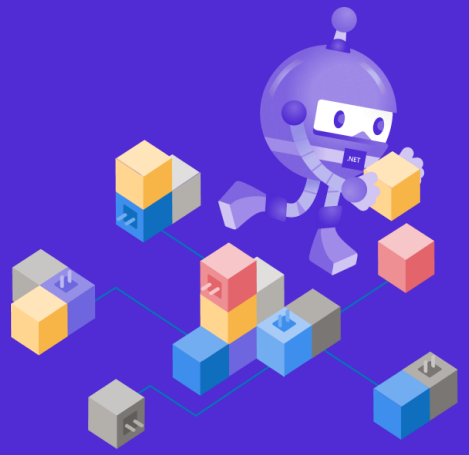
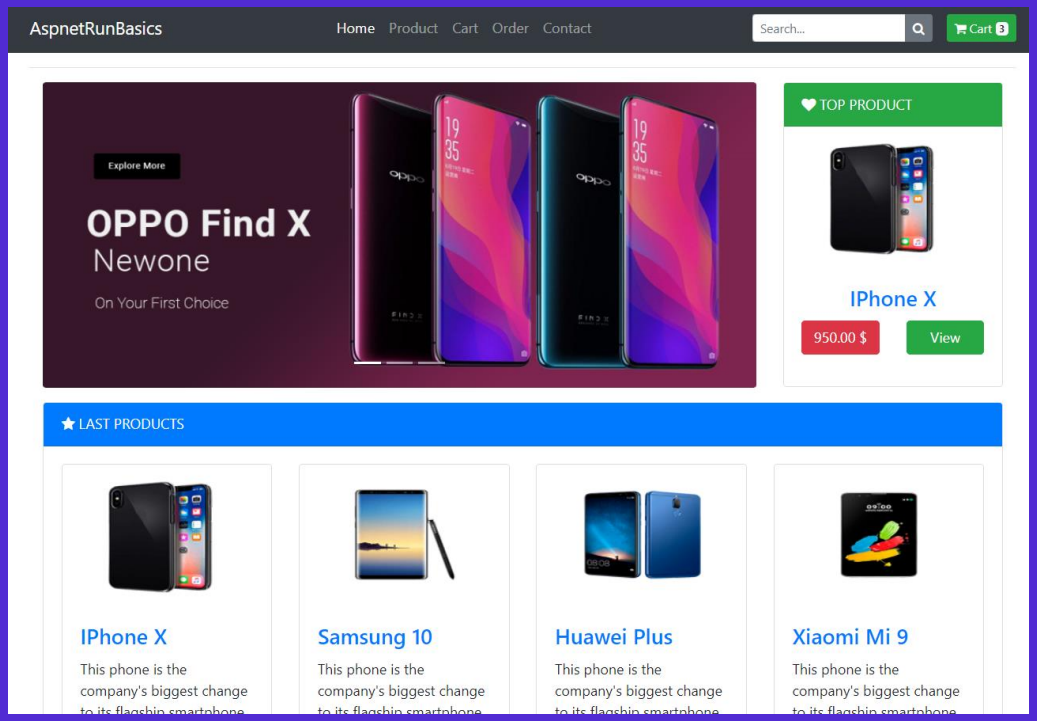
Microservices Architecture and Implementation on .Net





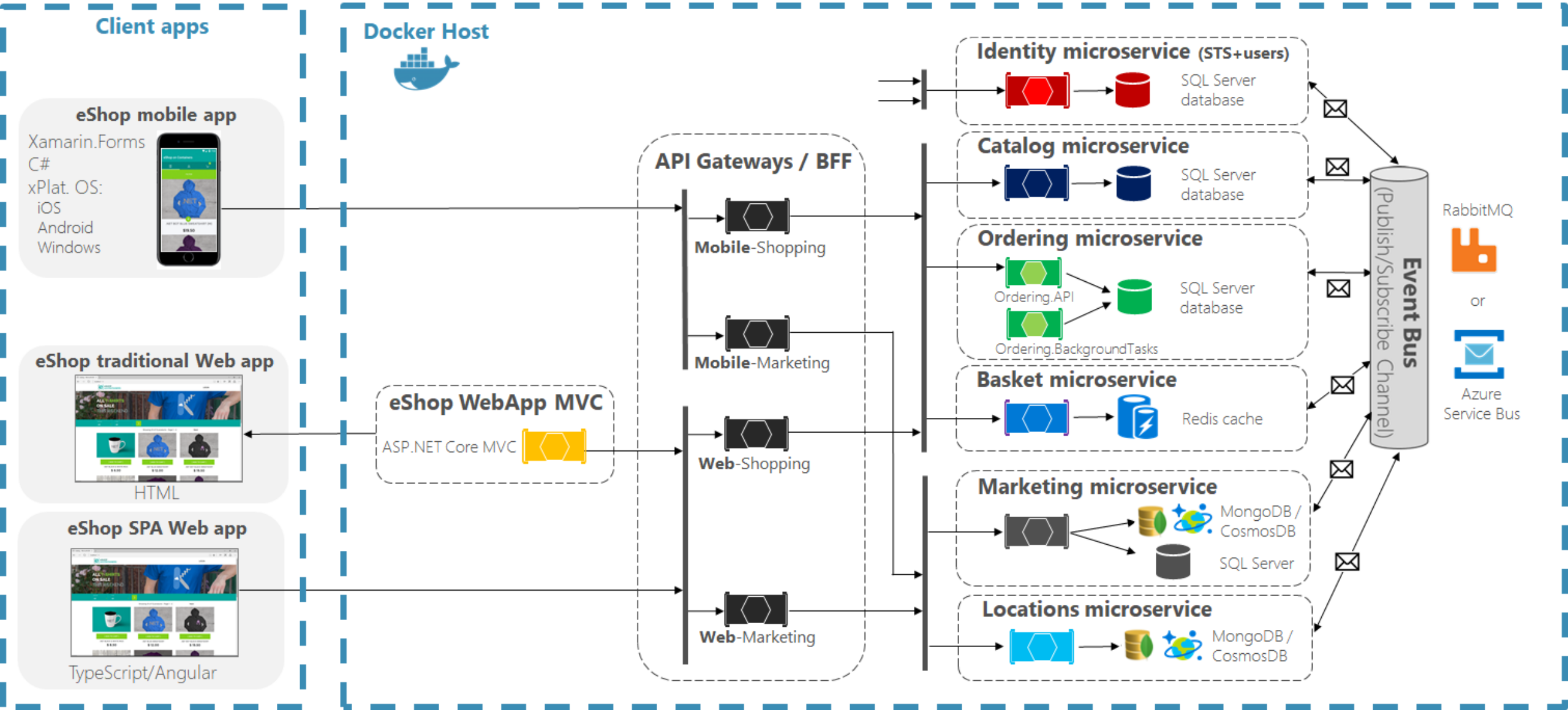
Mehmet Ozkaya

Software Architect, .NET

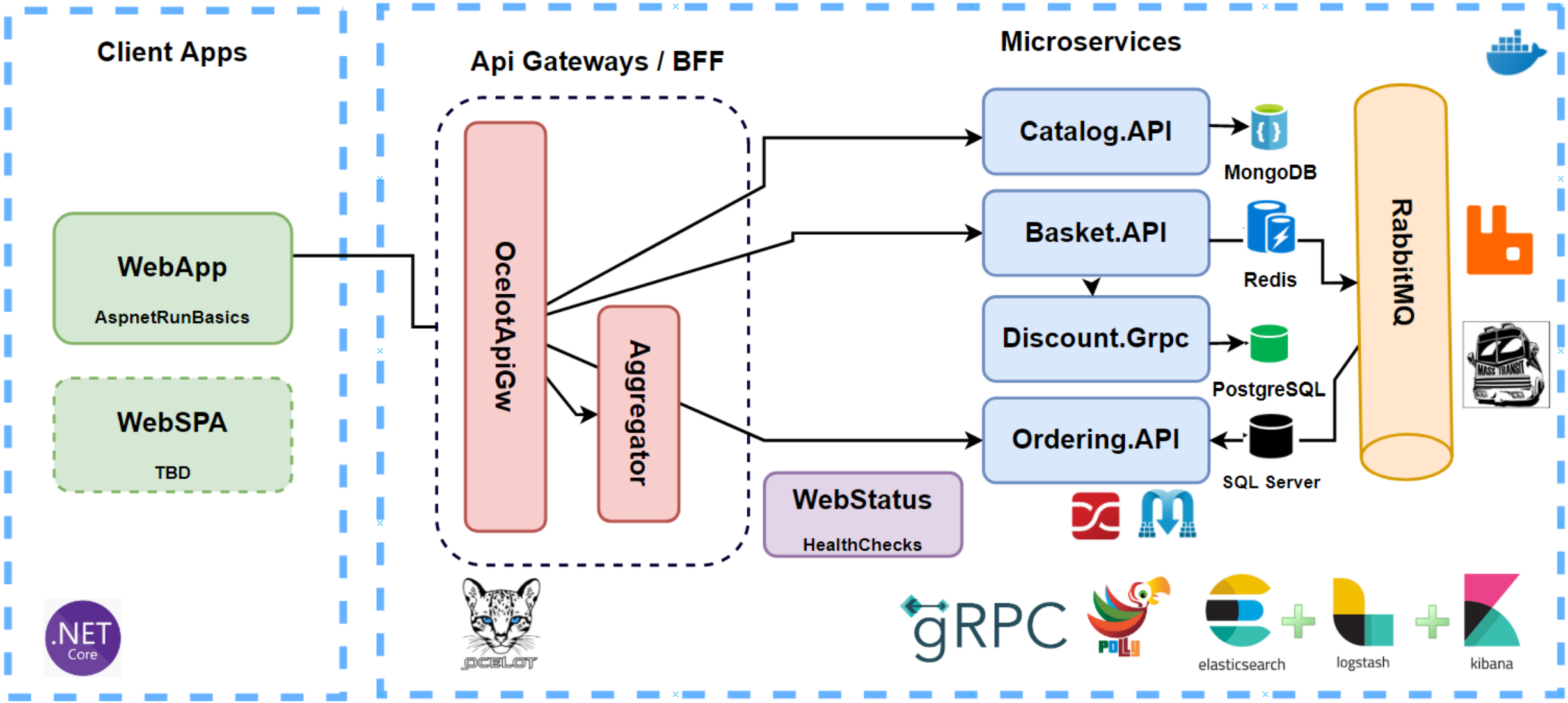
@ezozkme

eShopOnContainers reference application

(Development environment architecture)

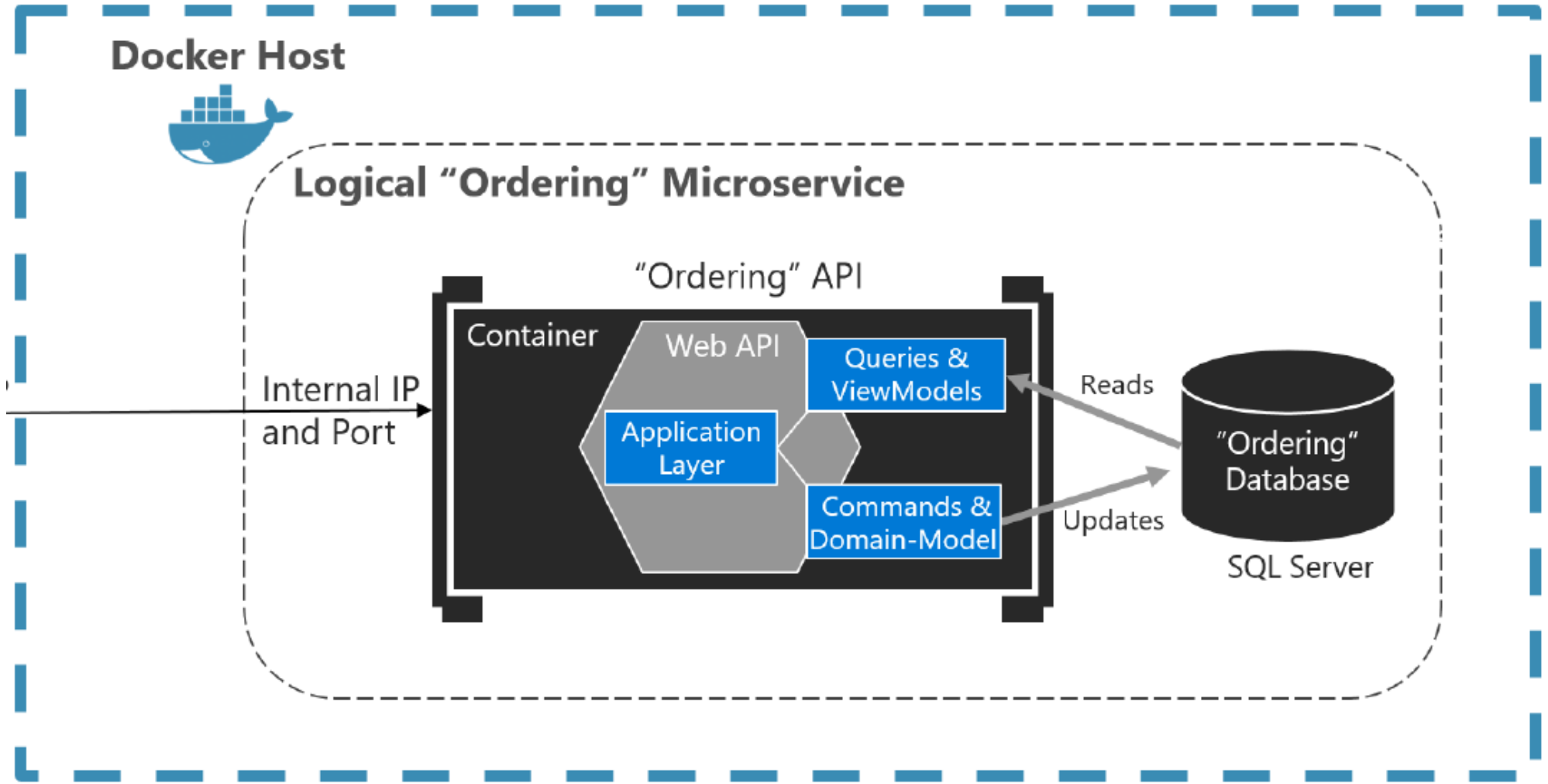


Big Picture


Client Apps
WebApp
AspnetRunBasics
WebSPA
TBD
Api Gateways / BFF
OcelotApiGw
Aggregator
WebStatus
HealthChecks
Microservices
Catalog.API
MongoDB
Basket.API
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
OCELOT
gRPC
POLLY
elasticsearch
logstash
kibana

