



الجامعة السورية الخاصة
SYRIAN PRIVATE UNIVERSITY

Week 9

كلية الهندسة المعلوماتية

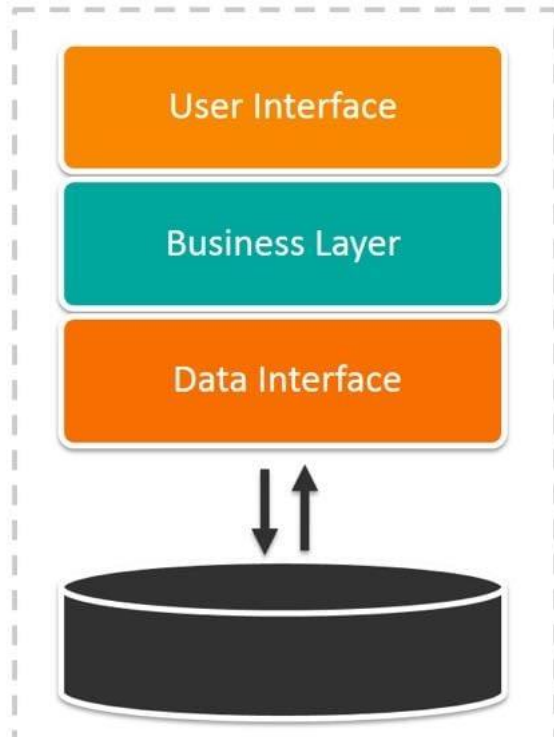
مقرر بنيان البرمجيات

Microservices Architecture 2

د. رياض سنبل

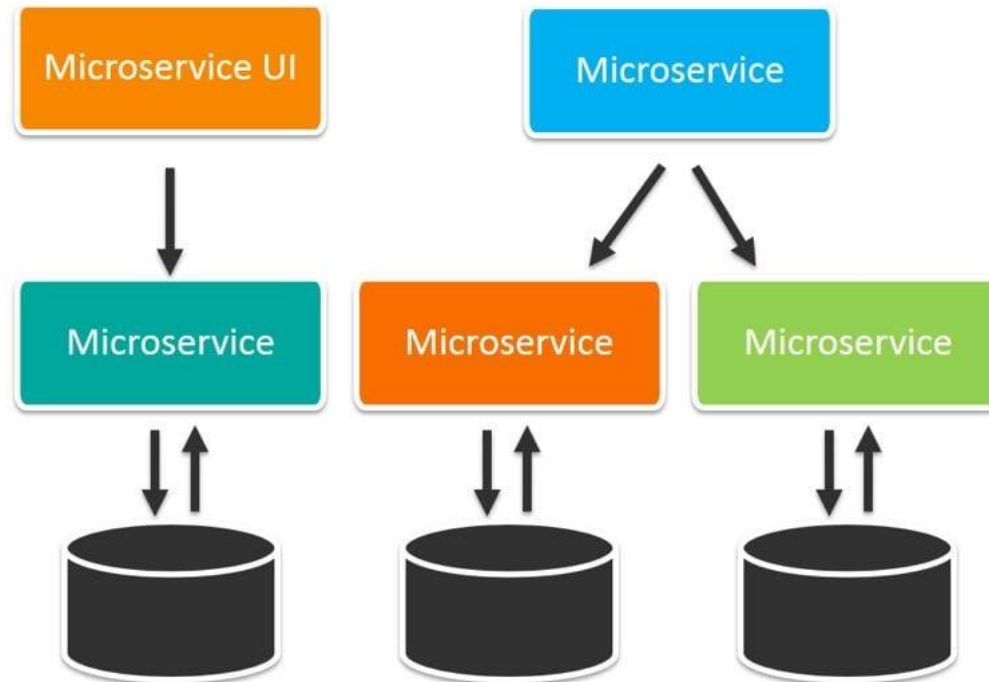
Monolithic vs Microservices

Monolithic Architecture



deployed as a single bundle of executables and libraries on a unified platform

Microservices Architecture



Multiple independent software components orchestrated to form a unified application

But.. Loose coupling is essential!

