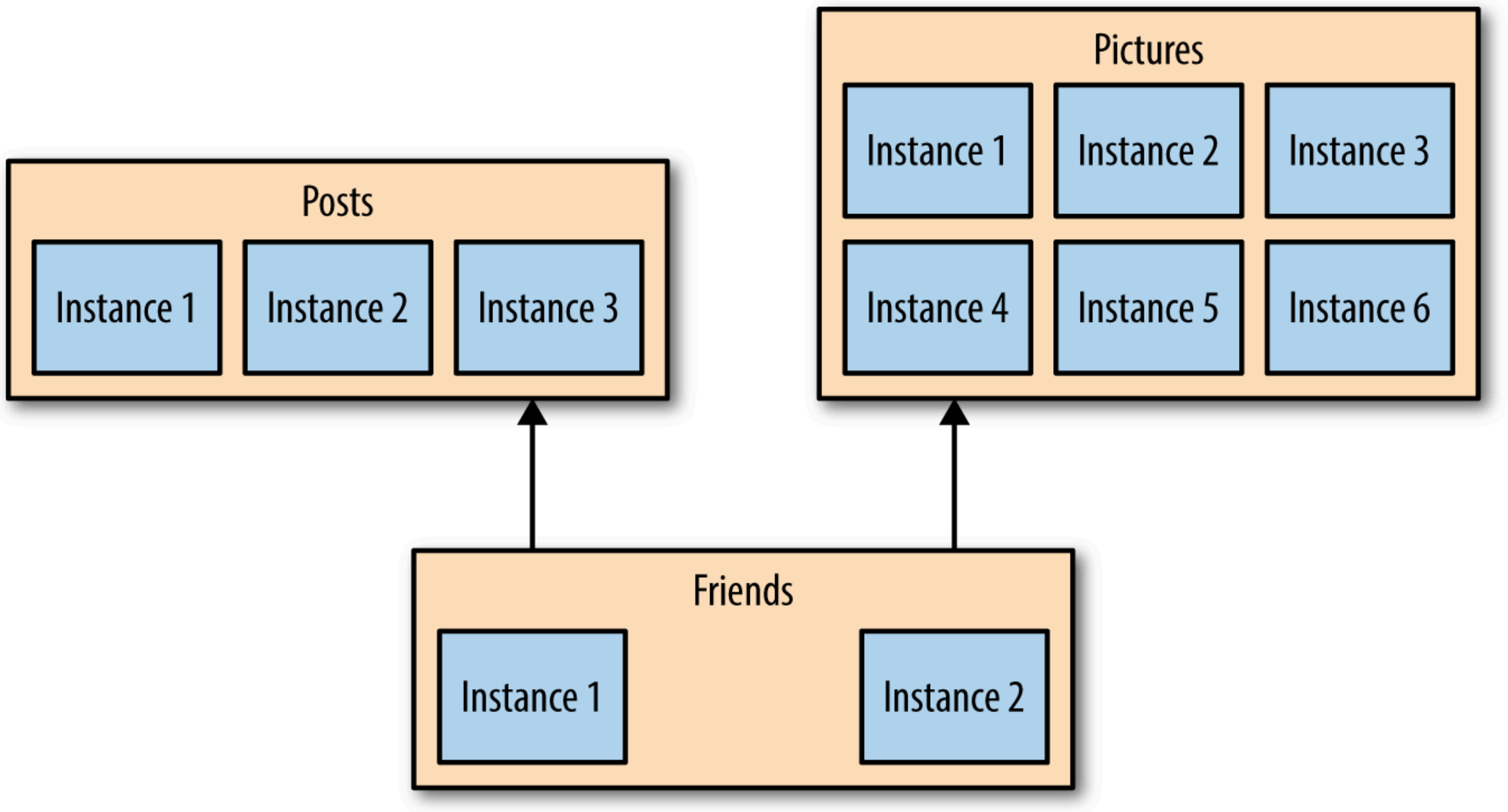
1. Technology heterogeneous

The right tool for each job

Allow easy experimenting and adoption of new technology

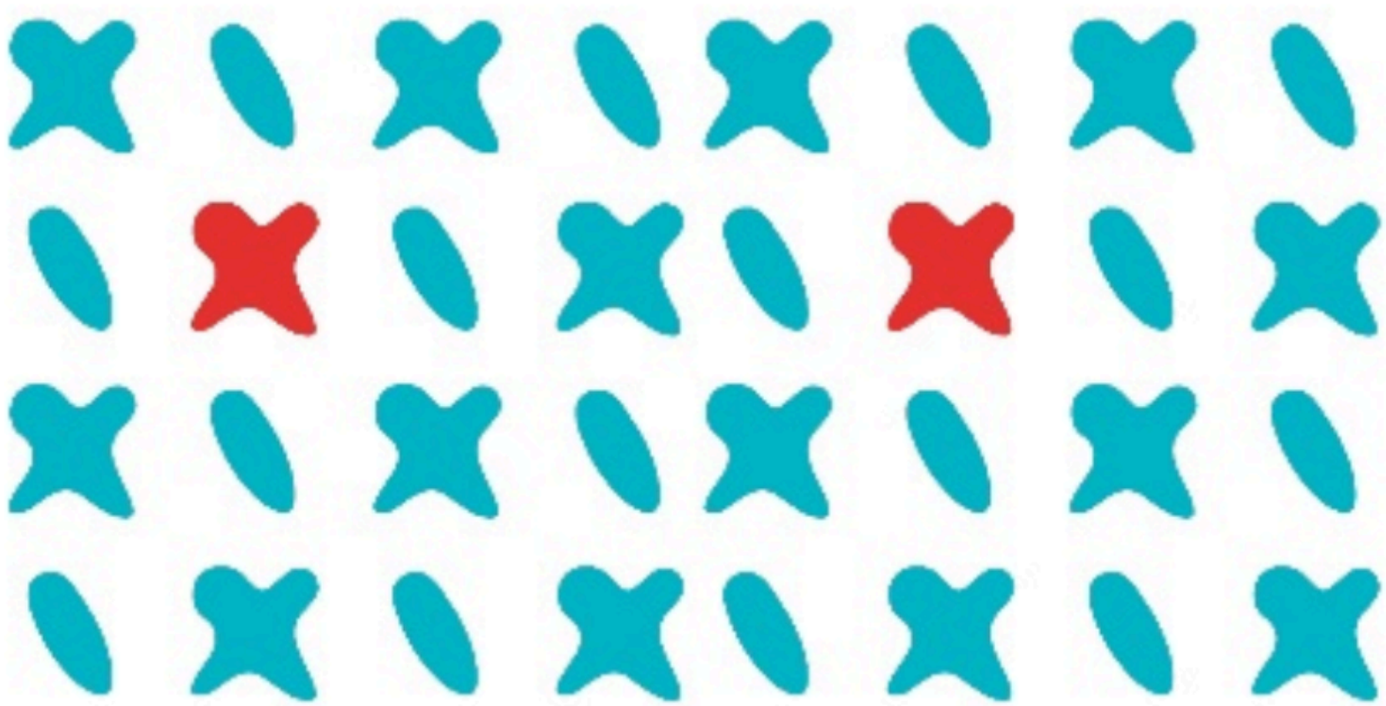


2. Scaling

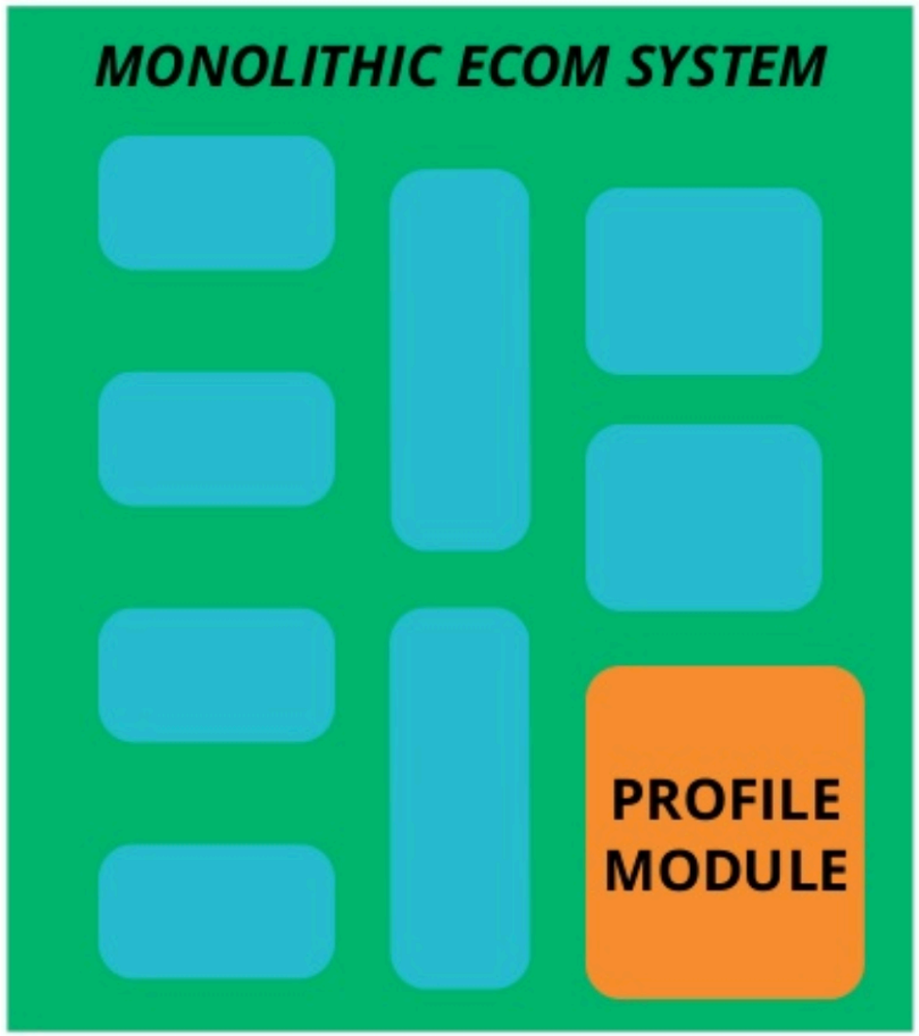


3. Ease of deployment

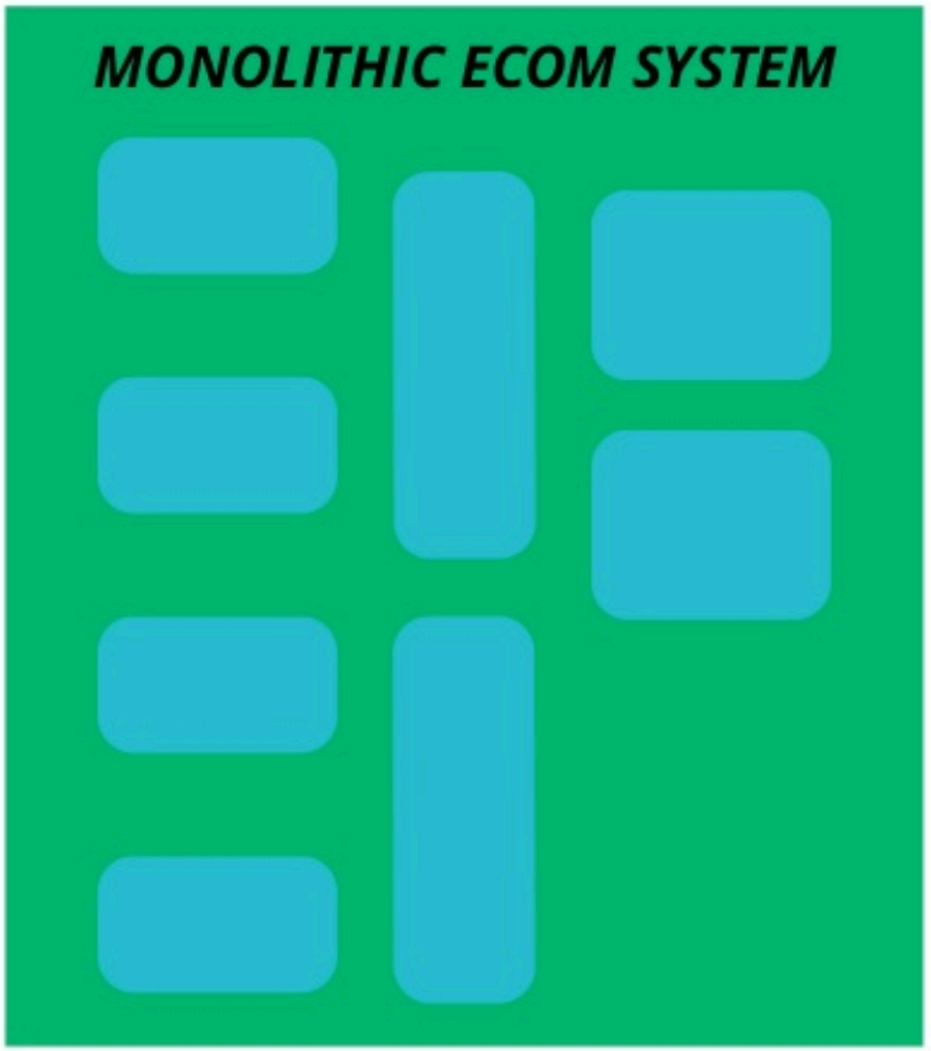
Deploys are faster, independent and problems can be isolated more easily