Simplified CQRS and DDD microservice

High level design



aspnetrun

The best path to leverage your aspnet skills. Onboarding to .Net Software Architect jobs. Download latest real world asp.net core microservices applications.

Istanbul https://aspnetrun.azurewebsites.net ezozkme@gmail.com

Repositories 13 | Packages | People 1 | Teams | Projects 1 | Settings

Pinned repositories

Customize pinned repositories

learn

The best path to .Net Microservices Udemy Learning Path. .Net world evolving to the microservices and Cloud-native systems to provide rapid change, large scale, and resilience cutting-edge systems....

2 1

run-aspnetcore-microservices

Microservices on .Net platforms which used Asp.Net Web API, Docker, RabbitMQ, MassTransit, Grpc, Ocelot API Gateway, MongoDB, Redis, PostgreSQL, SqlServer, Dapper, Entity Framework Core, CQRS and C...

C# 420 175

run-aspnetcore

Template

A starter kit for your next ASP.NET Core web application. Boilerplate for ASP.NET Core reference application, demonstrating a layered application architecture with applying Clean Architecture and D...

C# 228 57

run-aspnet-identityserver4

Secure microservices with using standalone Identity Server 4 and backing with Ocelot API Gateway. Protect our ASP.NET Web MVC and API applications with using OAuth 2 and OpenID Connect in IdentityS...

C# 39 18

run-aspnet-grpc

Using gRPC in Microservices for Building a high-performance Interservice Communication with .Net 5. See gRPC Microservices and Step by Step Implementation on .NET Course w/ discount->

C# 34 10

run-devops

Deploying .Net Microservices into Kubernetes, and moving deployments to the cloud Azure Kubernetes Services (AKS) with using Azure Container Registry (ACR) and how to Automating Deployments with Az...

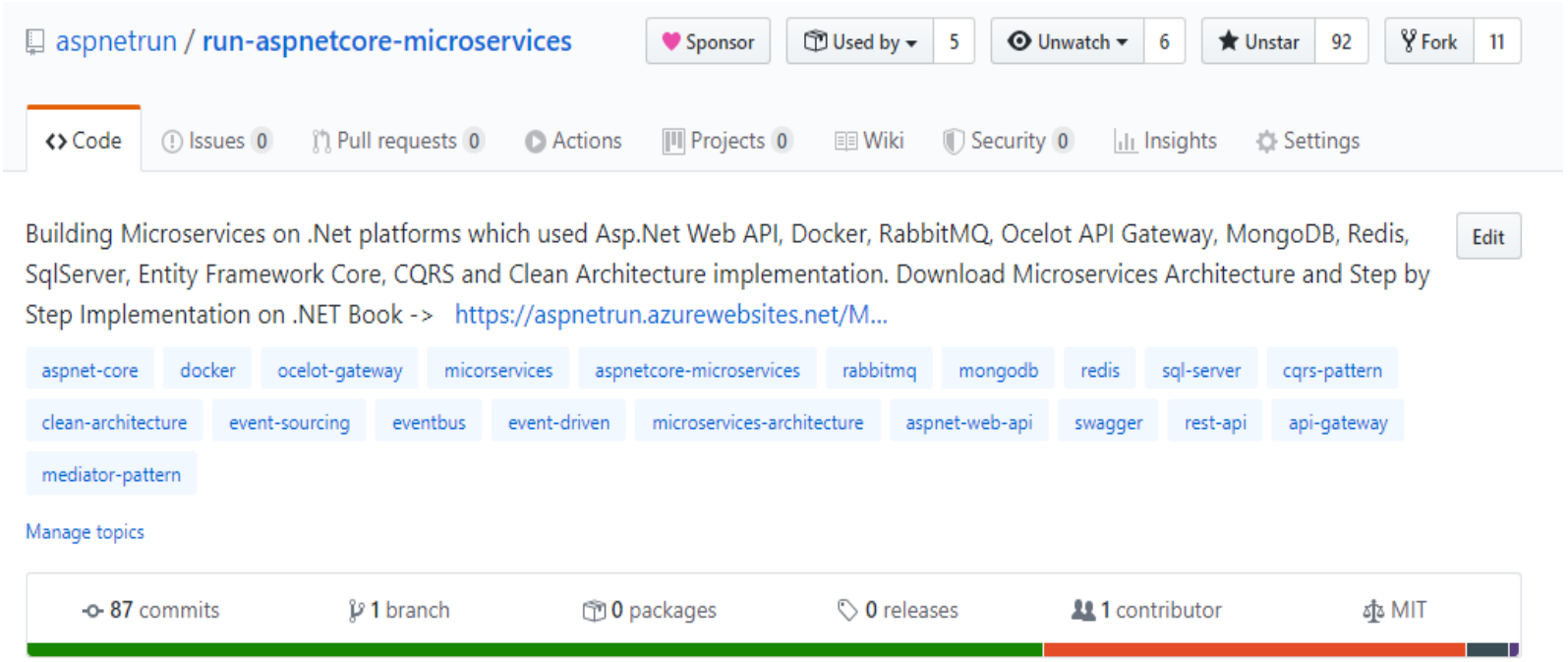
C# 4 8

Prerequisites

- Basics knowledge of C#
- Have knowledge of Asp.Net MVC and REST API’s
- Docker Container knowledge

Source Code on Github

- Source code on Github
- Fork the repository
- Open issues
- Send Pull Requests



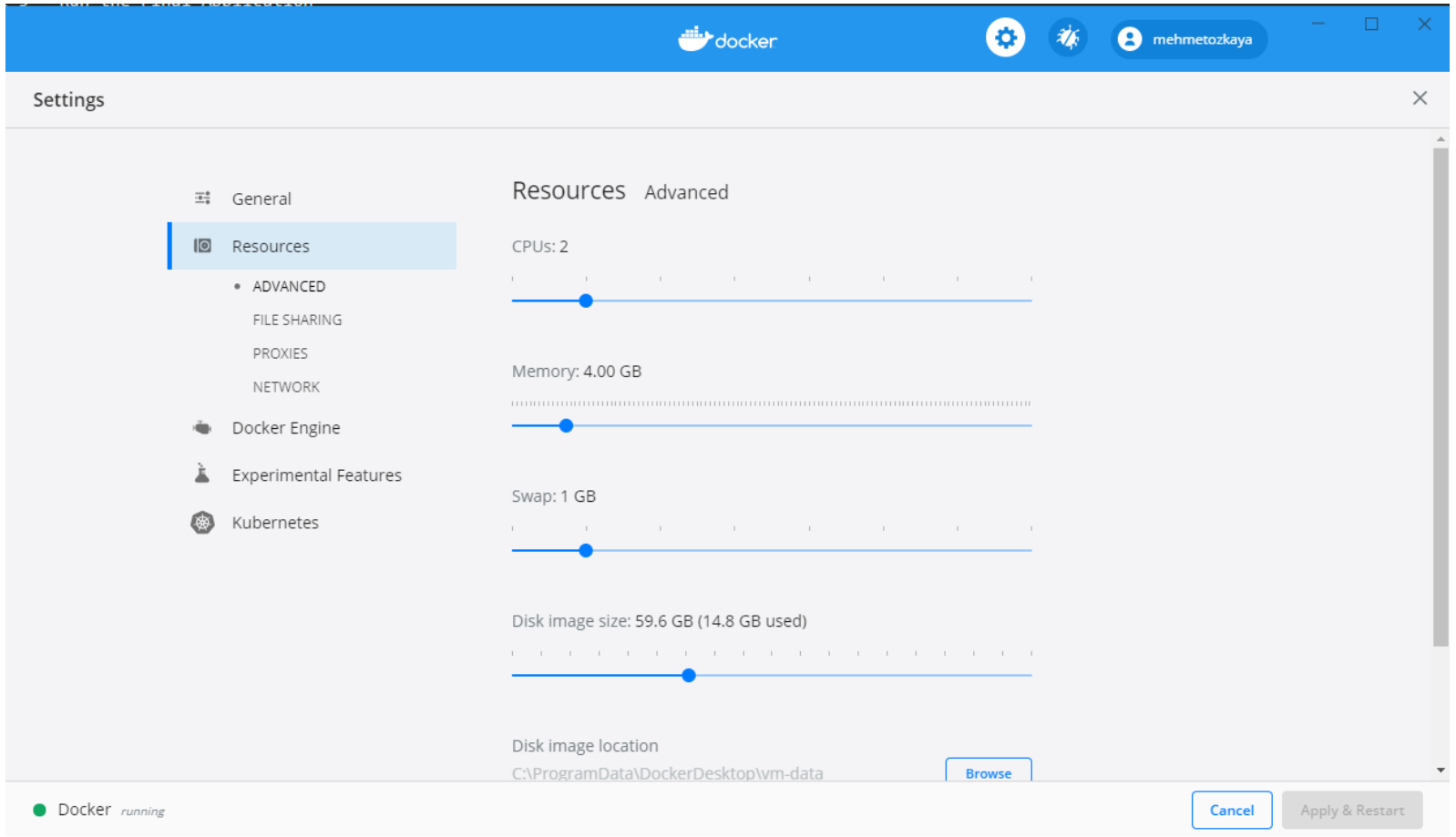
https://github.com/aspnetrun/run-aspnetcore-microservices

Tools that we will use

- .NET 5.x or above SDK
- Visual Studio 2019 v16.x or above
- Docker Desktop
- Postman

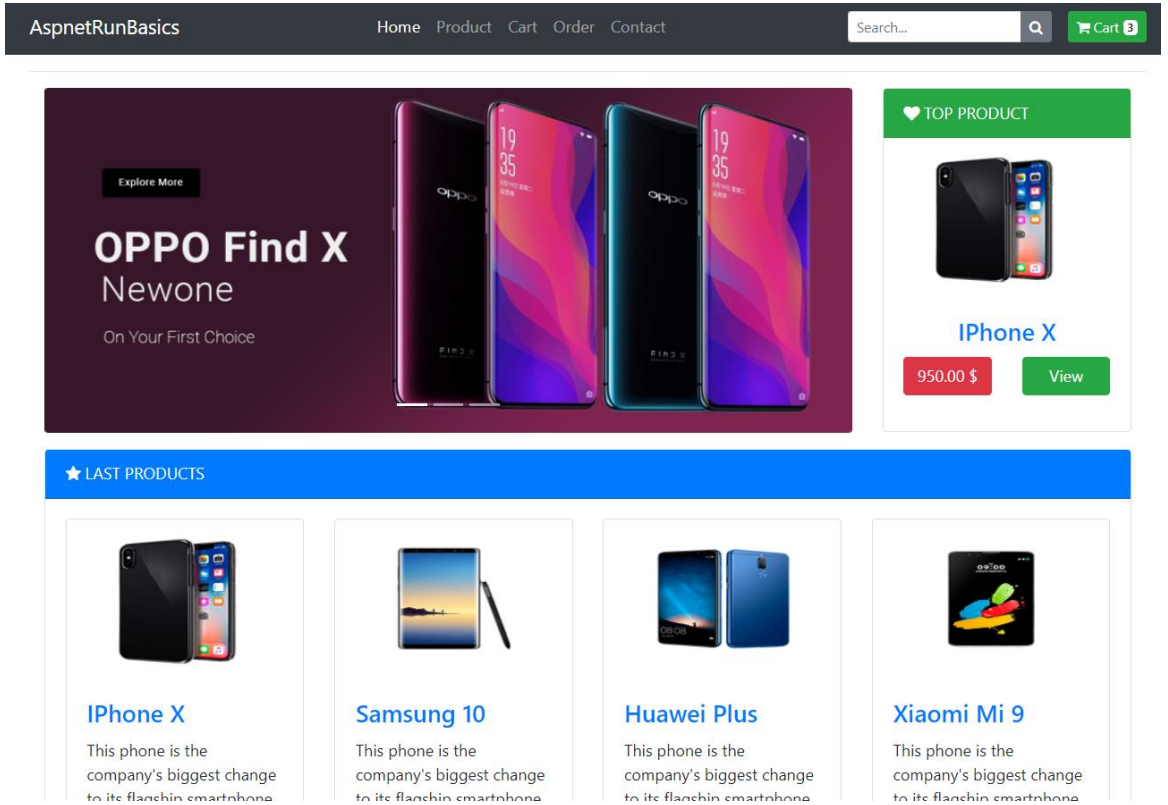
Configure Docker Desktop

- Once Docker for Windows is installed, go to the **Settings > Advanced** option
- Memory – 4 GB
- CPU - 2