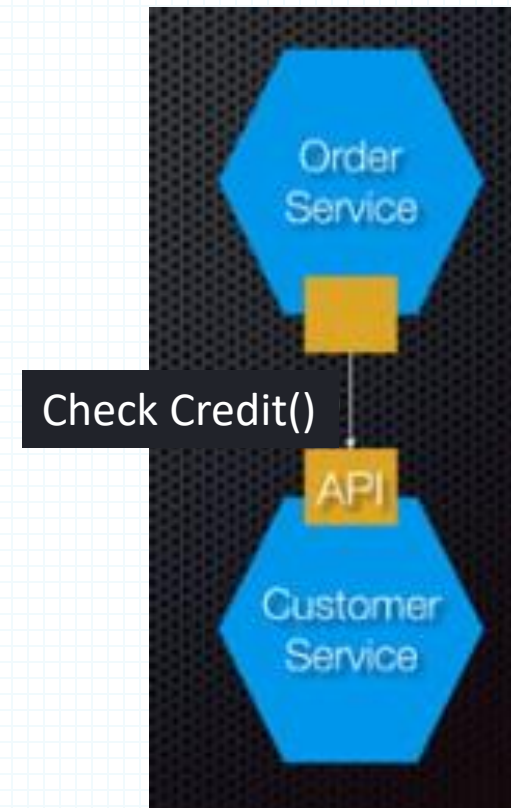
- **Service collaborate.. Thus:**

- ⇒ **Design Time Coupling:**

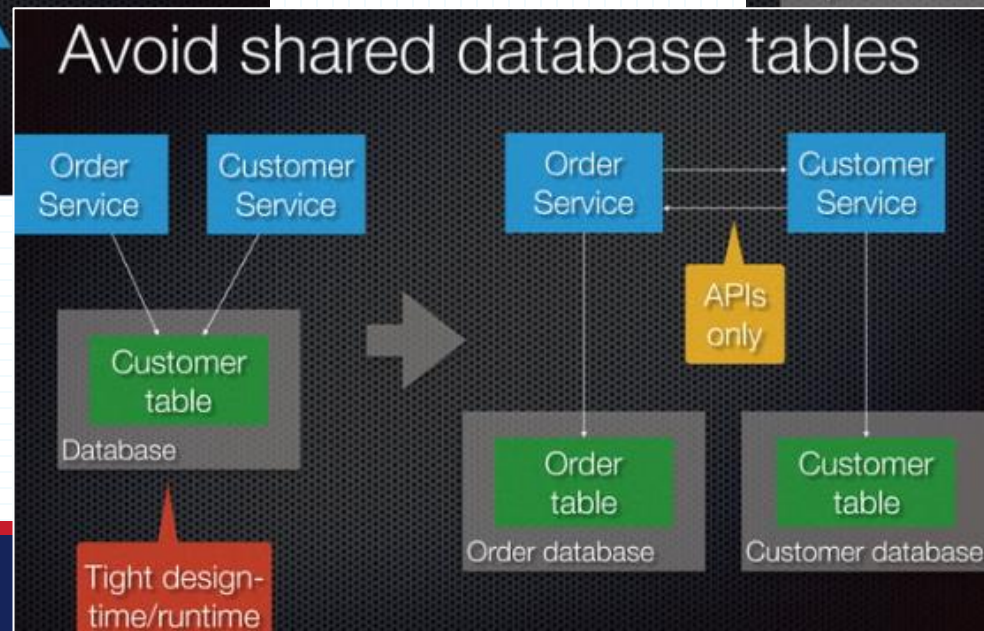
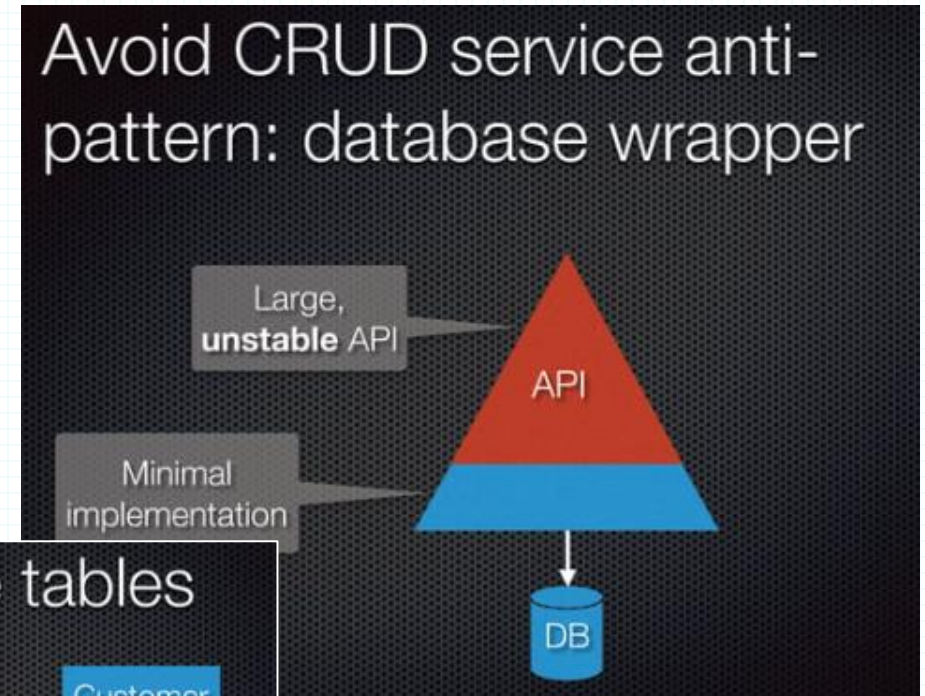
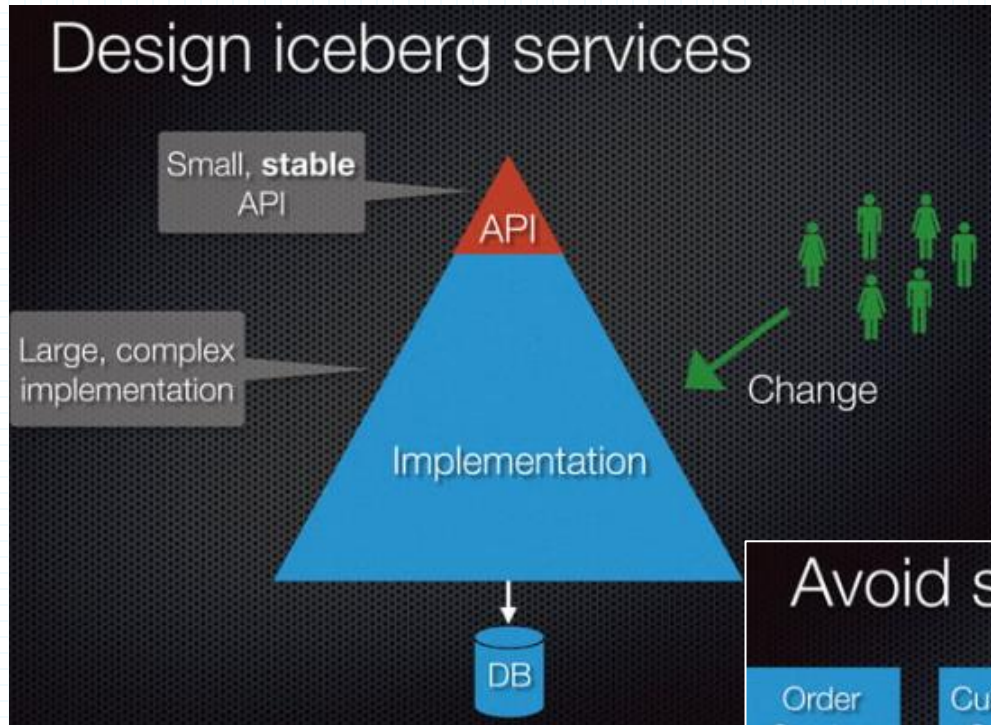
Change Service A -> change Service B