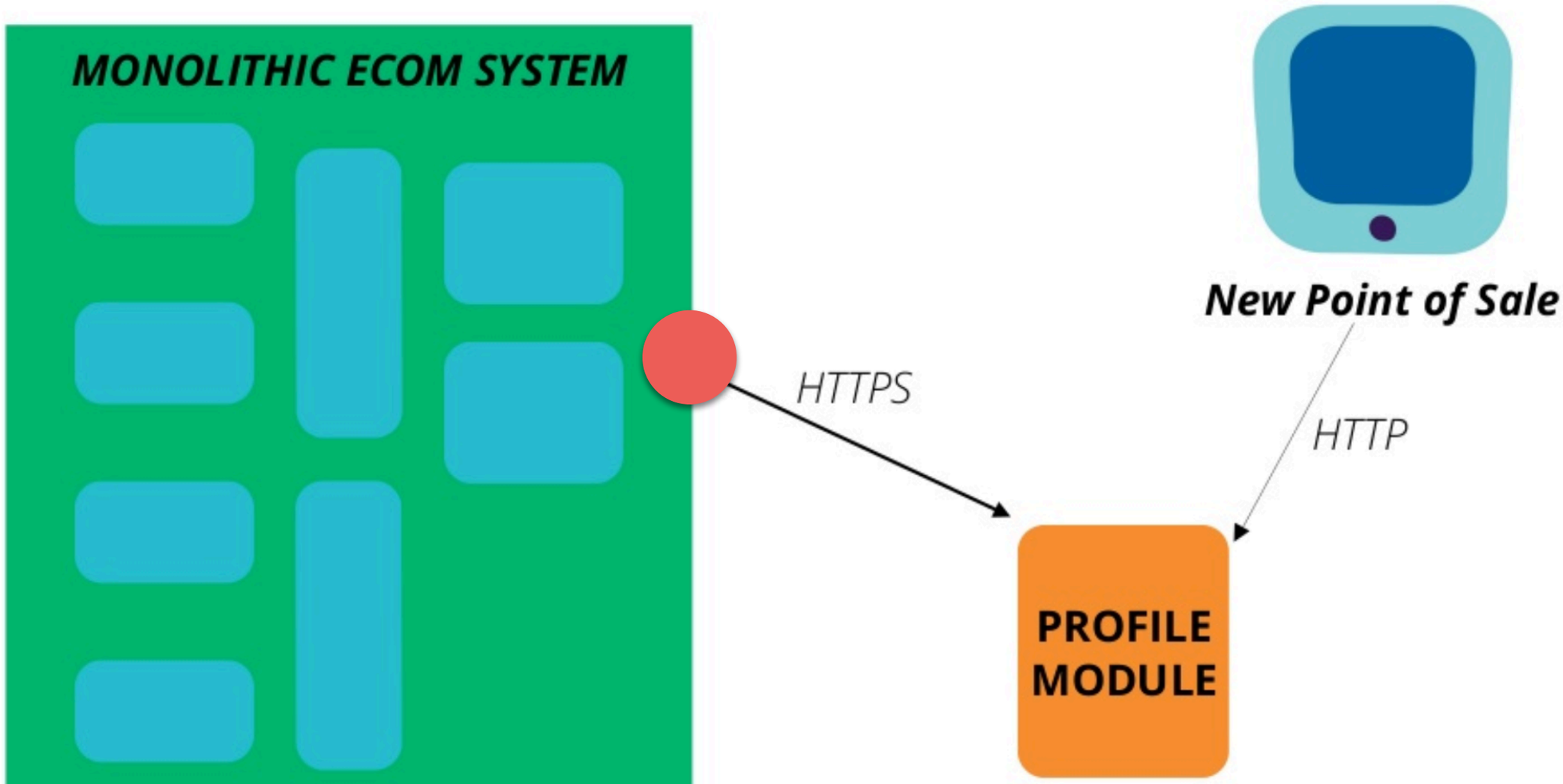
4. Composability and replaceability



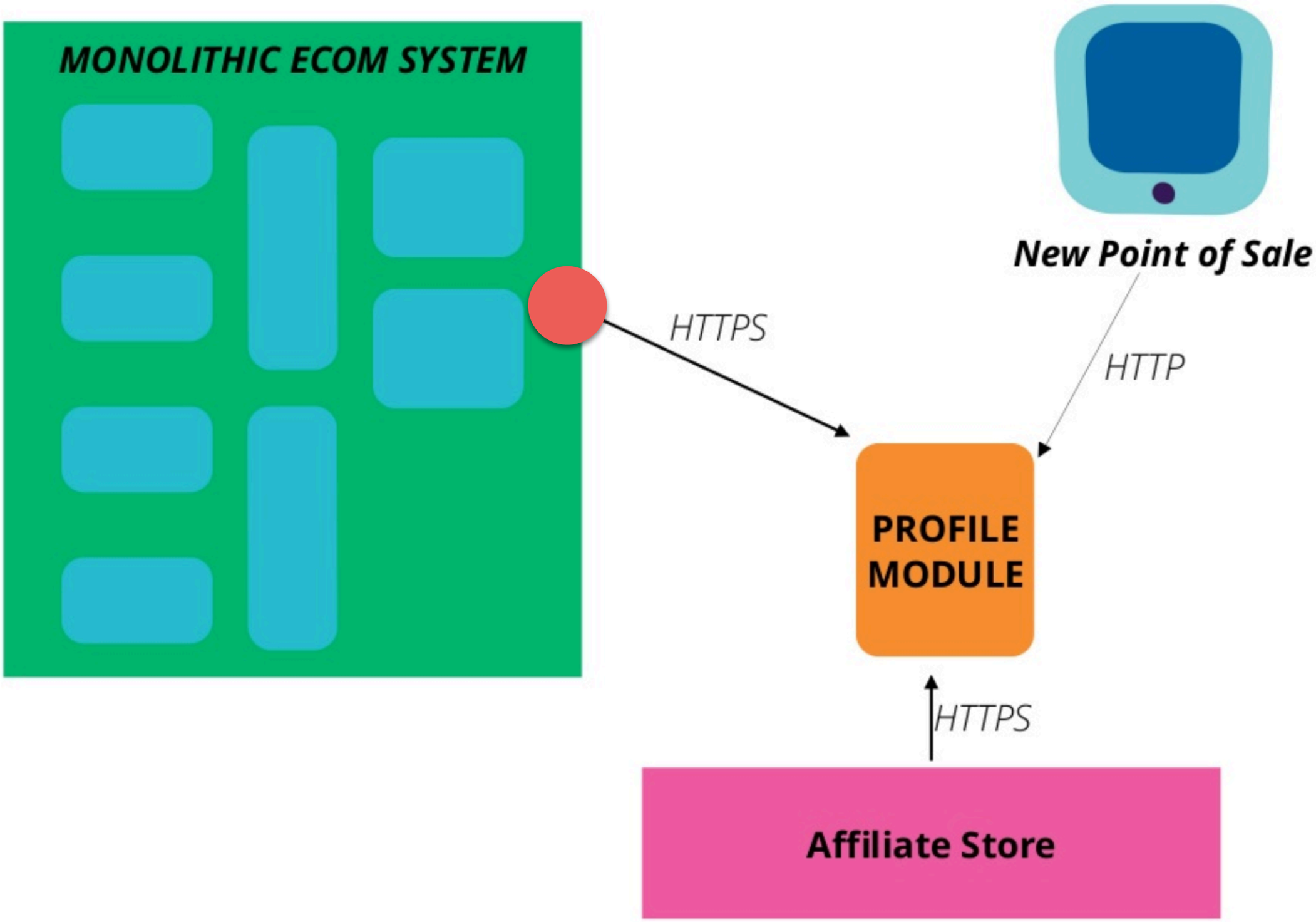
4. Composability and replaceability



4. Composability and replaceability



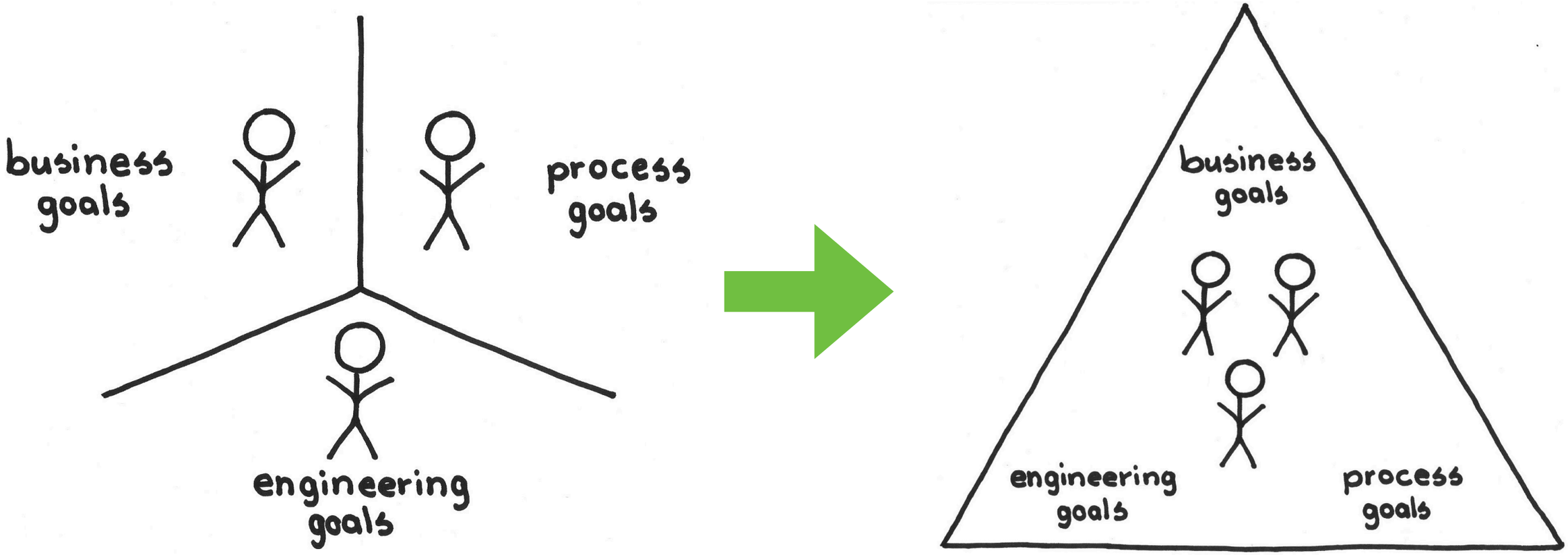
4. Composability and replaceability



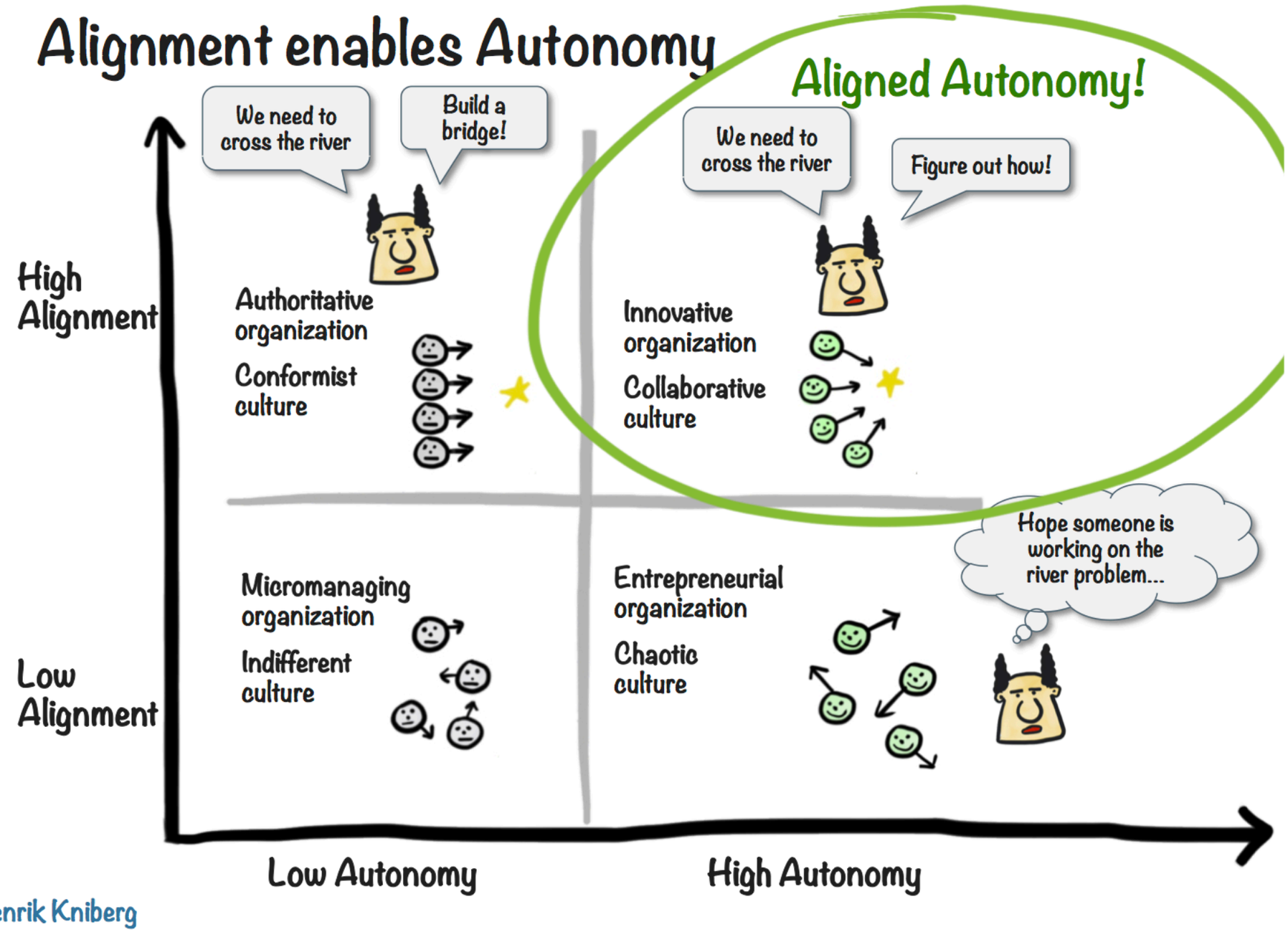
5. Organization alignment

Small teams and smaller codebases

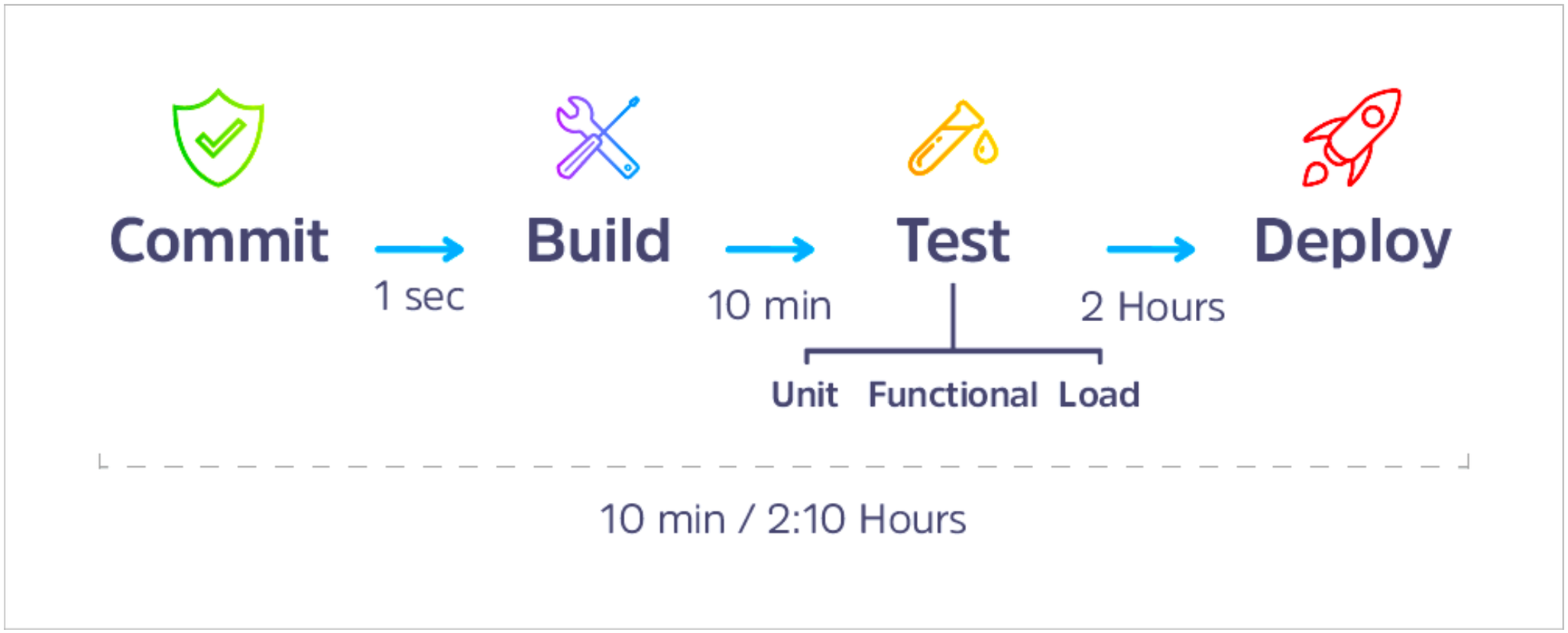
Autonomous team



Autonomous team



Autonomous team

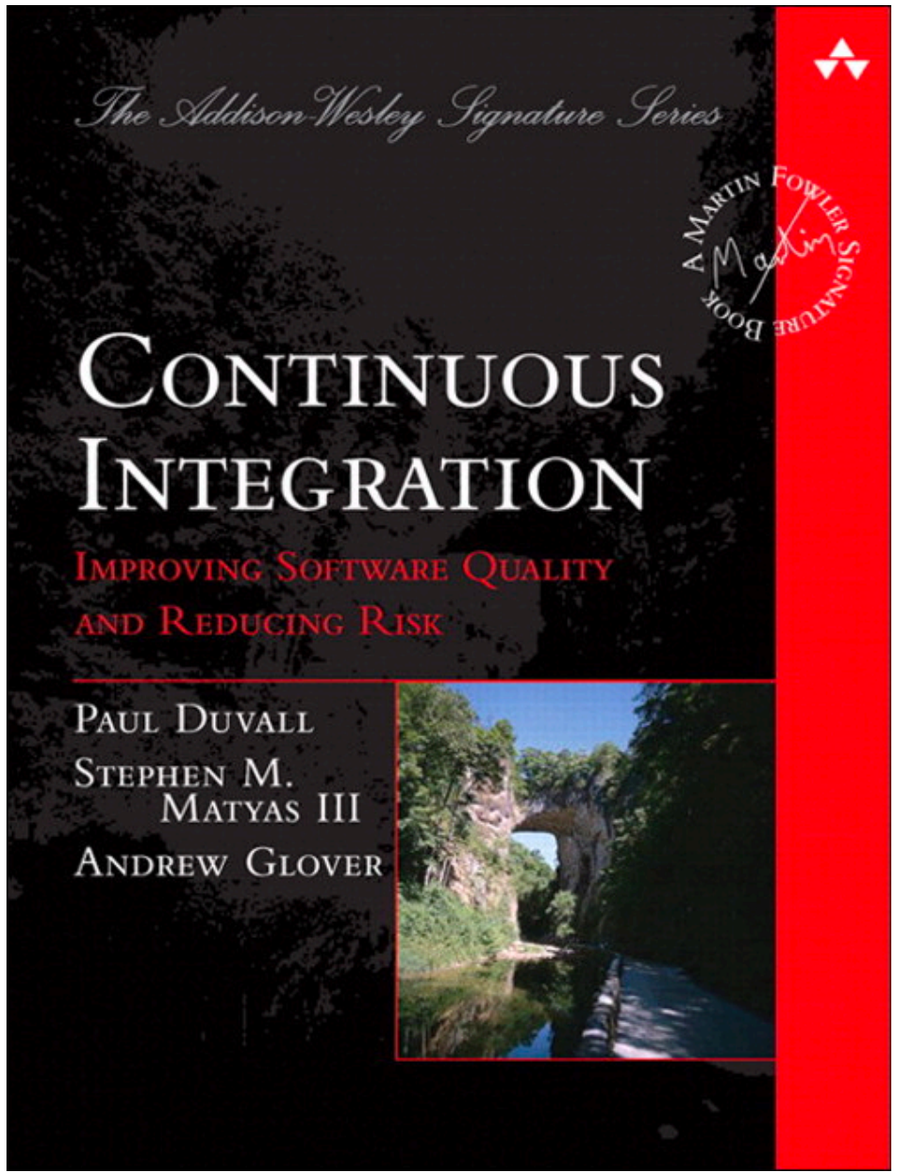


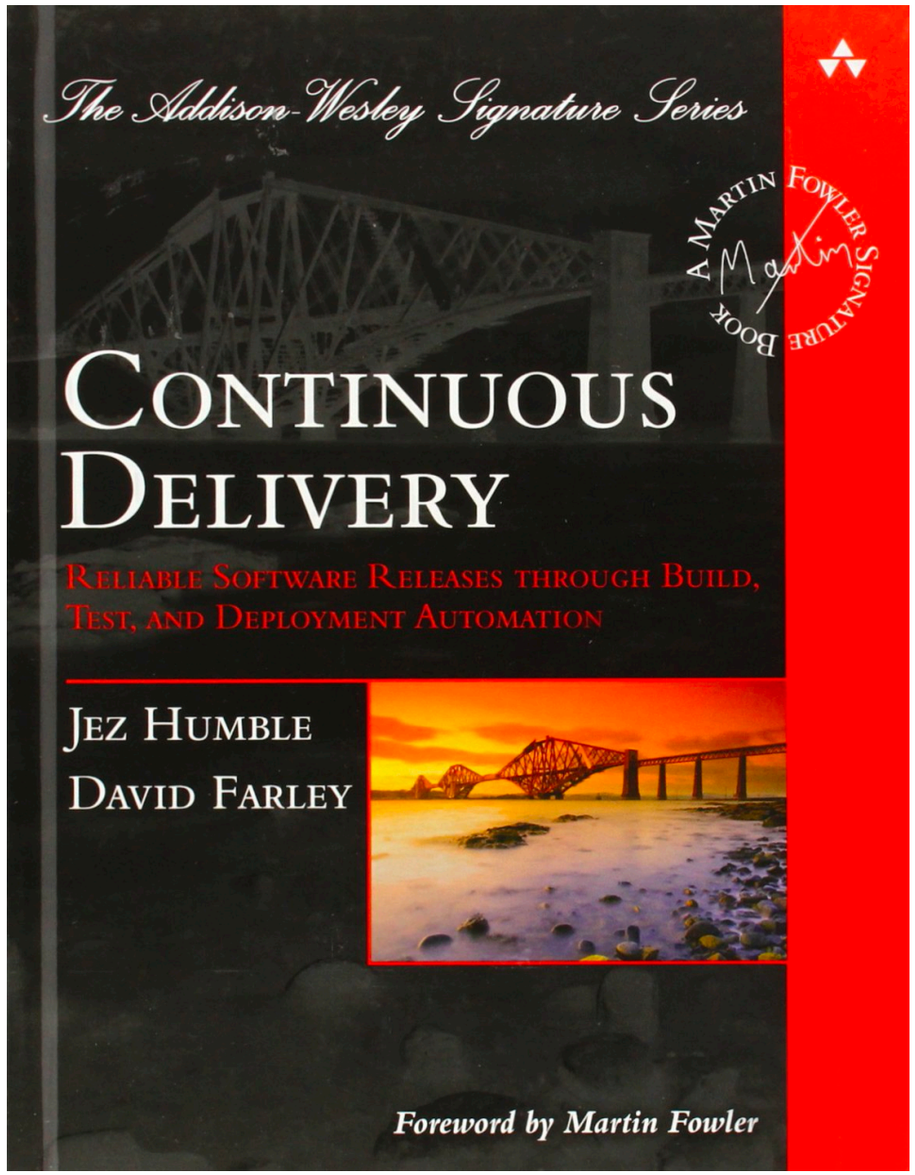
6. Enable Continuous Delivery

A part of DevOps

Set of practices for the **rapid**, **frequent** and **reliable delivery** software

Continuous Delivery/Deployment





Continuous Delivery/Deployment

Testability
Deployability
Autonomous team and loose coupling

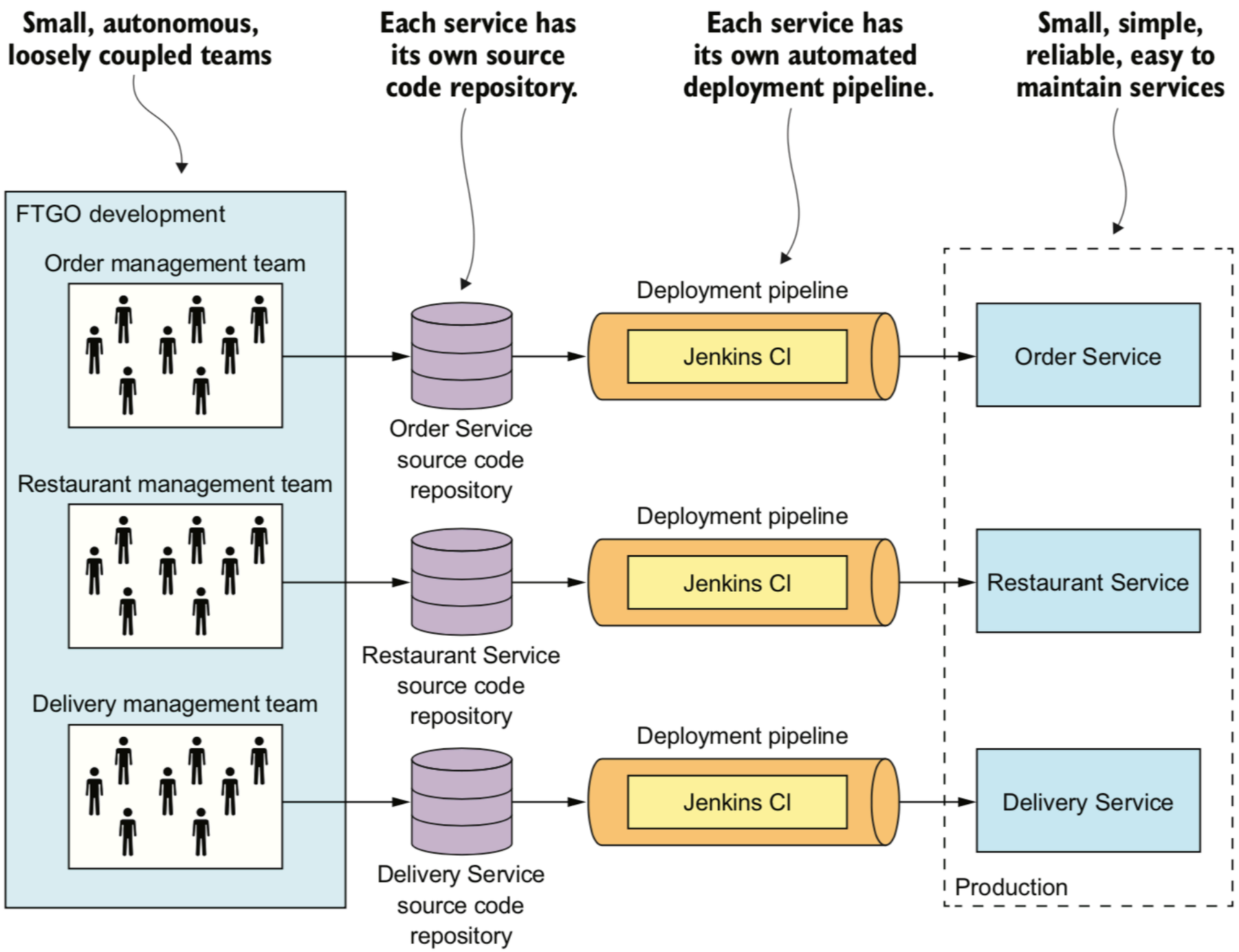
Benefits of Continuous Delivery

Reduce time to market

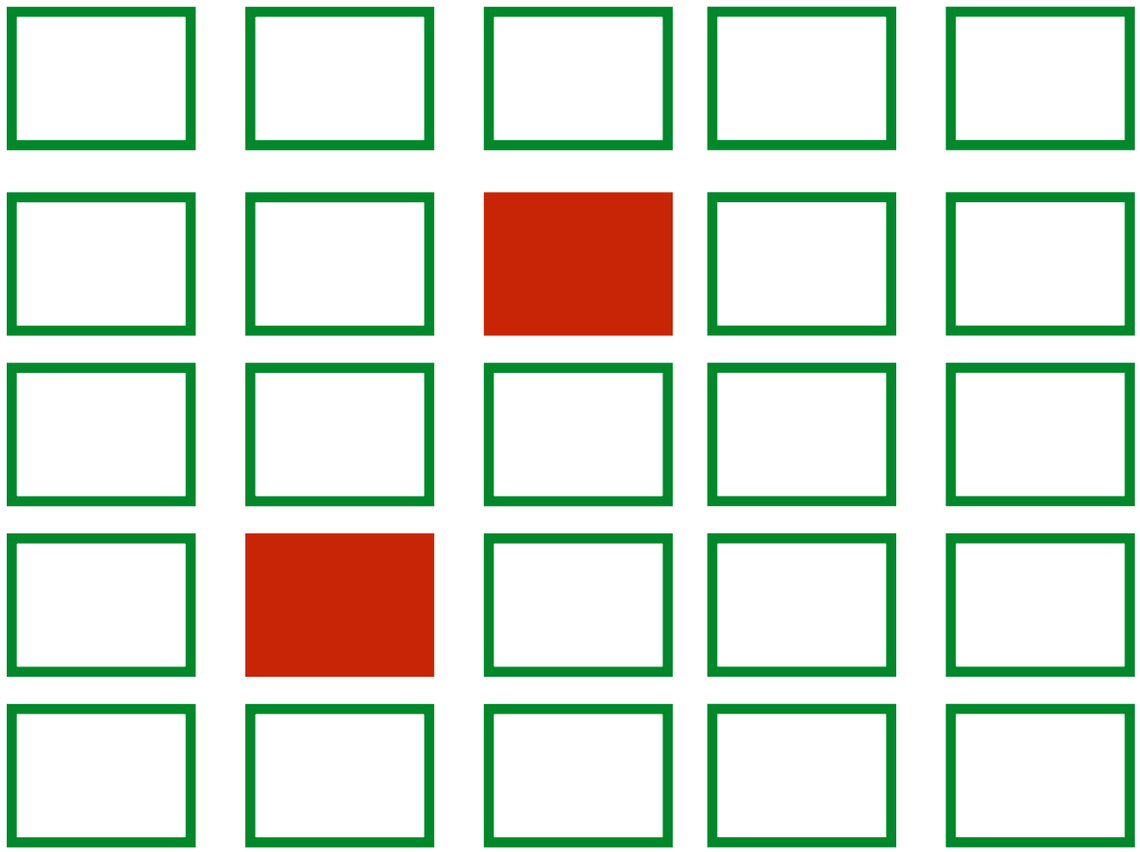
Enable **business** to provide reliable service

Employee satisfaction is higher

Continuous Delivery for service



7. Better Fault isolation



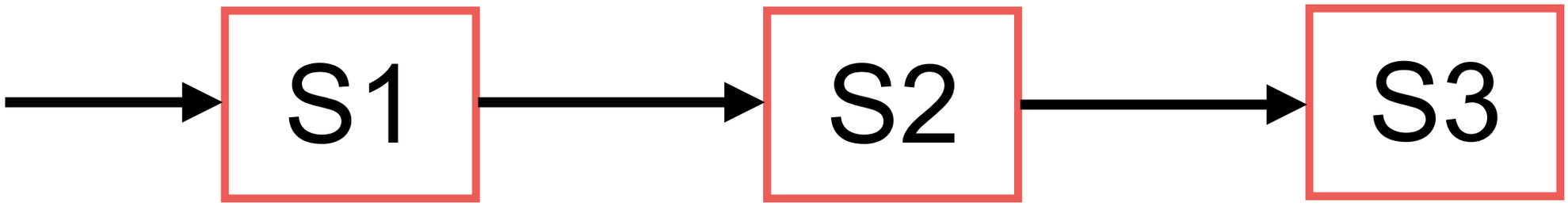
Drawbacks of Microservice

Drawbacks of Microservice

Find the right set of services
Distributed systems are complex
How to develop, testing and deploy ?

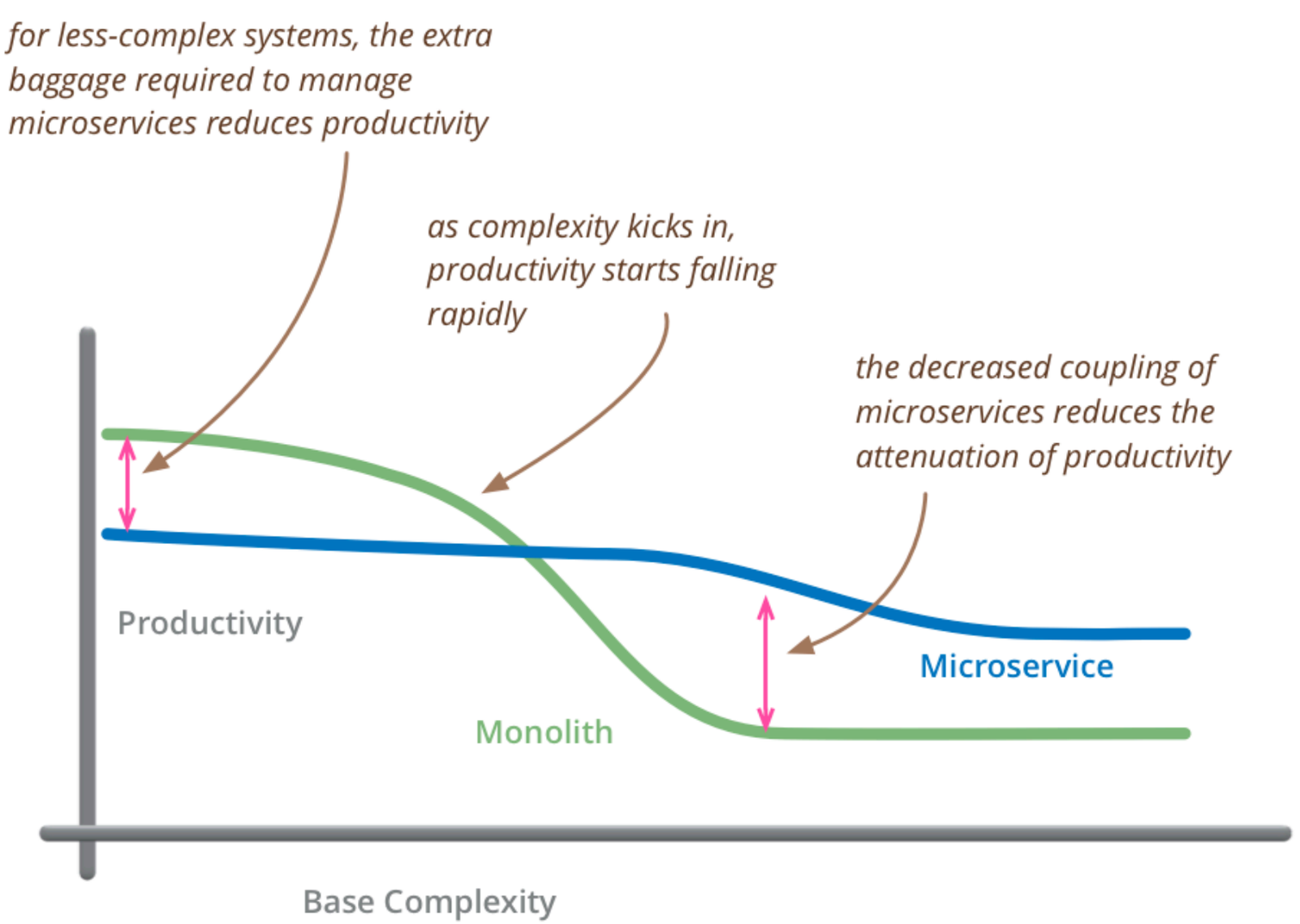
Drawbacks of Microservice

Deploy feature that required multiple service ?



Drawbacks of Microservice

Decide to use when adopt is difficult !!



but remember the skill of the team will outweigh any monolith/microservice choice

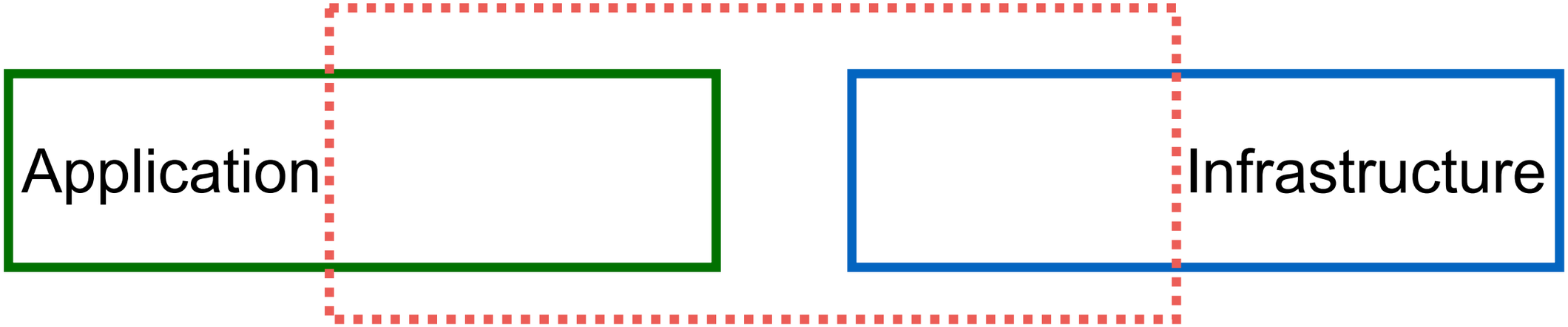
Microservice architecture patterns

3 Layers of service patterns

Application patterns

Application infrastructure pattern

Infrastructure pattern



Patterns for Microservice

Decompose application into services

Data patterns

Communication patterns

Service deployment patterns

Observability patterns

Automated testing of services

Security patterns

Decompose application into services

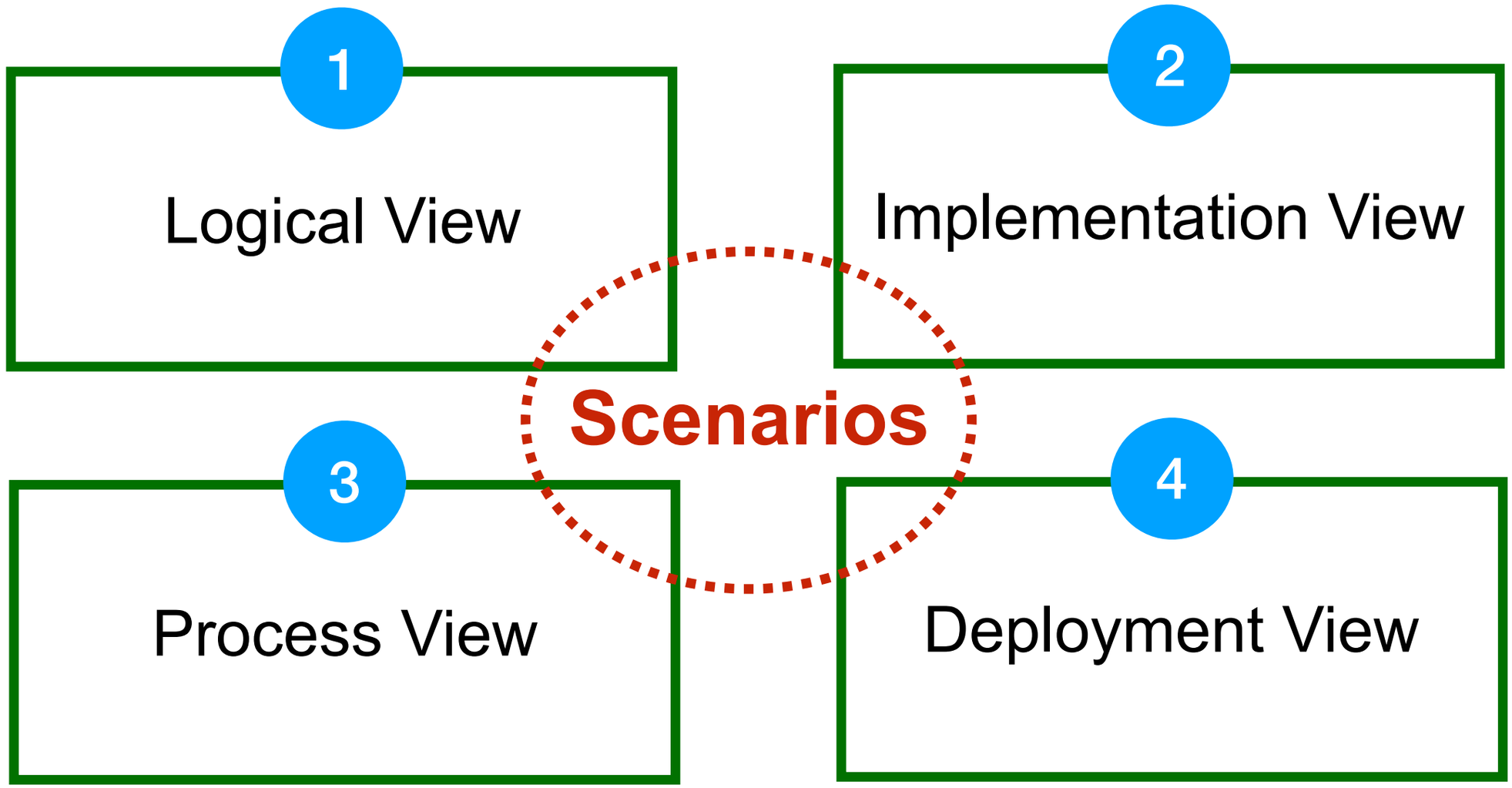
Premature splitting is the root of all **evil**.

Every time you make the decision to split out a new microservice, there's a **risk** of ending up with a bloated app.

4 View model of Software Architecture

1. Logical View
2. Implementation View
3. Process View
4. Deployment View

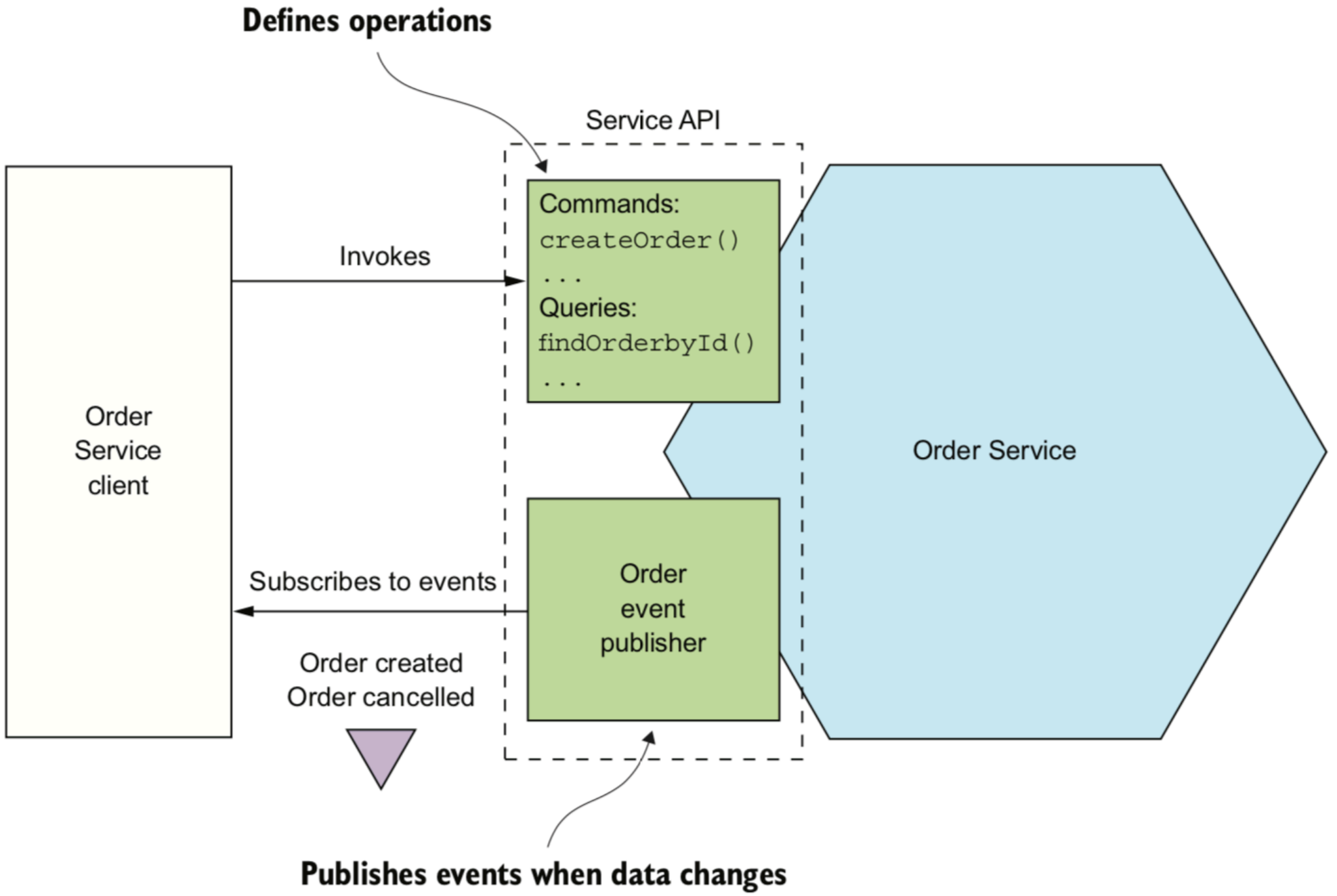
4 View model of Software Architecture



What is service ?

Standalone and loosely couple
Independently deployable software component
Implement some useful functionality

Example of service



Decompose application into services

By business capability ?
By subdomain/technical ?