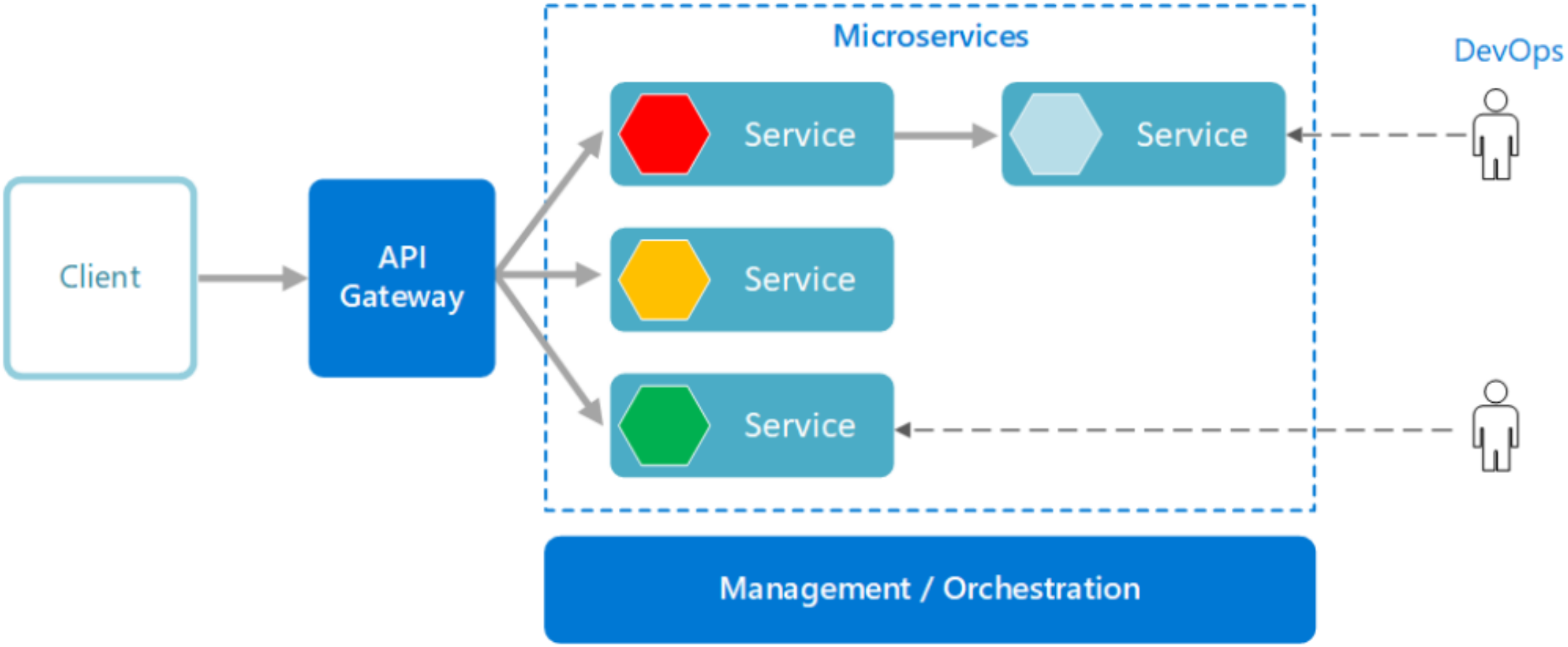
Run Final Application

- Clone Microservices Repository
- Docker-compose up
- Follow steps on github documentation
- Run the Project Section
- DEMO



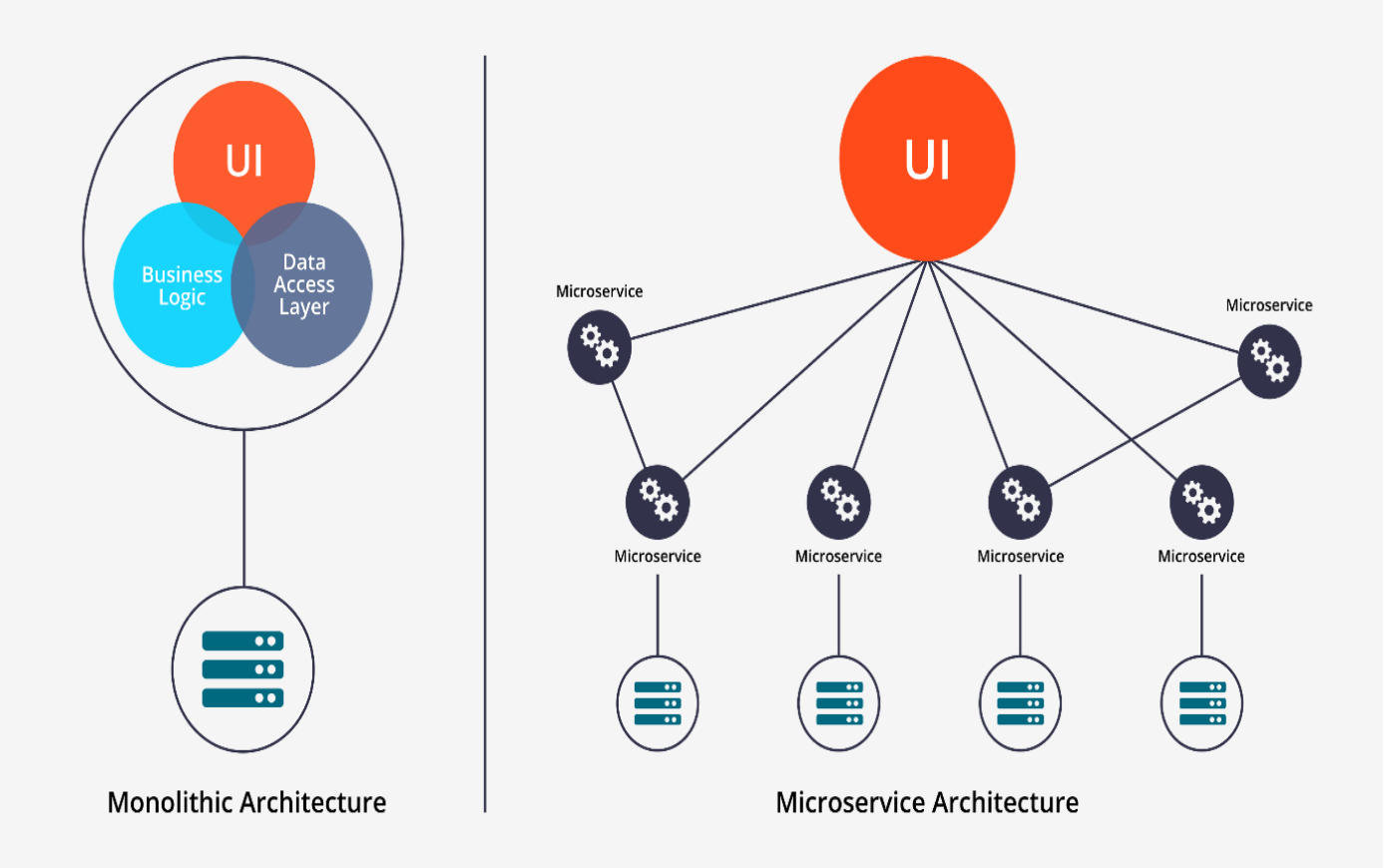
https://github.com/aspnetrun/run-aspnetcore-microservices

What are Microservices ?



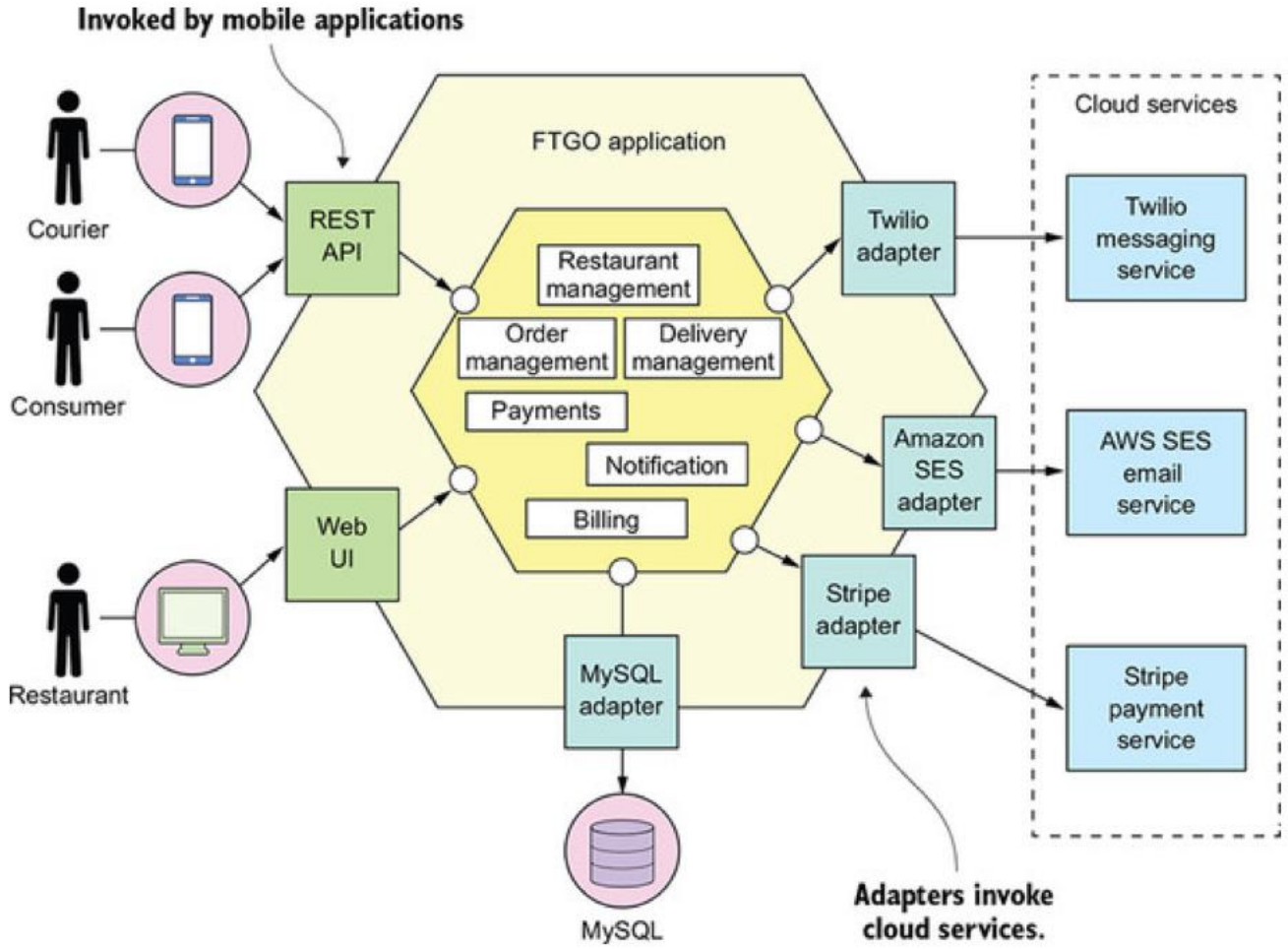
Microservices Characteristics

- Small, independent, and loosely coupled
- Separate codebase
- Deployed independently
- Persisting their own data
- Well-defined APIs
- Technology agnostic