- ⇒ **Runtime Coupling:**

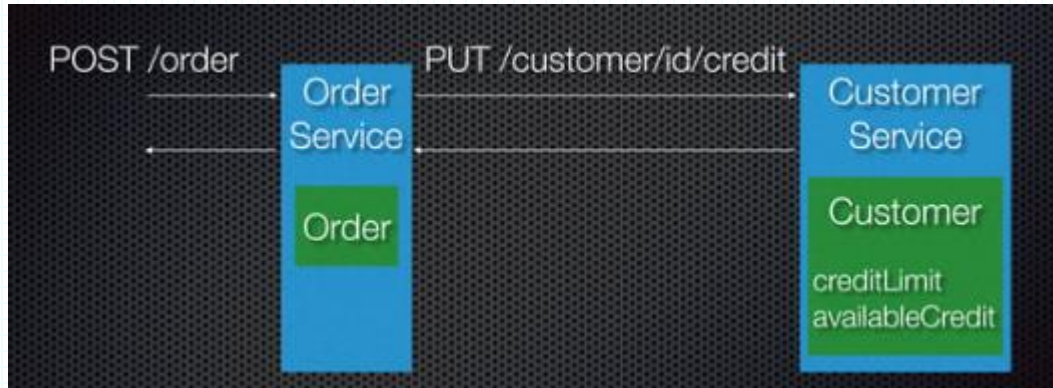
Service A cannot respond to a synchronous request until service B responds



Design Time Coupling... Solutions

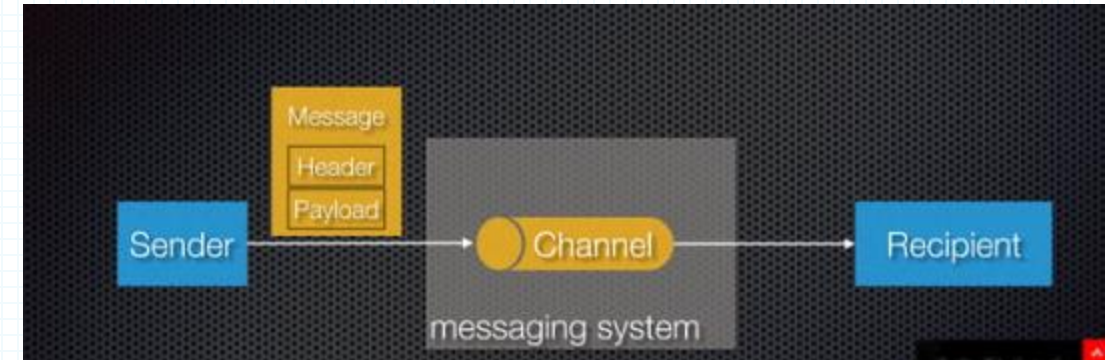


Runtime Coupling ... Solution



Reduce Availability!

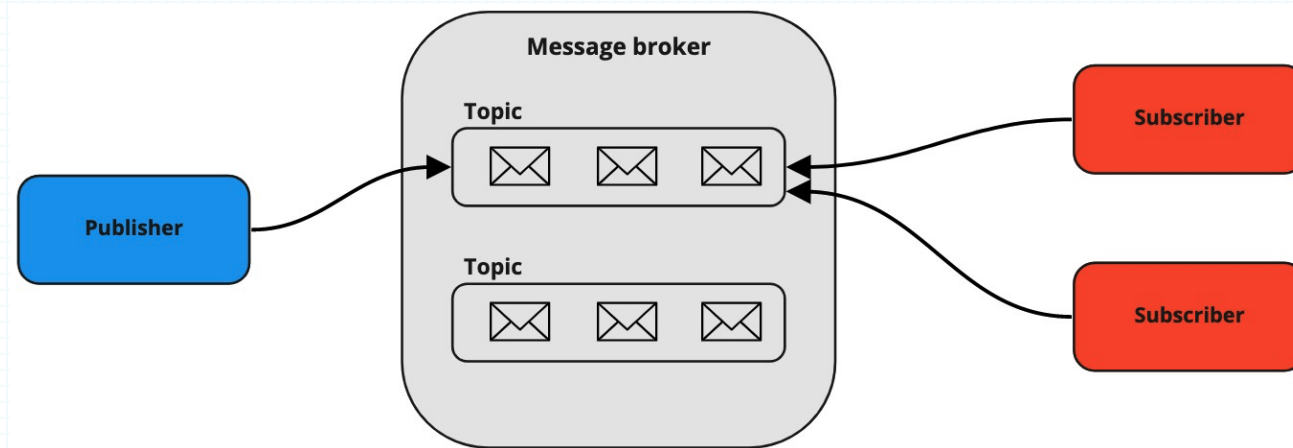
```
availability(createOrder) =  
availability(OrderService) x  
availability(CustomerService)
```



Use Async Messaging

What is a Message Broker?