Step to define services

1. Identify system operations
2. Identify services
3. Define service APIs and collaboration

1. Identify system operations

Start with functional requirements
User story

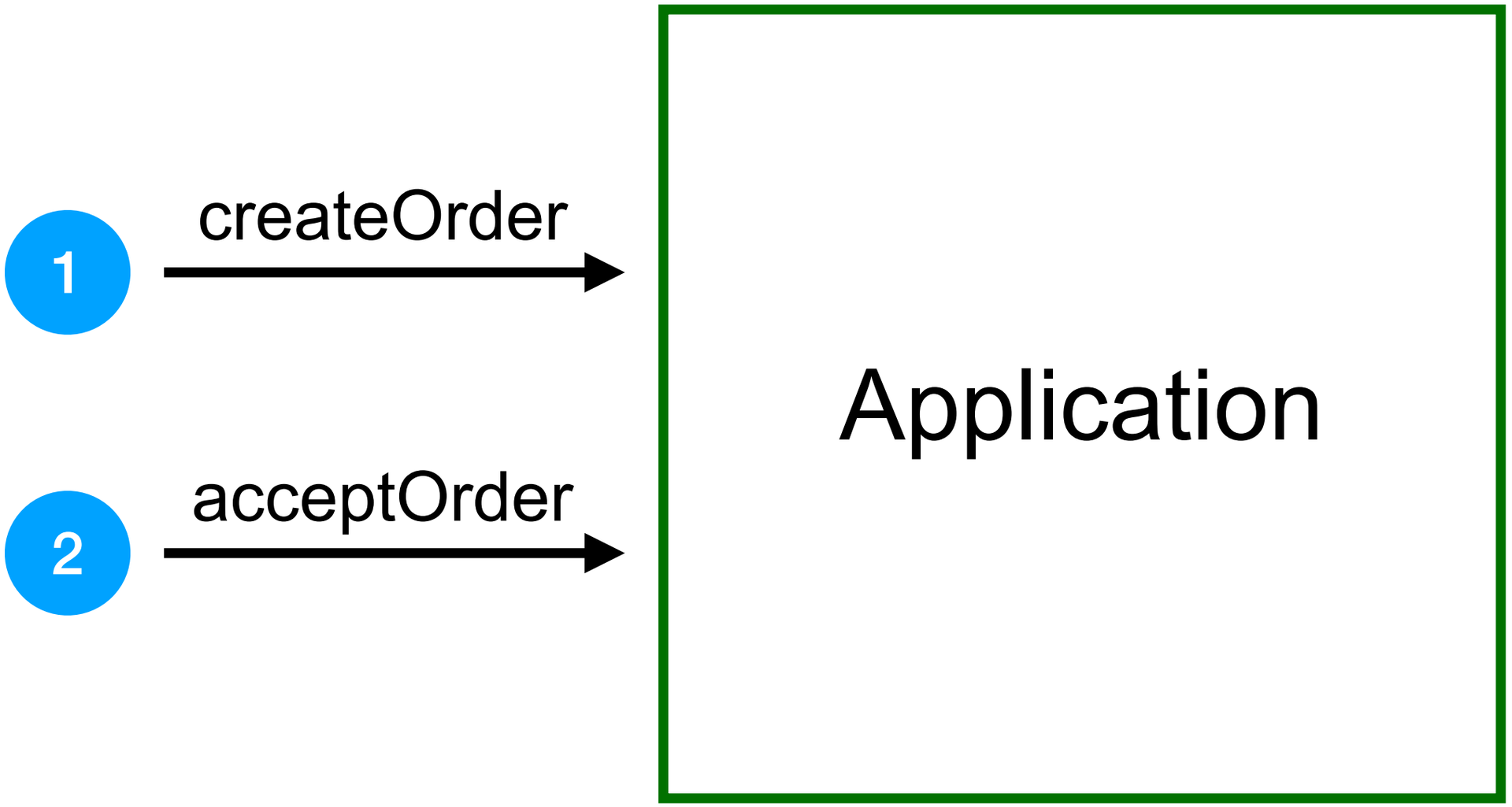
1

ลูกค้าต้องการสั่งซื้ออาหาร

2

ร้านอาหารรับคำสั่งซื้อ

1. Identify system operations



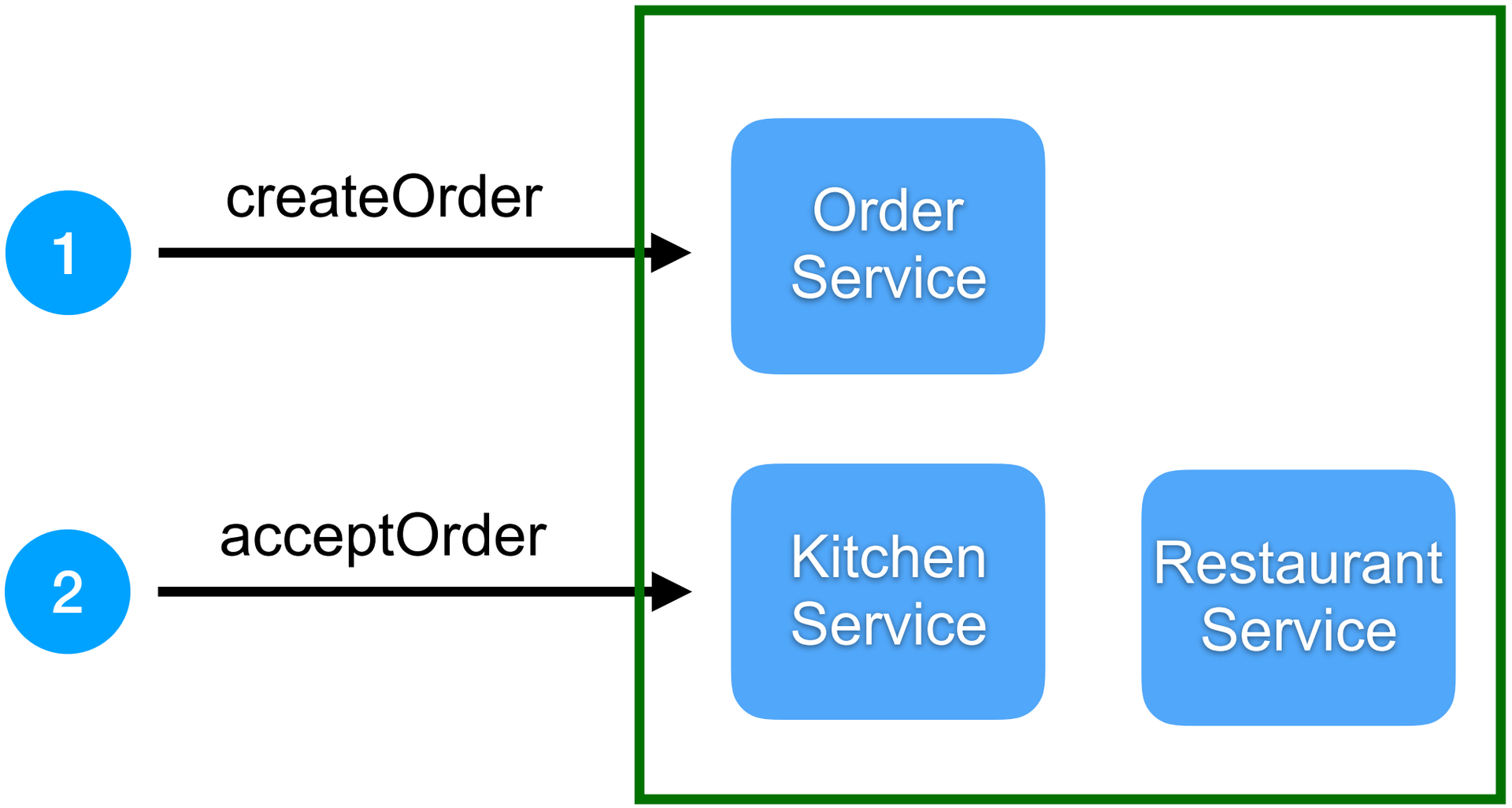
2. Identify services

Try to decomposition into services

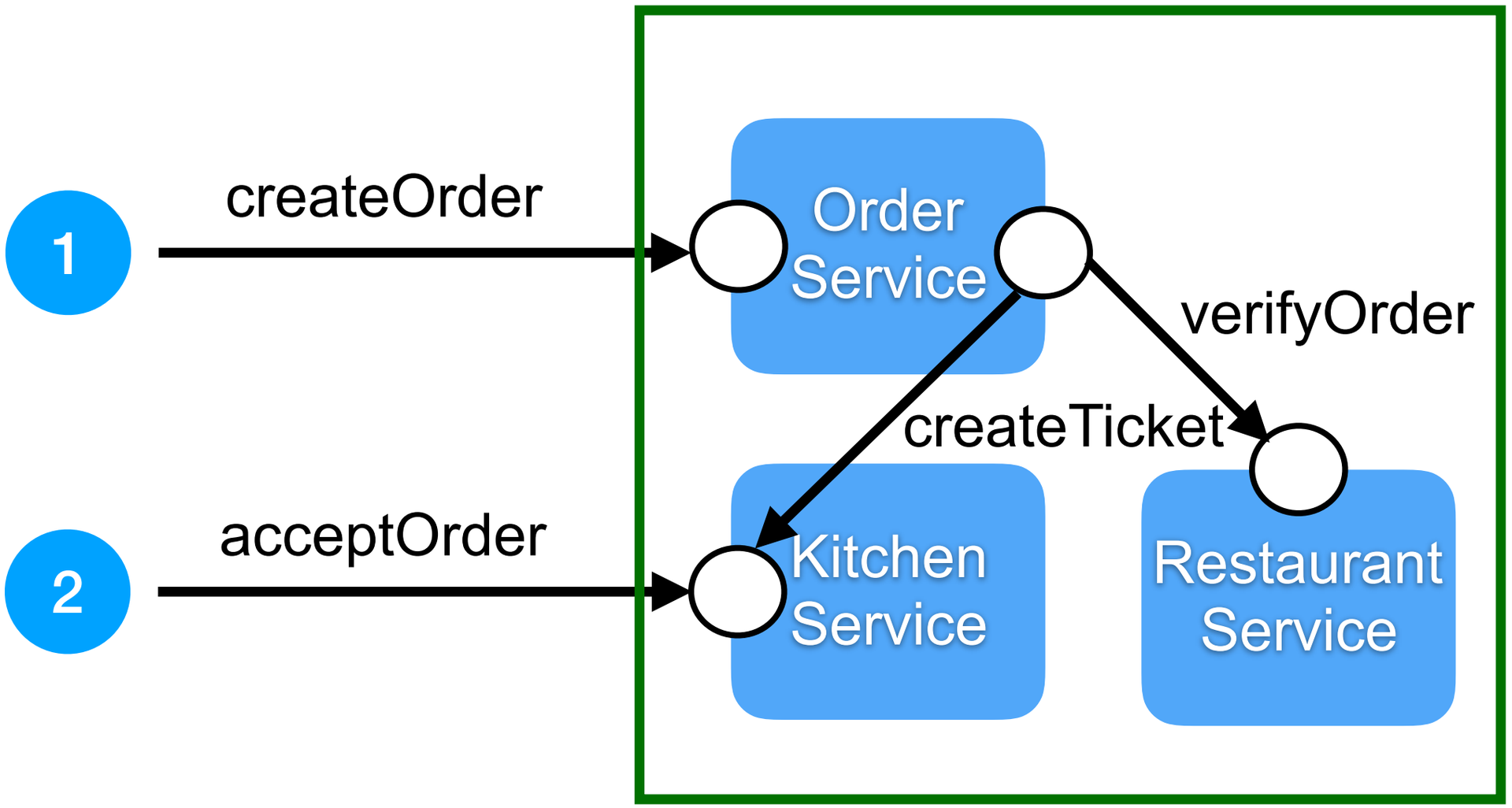
Business > Technical concept

What > How

2. Identify services



3. Define service APIs and collaborations



Problems when decompose services ?

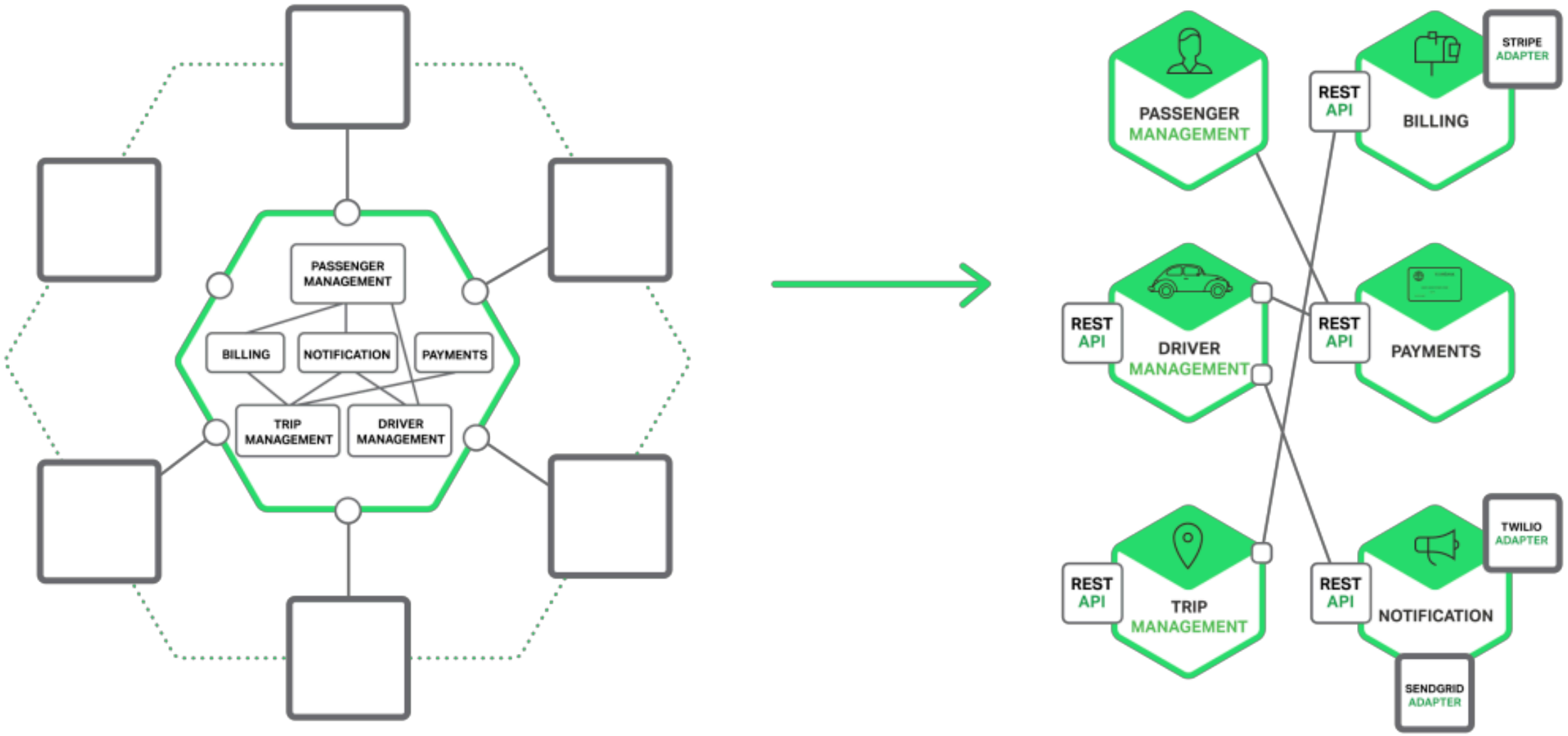
Network latency
Reliability of communication (sync)
Maintain data consistency
God classes

Communication between services

Communication patterns

Communication style
Discovery service
Reliability of communication
Transactional messaging
External API

Inter Process Communication (IPC)

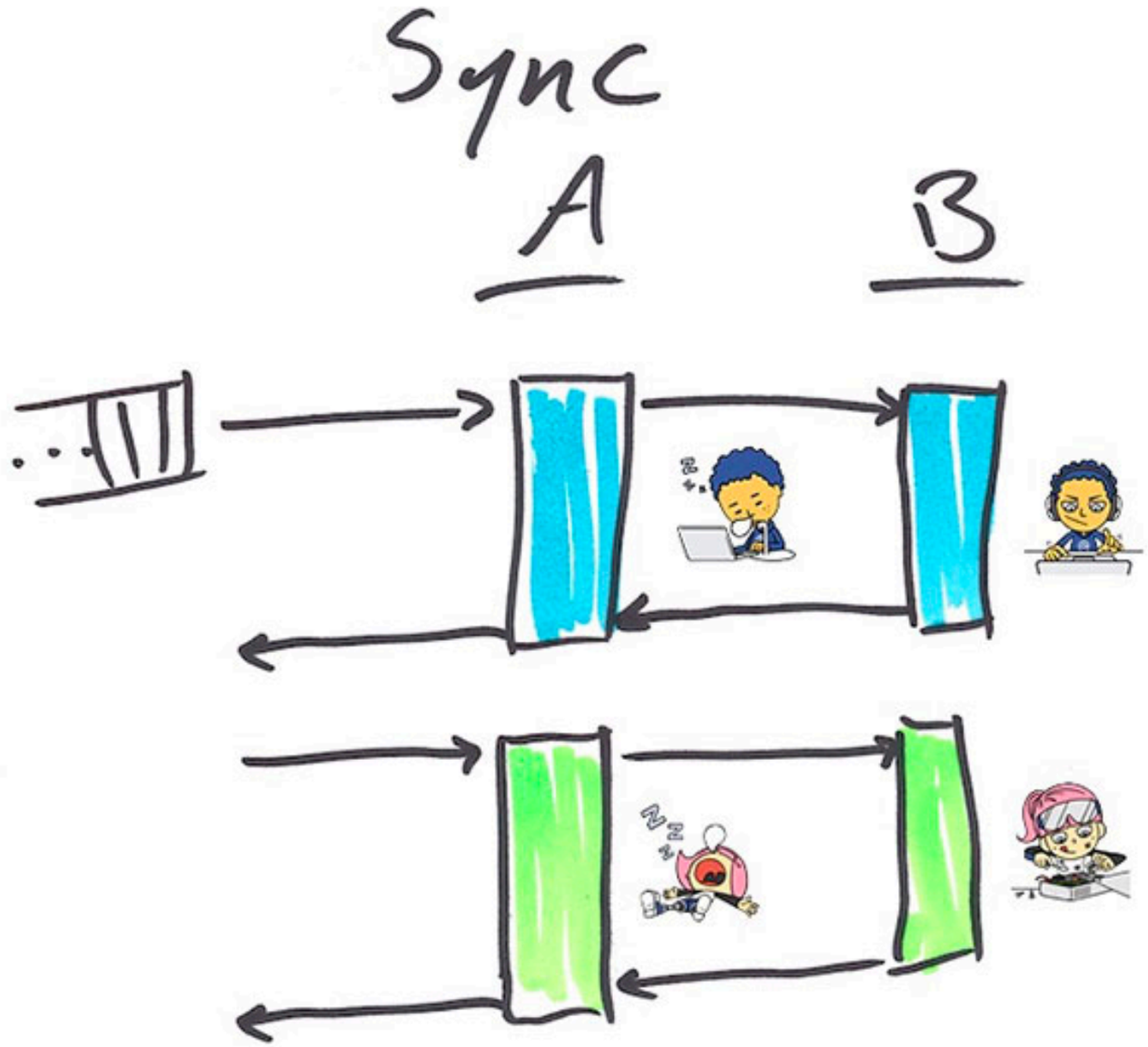


https://www.nginx.com

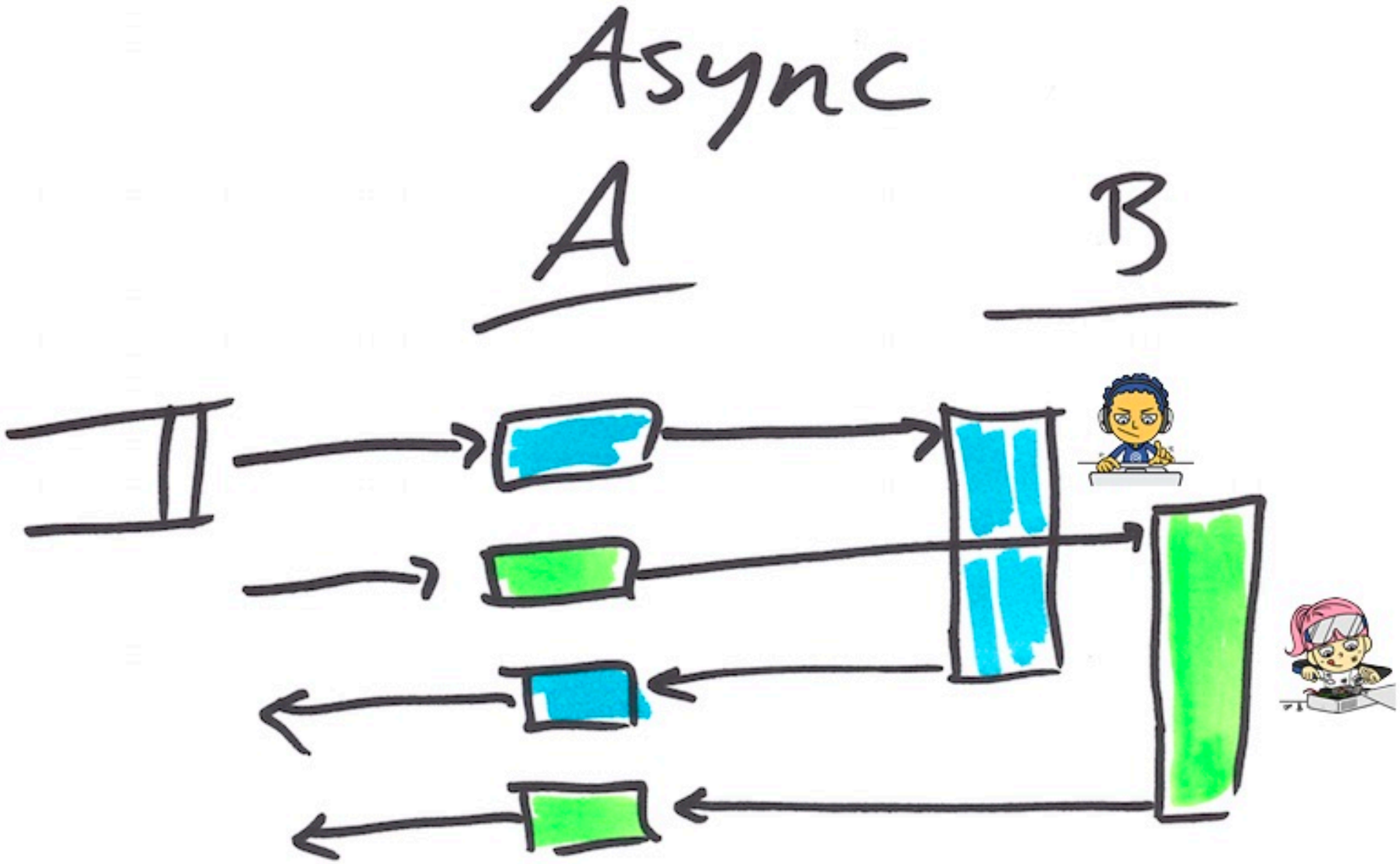
Interaction Styles

	One-to-one	**One-to-many**
Synchronous	Request/response	-
Asynchronous	Async request/response	Publish/subscribe
	Notification	Publish/async response

Synchronous

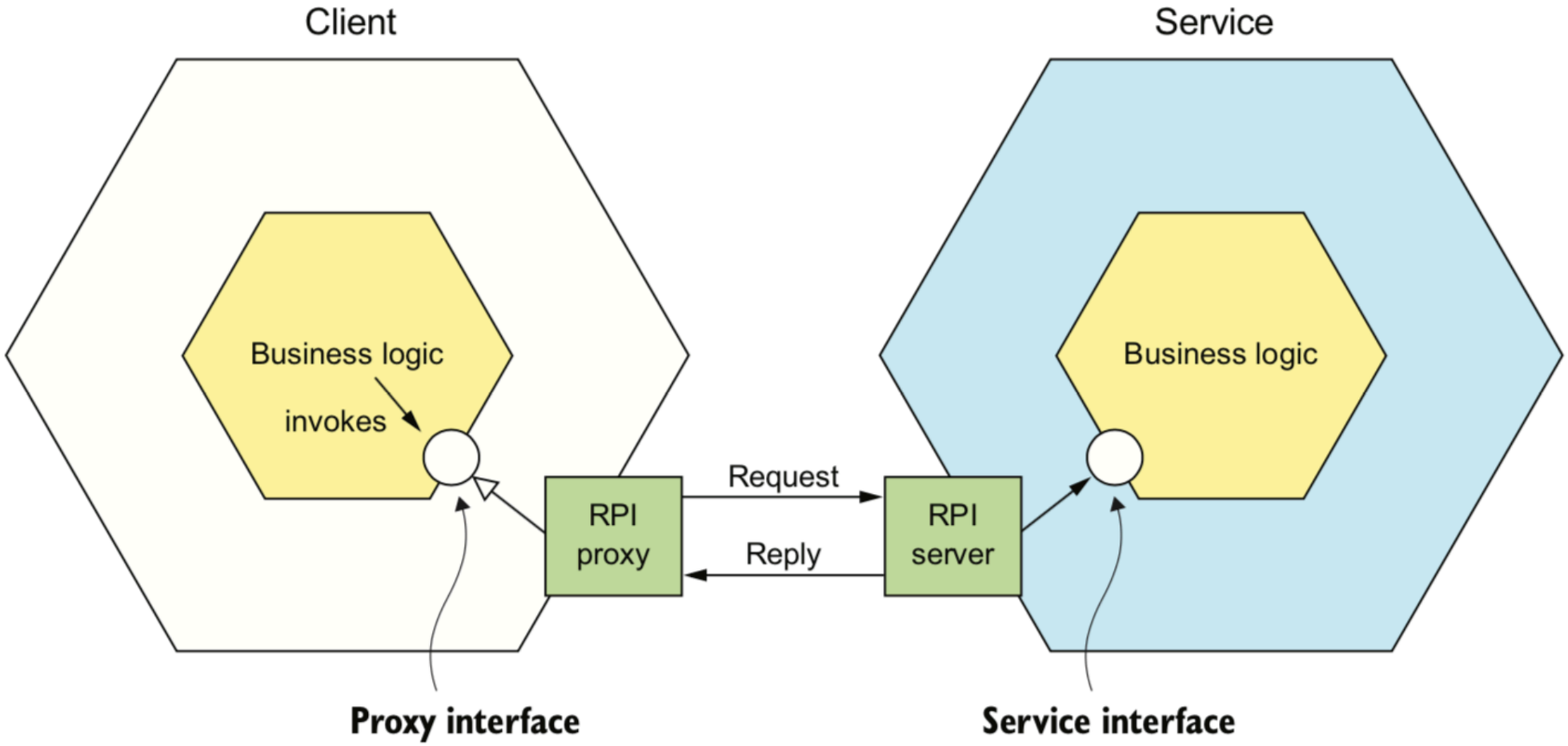


Asynchronous



Synchronous Remote Procedure Invocation

Synchronous Remote Procedure Invocation



Synchronous Remote Procedure Invocation

REST

gRPC

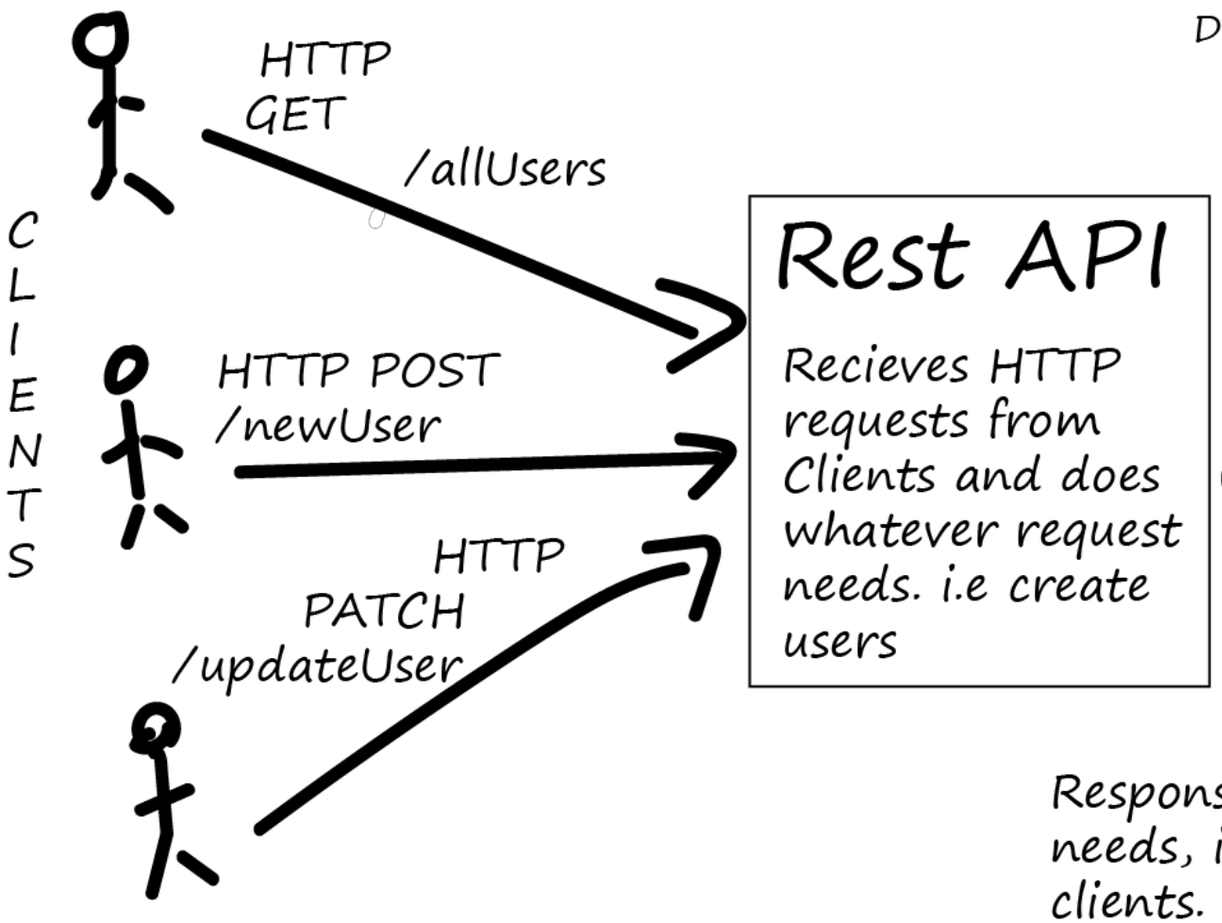
Handling failure with **Circuit breaker**

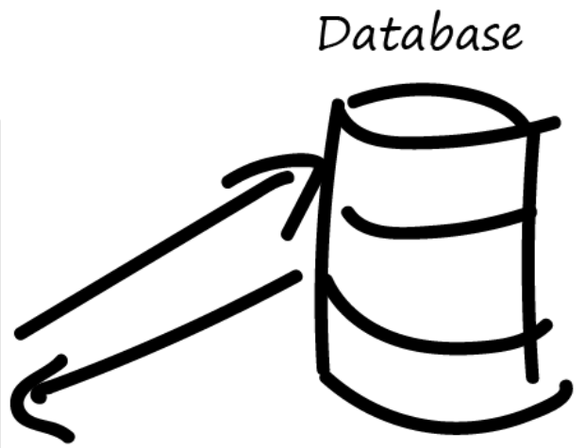
Service discovery

REpresentational **S**tate **T**ransfer

Rest API Basics

Typical HTTP Verbs:
GET -> Read from Database
PUT -> Update/Replace row in Database
PATCH -> Update/Modify row in Database
POST -> Create a new record in the database
DELETE -> Delete from the database





Our Rest API queries the database for what it needs

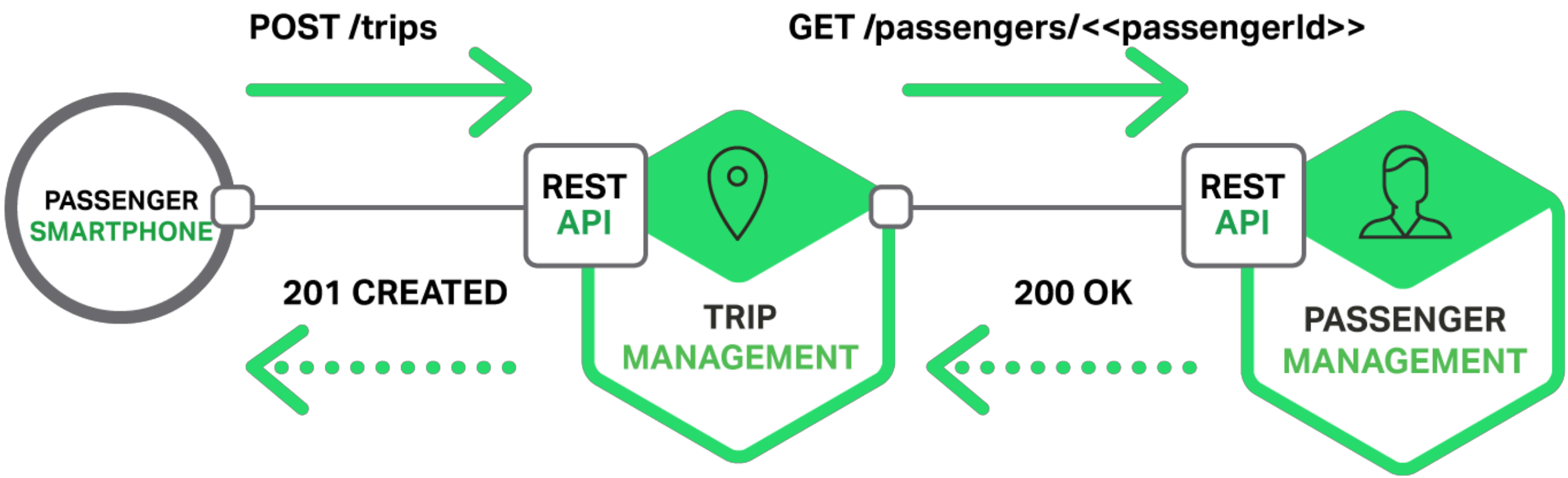
Our Clients, send HTTP Requests and wait for responses

Response: When the Rest API has what it needs, it sends back a response to the clients. This would typically be in JSON or XML format.