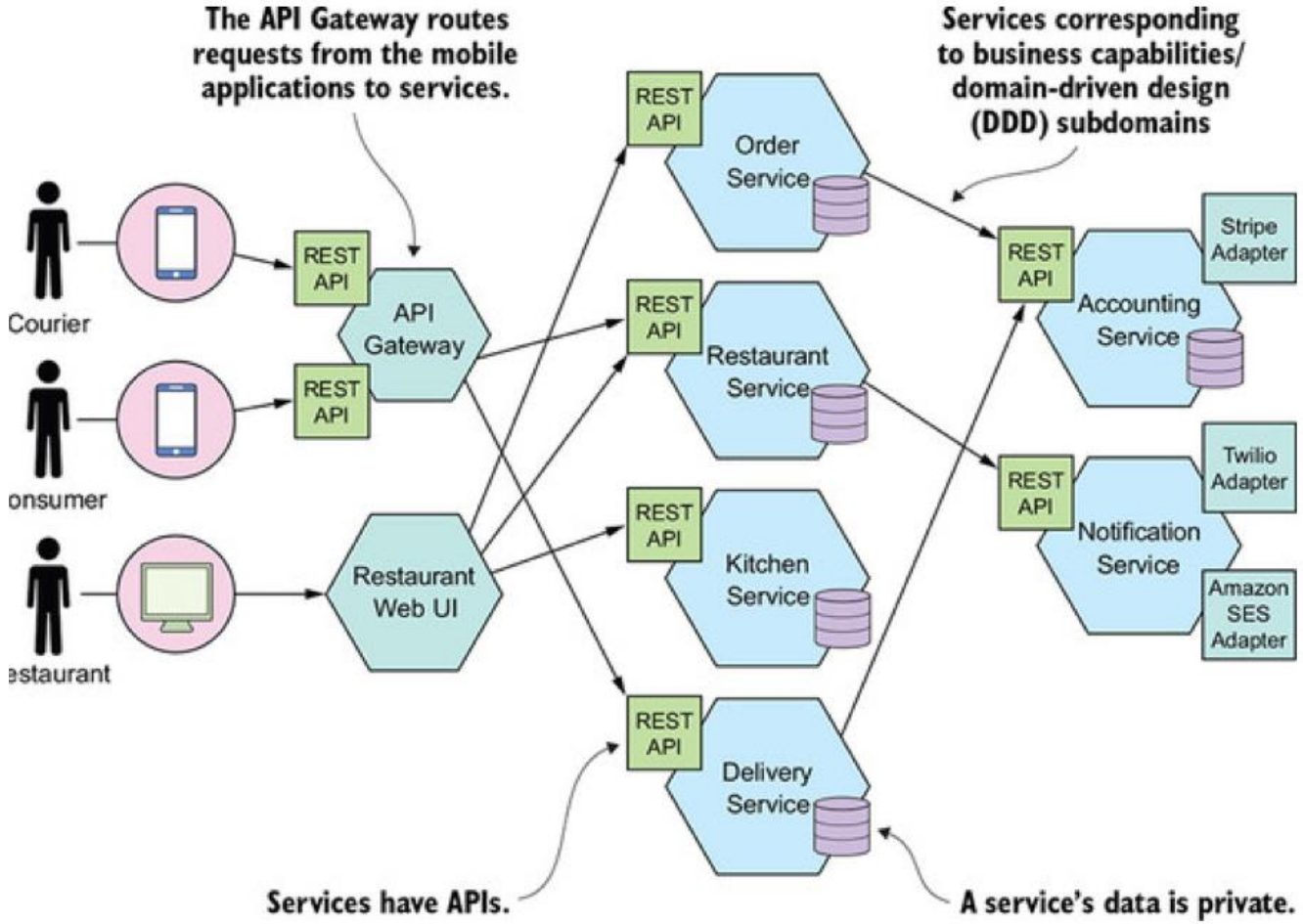
Monolithic Architecture Pros-Cons

- Single codebase
- Easy to develop, debug and deployments
- Complexity
- Hard to maintenance
- Challenge of making changes
- Inability to apply new technology

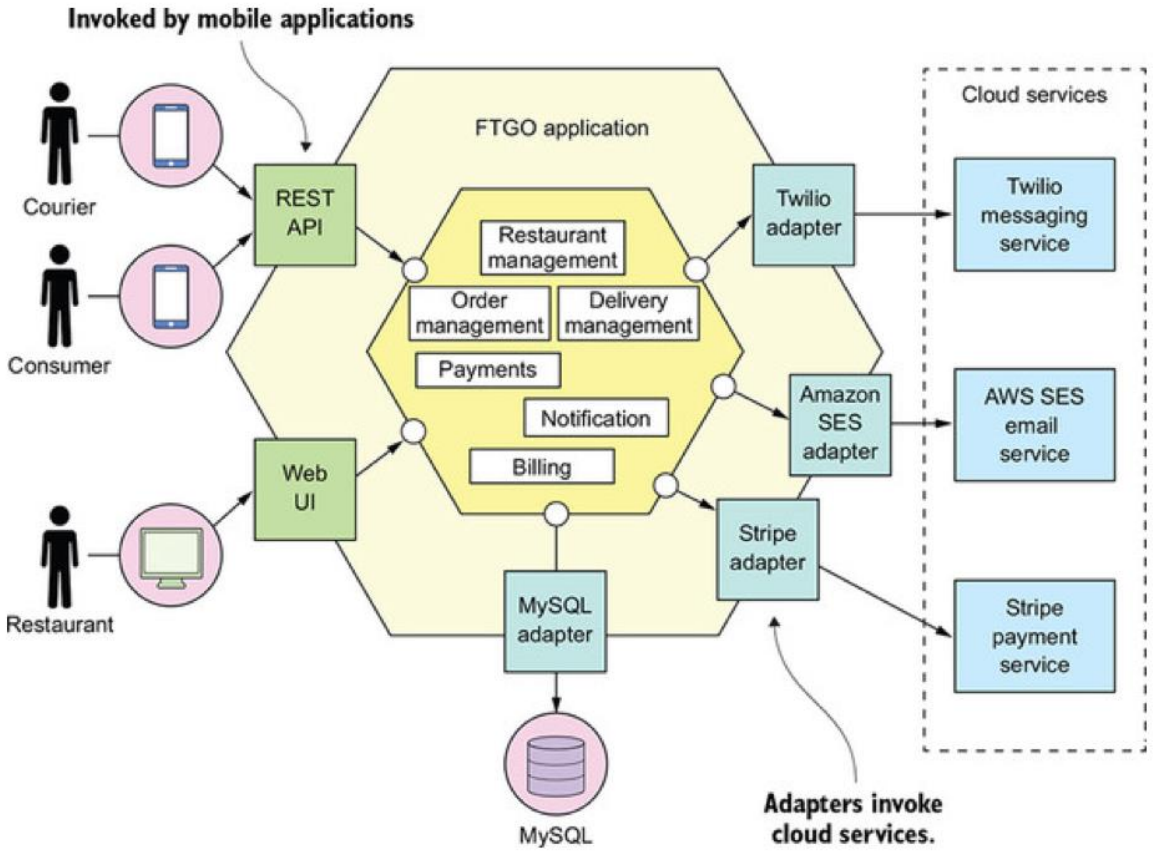


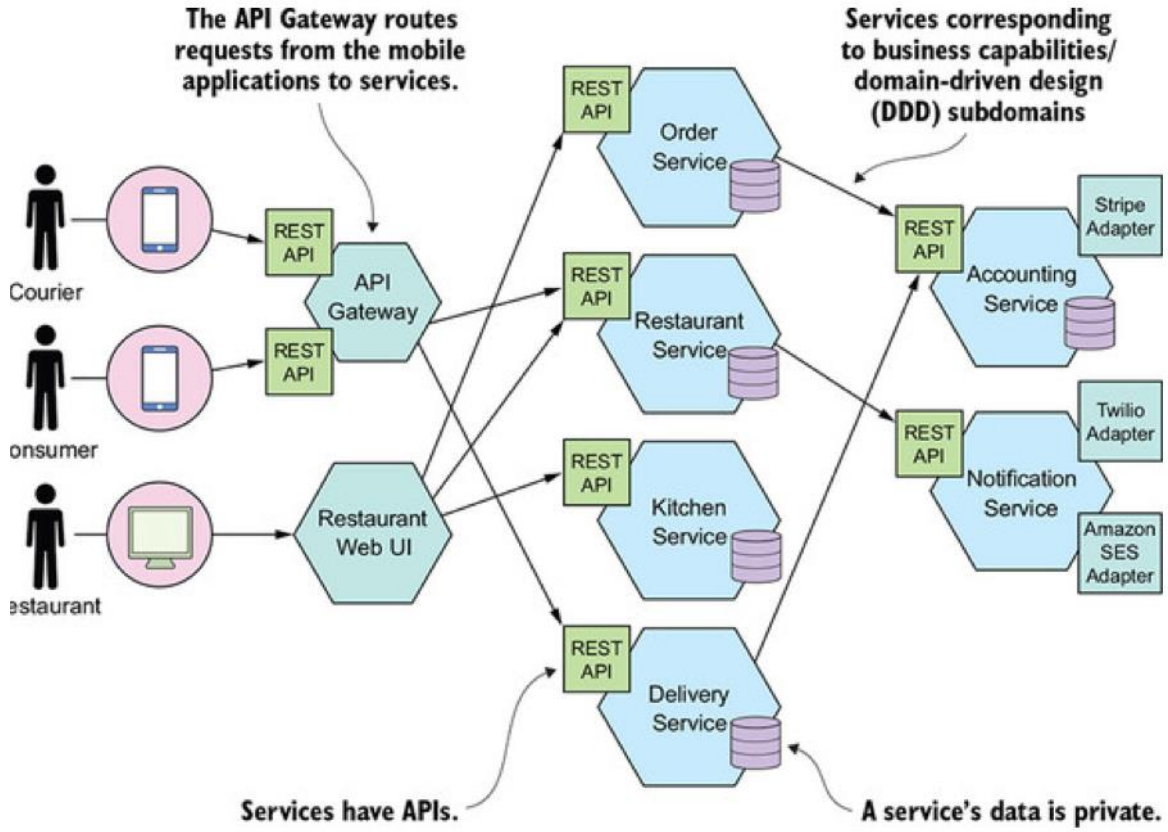
Microservices Architecture Pros-Cons

- Independent Services
- Better scalability
- Technology Diversity
- Agility
- Small, focused teams
- Challenge of management and traceability

