الجامعة السورية الخاصة
SYRIAN PRIVATE UNIVERSITY

Week 8	كلية الهندسة المعلوماتية	مقرر بنيان البرمجيات

Microservices Architecture

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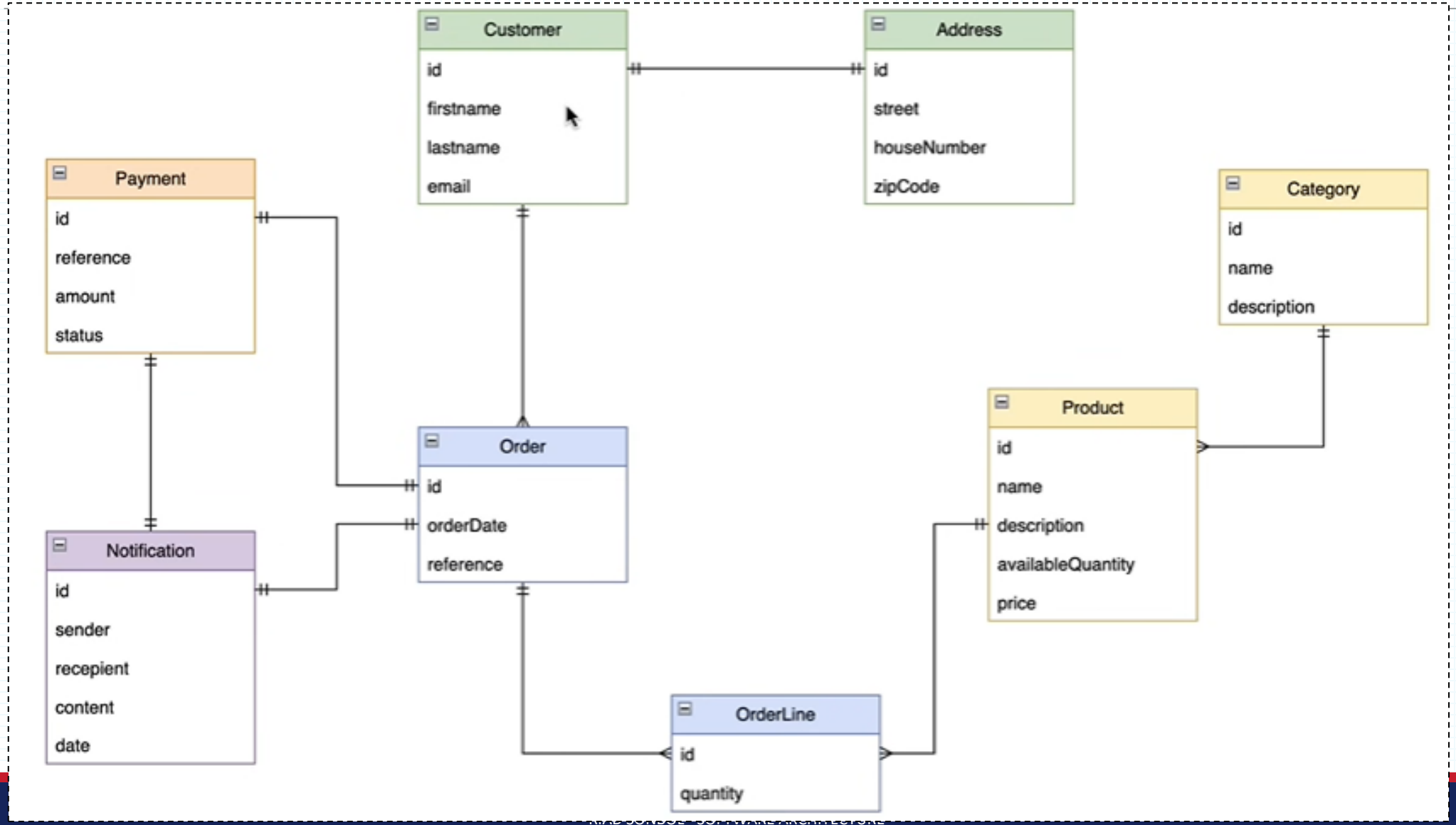
What is Domain-Driven Design?

- Domain-driven design (DDD) is a major software design approach, focusing on modeling software to match a domain according to input from that domain's experts.
- Under domain-driven design, the structure and language of software code (class names, class methods, class variables) should match the business domain
- Approach to software development focusing on domain complexity
- The term was coined by Eric Evans in his book of the same name published in 2003.

Why Use DDD?

- **Manages complexity**: DDD breaks down complex business logic into smaller, understandable models within clearly defined boundaries.
- **Clear communication using domain language**: It promotes a shared vocabulary (ubiquitous language) between developers and domain experts to avoid misunderstandings.
- **Aligns software with business goals**: DDD ensures the software design reflects real-world business processes and priorities.
- **Foundation for microservices architecture**: Each bounded context in DDD can map naturally to a microservice, encouraging modular and scalable systems.