REST :: mapping with HTTP verbs

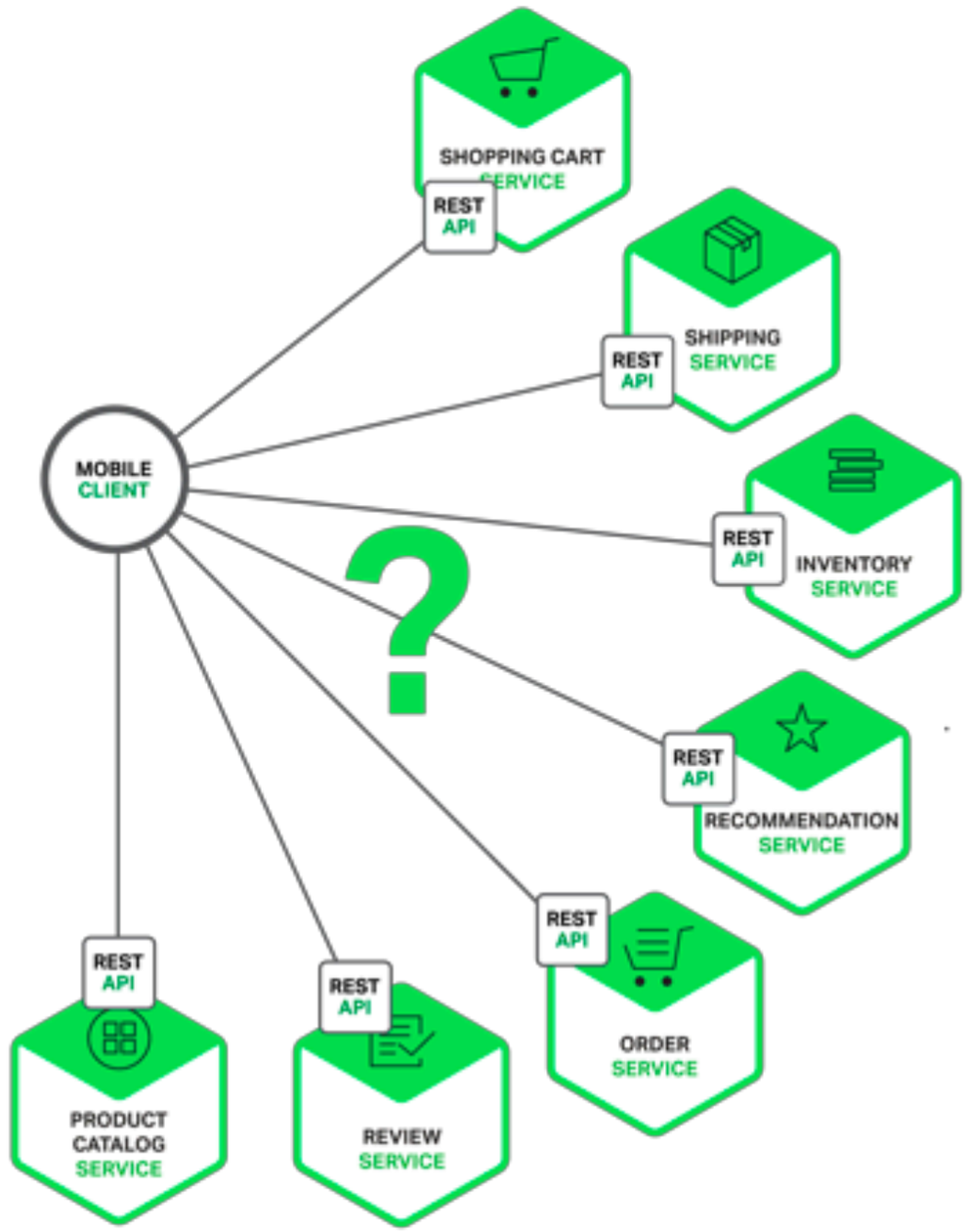
Activity	HTTP Method
Retrieve data	GET
Create new data	POST
Update data	PUT
Delete data	DELETE

Request and response format



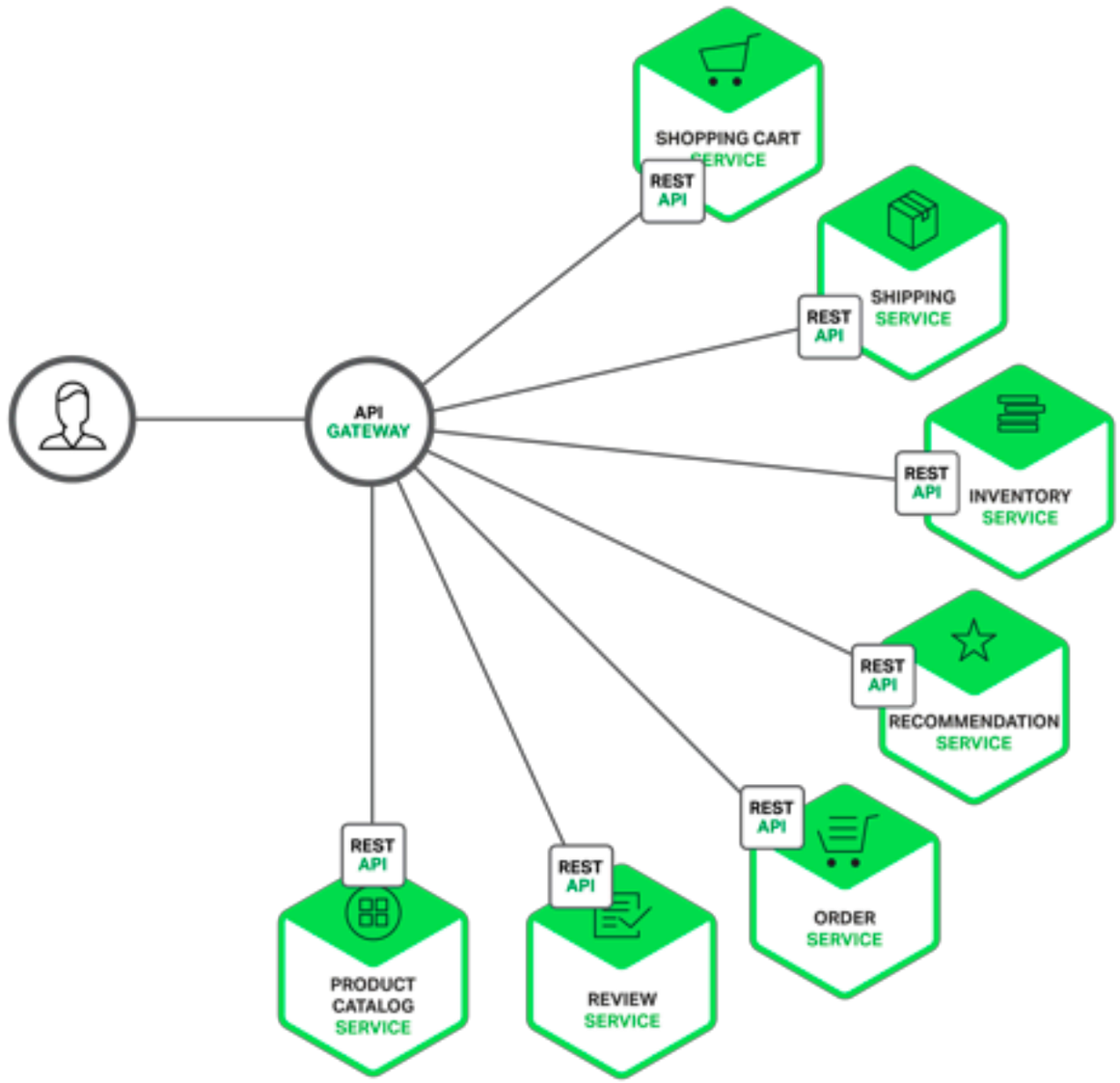
https://www.nginx.com

Direct communication !!



https://www.nginx.com

Working with API gateway



https://www.nginx.com

Functions of API gateway

Authentication
Authorization
Rate limiting
Caching
Metrics collection
Request logging

Benefits

Encapsulation interface structure
Client talk to service via gateway
Reduce round trip between service

Drawbacks

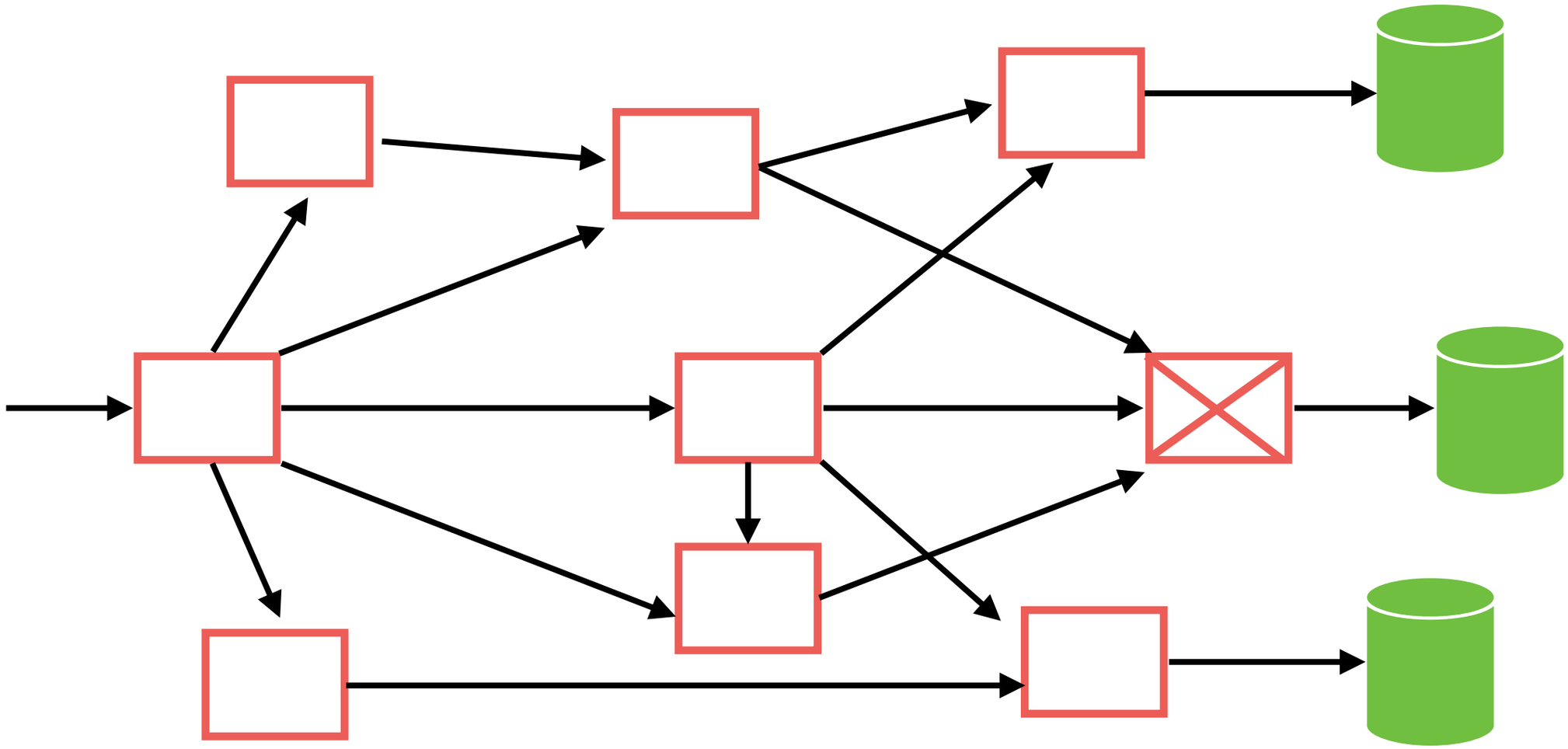
Development/Performance bottleneck

Single point of failure

Waiting for update data in gateway

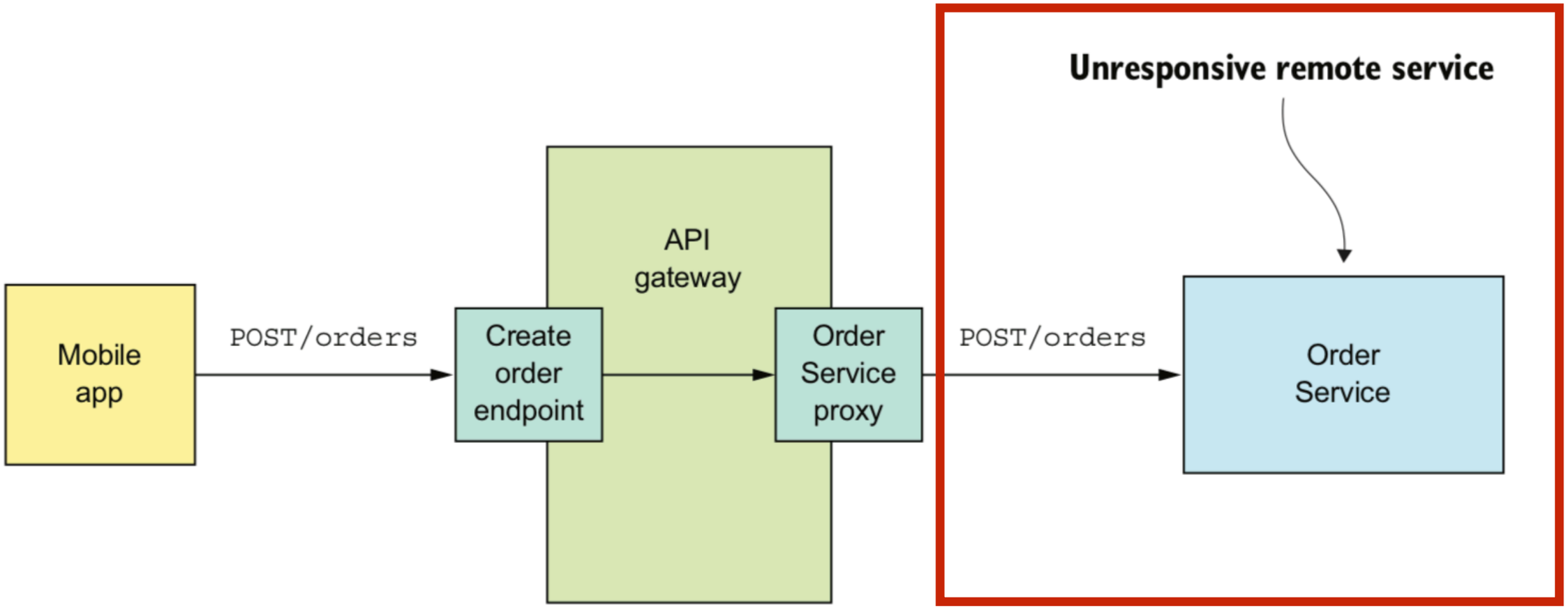
Circuit Breaker pattern

How to handling partial failure ?



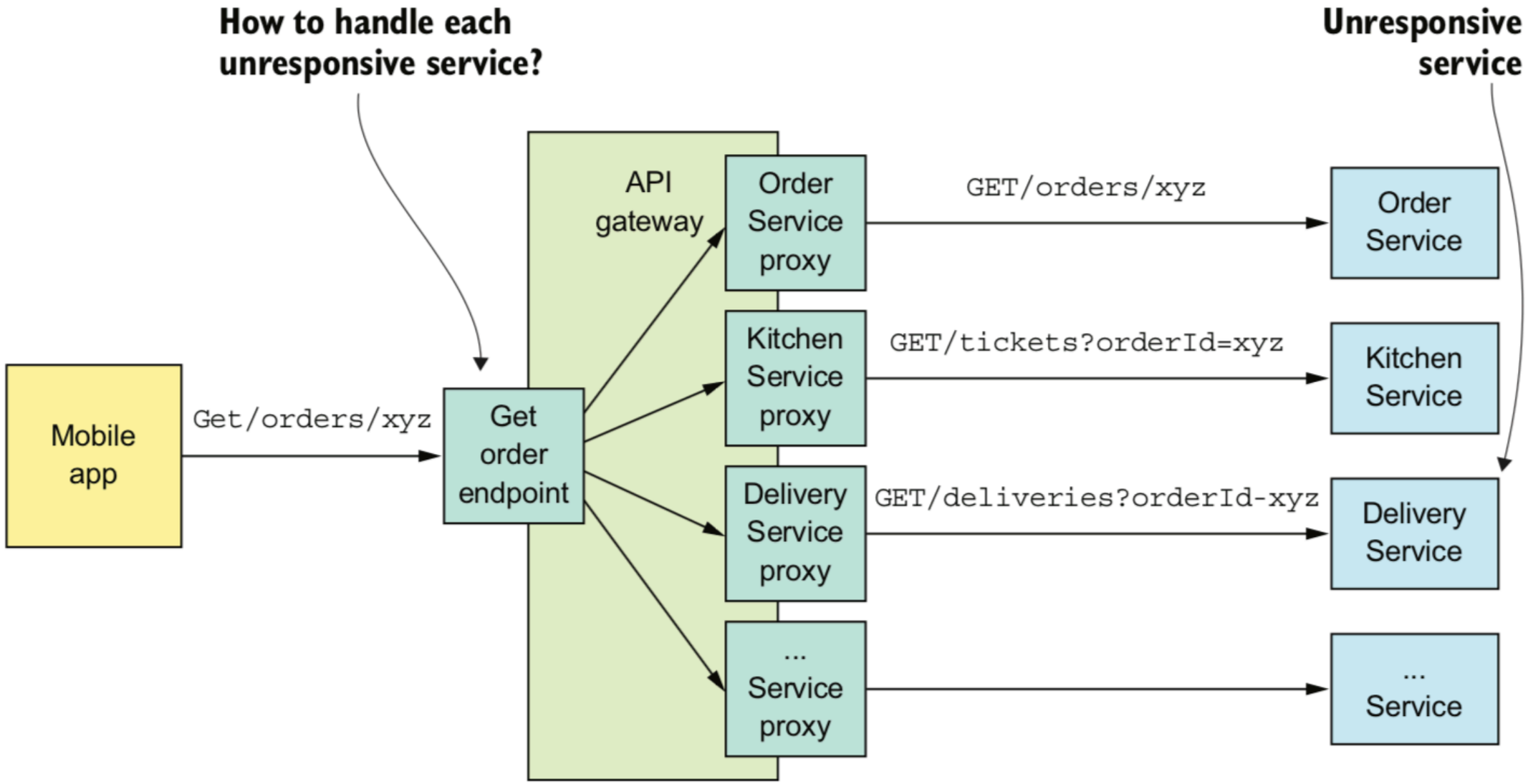
Circuit Breaker pattern

How to handling partial failure ?



Circuit Breaker pattern

How to handling partial failure ?