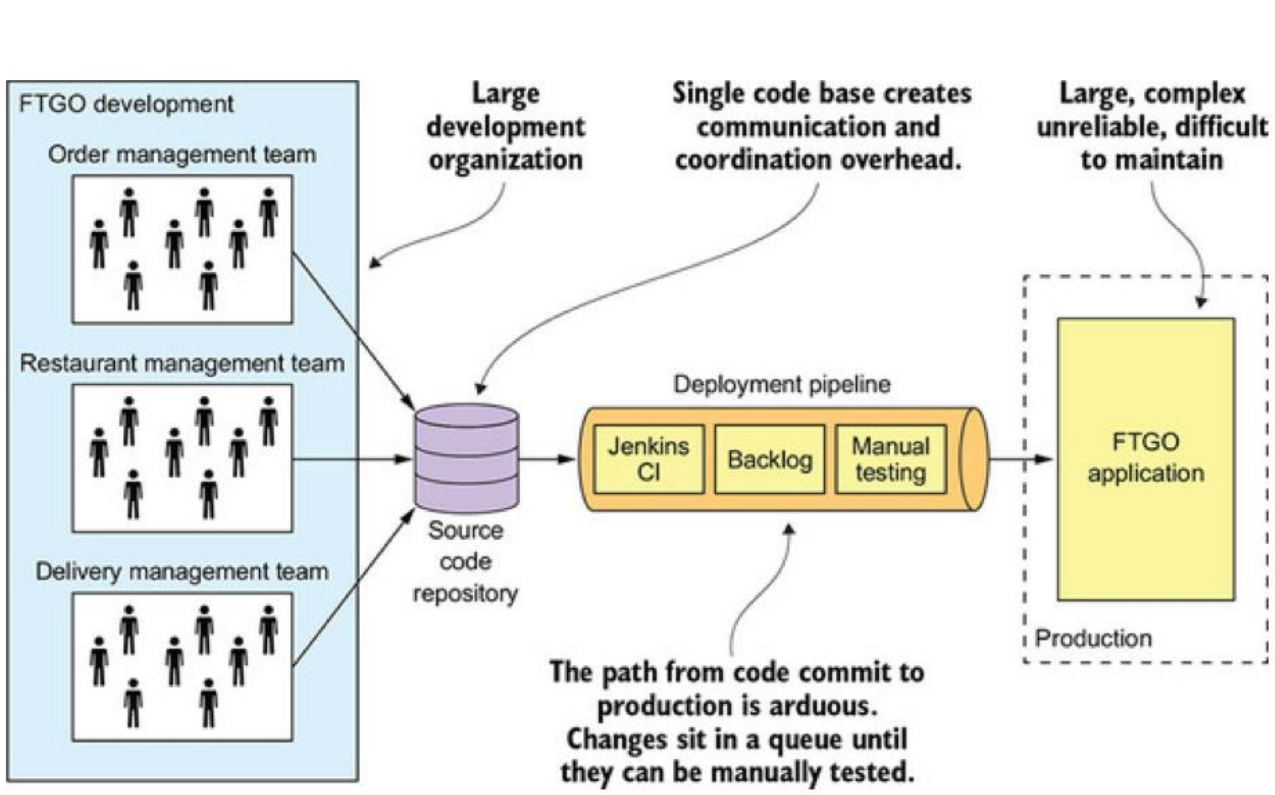


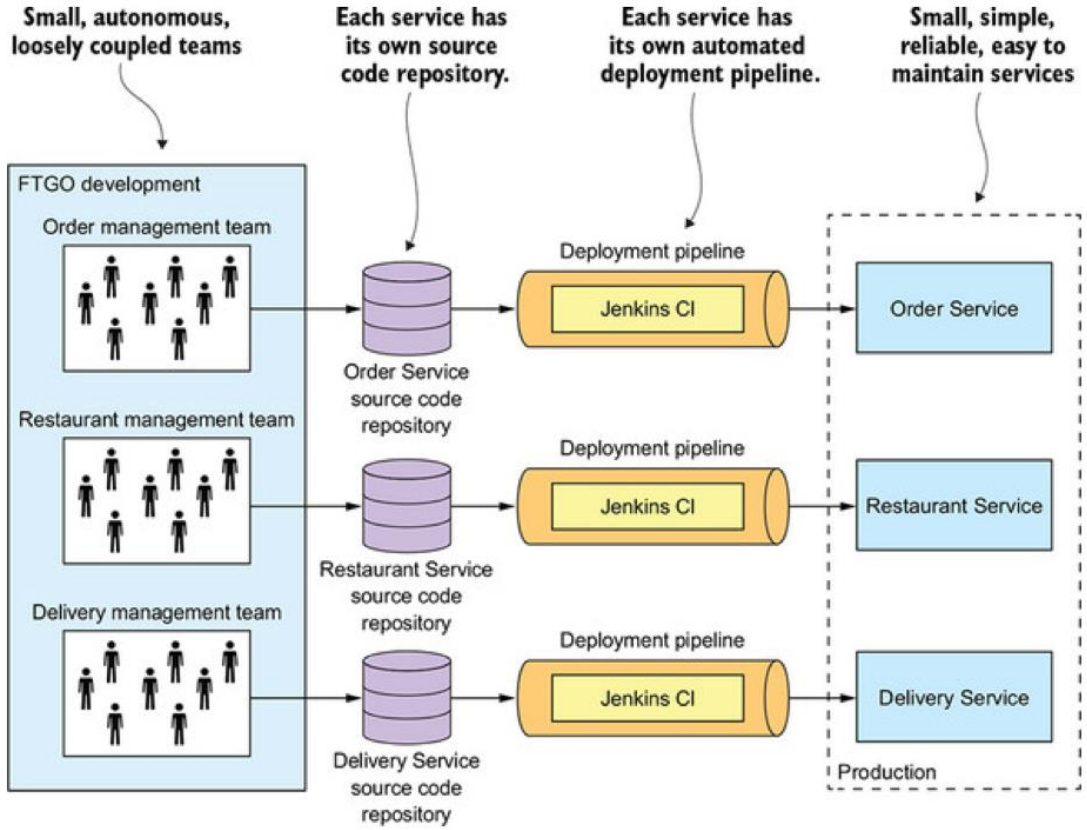
Architecture Comparison





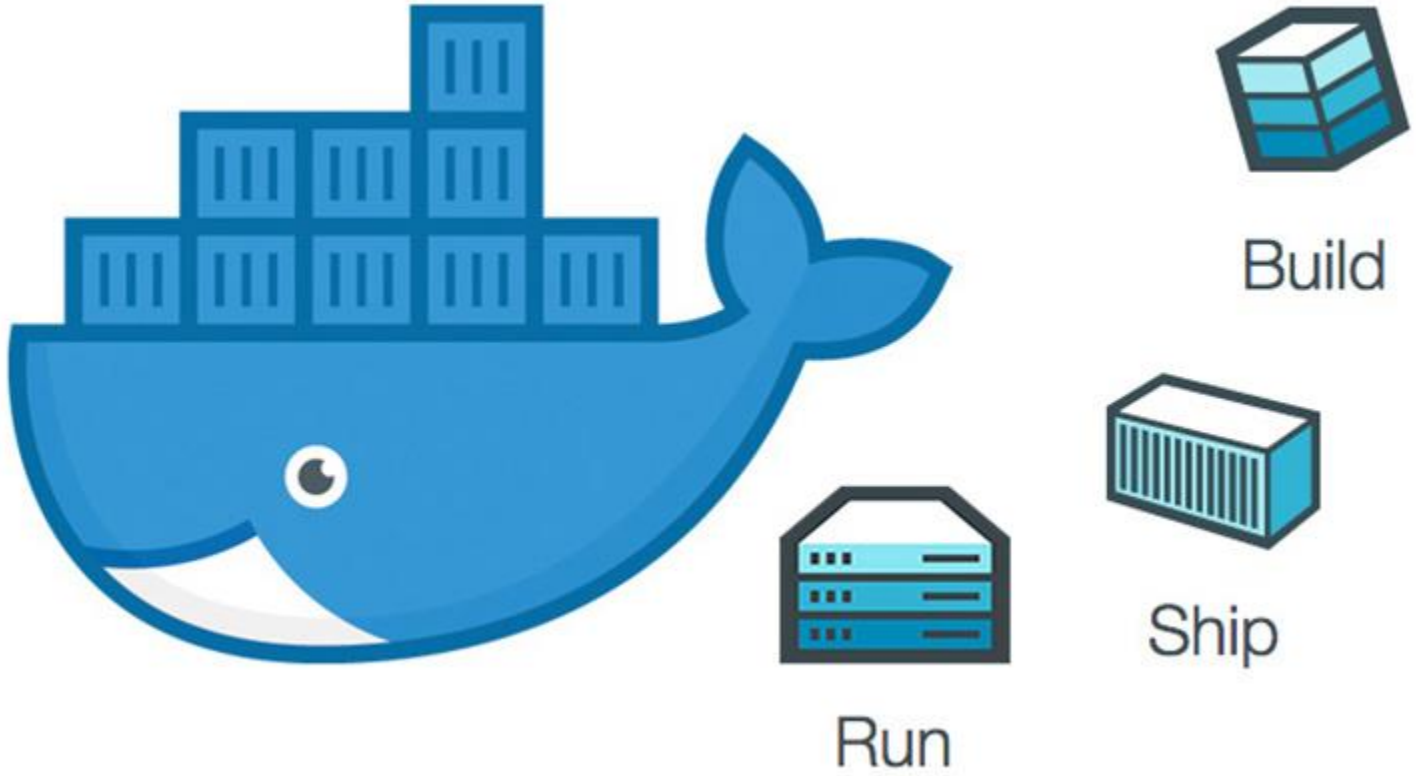
Deployment Comparison





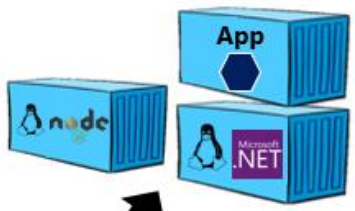
Docker and Container

- Developing, Shipping, and Running applications
- Reduce time to production
- Run anywhere
- Container packages code and dependencies



Basic taxonomy in Docker

A **Registry**
Stores many static images

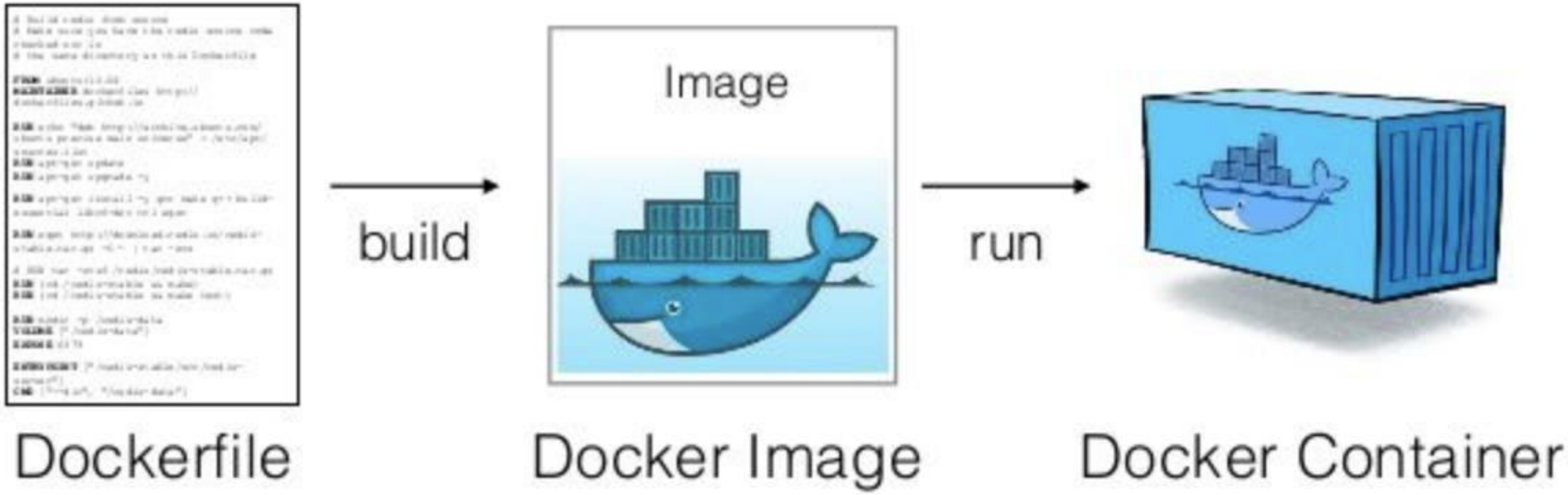


Images
Static, persisted container image

Container
Image-instance running an app process (service/web)

- **On-premises** (‘n’ private organizations)
  - **Hosted Docker Registry**
  - **Docker Trusted Registry on-prem.**
- **Public Cloud** (specific vendors)
  - **Docker Hub Registry**
  - Docker Trusted Registry on-cloud
  - **Azure Container Registry**
  - AWS Container Registry
  - Google Container Registry
  - Quay Registry
  - Other Cloud