Example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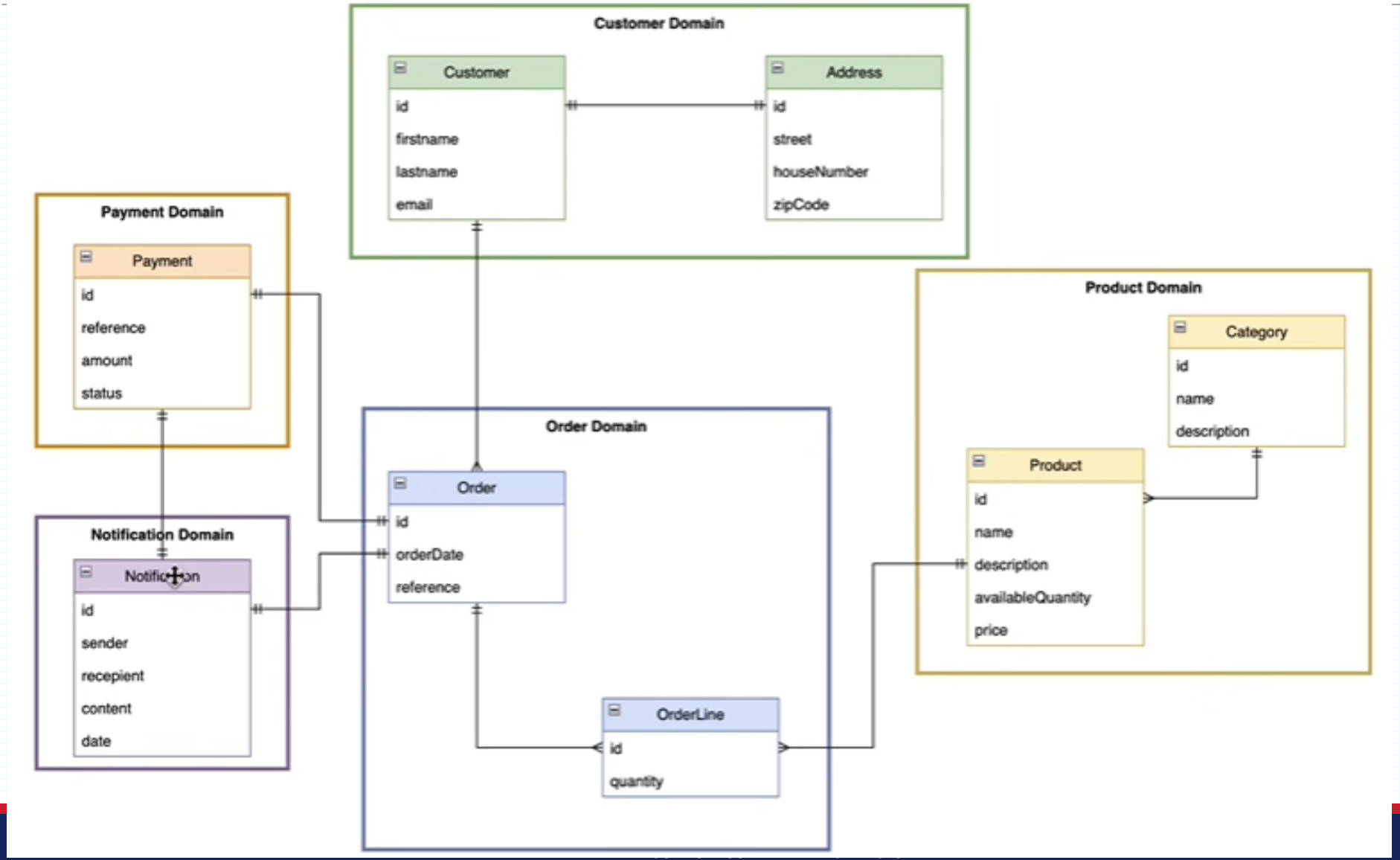
Example