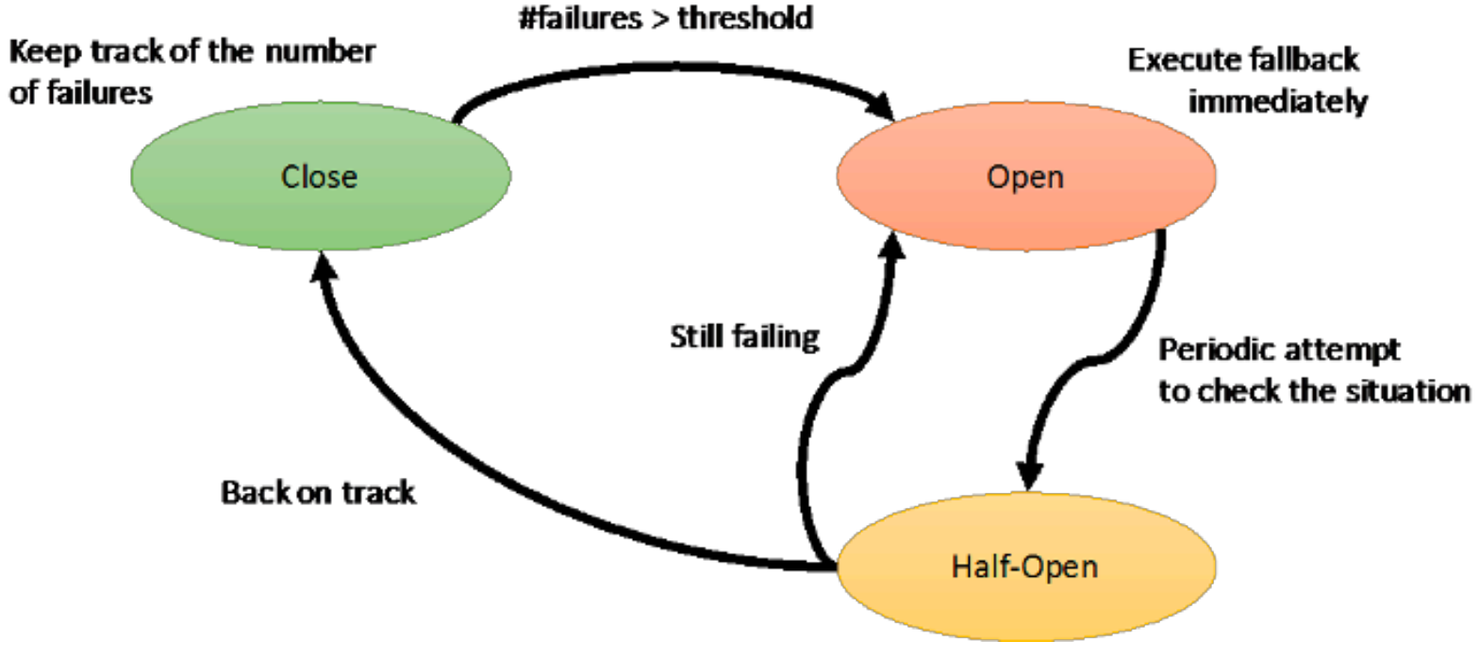
Develop robust patterns

Network timeout
Limit request from client to service
Circuit braker pattern

Circuit Breaker pattern

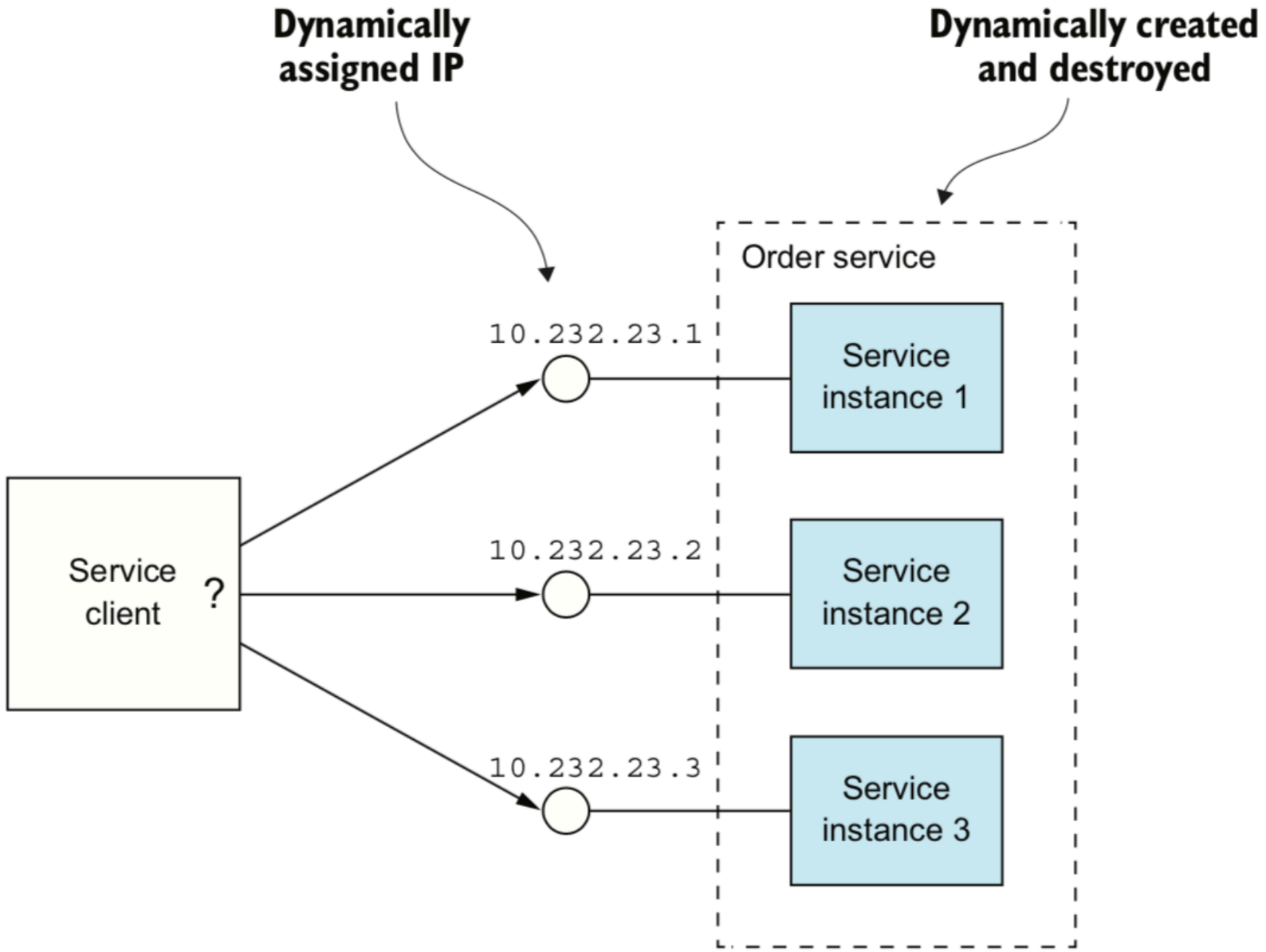
Track the number of success and failure

If error rate exceed some threshold then enable circuits breaker

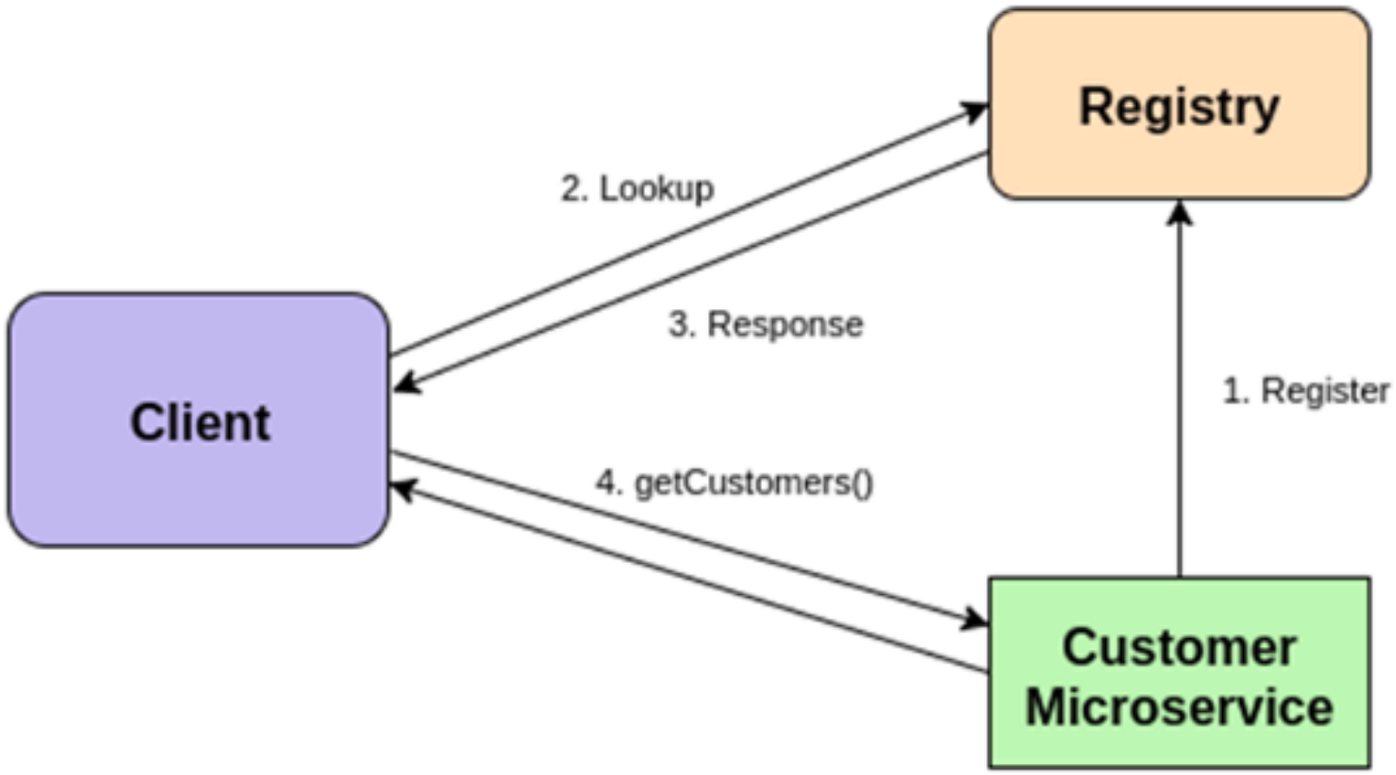


Service Discovery

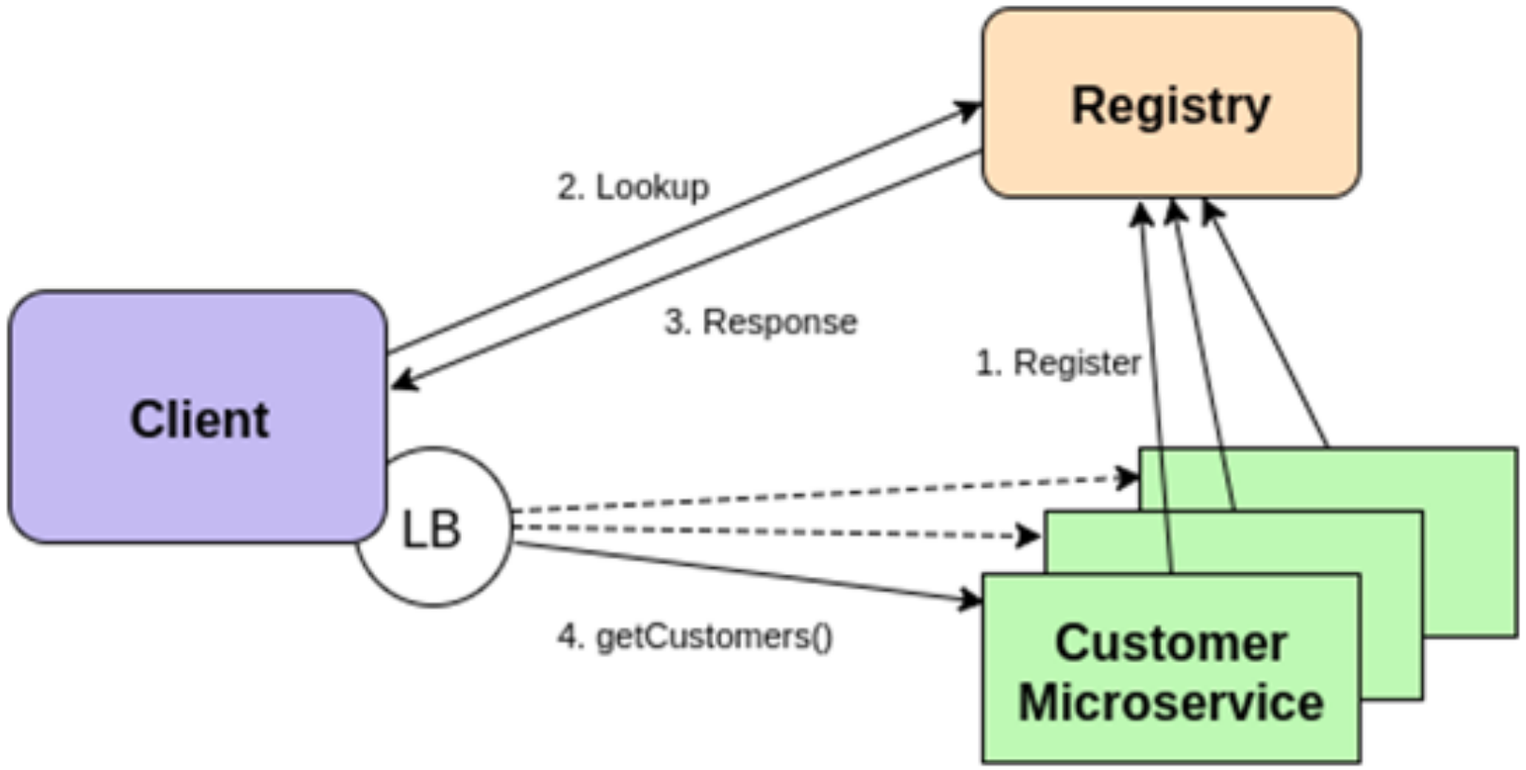
How to call another services ?



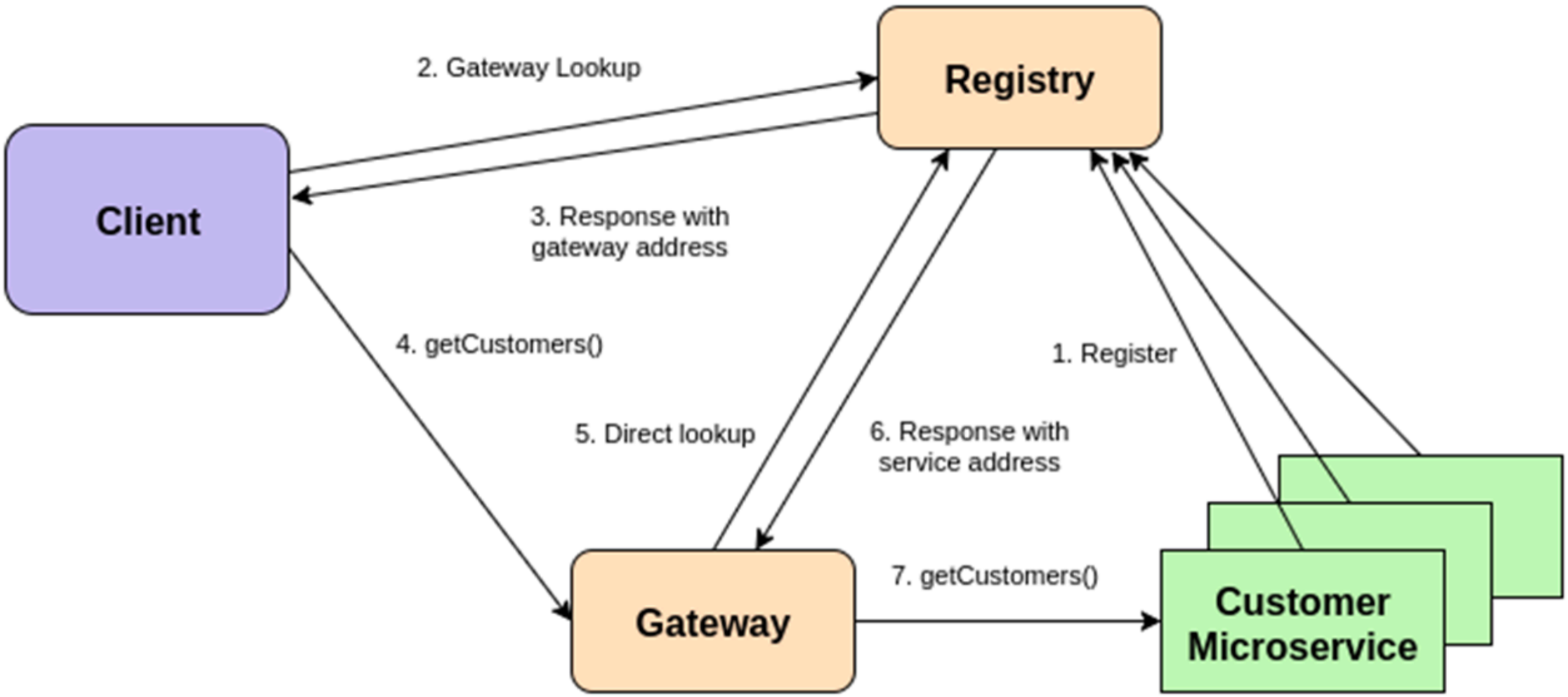
Service Discovery



Service discovery with Load balance

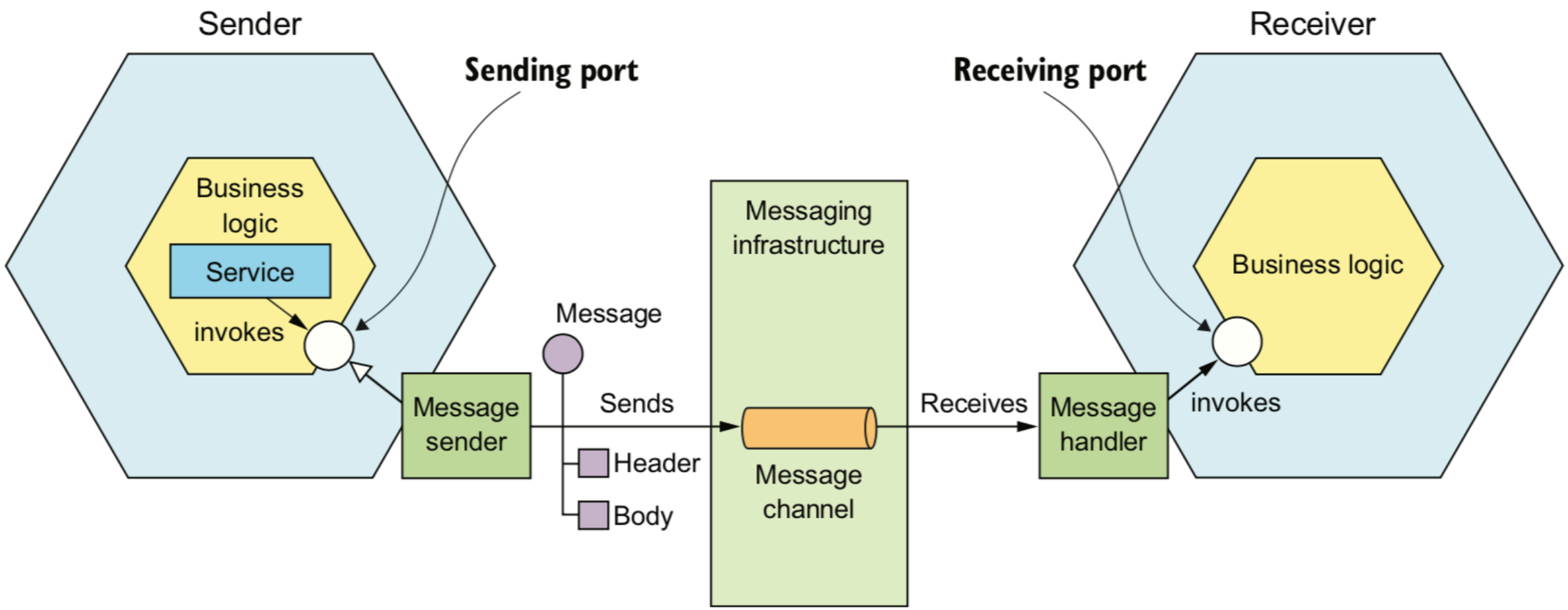


Service discovery with API gateway

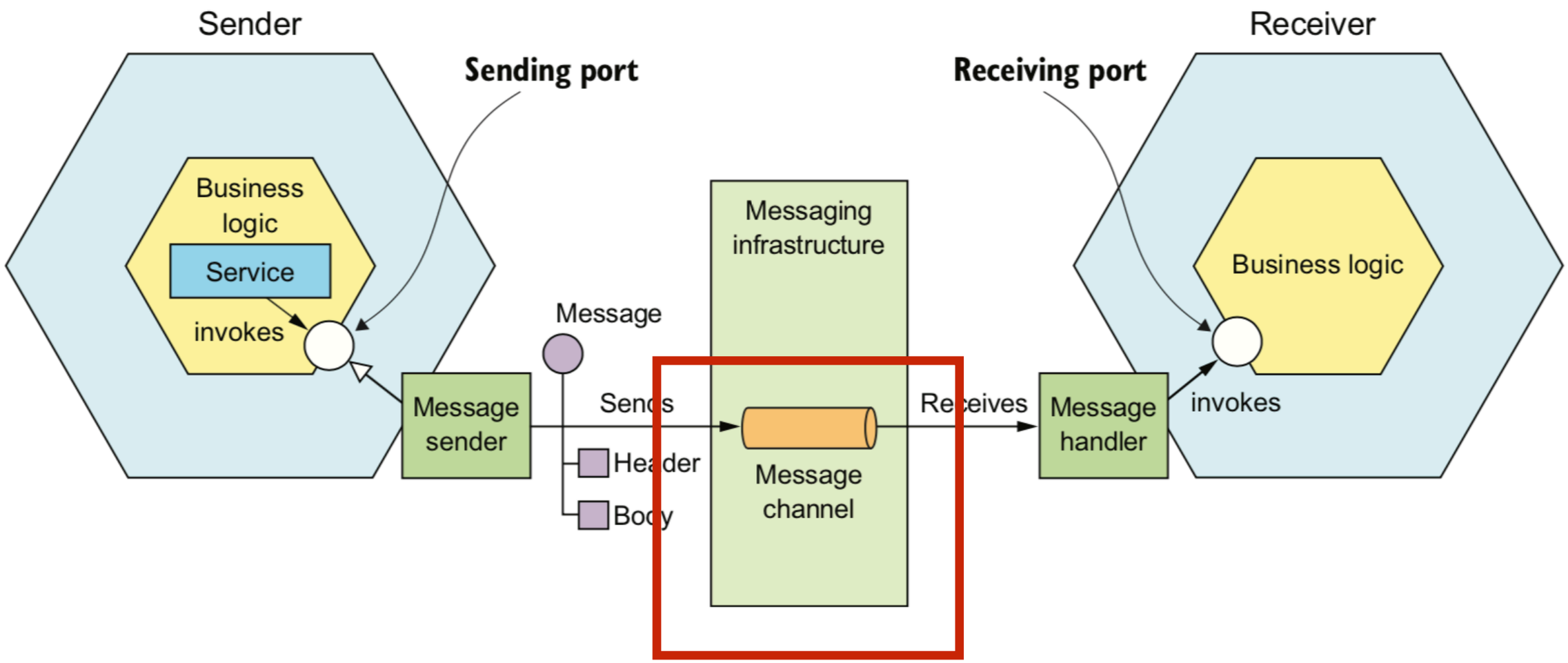


Asynchronous messaging pattern

Asynchronous messaging pattern

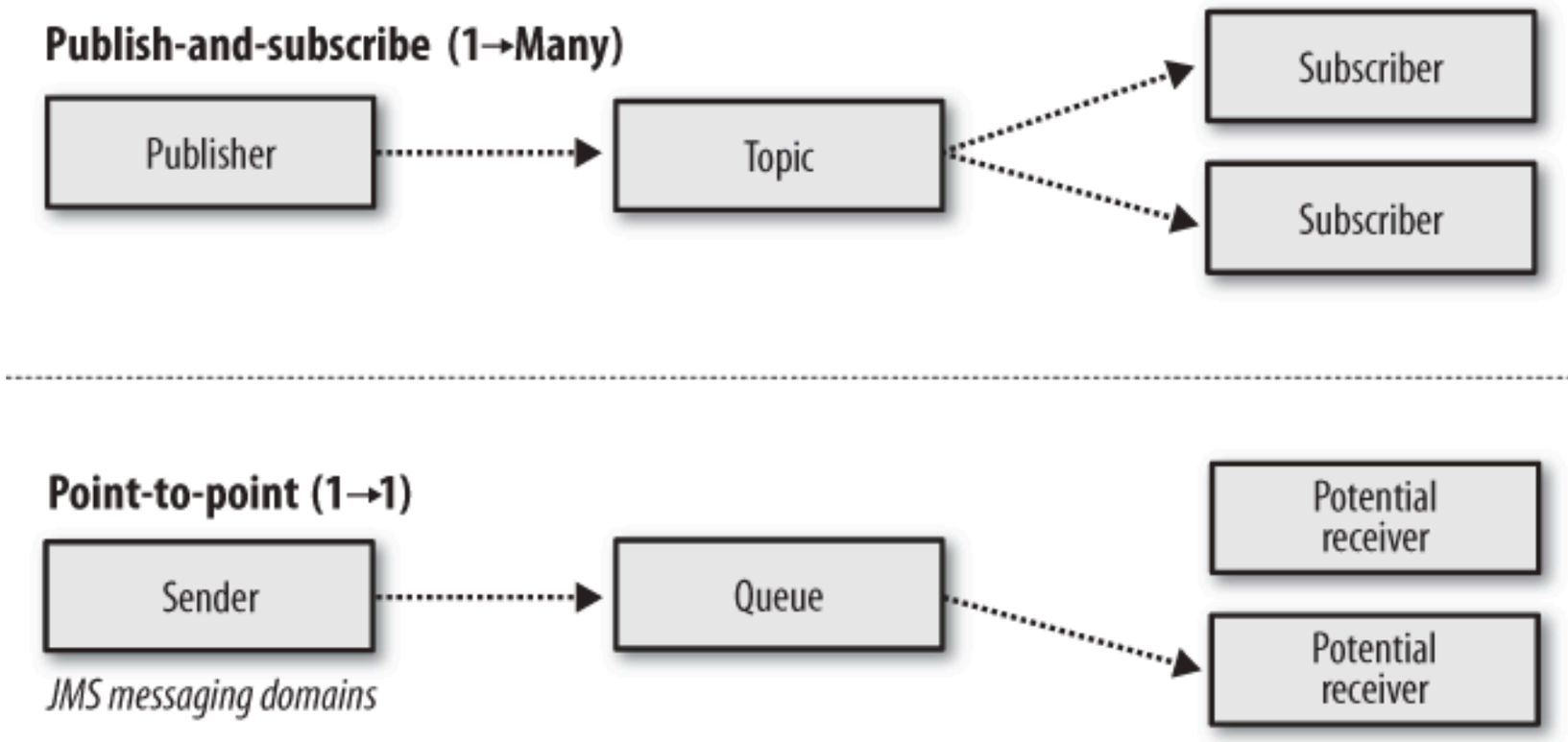


Asynchronous messaging pattern

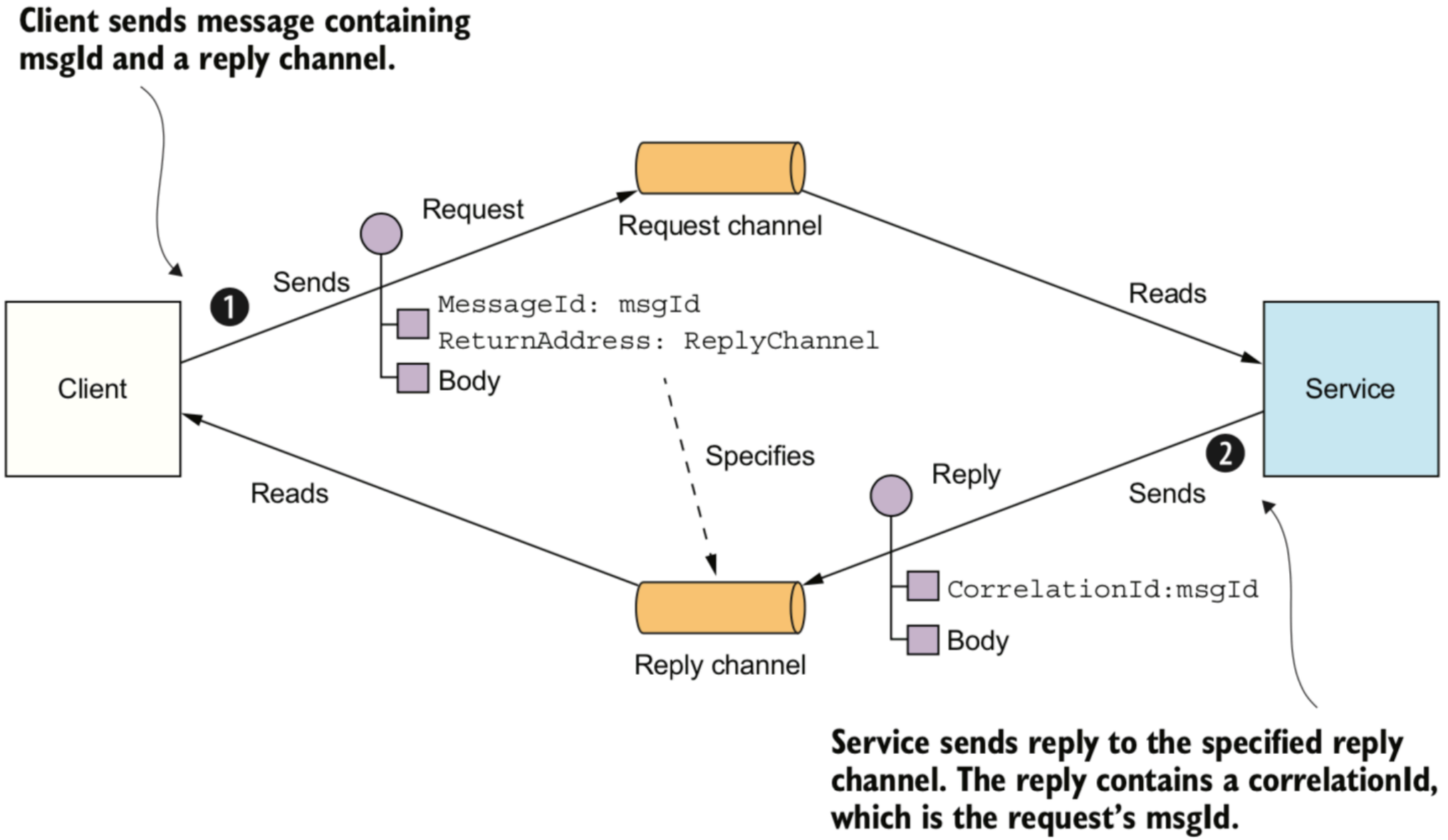


Messaging channels

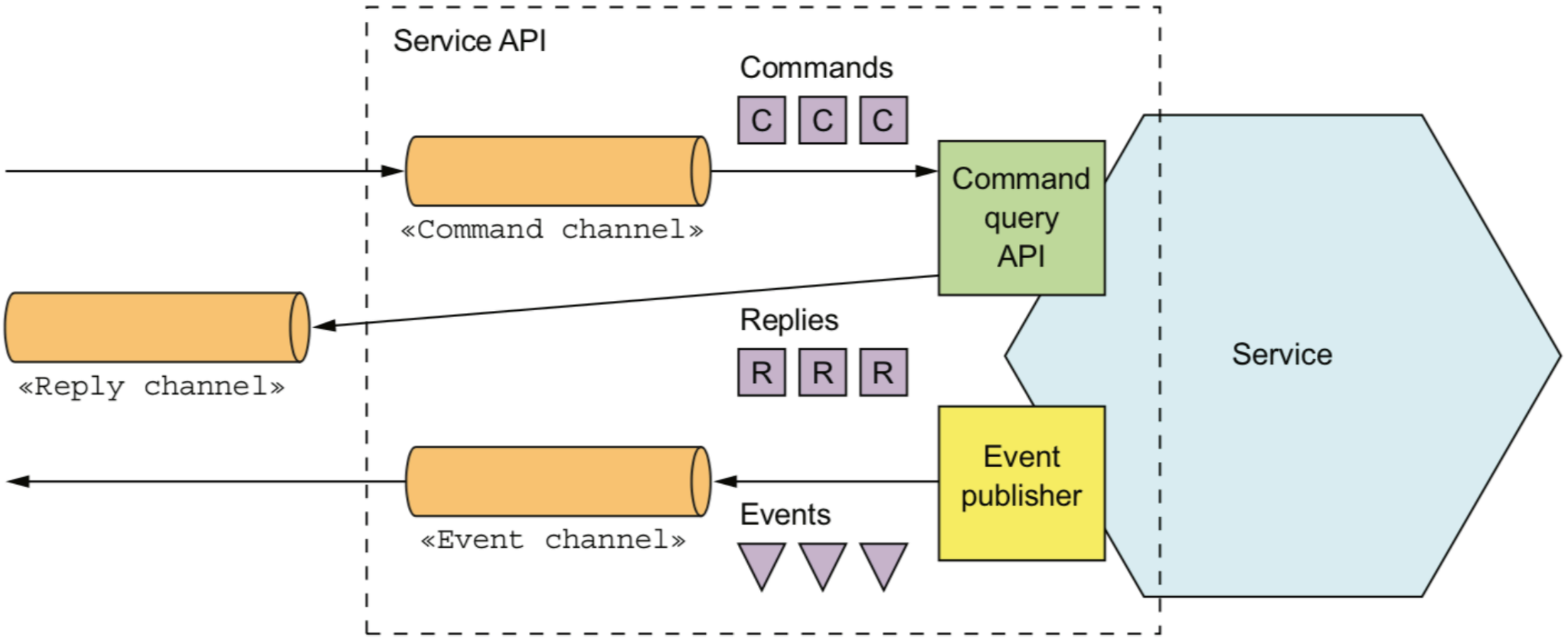
Point-to-point
Publish-subscribe



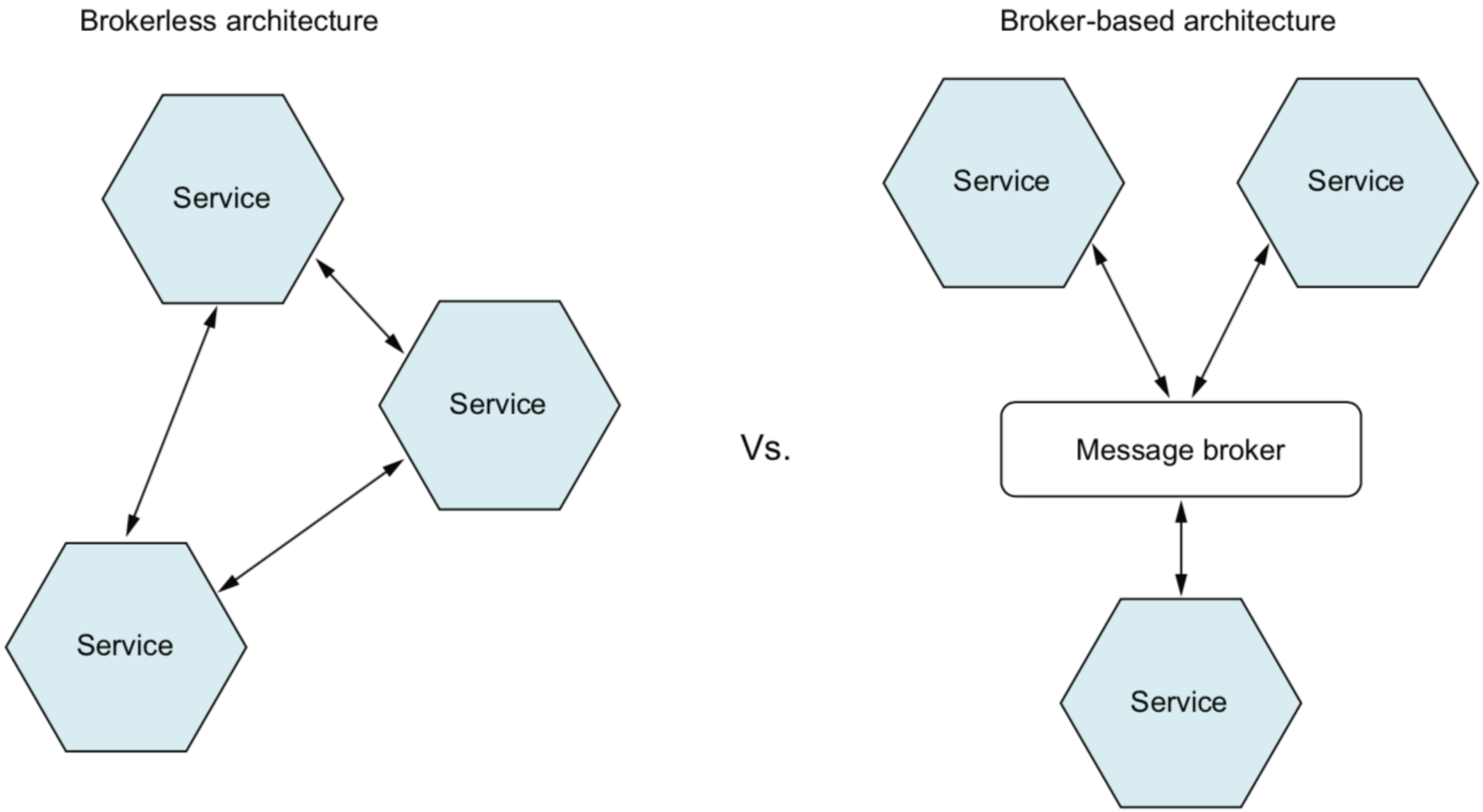
Async request/response (1)