- **Middleware for message transmission between services:** A message broker acts as an intermediary that routes messages between services to enable smooth and reliable communication.
- **Decouples sender and receiver:** It allows services to interact without needing to know each other directly, increasing flexibility and resilience.
- **Supports asynchronous communication:** Message brokers let services send and receive messages without blocking, enabling faster and more scalable systems.

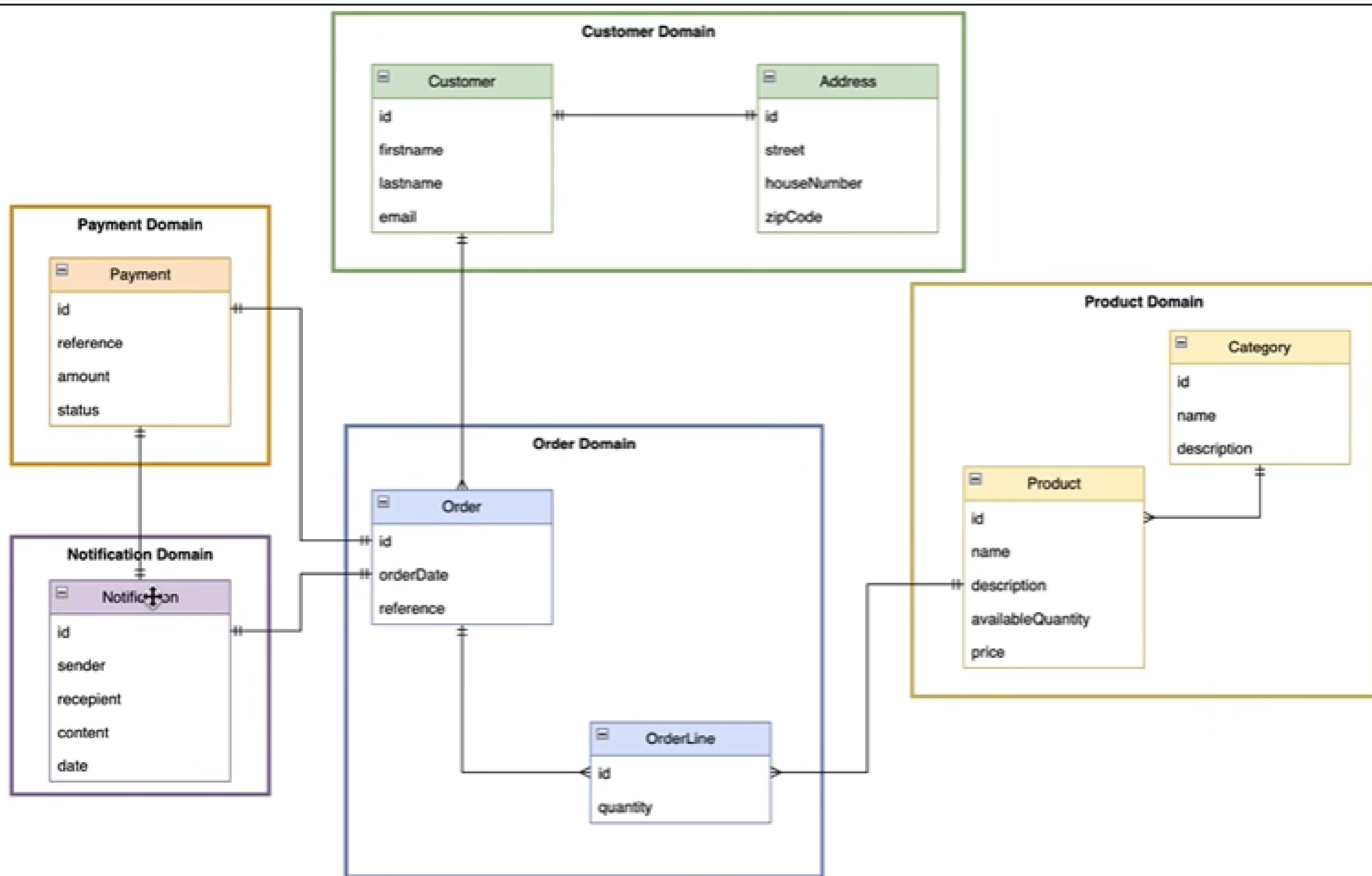


Popular Message Brokers

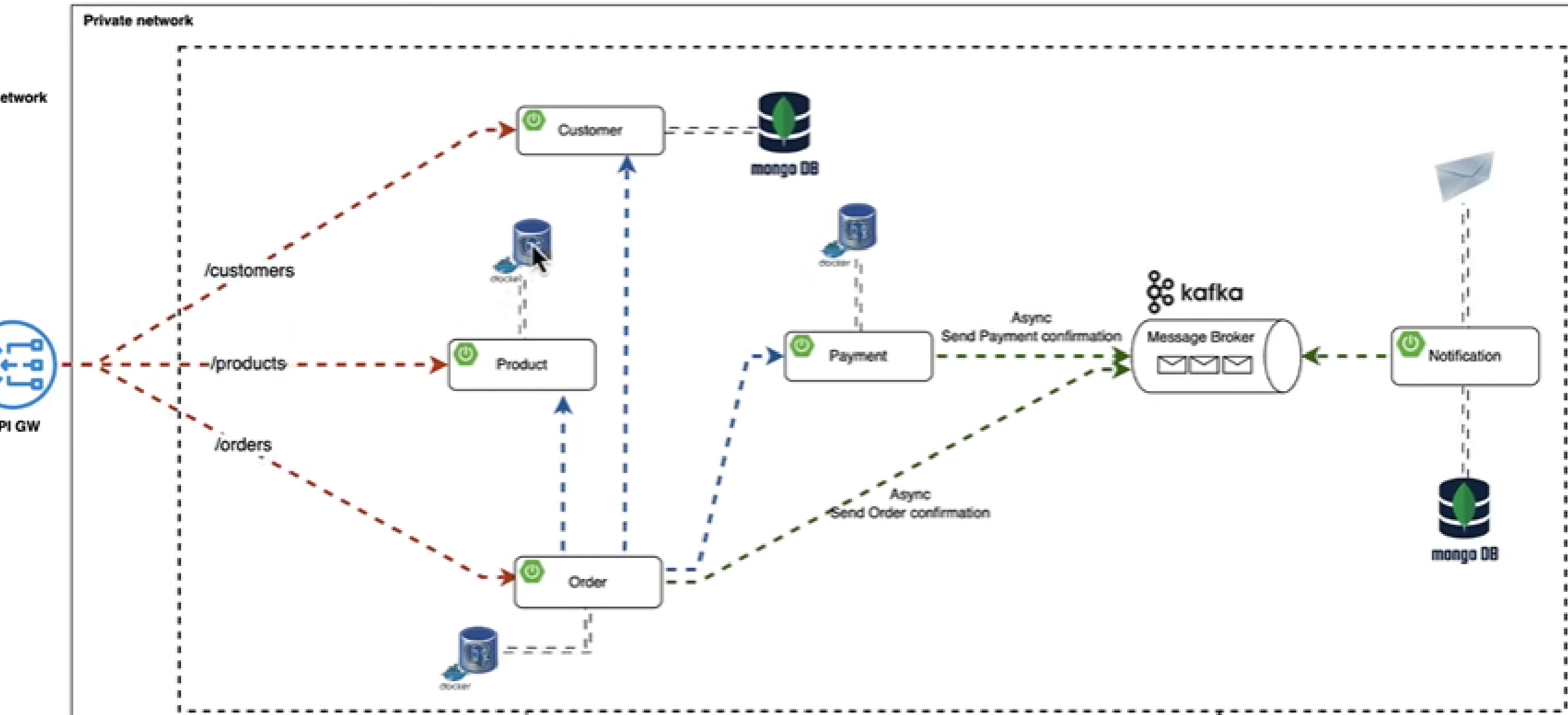
- RabbitMQ: Queue-based, AMQP support
- Apache Kafka: Distributed, high-throughput, stream processing



Example



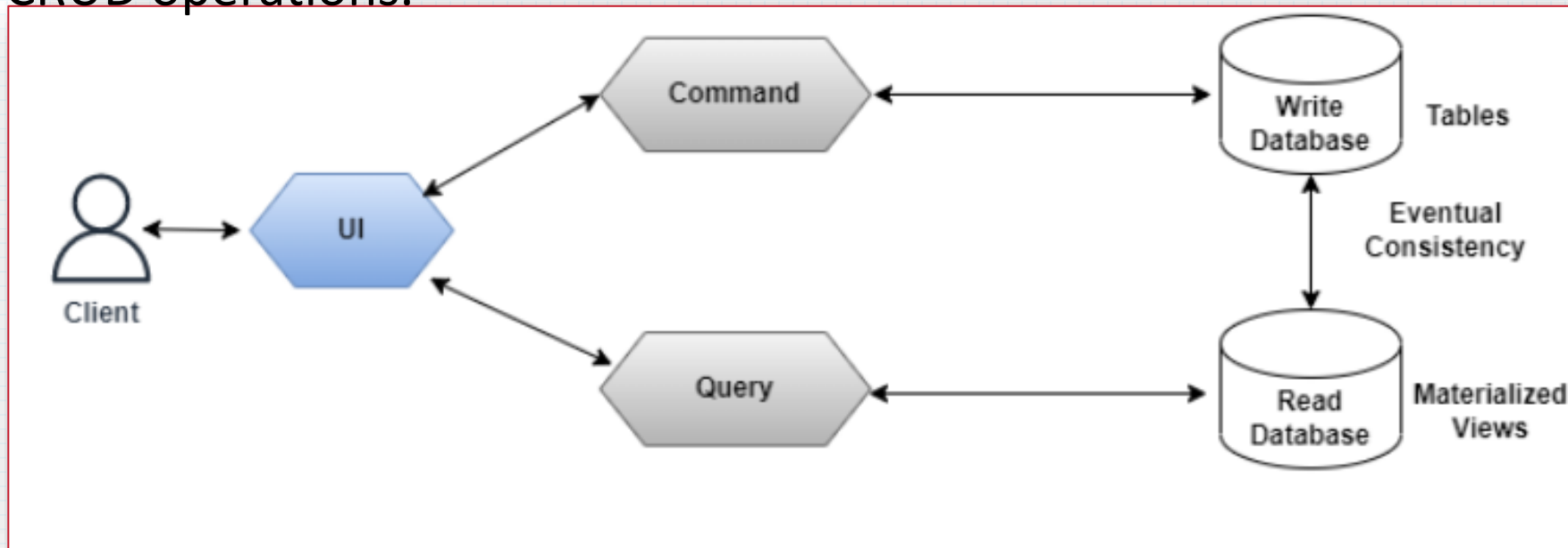
More details example



Related Design Patterns

(Command and Query Responsibility Segregation - CQRS)