Customer Domain
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Payment Domain
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Product Domain
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Product
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description
availableQuantity
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Order Domain
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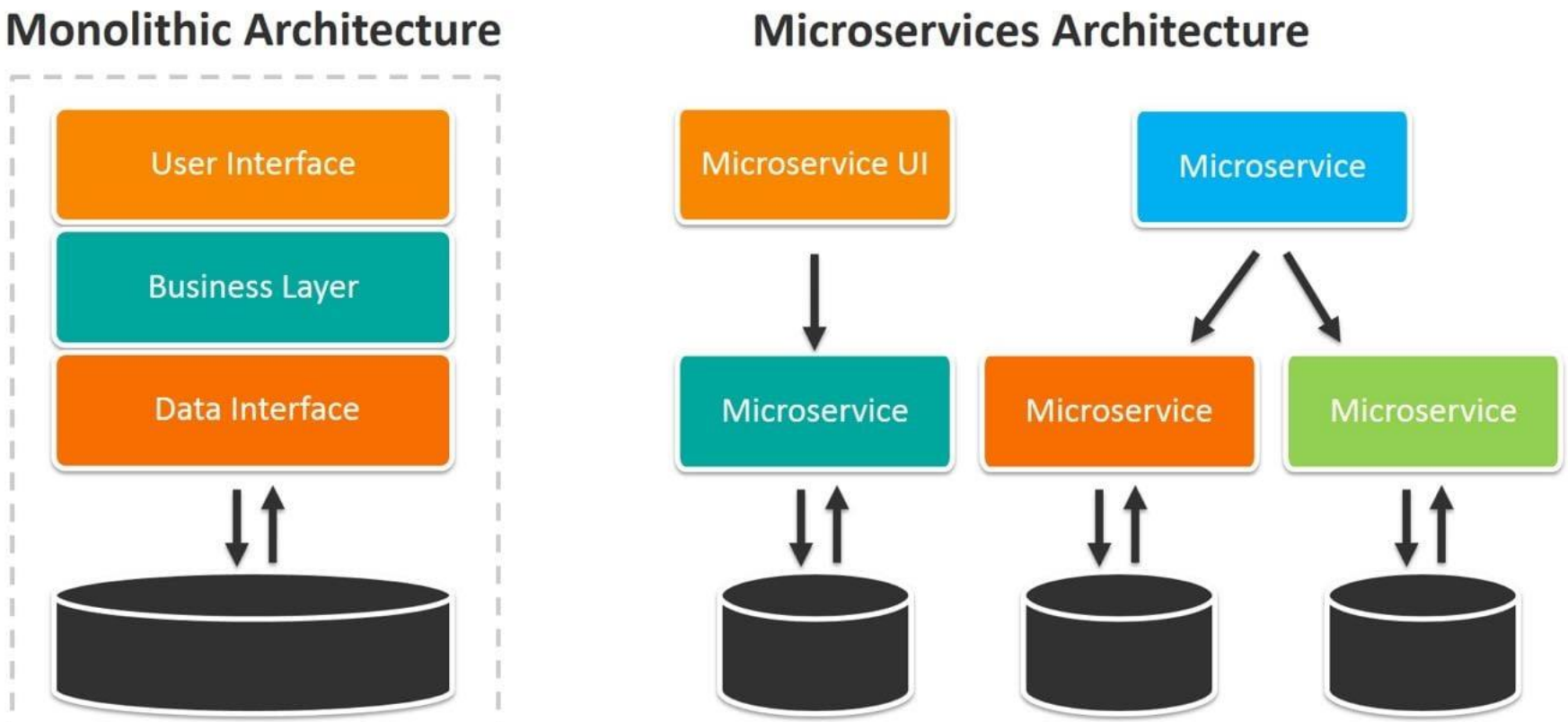
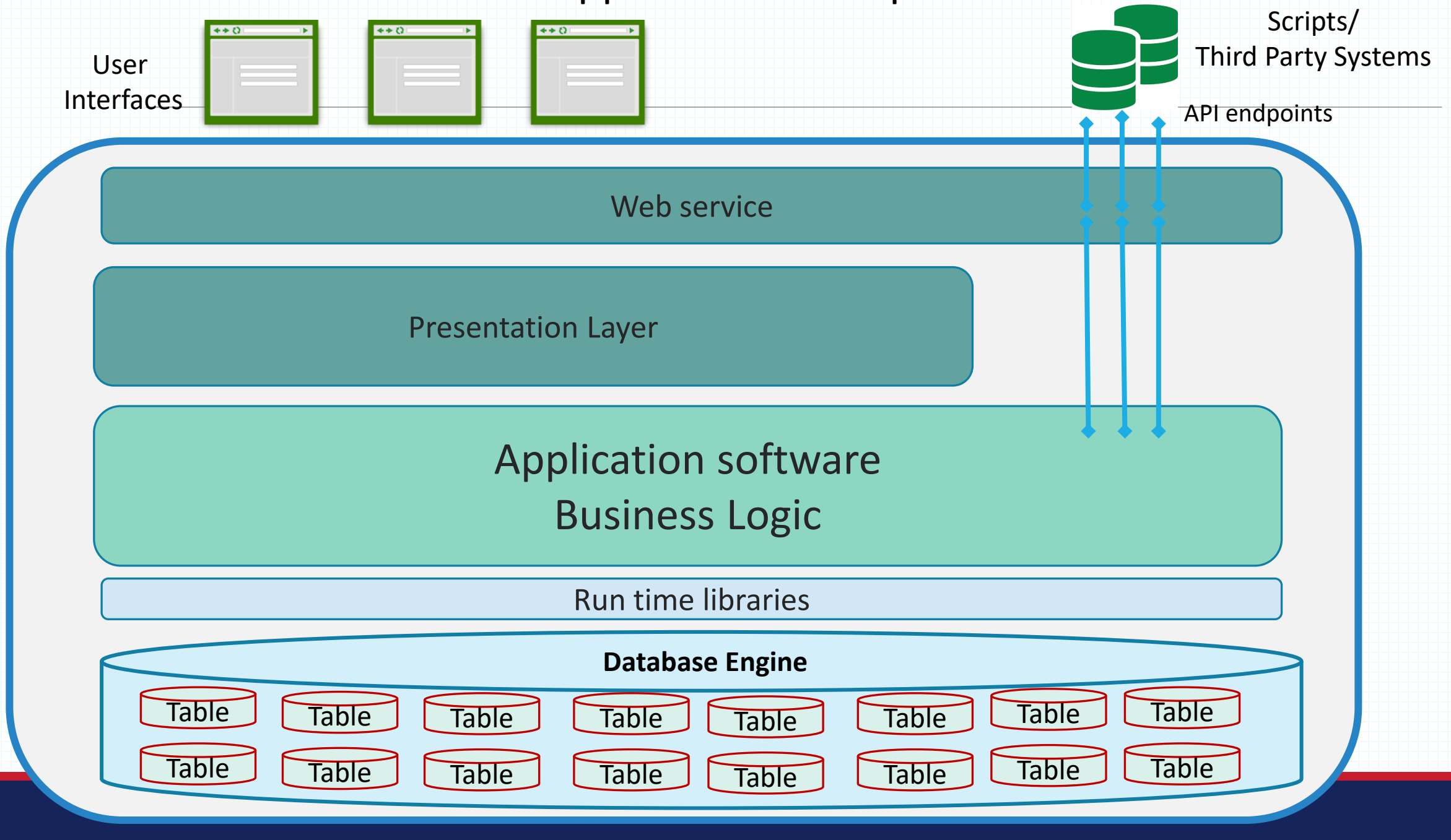
Monolithic vs Microservices