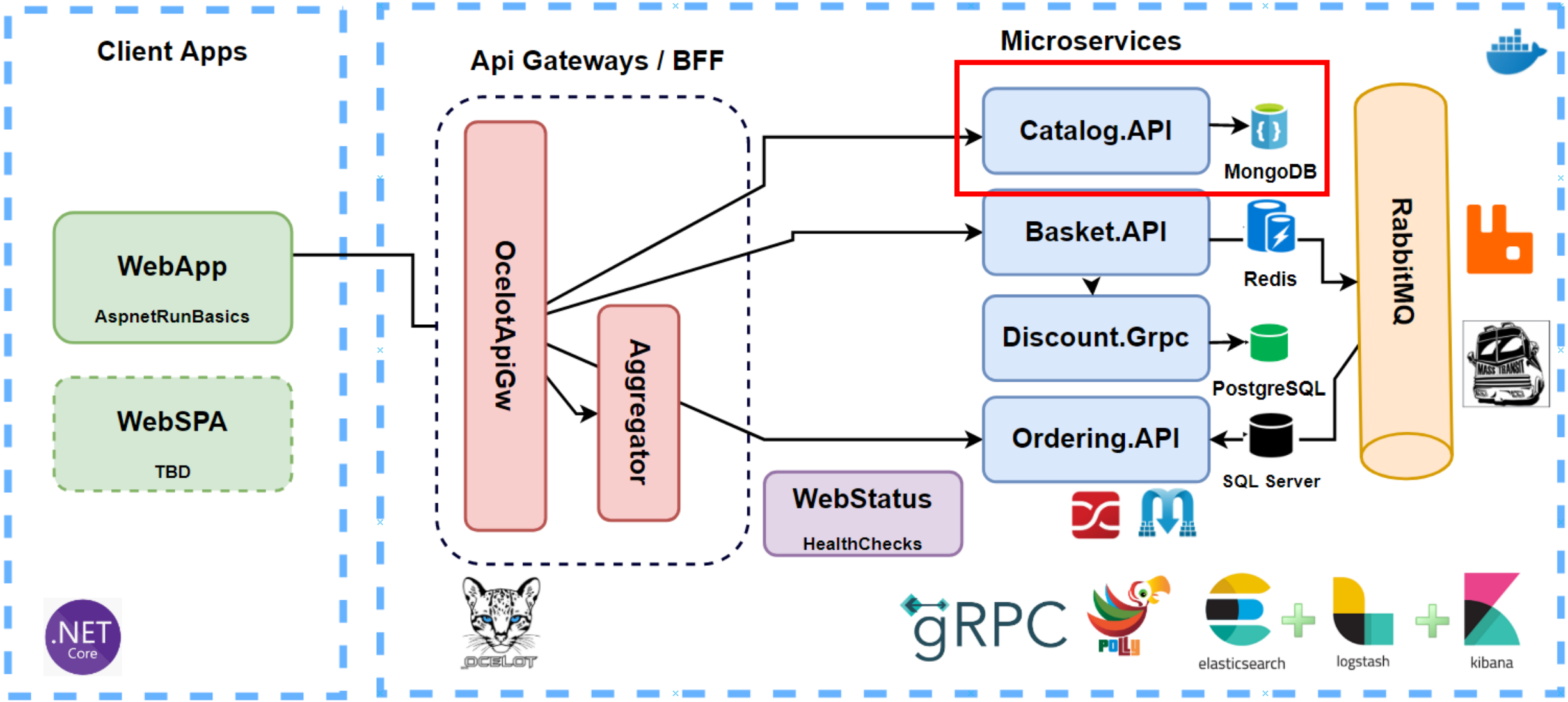
Docker Application Containerization



Section 2
Developing Your First Microservice

Catalog.API with MongoDb

Big Picture


Client Apps
WebApp
AspnetRunBasics
WebSPA
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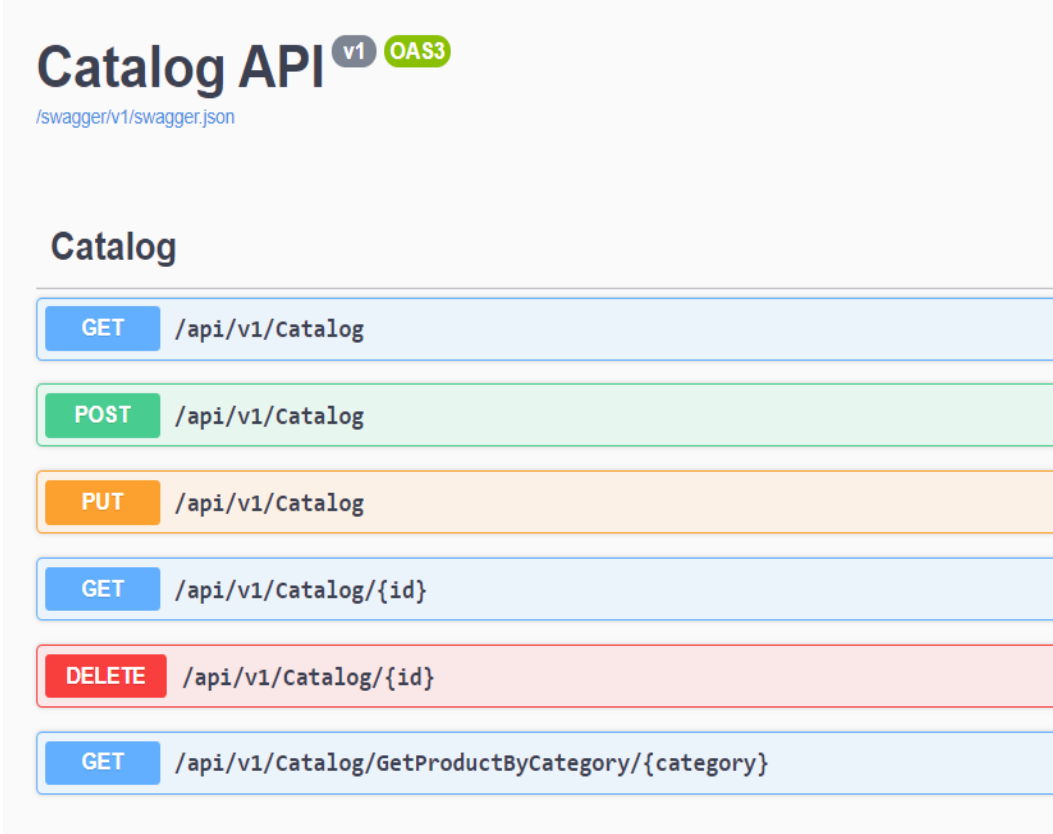
Api Gateways / BFF
OcelotApiGw
Aggregator
WebStatus
HealthChecks
Microservices
Catalog.API
MongoDB
Basket.API
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

MongoDb in Catalog Microservices

- Open-source NoSQL Database
- Cassandra, BigTable, Dynamo
- Json format and in collections as documents
- Document Database

Catalog API Microservices

- ASP.NET Core Web API application
- REST API principles, CRUD operations
- MongoDB database connection and containerization
- Repository Pattern Implementation
- Containerize Catalog Microservices with MongoDB using Docker Compose

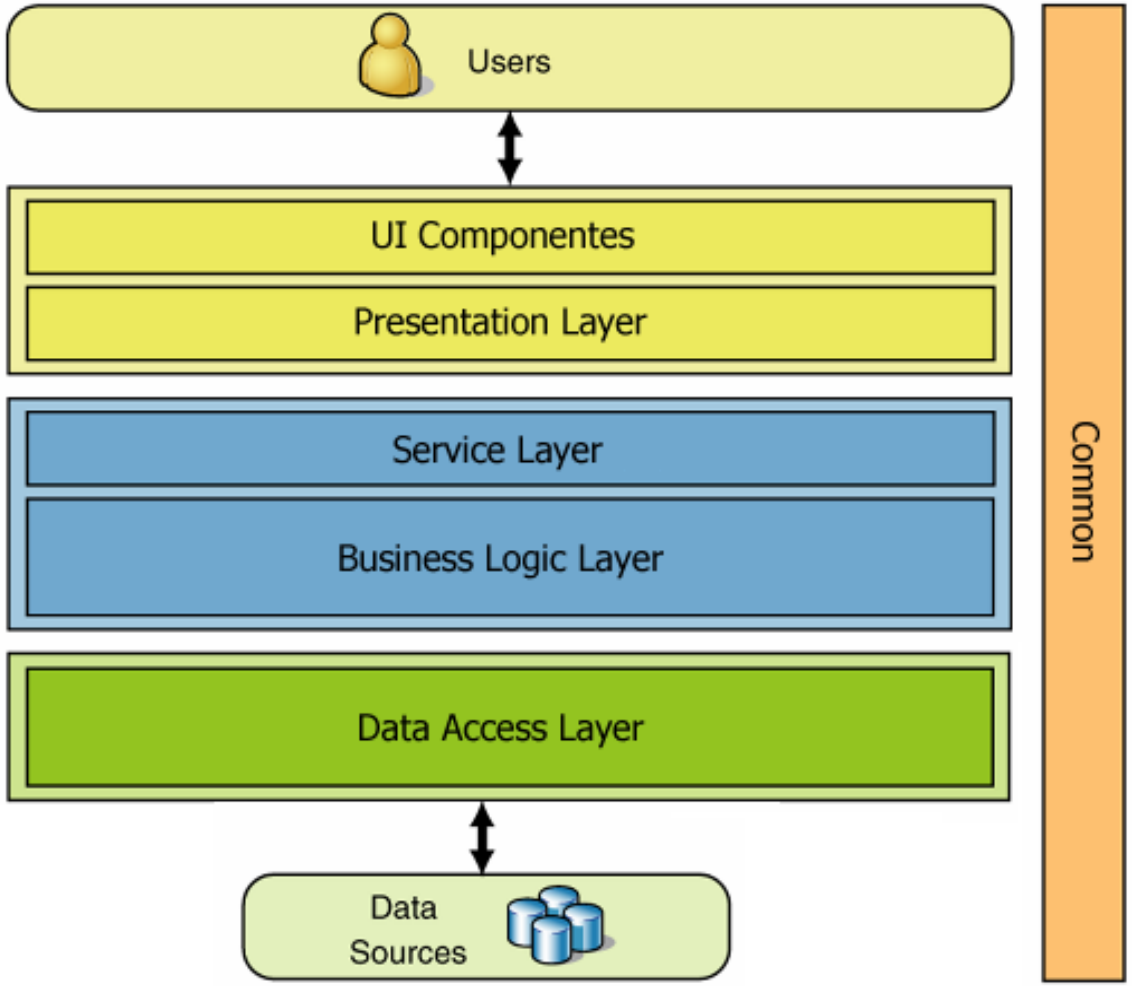


Catalog REST Apis

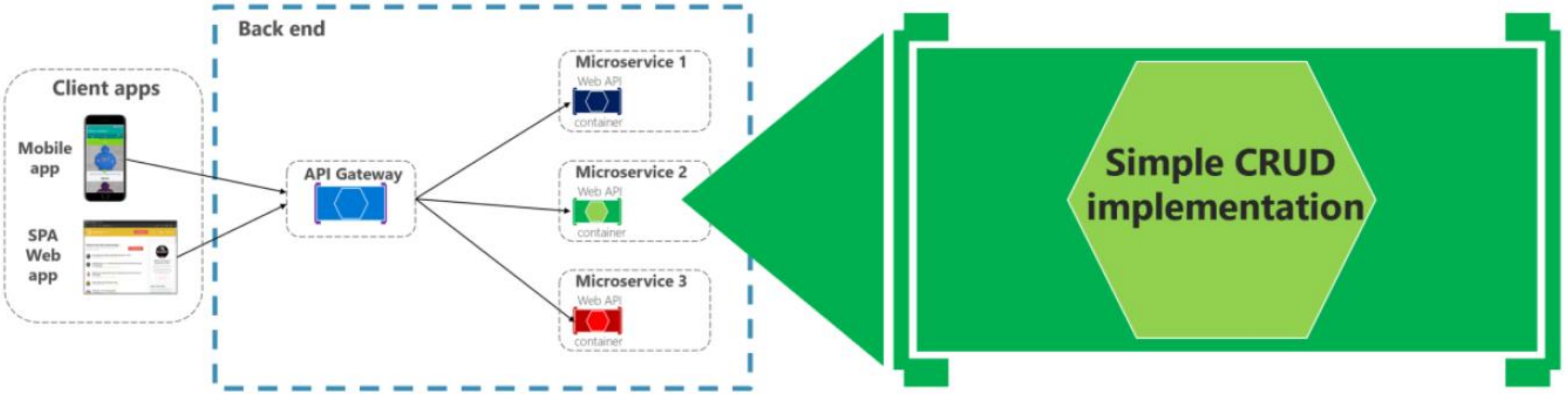
Method	Request URI	Use Case
GET	api/v1/Catalog	Listing Products and Categories
GET	api/v1/Catalog/{id}	Get Product with product Id
GET	api/v1/Catalog/ GetProductByCategory /{category}	Get Products with category
POST	api/v1/Catalog	Create new Product
PUT	api/v1/Catalog	Update Product
DELETE	api/v1/Catalog/{id}	Delete Product

Catalog Layered Archictecture

- Data Access Layer
- Business Logic Layer
- Presentation Layer



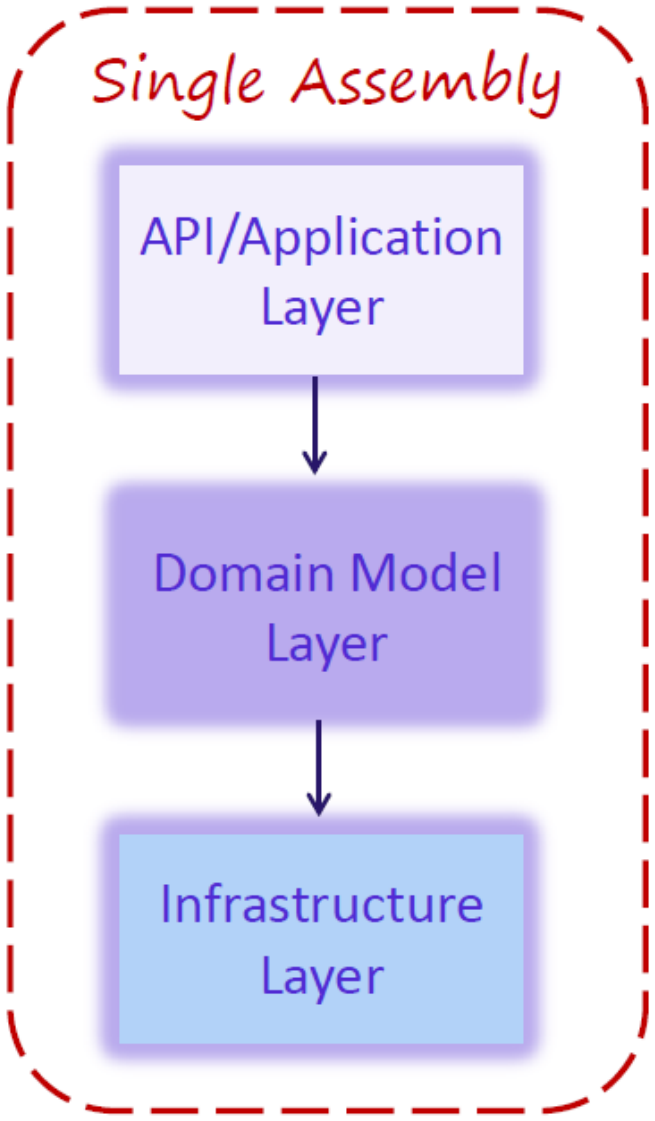
Catalog API – Simple CRUD Microservices



- External microservice patterns
- API Gateway
- Resilient communication
- Pub/Sub and event driven