Async request/response (2)



Messaging-based use message broker



Message broker

Benefits

Loose-coupling
Message buffer
Flexible communication

Drawbacks

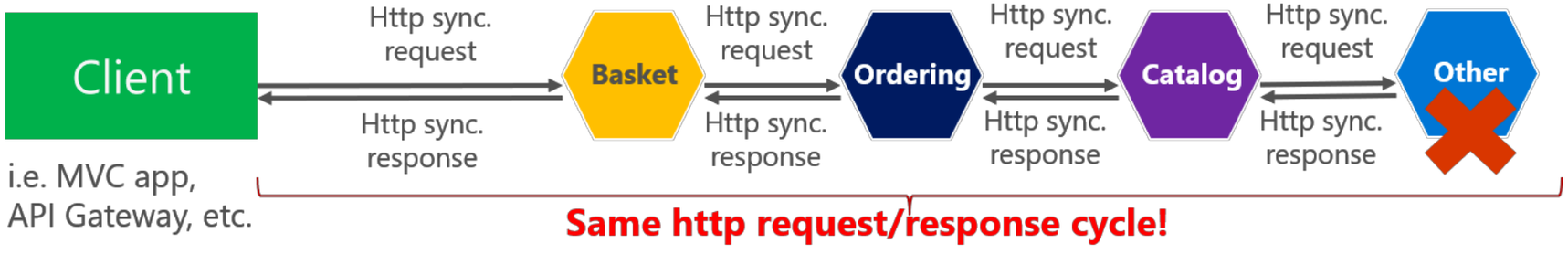
Performance bottleneck
Single point of failure
Operational complexity

Communication

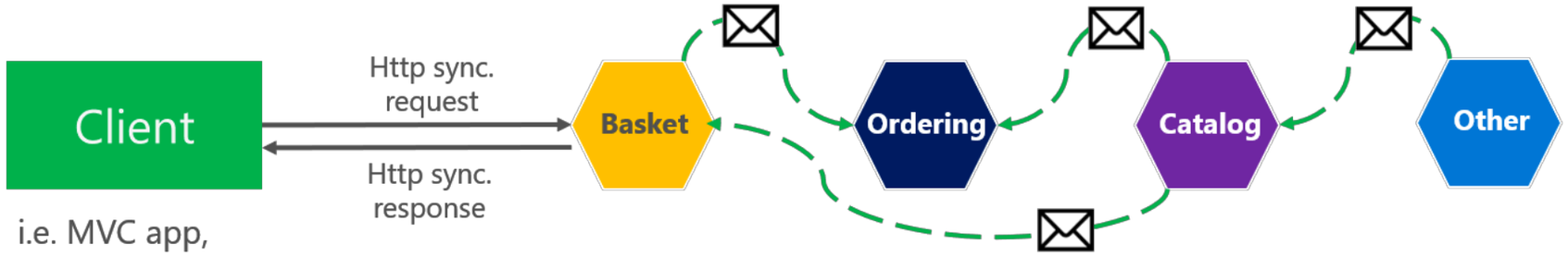
Synchronous vs. async communication across microservices

Anti-pattern

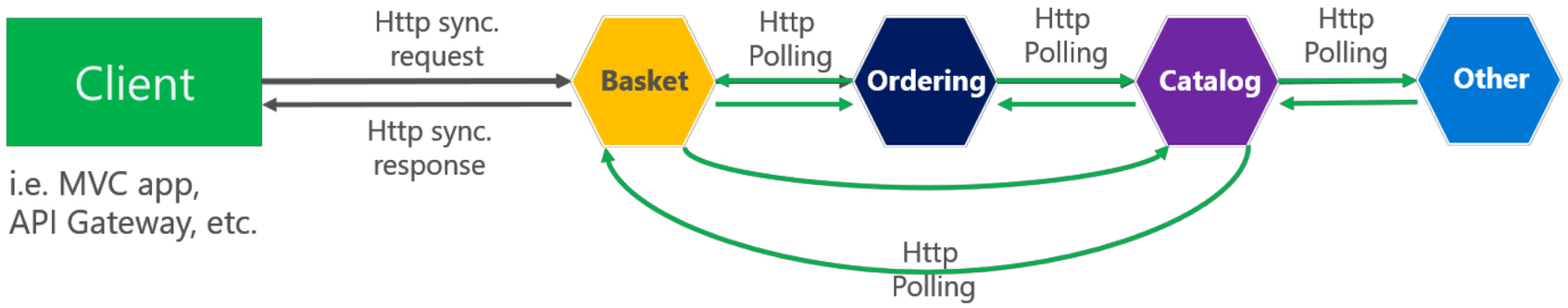
Synchronous
all req./resp. cycle



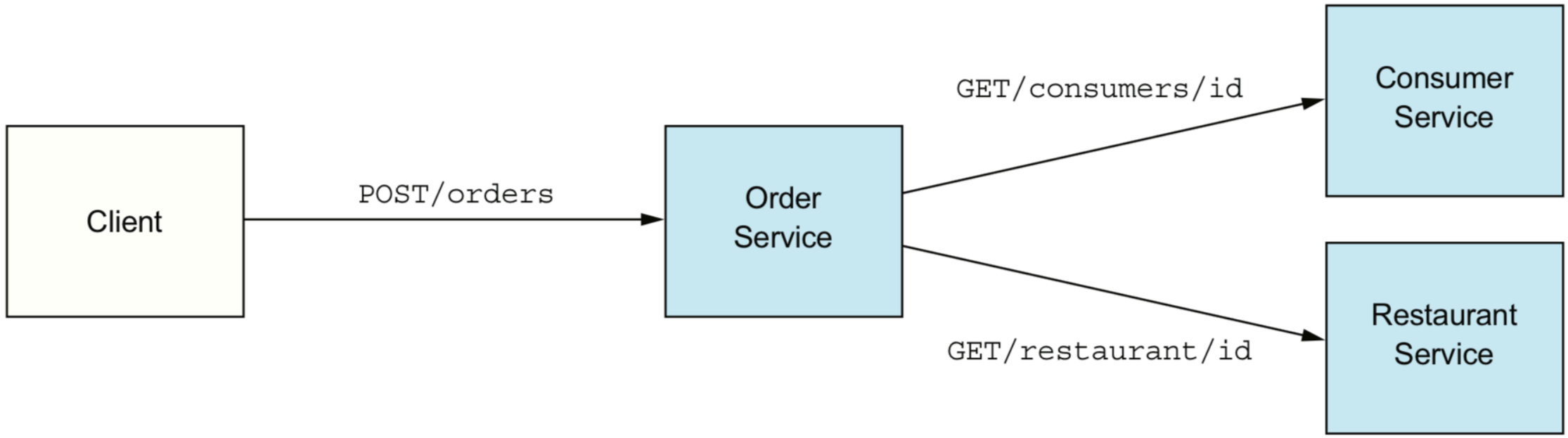
Asynchronous
Comm. across
internal microservices
(EventBus: i.e. **AMPQ**)



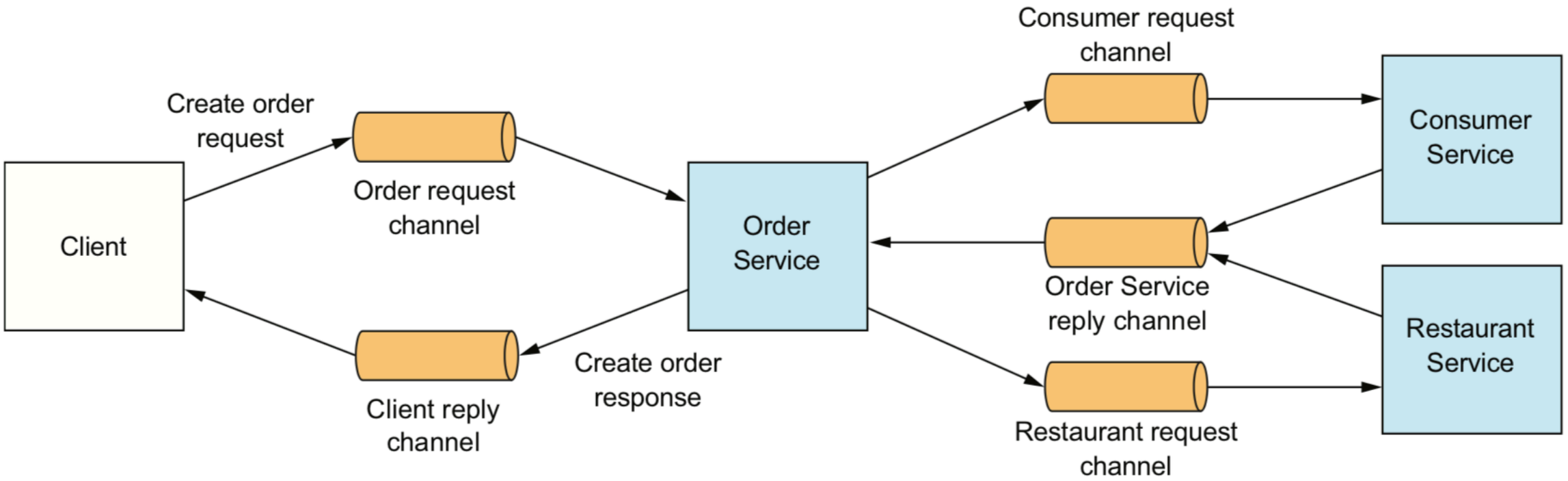
"Asynchronous"
Comm. across
internal microservices
(Polling: **Http**)



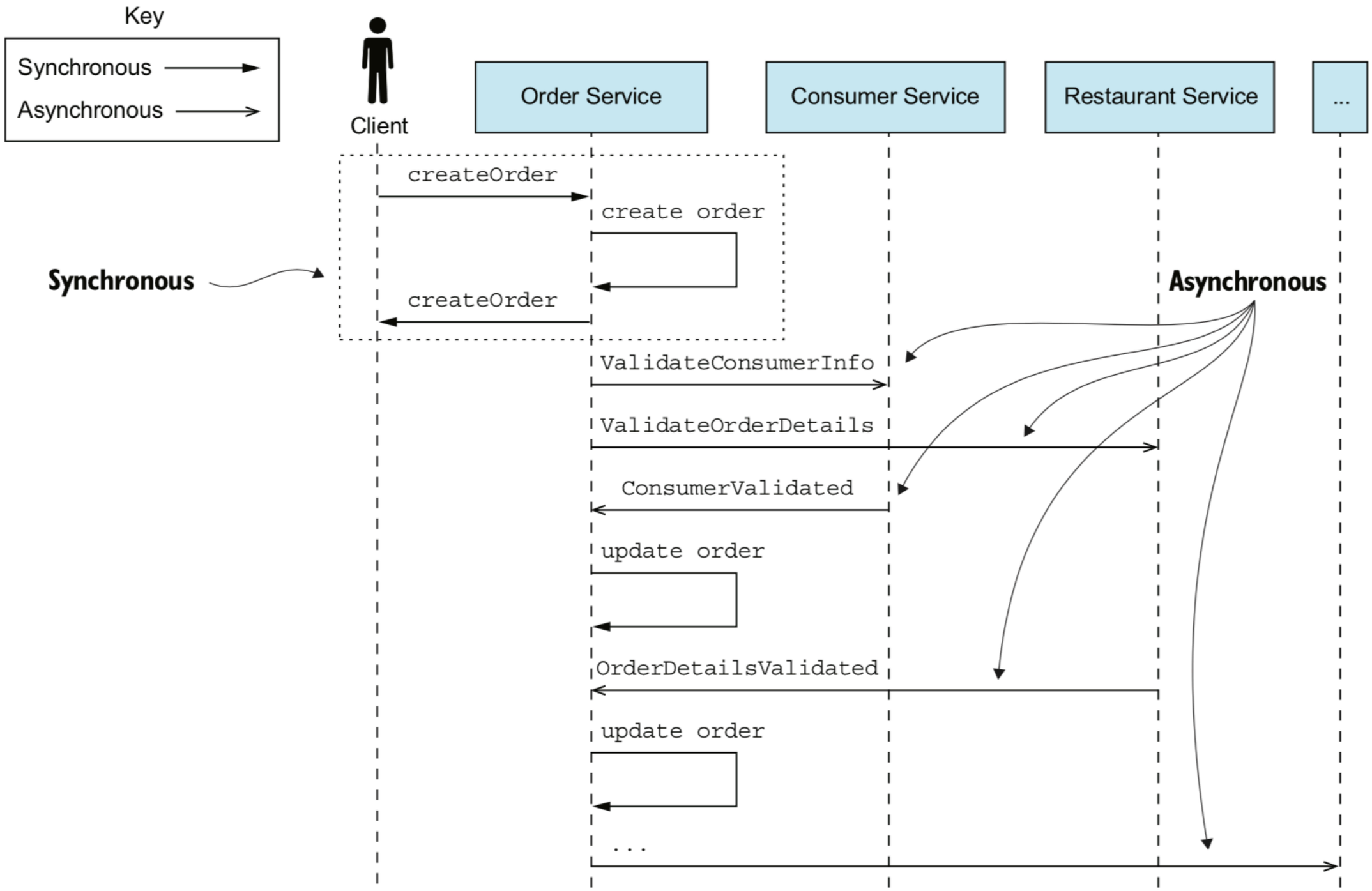
Synchronous reduce availability



Replace with asynchronous (1)

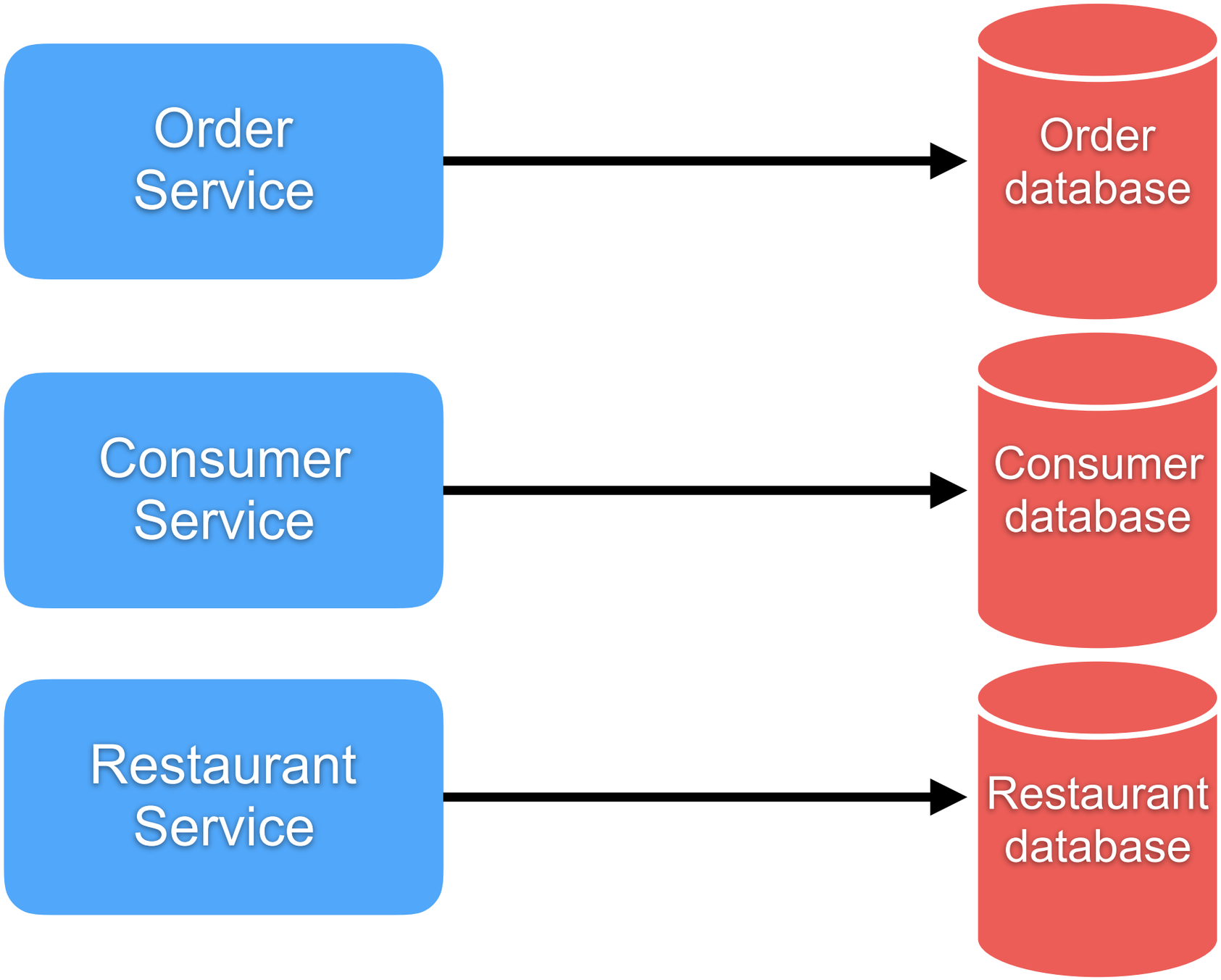


Replace with asynchronous (2)



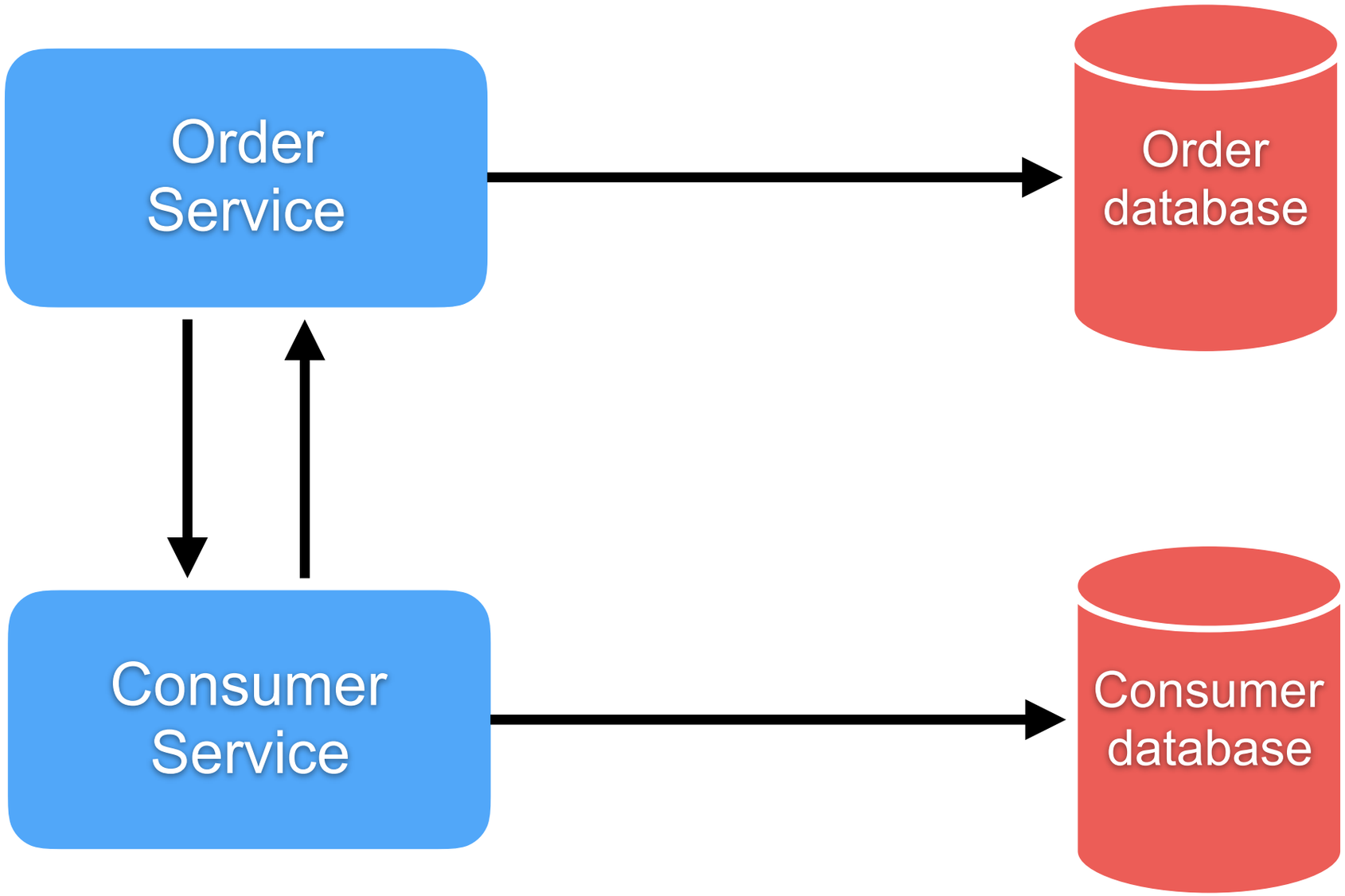
Manage data consistency

Database per service

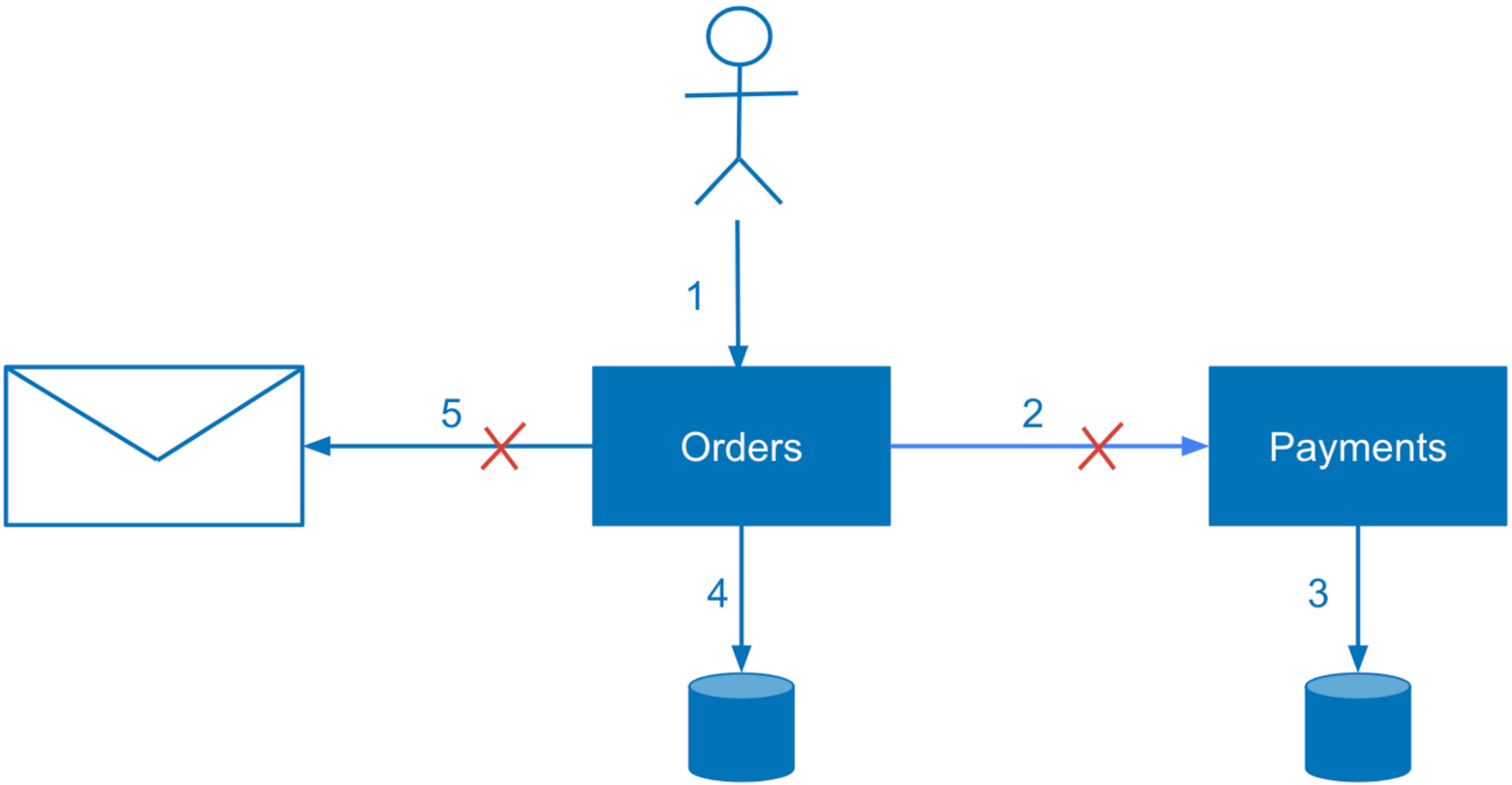


Private database
!=
Private database server

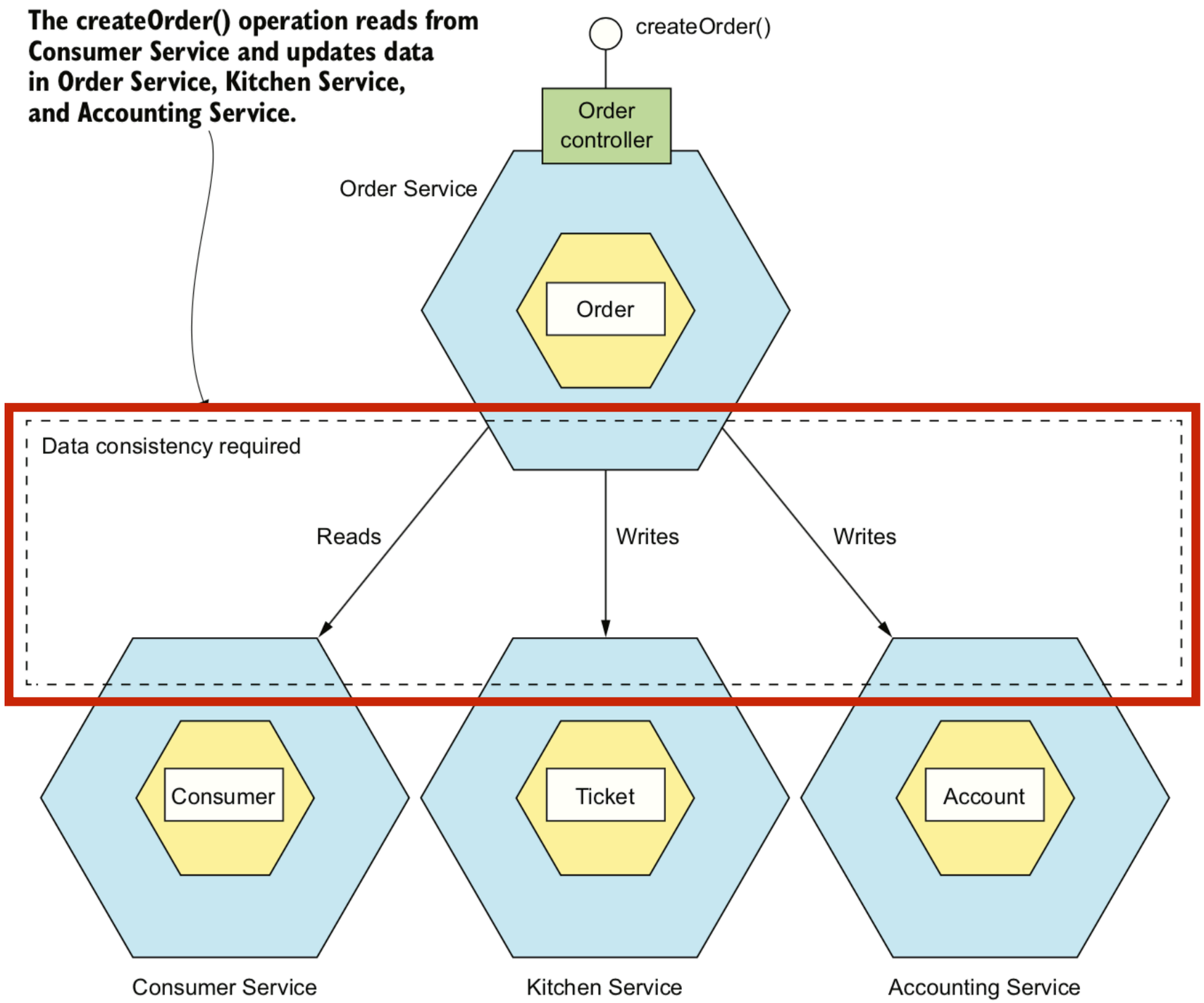
Loose coupling = encapsulation data



Distributed process failure !!



Problem ?



Can’t use ACID transaction !!