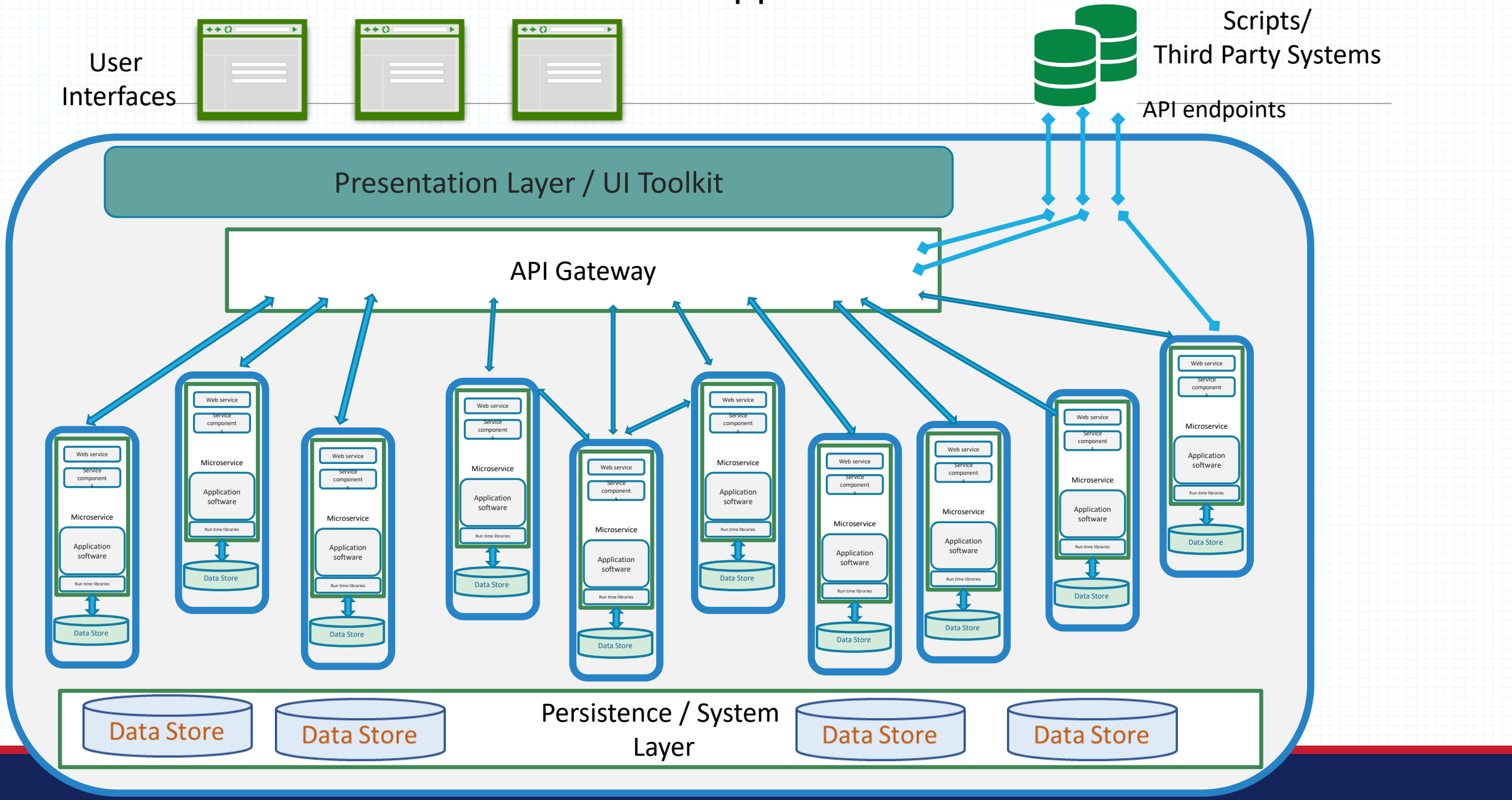
deployed as a single bundle of executables and libraries on a unified platform

Multiple independent software components orchestrated to form a unified application