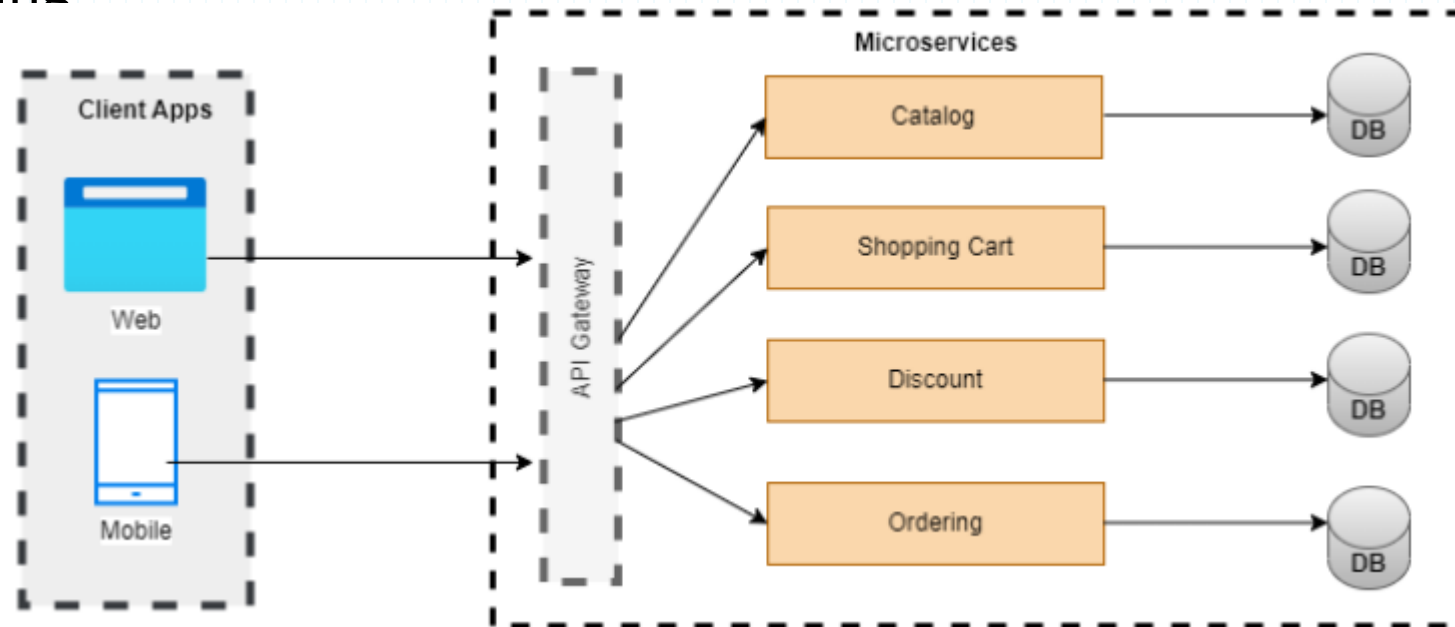
- CQRS offers to use “separation of concerns” principles and separate reads and writes into two databases.
- By this principle, we can use different databases for reading and writing database types, like using NoSQL for reading and using a relational database for CRUD operations.



Related Design Patterns

(API Gateway)