A - Atomicity

All or Nothing Transactions

C - Consistency

Guarantees Committed Transaction State

I - Isolation

Transactions are Independent

D – Durability

Committed Data is Never Lost

(c) http://blog.sqlauthority.com

CAP Theorem

Consistency

Availability

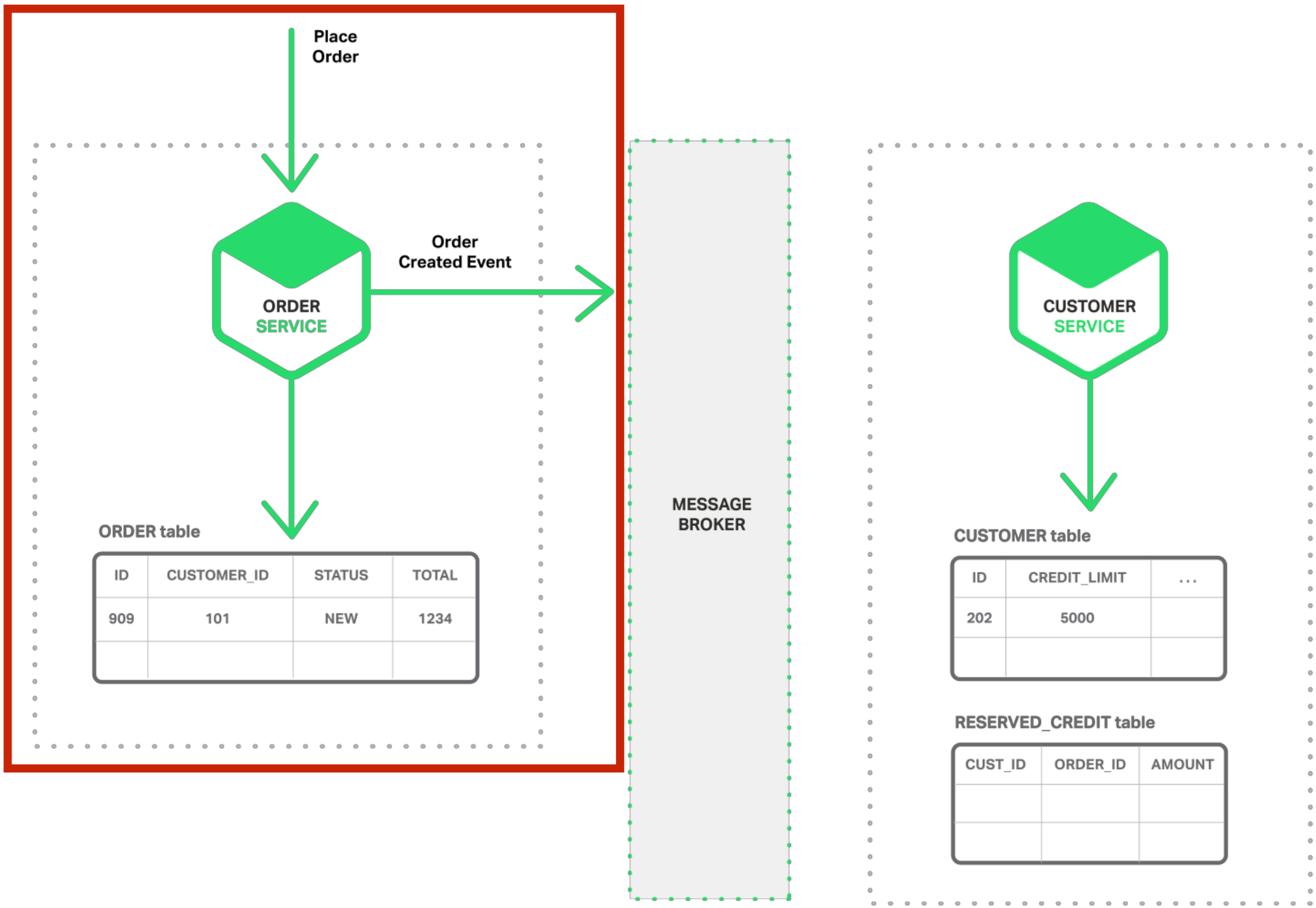
Partition Tolerance

http://robertgreiner.com/2014/08/cap-theorem-revisited/

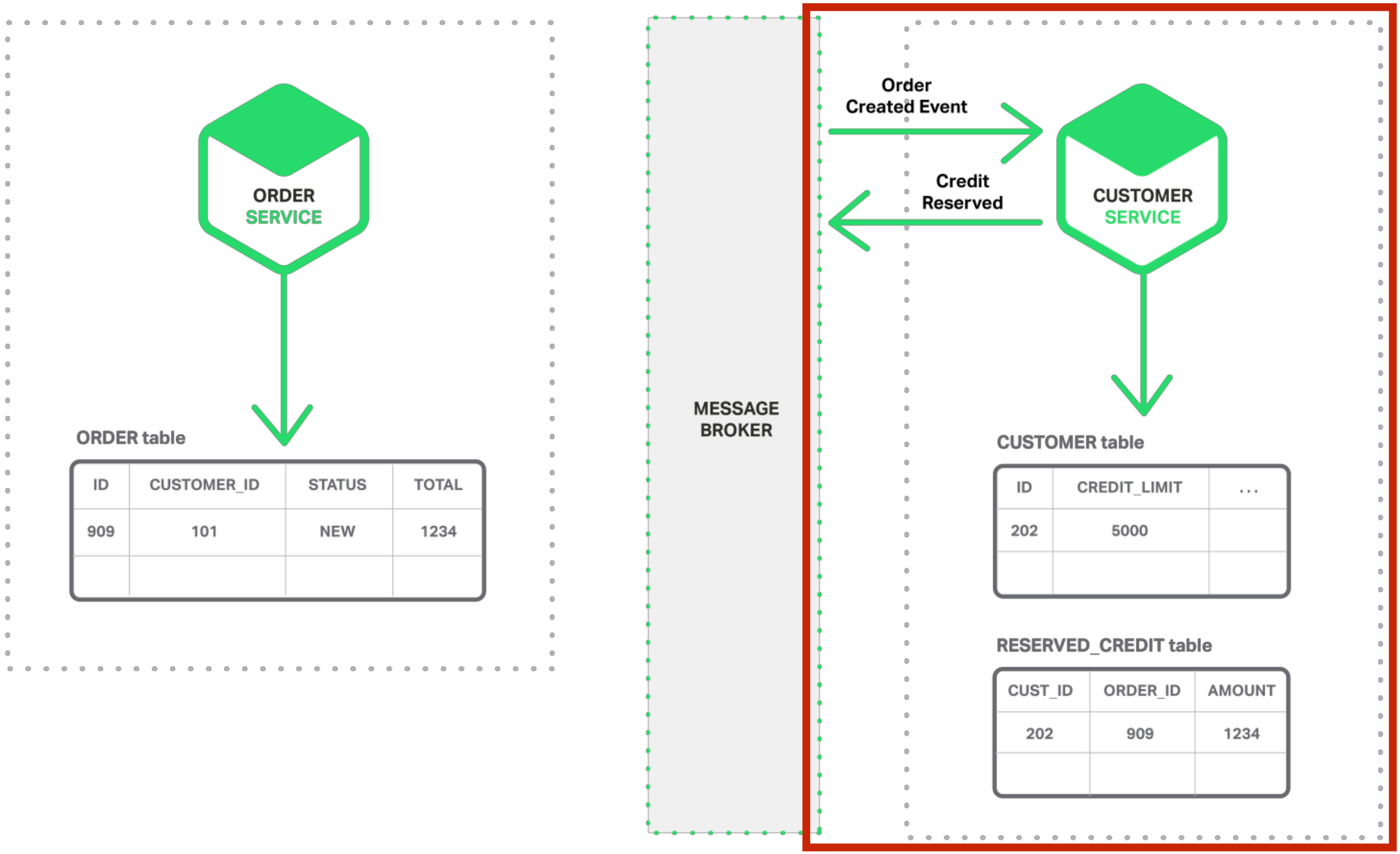
How to maintain data consistency ?

Using Event-driven architecture

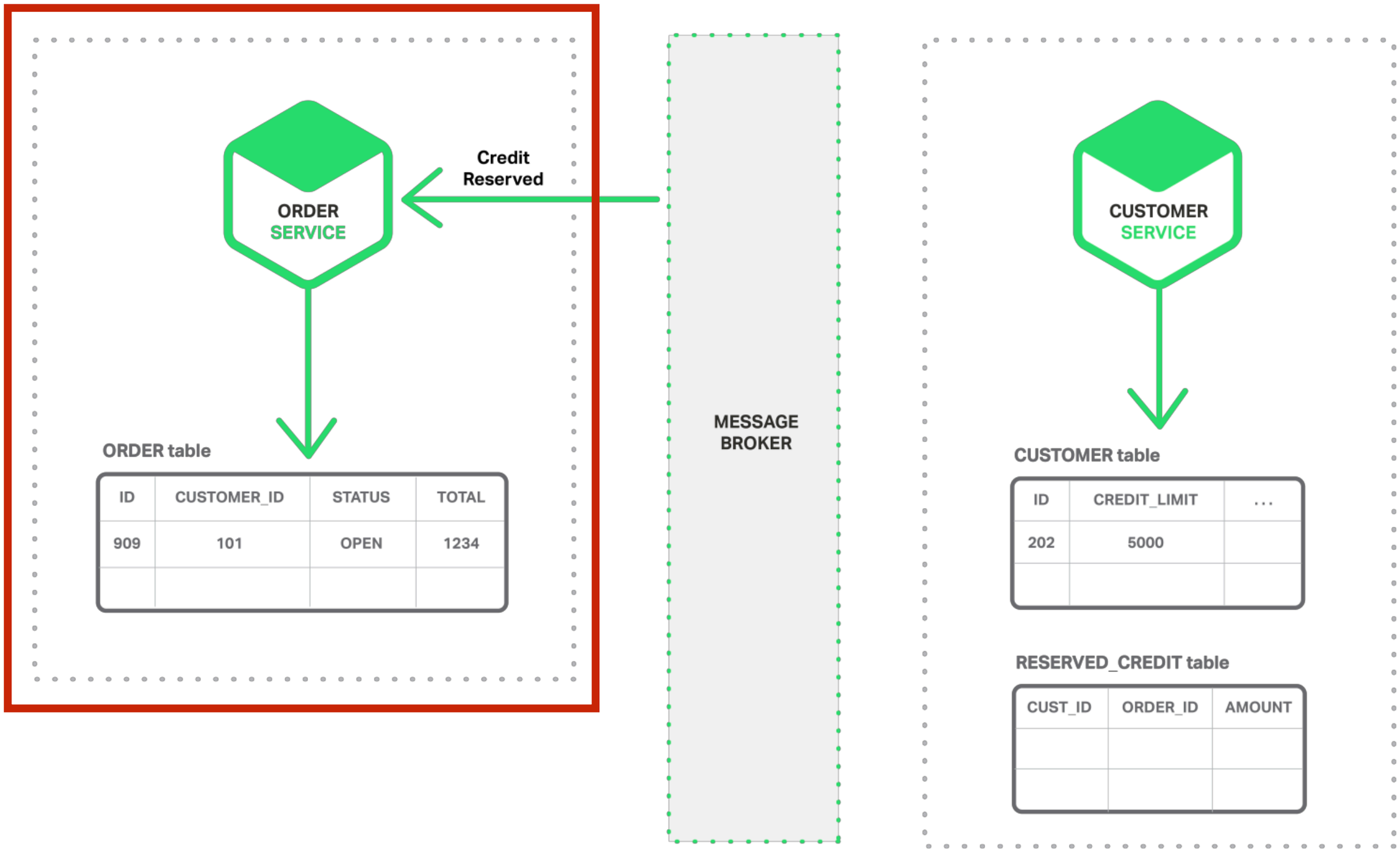
Step 1:: Create new order



Step 2:: Customer service consume



Step 3:: Order service consume



How to implement queries ?

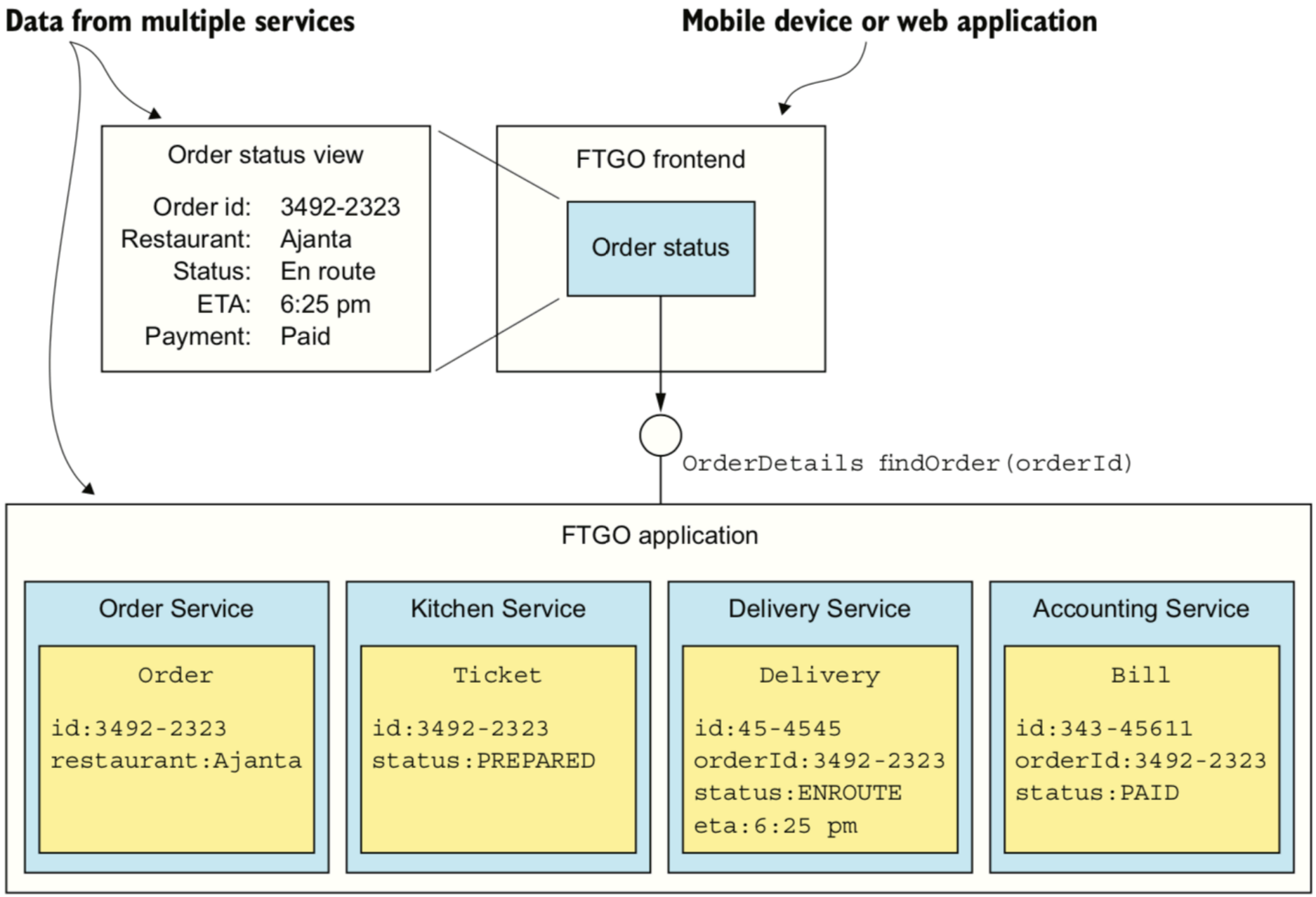
Query data from multiple services

API composition

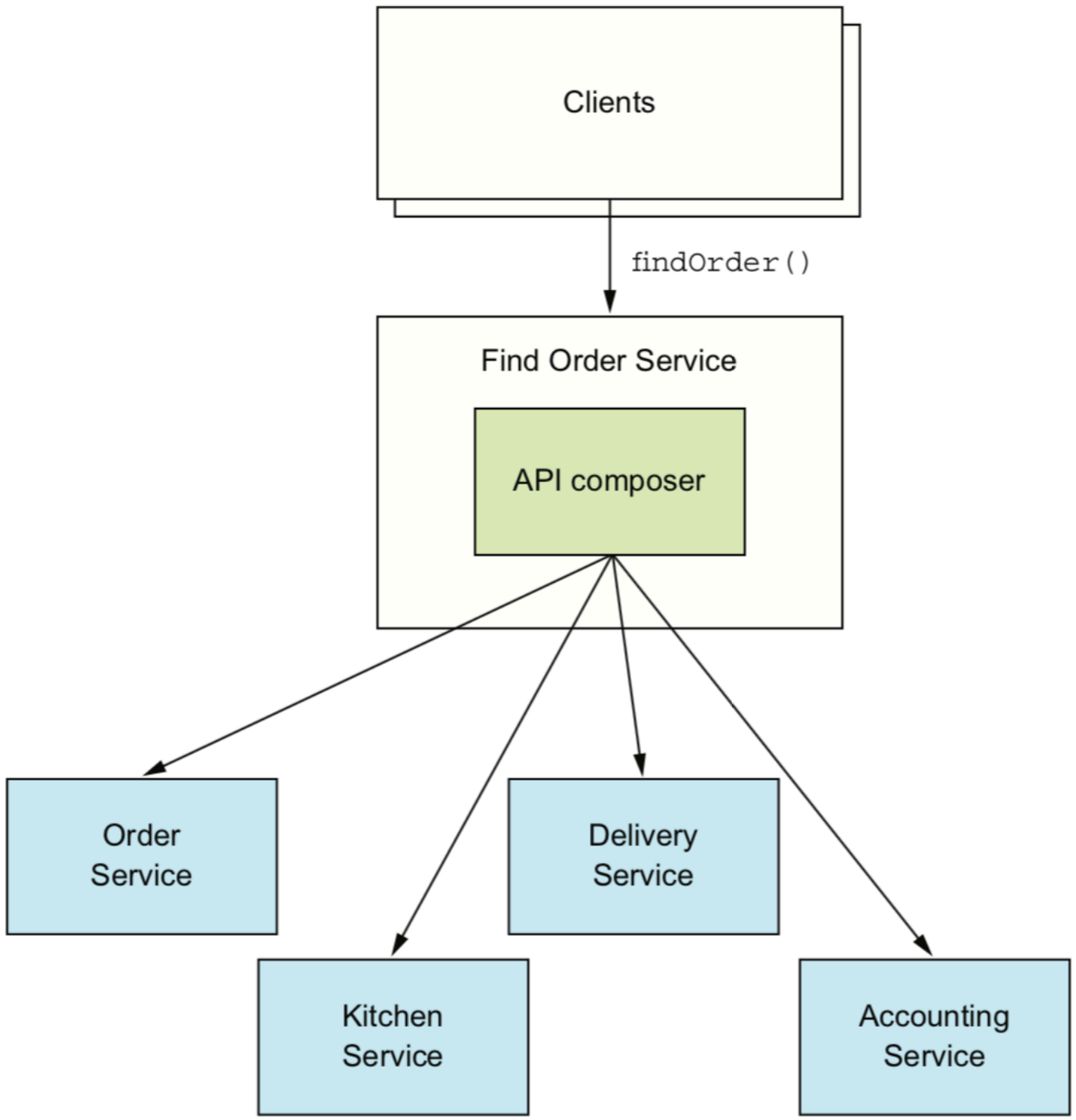
CQRS (Command Query Responsibility Segregation)

Cold data from services

Problem ?



API composition pattern



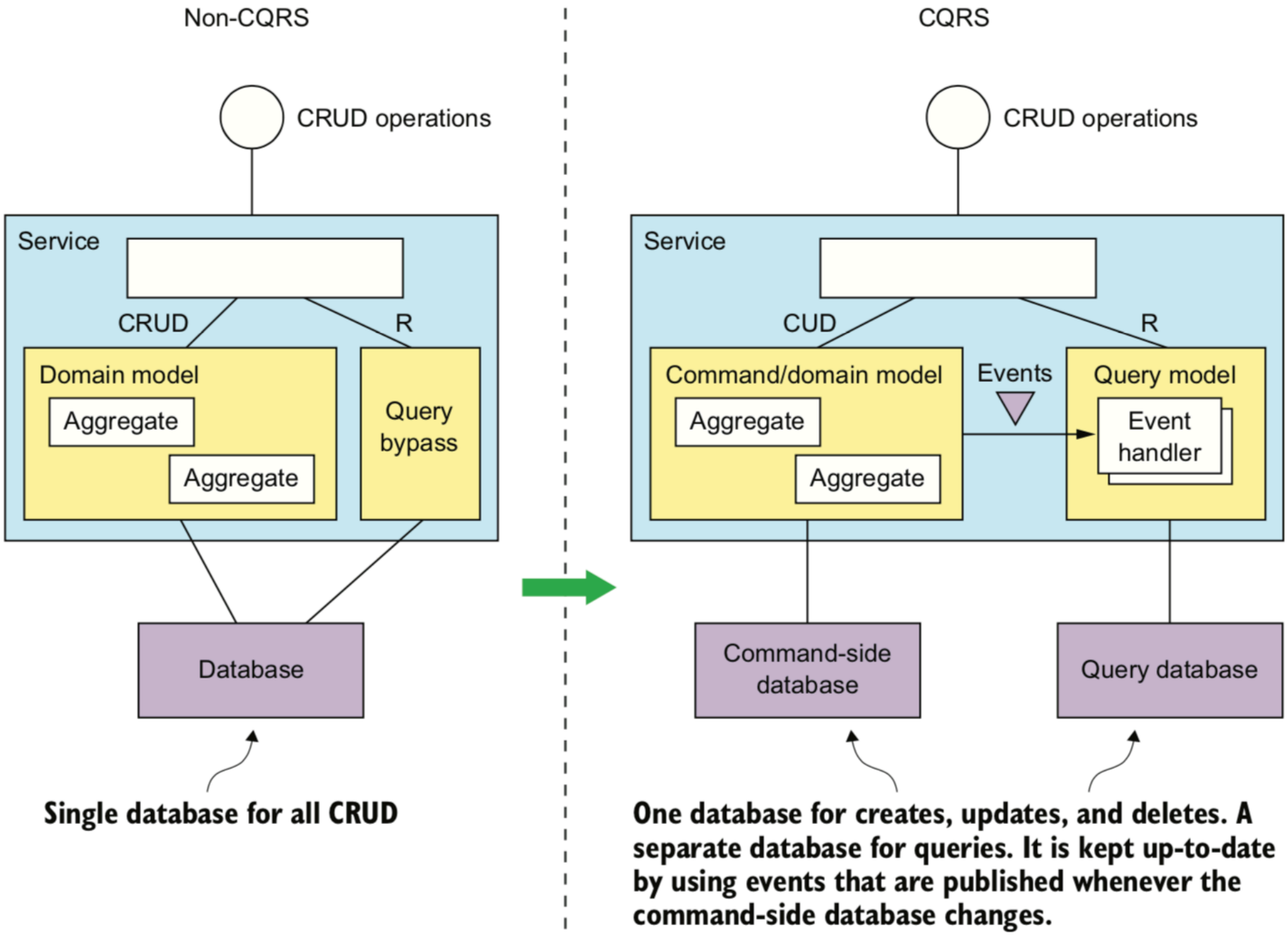
Drawbacks

Increase overhead

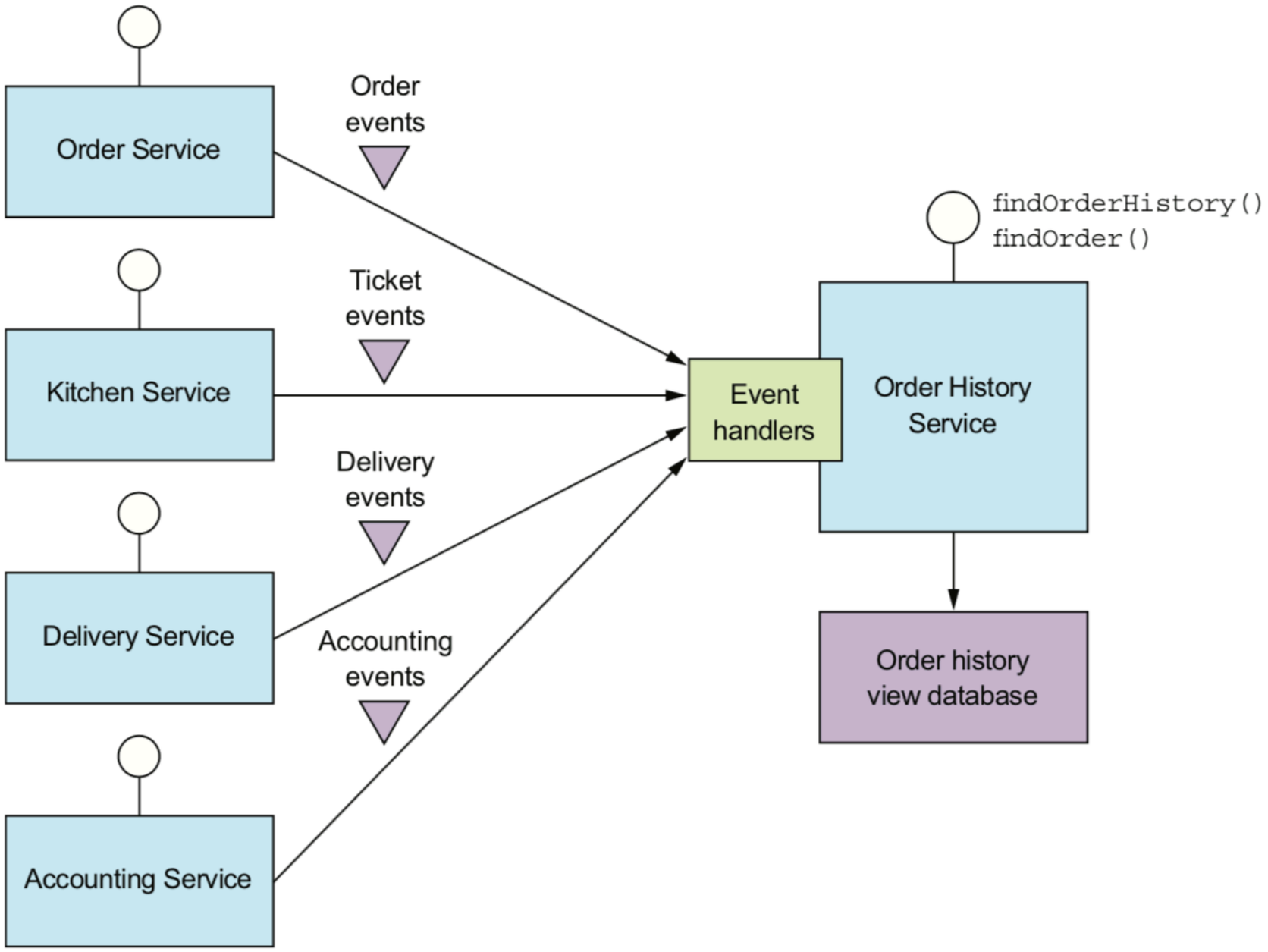
Lack of transactional data consistency

Reduce availability

CQRS = Separate command from query



CQRS = Query-side service



Benefits

Improve separation of concern
Efficiency query

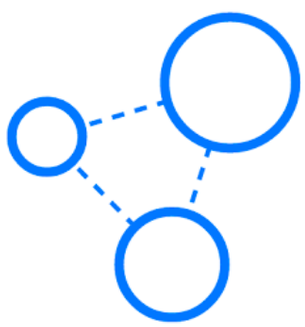
Drawbacks

More complex

Lag between command and query side

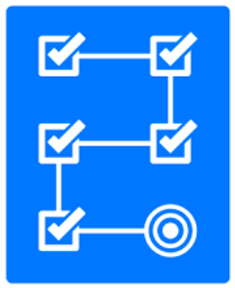
More ...

Beyond Microservice
Process and **Organization**



Flexible organizational structure

With clear roles and accountabilities

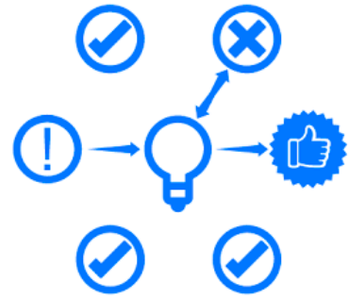


Efficient meeting formats

Geared toward action and eliminating over-analysis

More autonomy to teams and individuals

Individuals solve issues directly without bureaucracy

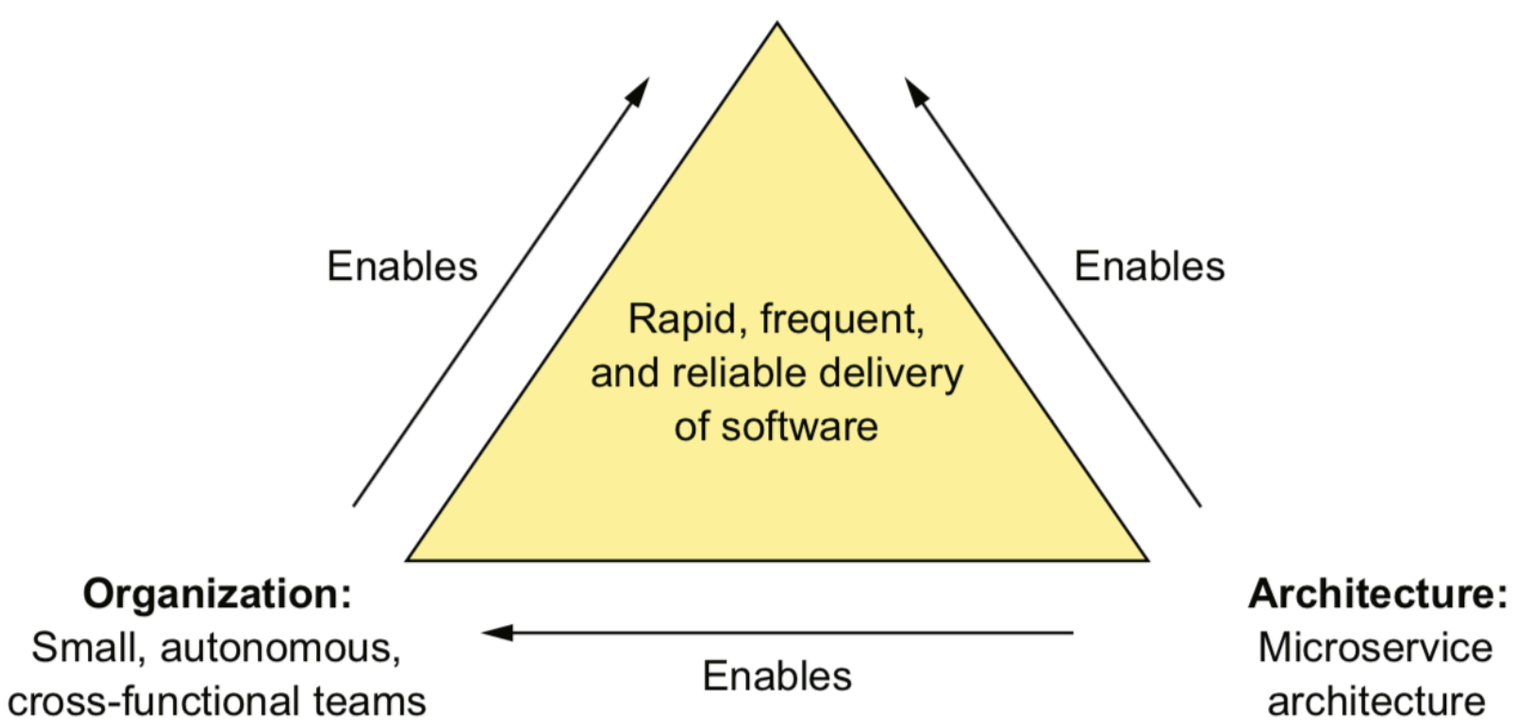


Unique decision-making process

To continuously evolve the organization's structure.