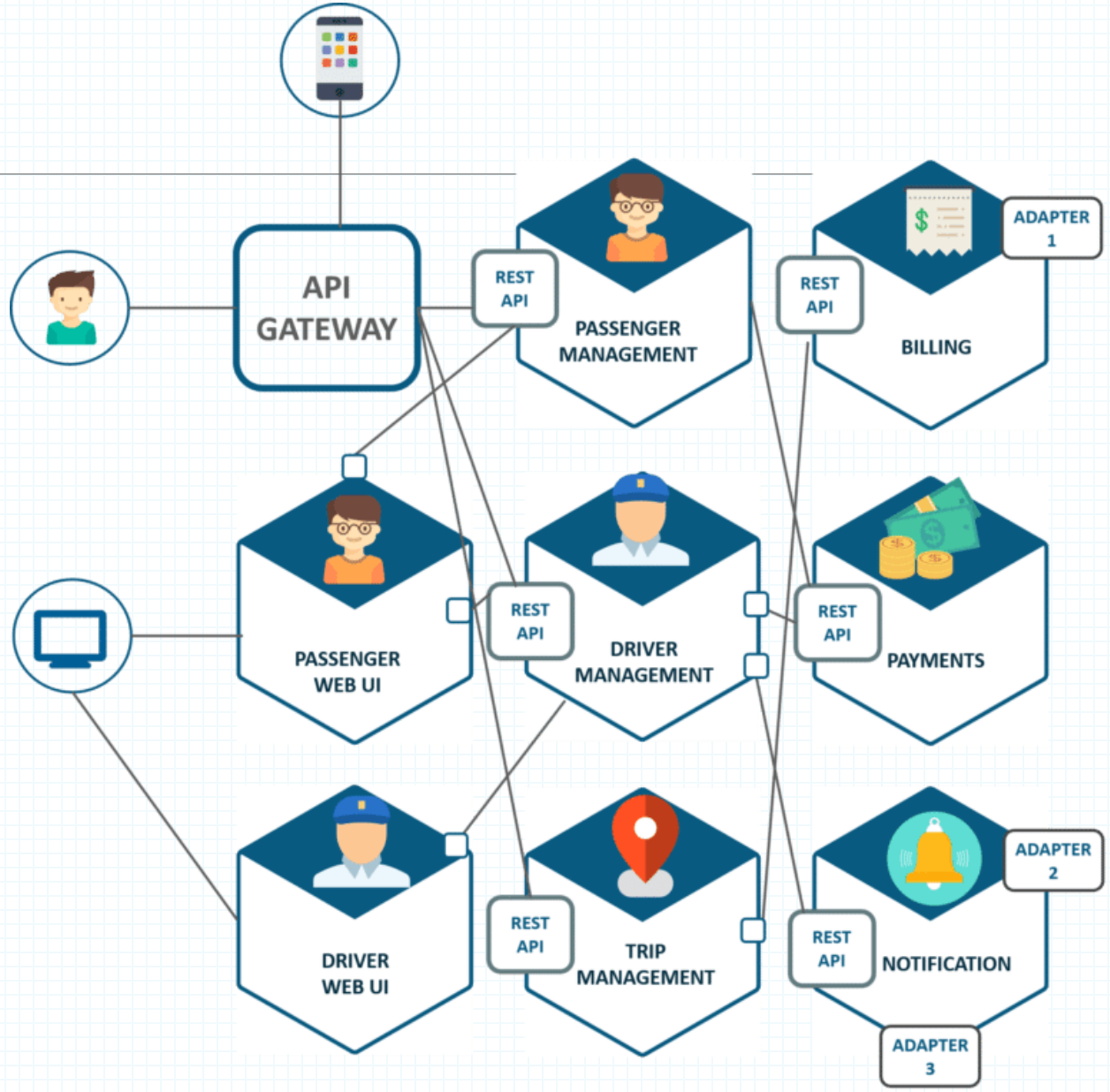
Monolithic Application Conceptual Model



Microservices-based Application



Example


API
GATEWAY
REST
API
PASSENGER
MANAGEMENT
REST
API
BILLING
ADAPTER
1
PASSENGER
WEB UI
REST
API
DRIVER
MANAGEMENT
REST
API
PAYMENTS
DRIVER
WEB UI
REST
API
TRIP
MANAGEMENT
REST
API
NOTIFICATION
ADAPTER
2
ADAPTER
3

Why Microservices!

- Successful applications often live a very long time + **Technology changes**

⇒ Need to be able to easily “modernize” application!

⇒ Need to deliver changes rapidly, frequently, and reliably.

- More complex Applications.. App **keep growing up**

⇒Need to divide team

⇒Need to improve testability, deployability, maintainability, modularity, evolvability.

Characteristics of Microservices

- **Independently deployable**: Each microservice can be developed, deployed, and updated without affecting other services.
- **Decentralized data management**: Every microservice owns and manages its own database, avoiding tight data coupling between services.
- **Technology agnostic**: Microservices can be built using different programming languages, databases, and frameworks, depending on the service's needs.
- **Focused on a single business capability**: Each microservice is designed to handle one specific business function, making the system modular and easier to understand.

But.. Loose coupling is essential!

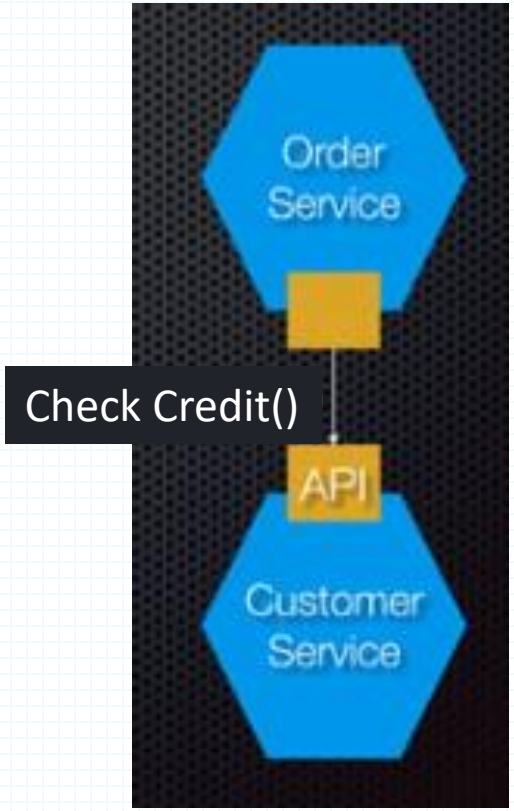
- **Service collaborate.. Thus:**

⇒ Design Time Coupling:

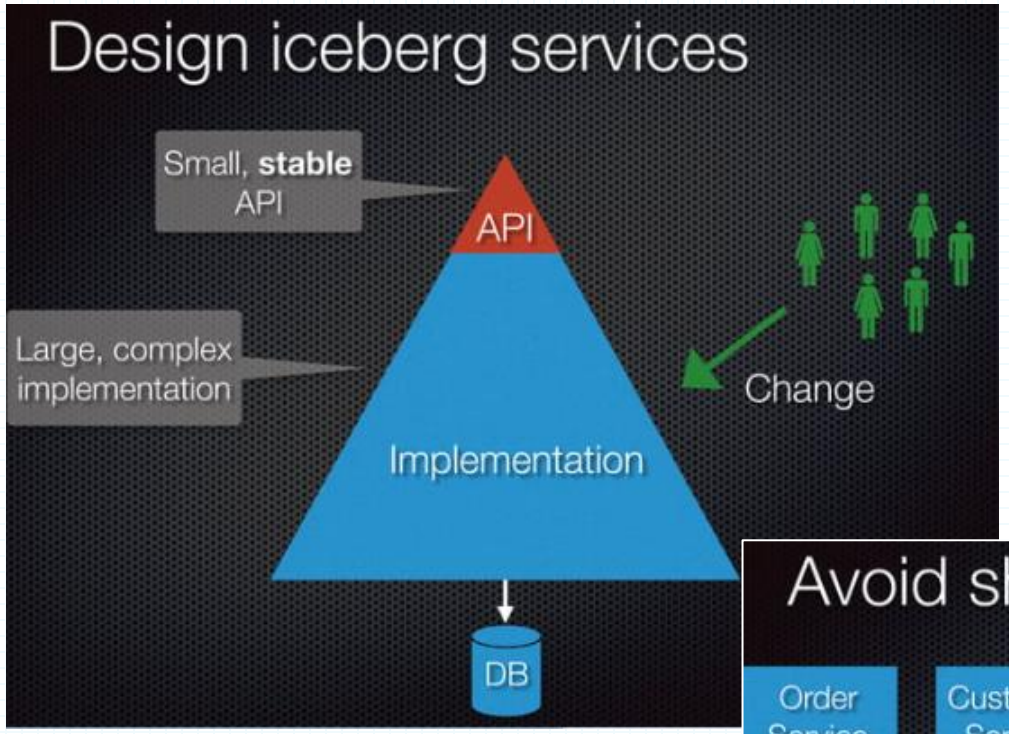
Change Service A -> change Service B

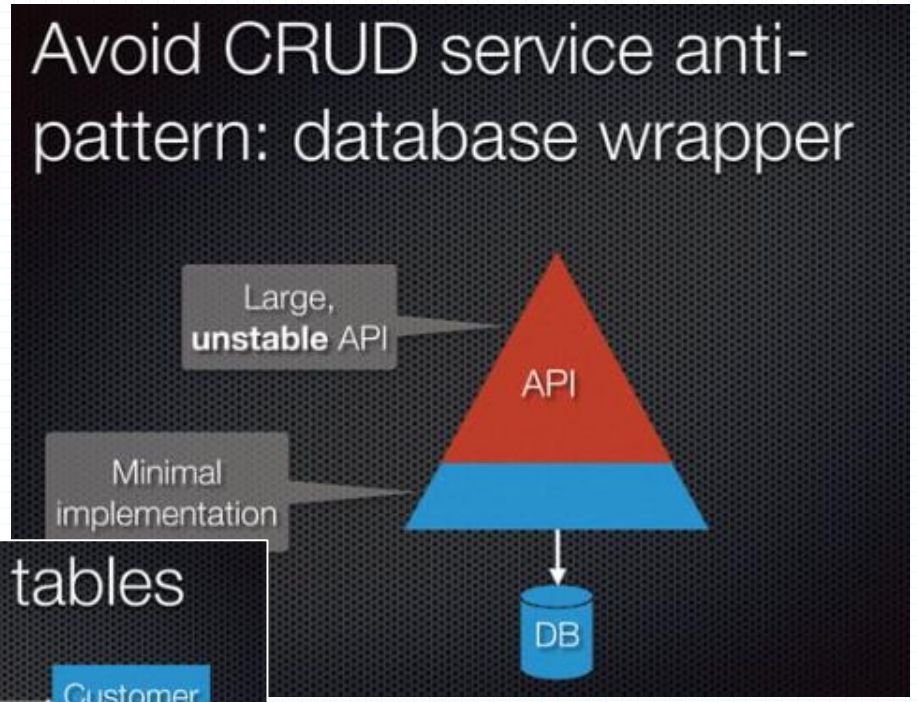
⇒ Runtime Coupling:

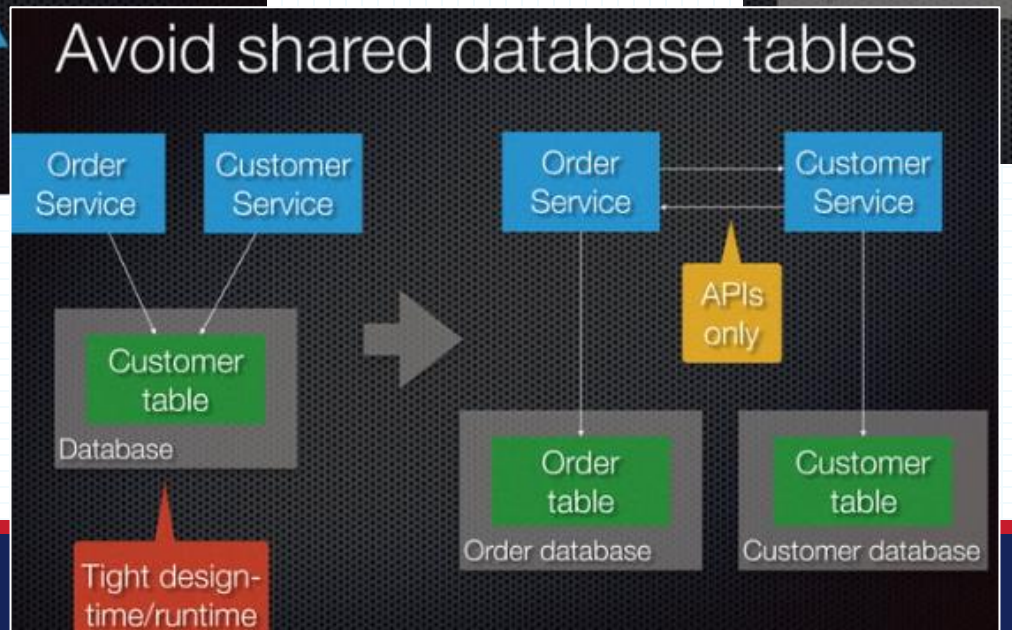
Service A cannot respond to a synchronous request until service B responds