Internal design patterns per microservice

Simple Data-Driven, CRUD Microservice

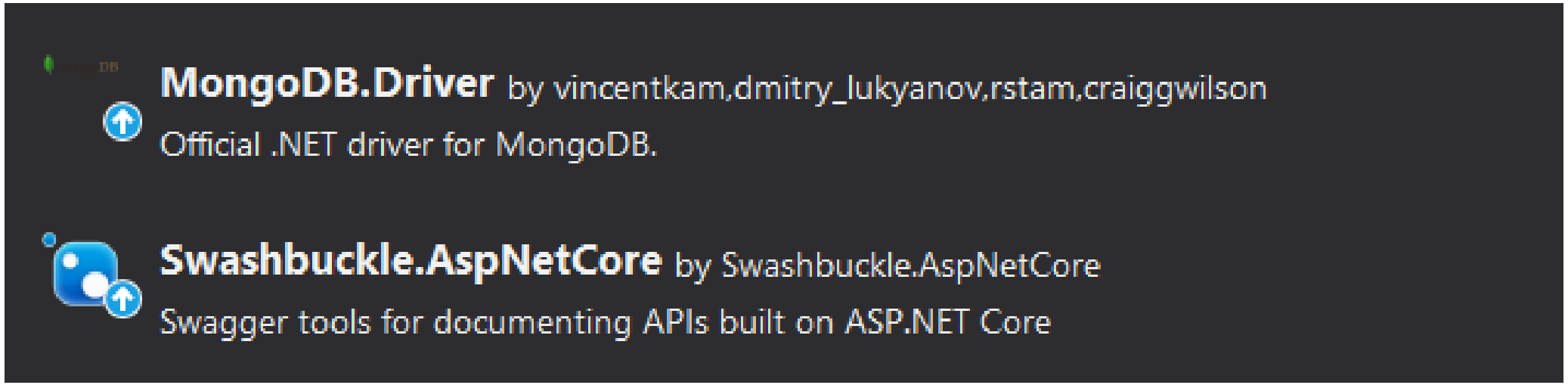


API/Application Layer: Entry point into service. Exposes endpoints and enforces validation. No business logic.

Domain Layer: Heart of the software. Contains business rules and logic. Business operations are implemented here.

Infrastructure Layer: Provides infrastructure plumbing. Primary responsibility is persistence of business state.

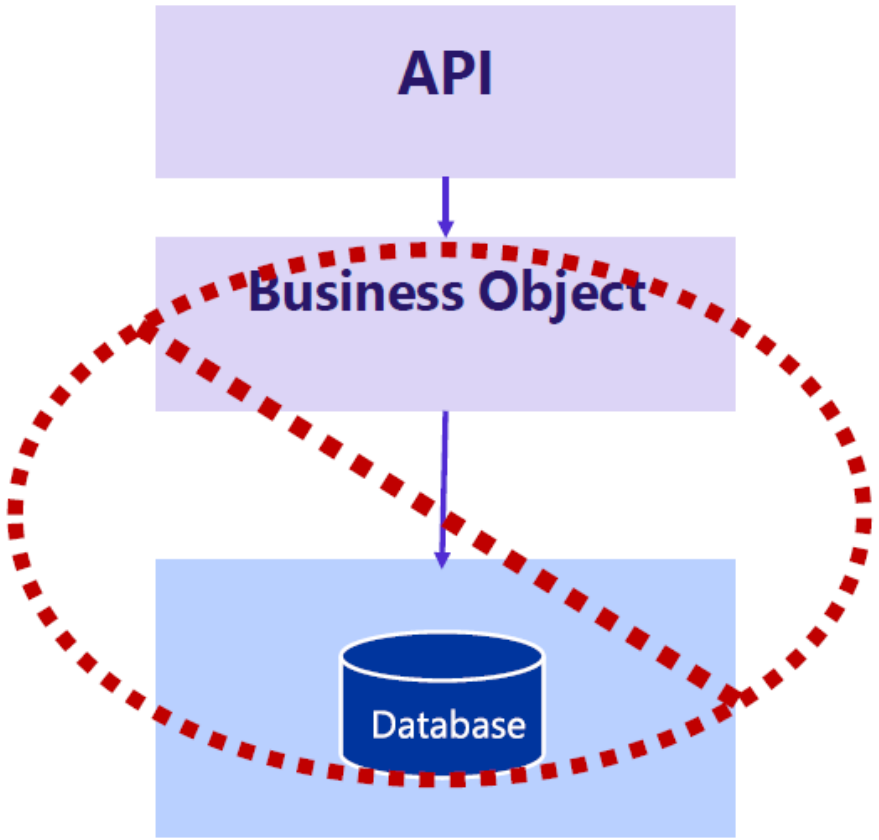
Catalog Microservice Nuget Packages



Repository Pattern

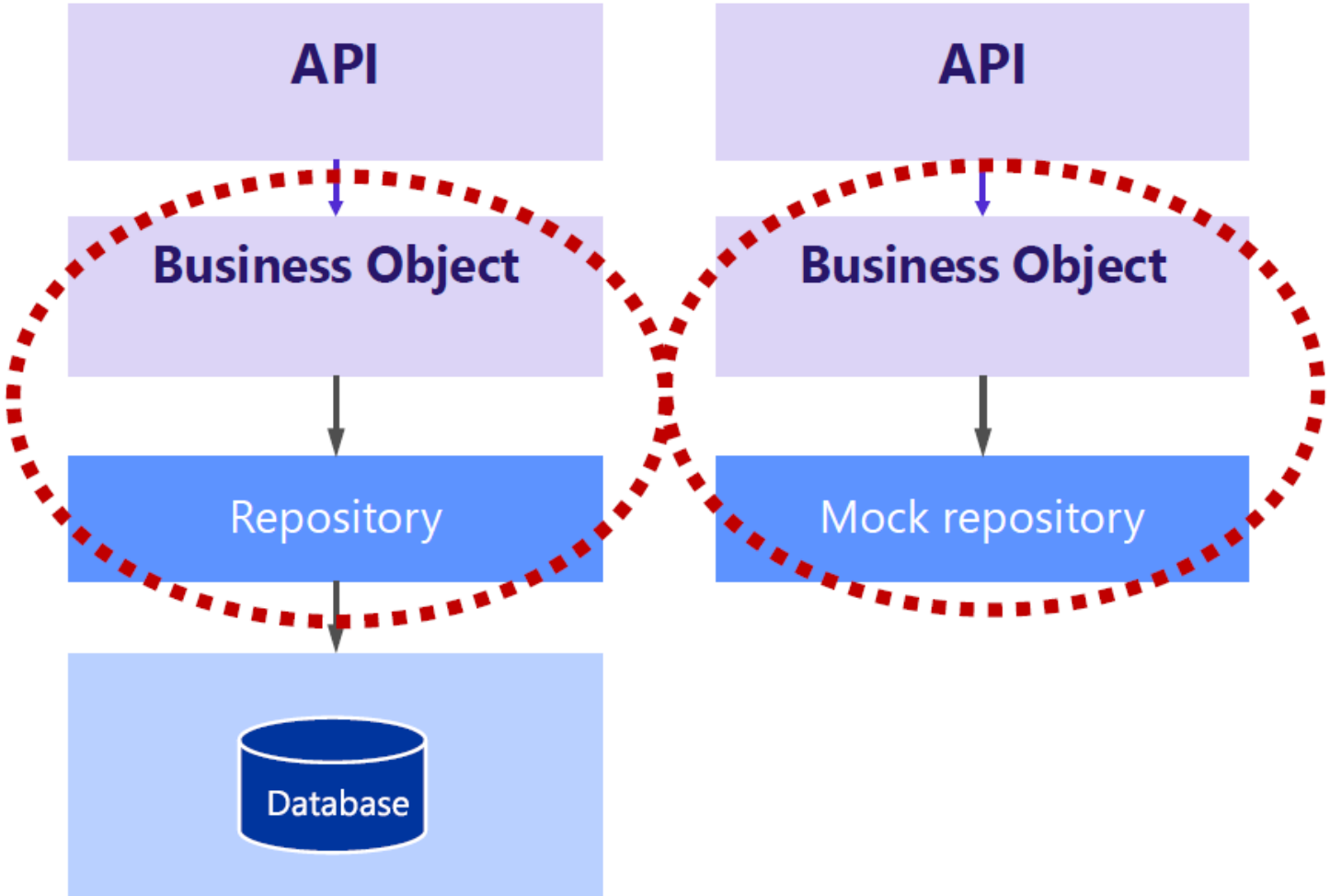
Without Repository

Direct access to database from controller/business layer



With Repository

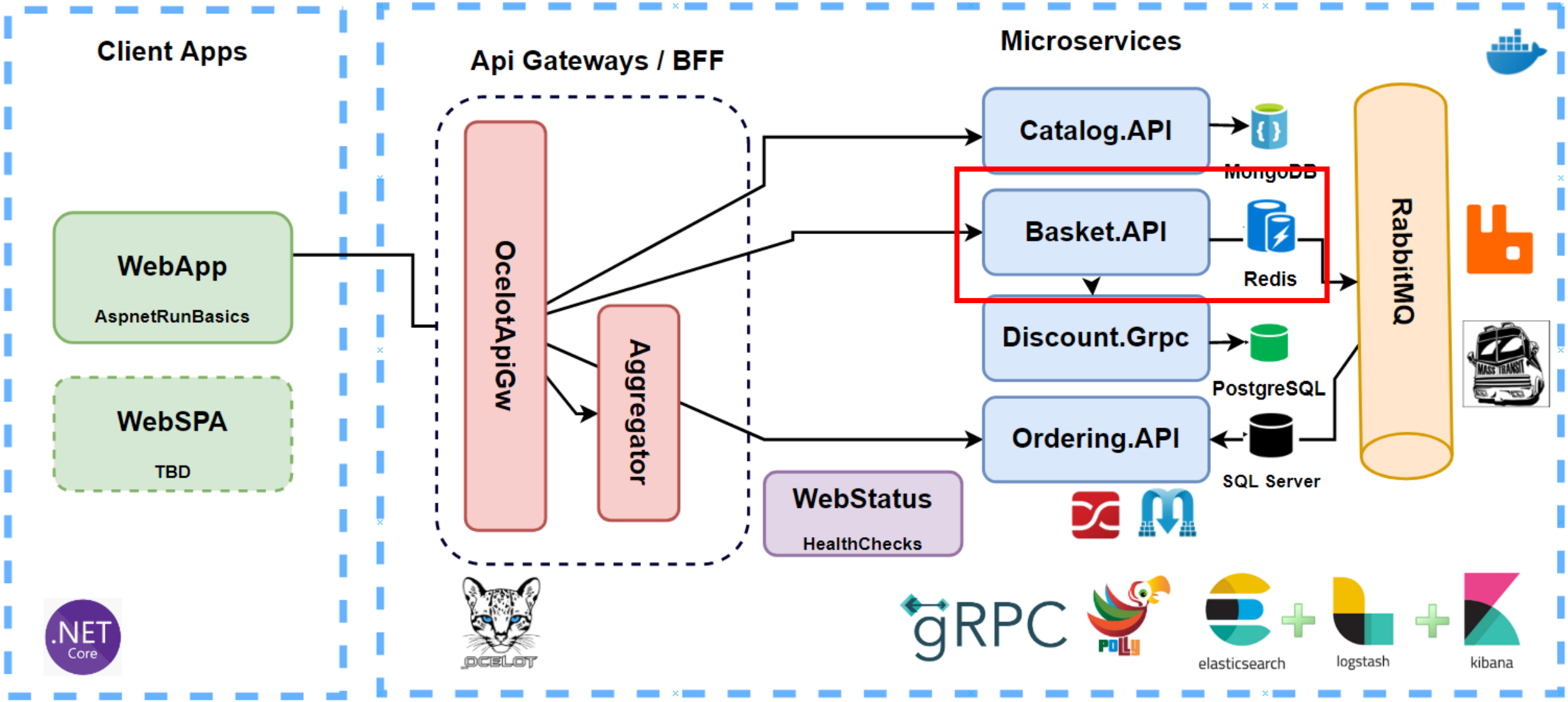
Abstraction layer between business layer and database context.
Unit tests can mock data to facilitate testing.