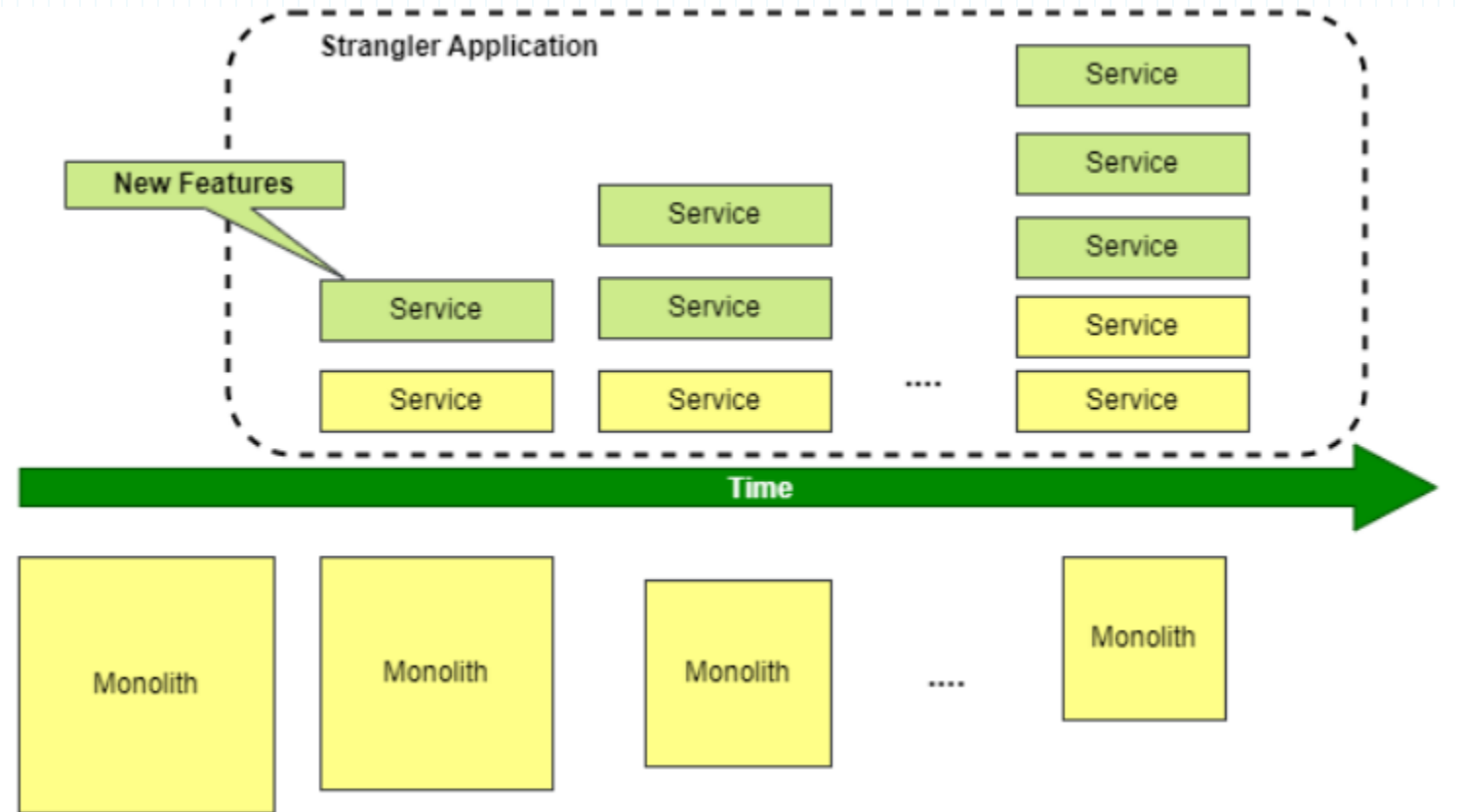
- API gateway acts as communication between the client and underlying services and serves as a single-entry point to the system while abstracting the underlying architecture.
- It also provides cross-cutting concerns like authentication, SSL termination, and caching



Related Design Patterns

(Strangler Pattern)

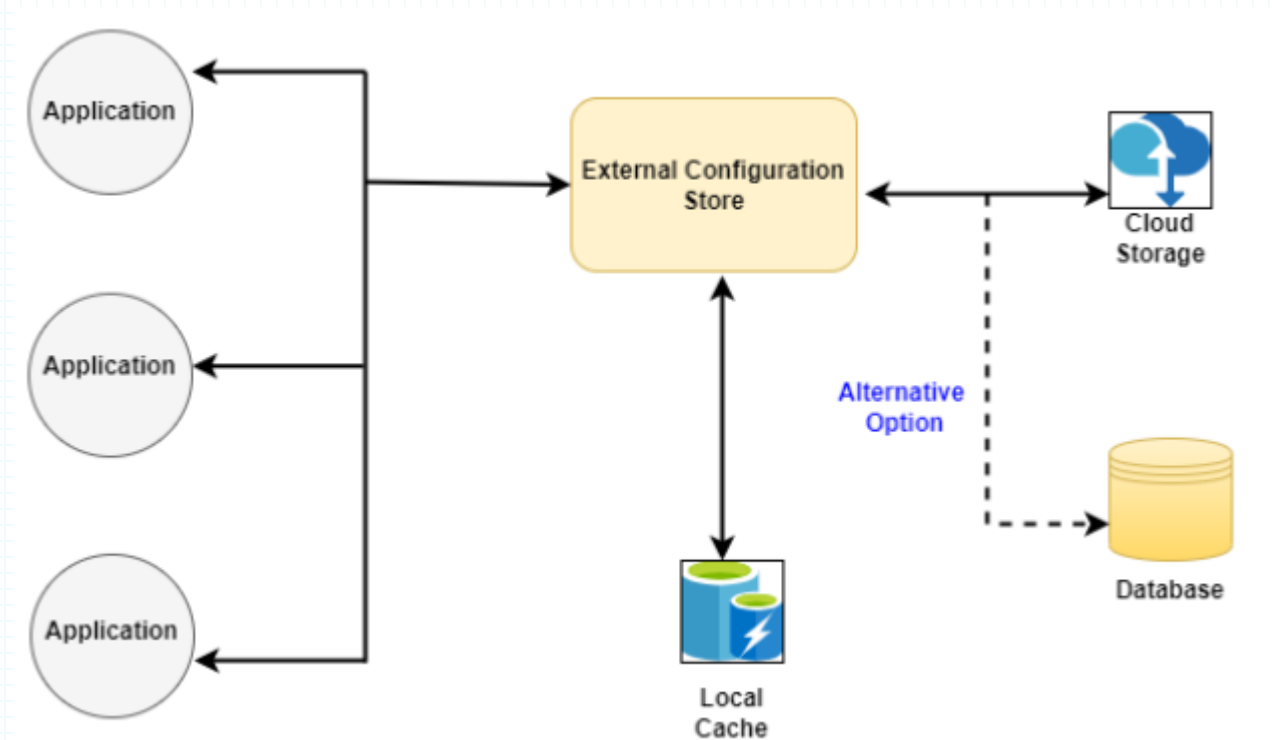
- to gradually migrate a Monolithic application to a Microservices-based architecture.
- This pattern is useful when the application is too large and complex to migrate simultaneously.