Success project needs …

Organization process
Development process
Delivery process



Don’t forget about the **human** side when adopt Microservice

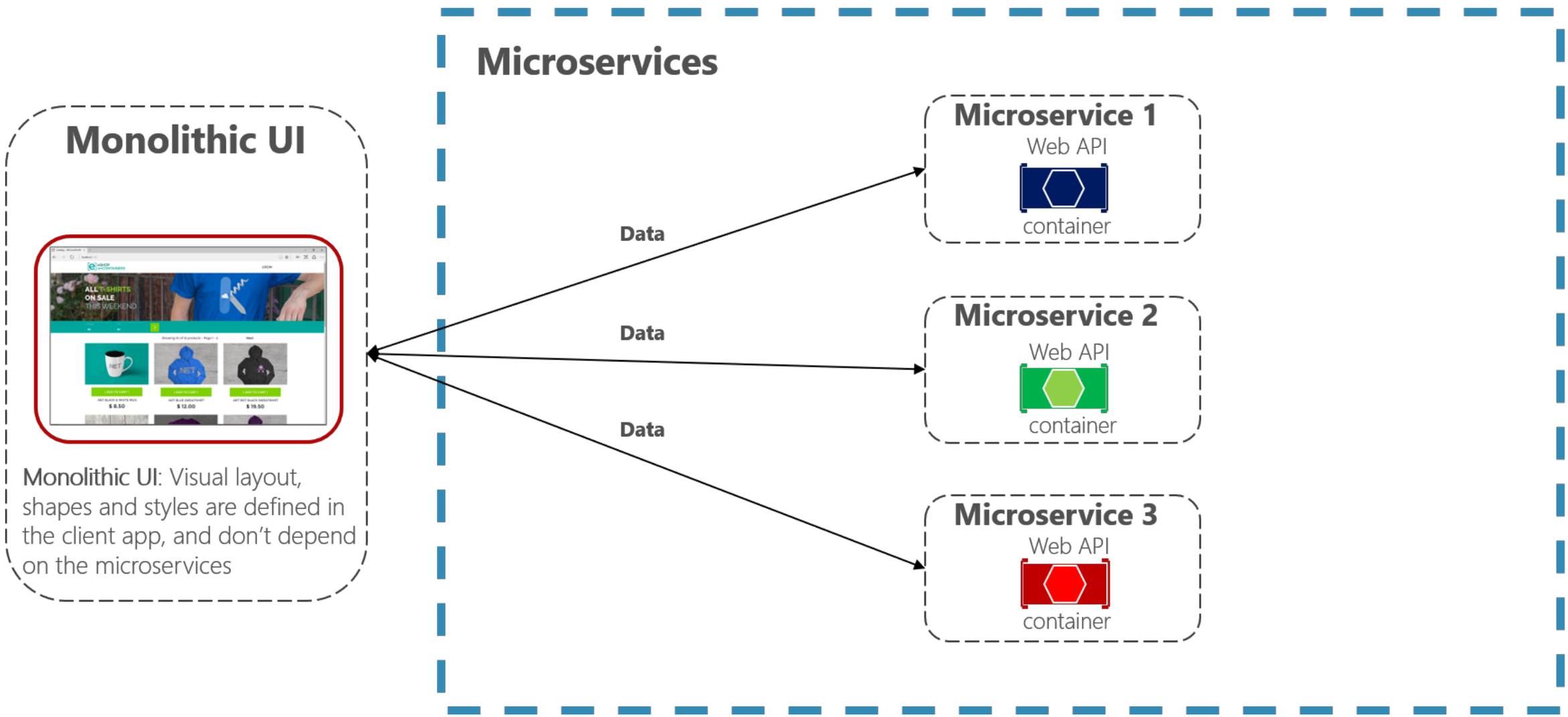
”organizations which design systems ... are constrained to produce designs which are copies of the communication structures of these organizations”

- Melvin Conwey, 1968 -

More ...

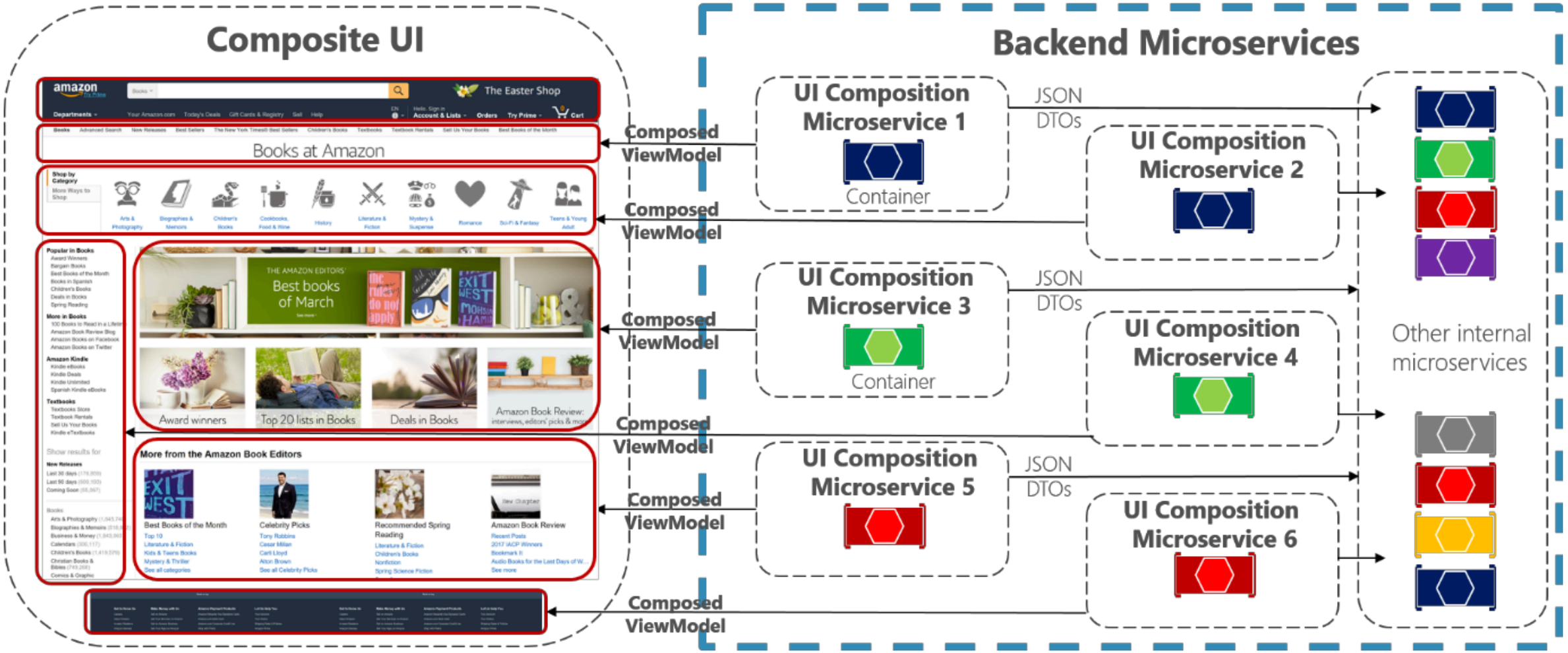
Integrate services with User Interface

Monolithic UI consuming microservices



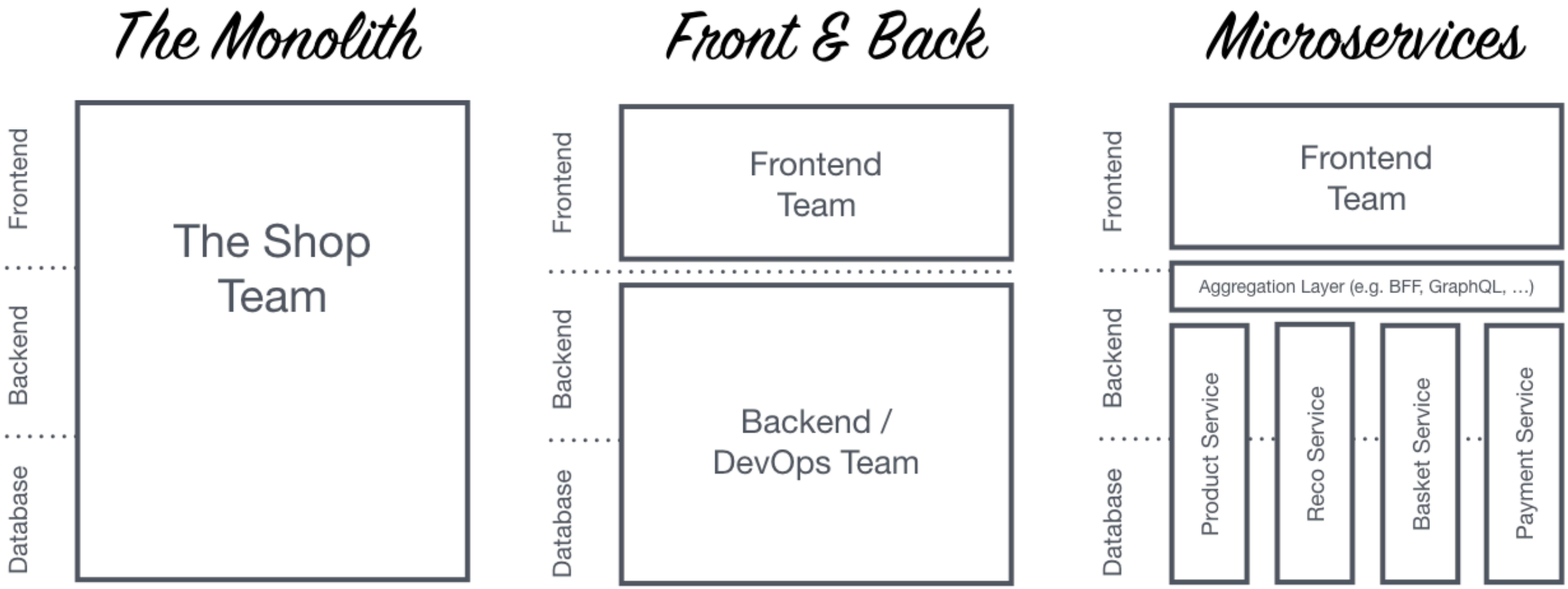
https://docs.microsoft.com

Composite UI *generated* by microservices



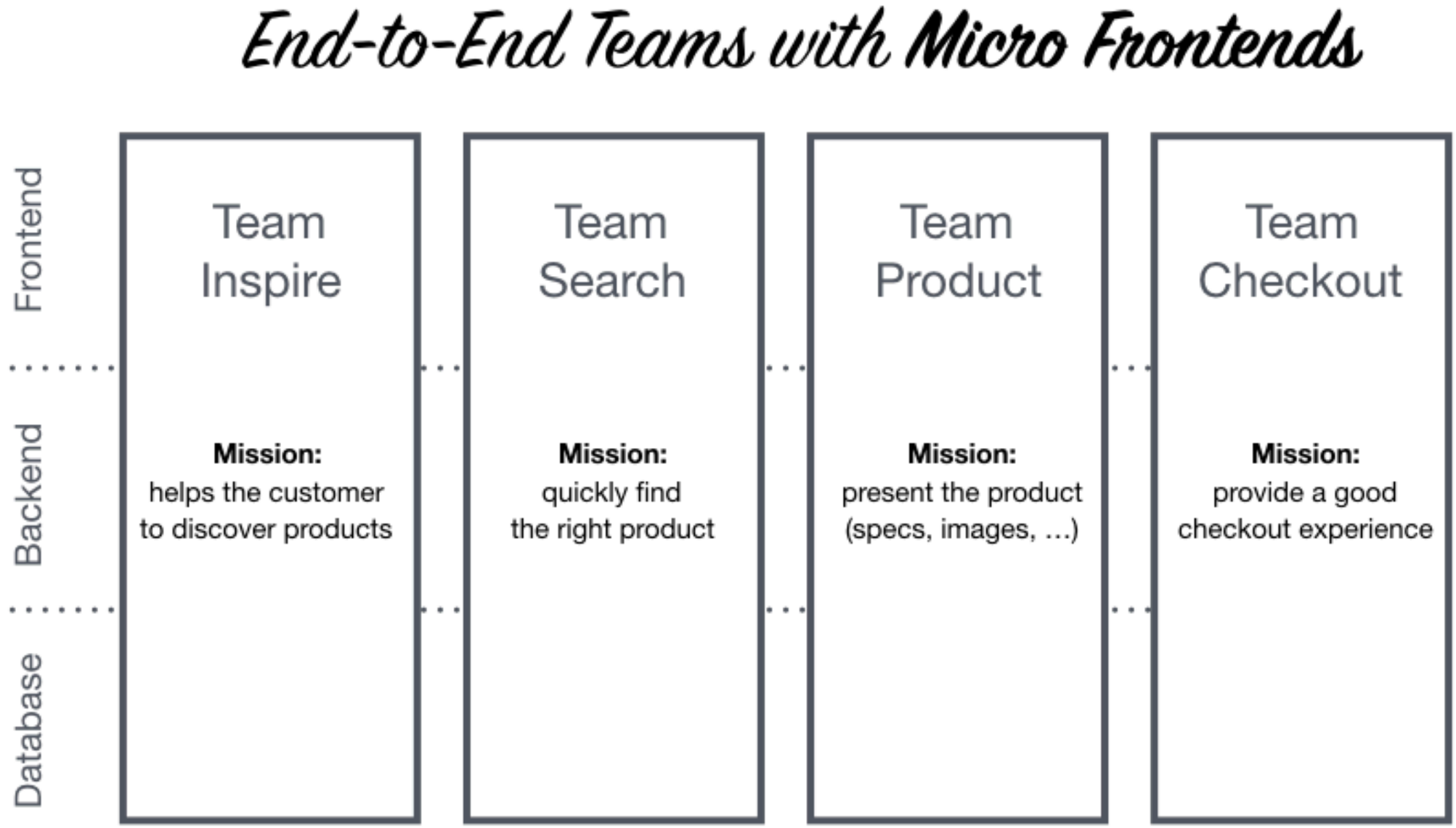
https://docs.microsoft.com

Monolith frontend



https://micro-frontends.org/

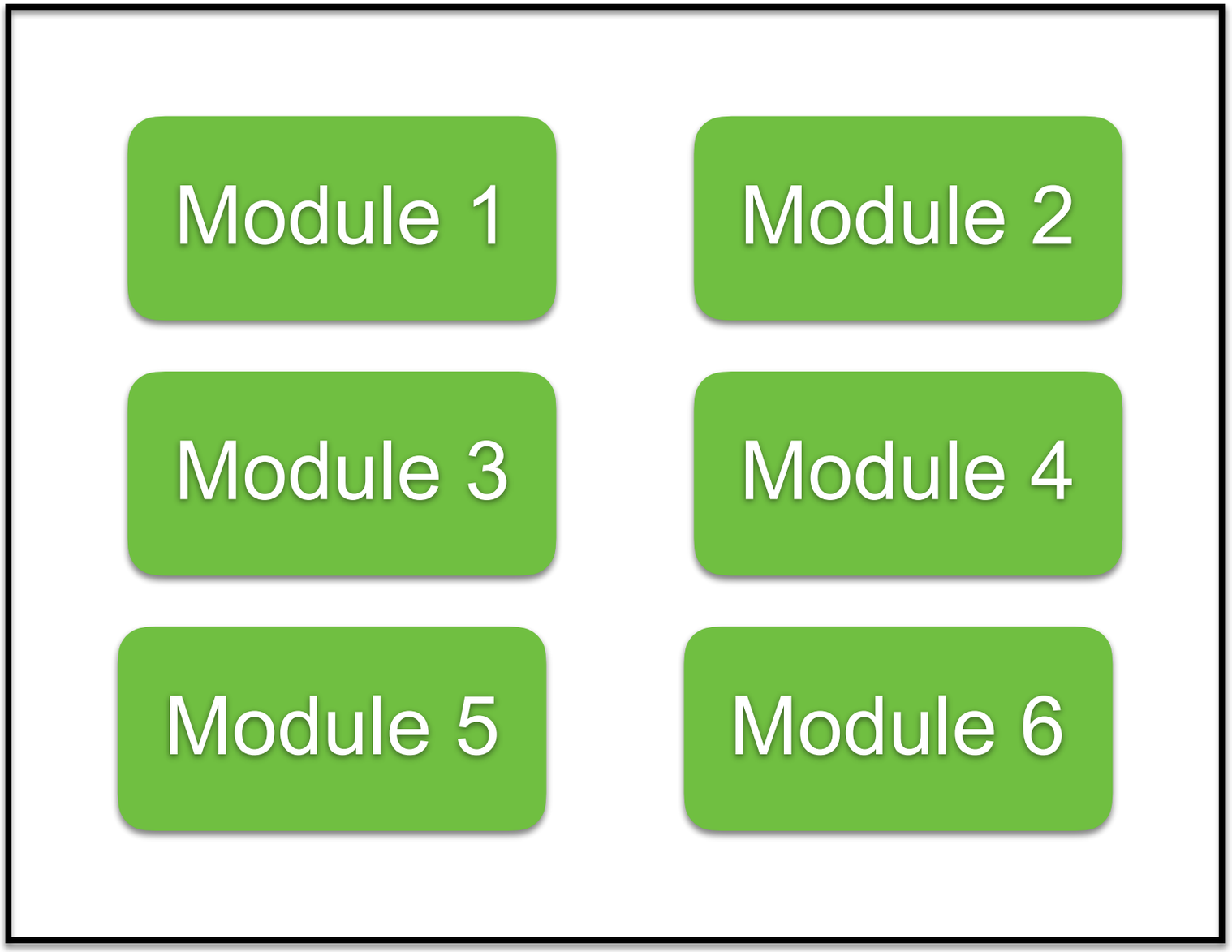
Micro frontend



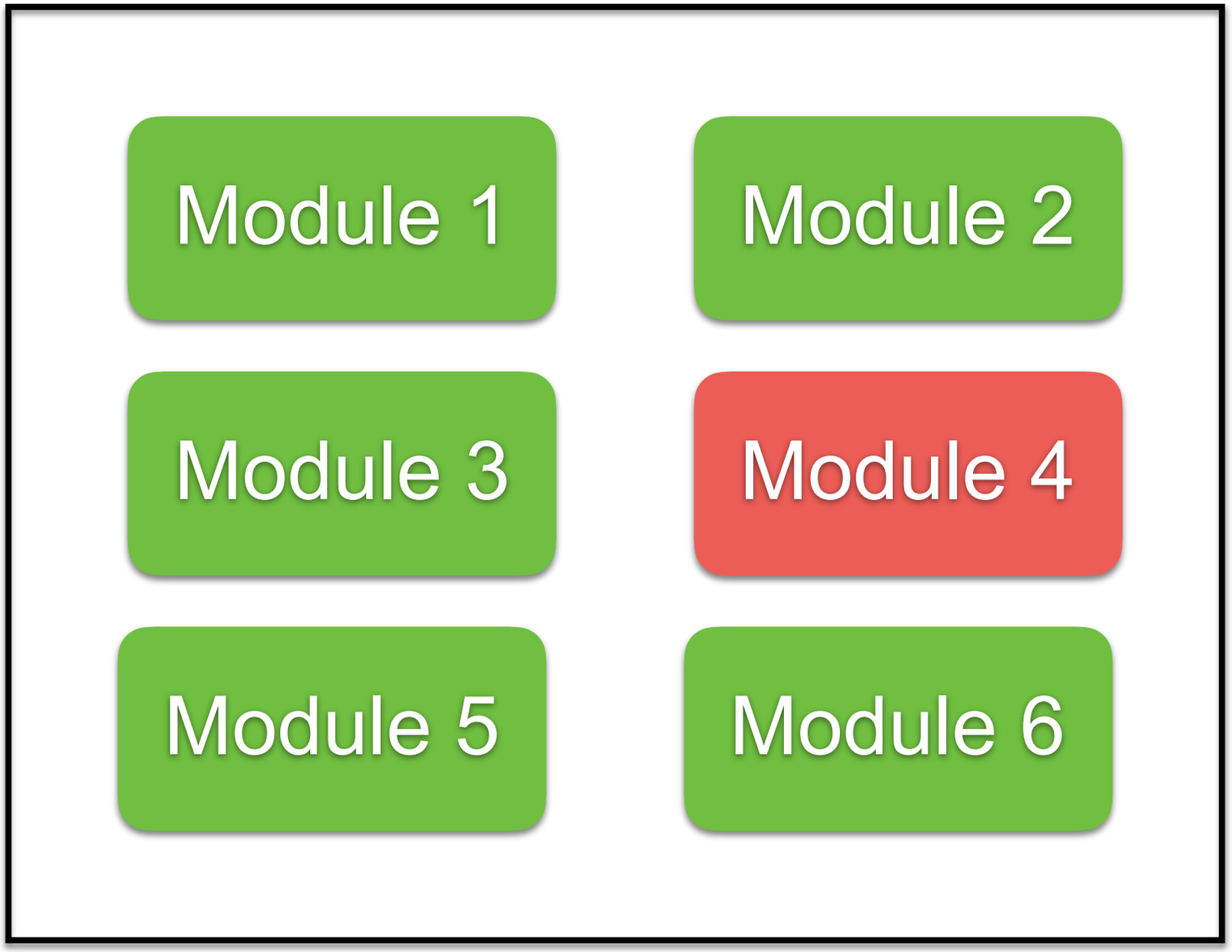
https://micro-frontends.org/

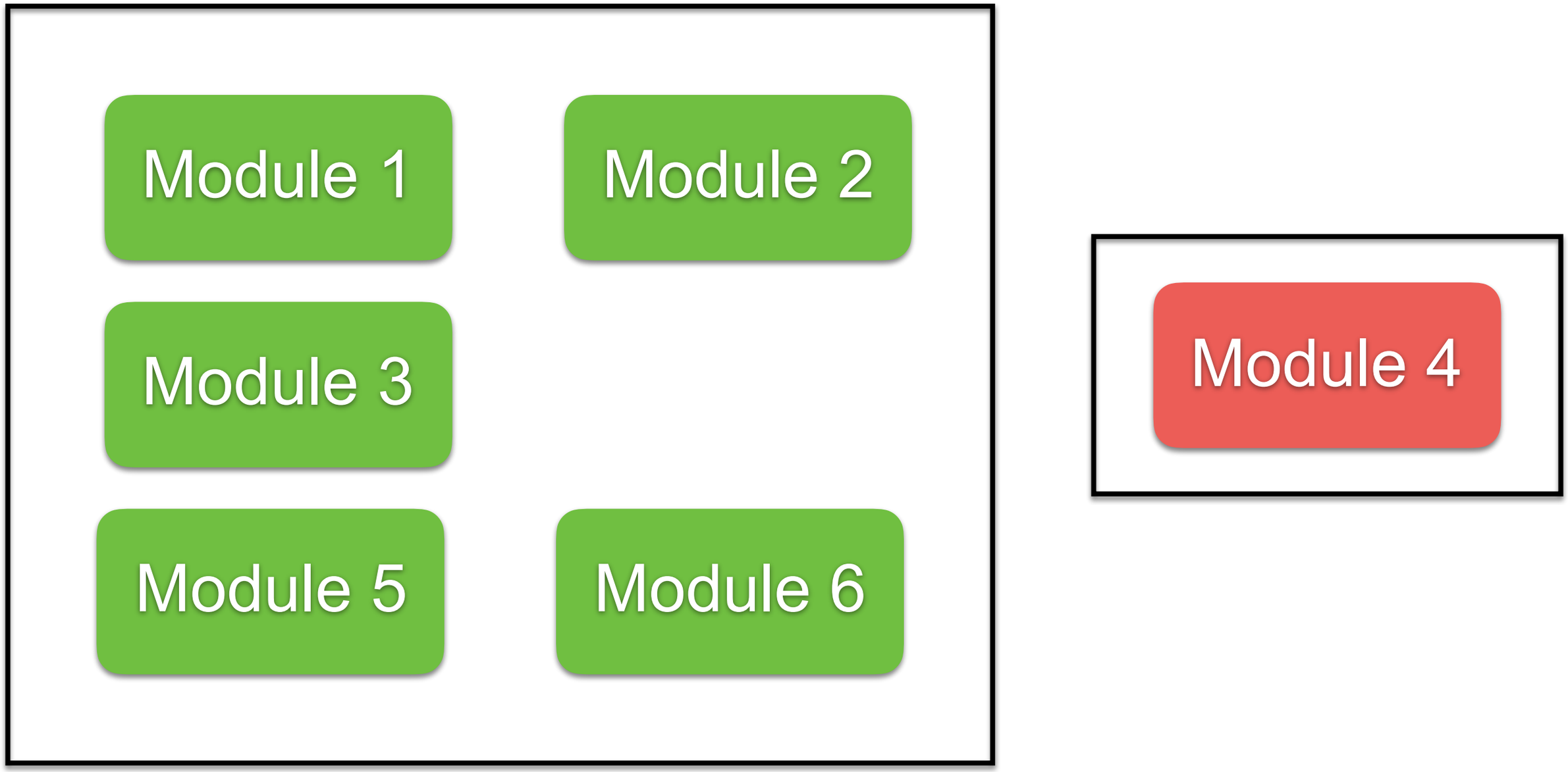
Summary

Let’s start with good monolith

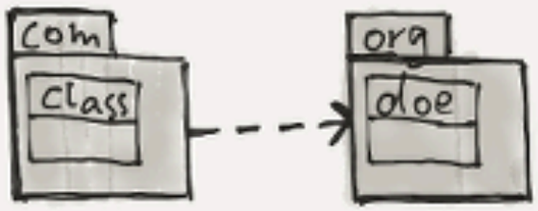


Find your problem

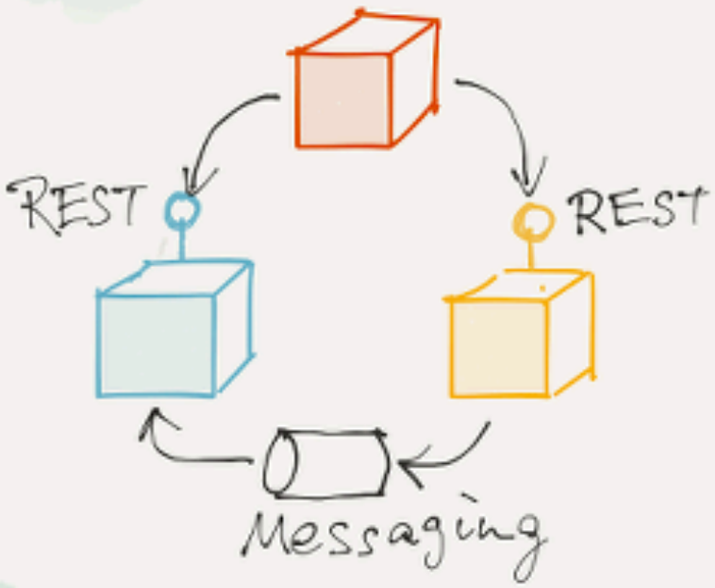




Architecture



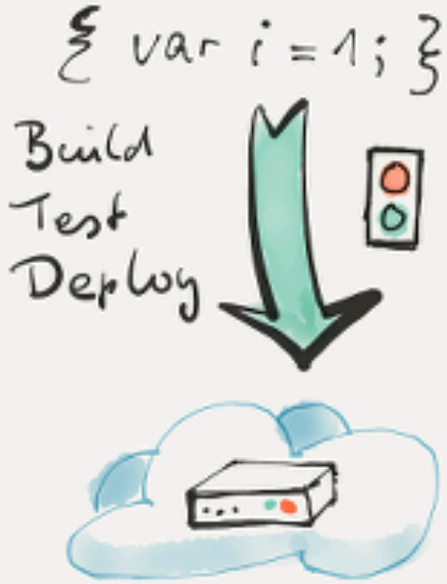
Microservices



People & Teams

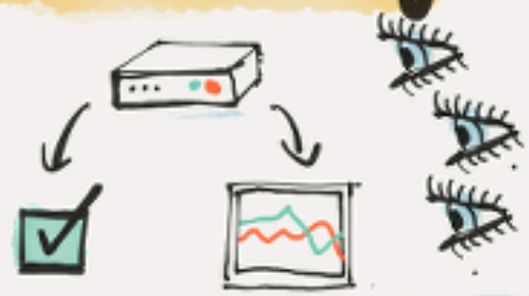
Deployment

Continous Delivery



Infrastructure

Monitoring



Features & Technology