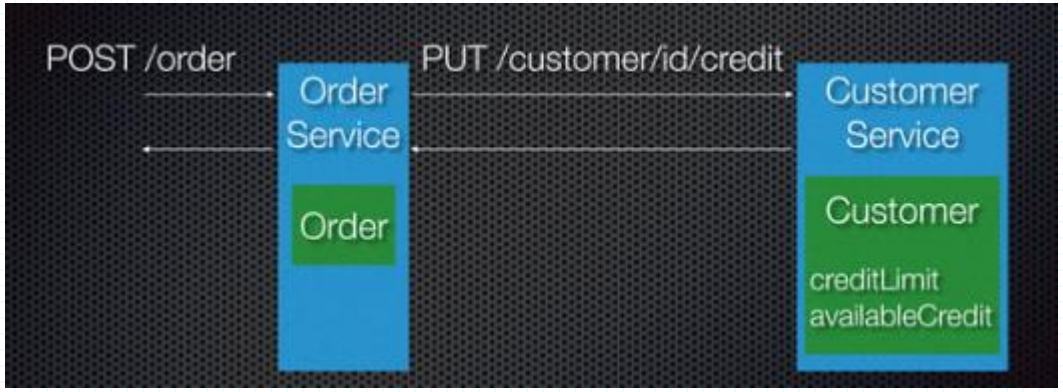
Design Time Coupling… Solutions

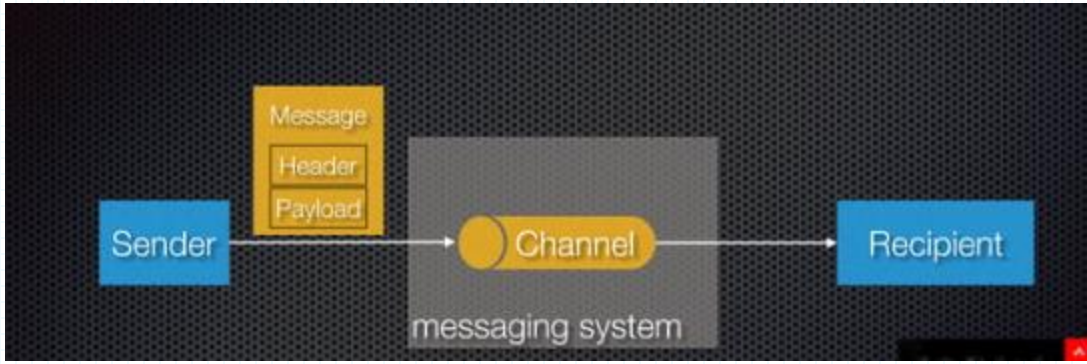






Runtime Coupling … Solution





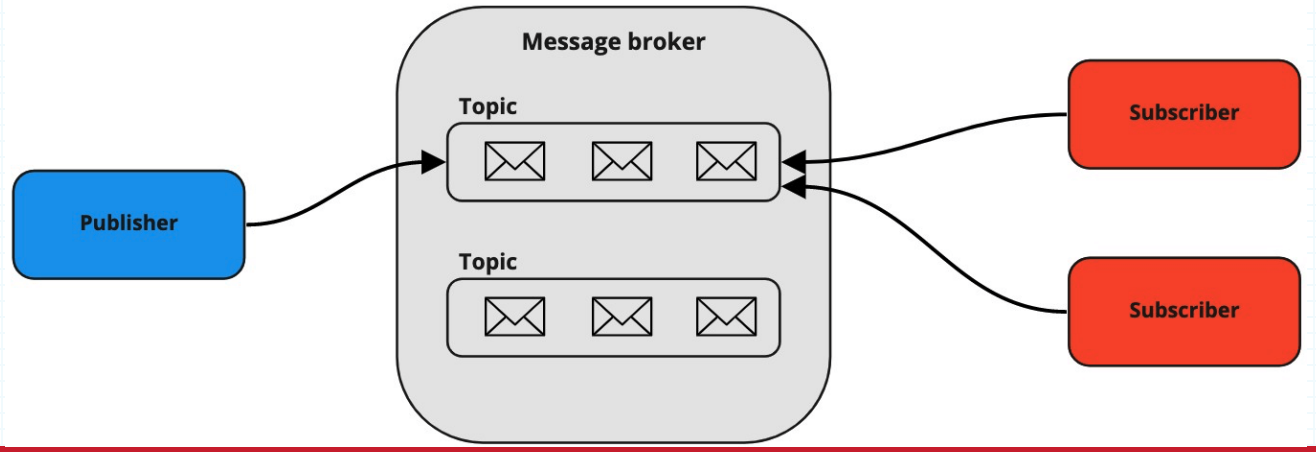
Reduce Availability!

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

Use Async Messaging

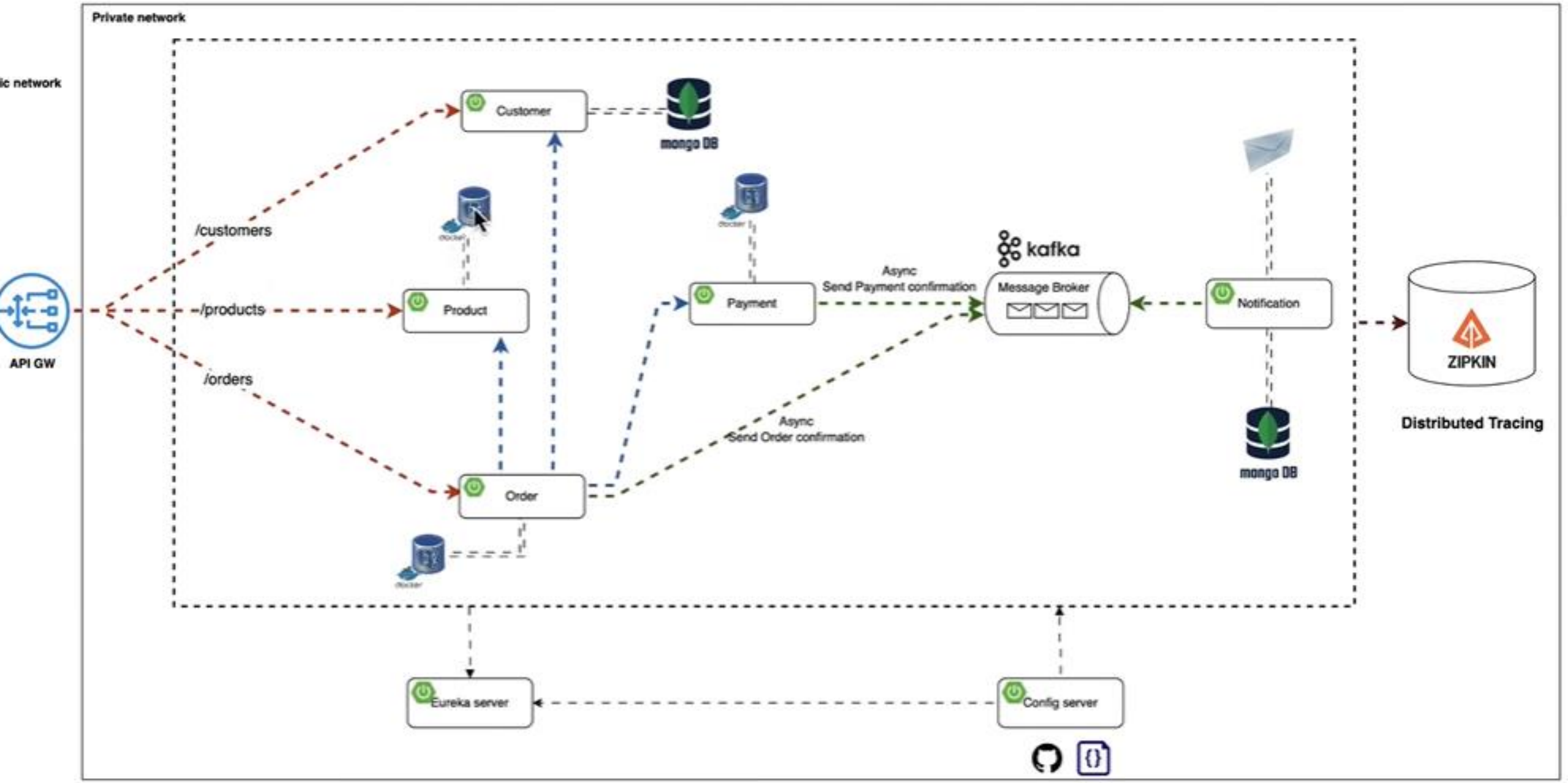
What is a Message Broker?

- **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


Private network
ic network
Customer
mongo DB
/customers
/products
/orders
API GW
Product
Payment
Async
Send Payment confirmation
kafka
Message Broker
Notification
ZIPKIN
Distributed Tracing
Async
Send Order confirmation
Order
mongo DB
Eureka server
Config server