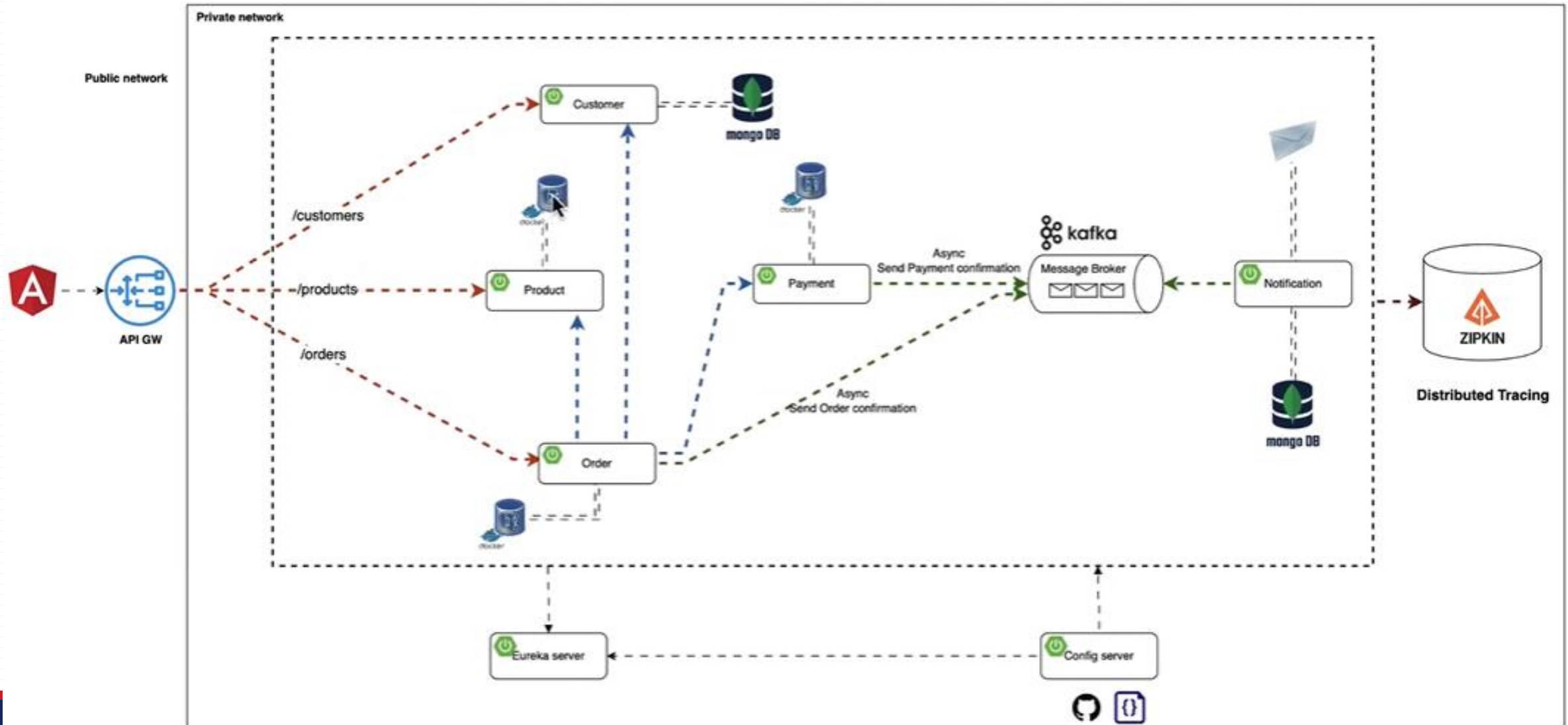
Related Design Patterns

(Externalized Configuration)

- Configuration Externalization is a design pattern where the configuration settings of an application are stored outside the codebase.
- This allows you to modify settings without changing or redeploying the application, enhancing flexibility, maintainability, and portability across different environments like development, testing, and production.



The Complete Example



حالة عملية للنقاش

شركة تطوير تعمل على بناء نظام برمجي لإدارة خدمات الرعاية الصحية عن بُعد، ويتميز النظام المراد بالخصائص التالية:

- يتكامل النظام مع أجهزة قياس العلامات الحيوية للمرضى لتحصيل البيانات والقياسات الحيوية مباشرة لتحليلها.
- يوفر واجهة مستخدم تفاعلية للأطباء والمرضى تتيح لهم مراقبة الحالة الصحية للمرضى بشكل لحظي عند الحاجة وتقديم الاستشارات عبر الإنترنت.
- يتيح النظام للمرضى حجز المواعيد والتواصل مع الأطباء عبر المحادثات النصية أو مكالمات الفيديو.
- يقدم النظام توصيات طبية مخصصة بناءً على بيانات المرضى وسجلهم الصحي باستخدام تقنيات الذكاء الاصطناعي.
- يوفر النظام خدمة إدارة الوصفات الطبية الإلكترونية، حيث يمكن للأطباء إصدار الوصفات وتحويلها مباشرة إلى الصيدليات.
- يدعم النظام تخزين الملفات الطبية بشكل آمن مع إمكانية مشاركتها مع مقدمي الرعاية الصحية بناءً على موافقة المريض.

Design microservices and define message broker