Section 3
Developing Basket.API Microservices with Redis

Basket.API with Redis

Big Picture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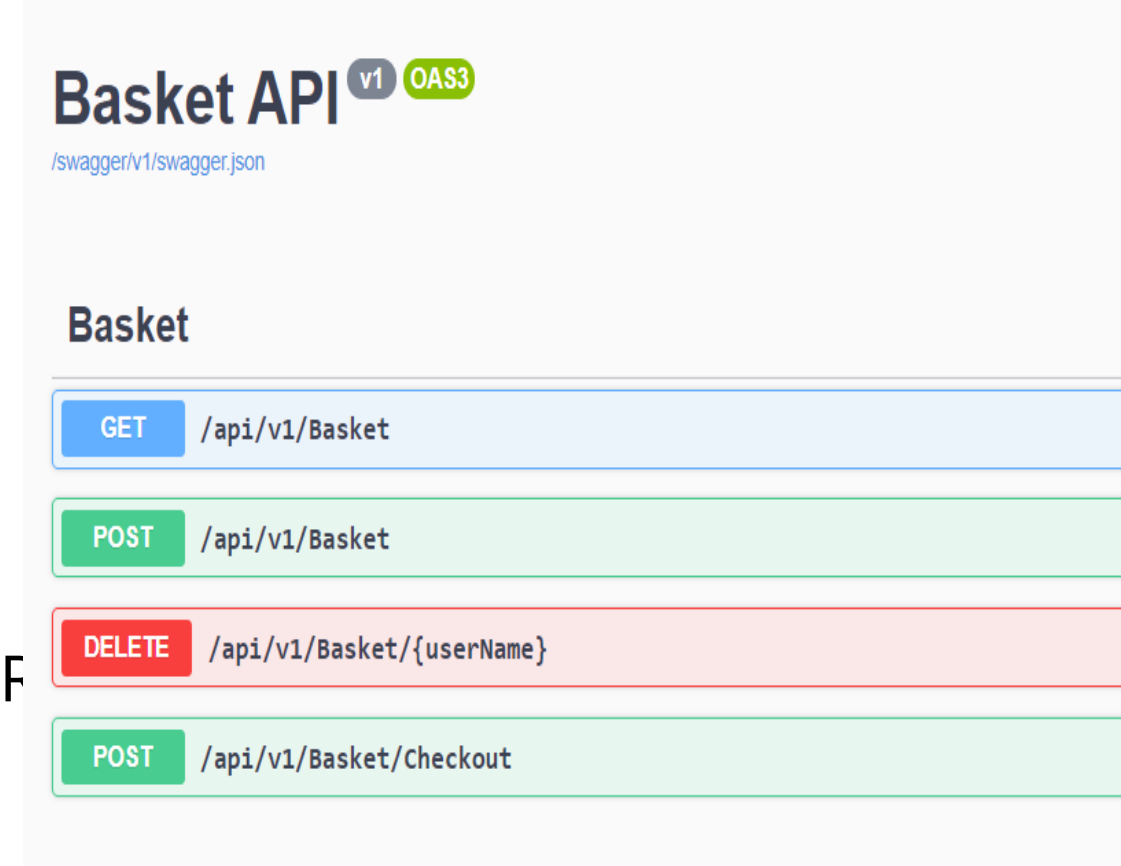
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

Redis in Basket Microservices

- Open-source NoSQL Database
- Remote Dictionary Server
- Key-value pairs
- Data Structure Server
- Extremely fast
- Save data both on RAM and on disk

Basket API Microservices

- ASP.NET Core Web API application
- REST API principles, CRUD operations
- Redis database connection and containerization
- Repository Pattern Implementation
- Containerize Basket Microservices with R database using Docker Compose

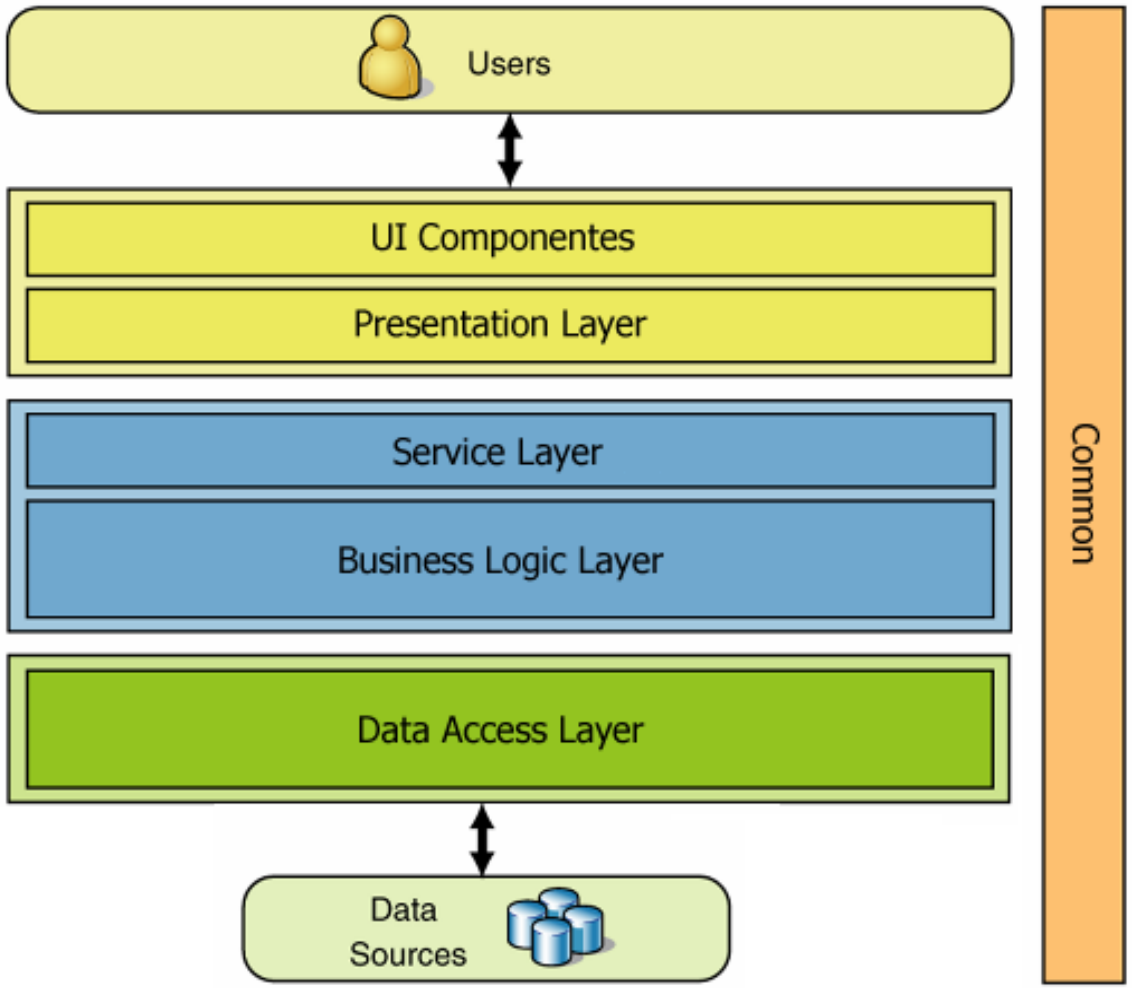


Basket REST Apis

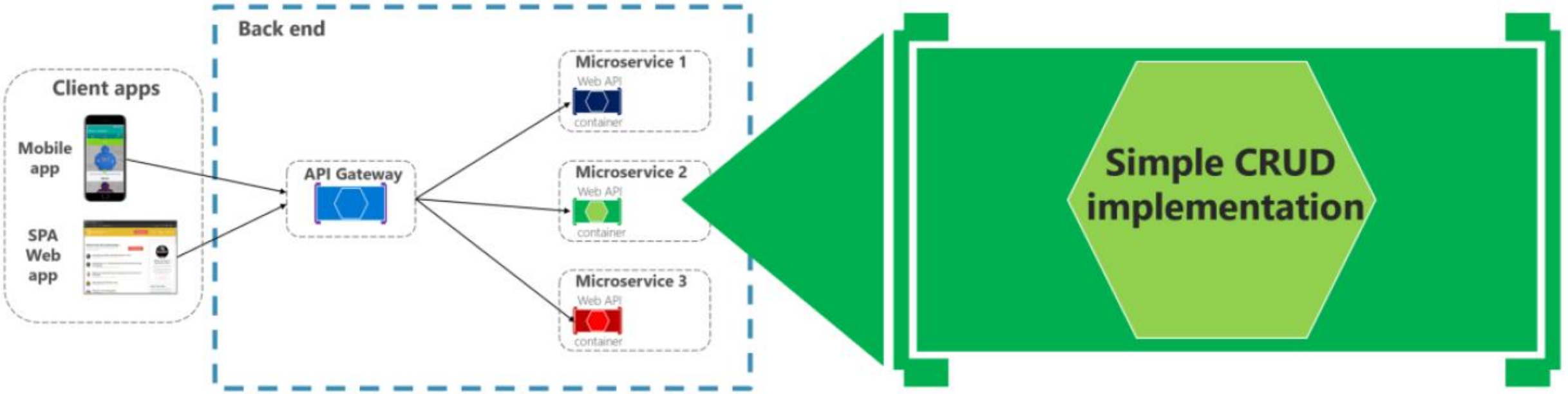
Method	Request URI	Use Case
GET	api/v1/Basket	Get Basket and Items with username
POST	api/v1/Basket	Update Basket and Items (add – remove item on basket)
DELETE	api/v1/Basket/{id}	Delete Basket
POST	api/v1/Basket/Checkout	Checkout Basket

Basket Layered Archictecture

- Data Access Layer
- Business Logic Layer
- Presentation Layer



Basket API – Simple CRUD Microservices



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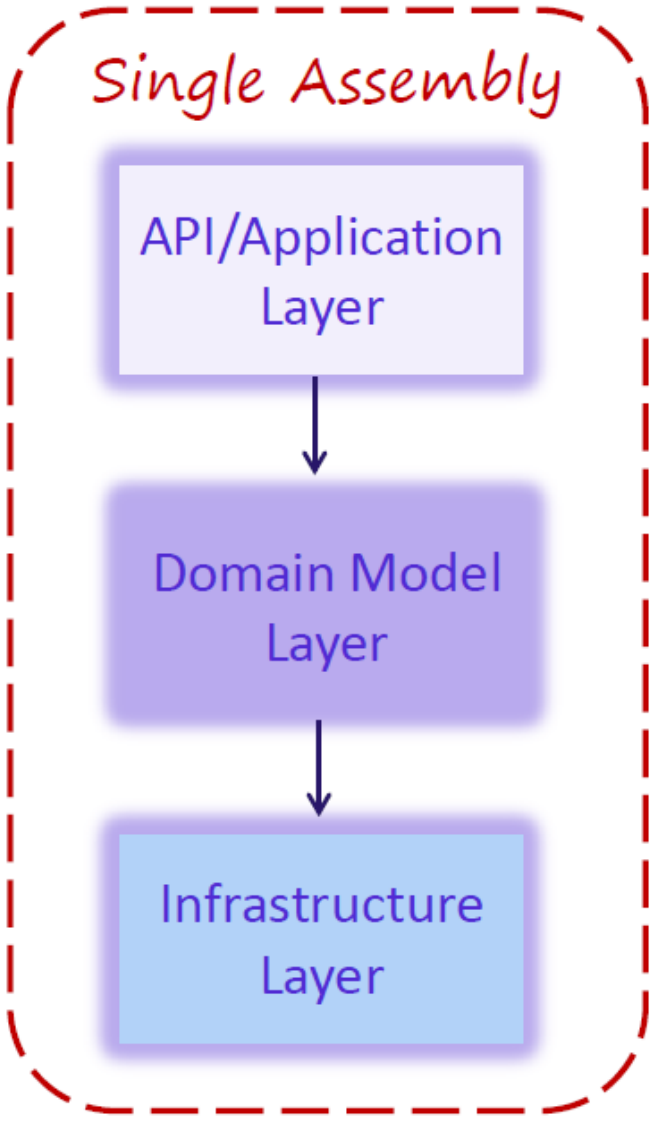
- API Gateway
- Resilient communication
- Pub/Sub and event driven

Internal design patterns per microservice

Simple Data-Driven, CRUD Microservice



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Domain Layer: Heart of the software. Contains business rules and logic. Business operations are implemented here.

Infrastructure Layer: Provides infrastructure plumbing. Primary responsibility is persistence of business state.

Basket Microservice Nuget Packages

- Microsoft.Extensions.Caching.StackExchangeRedis
- Newtonsoft.Json
- Swashbuckle.AspNetCore

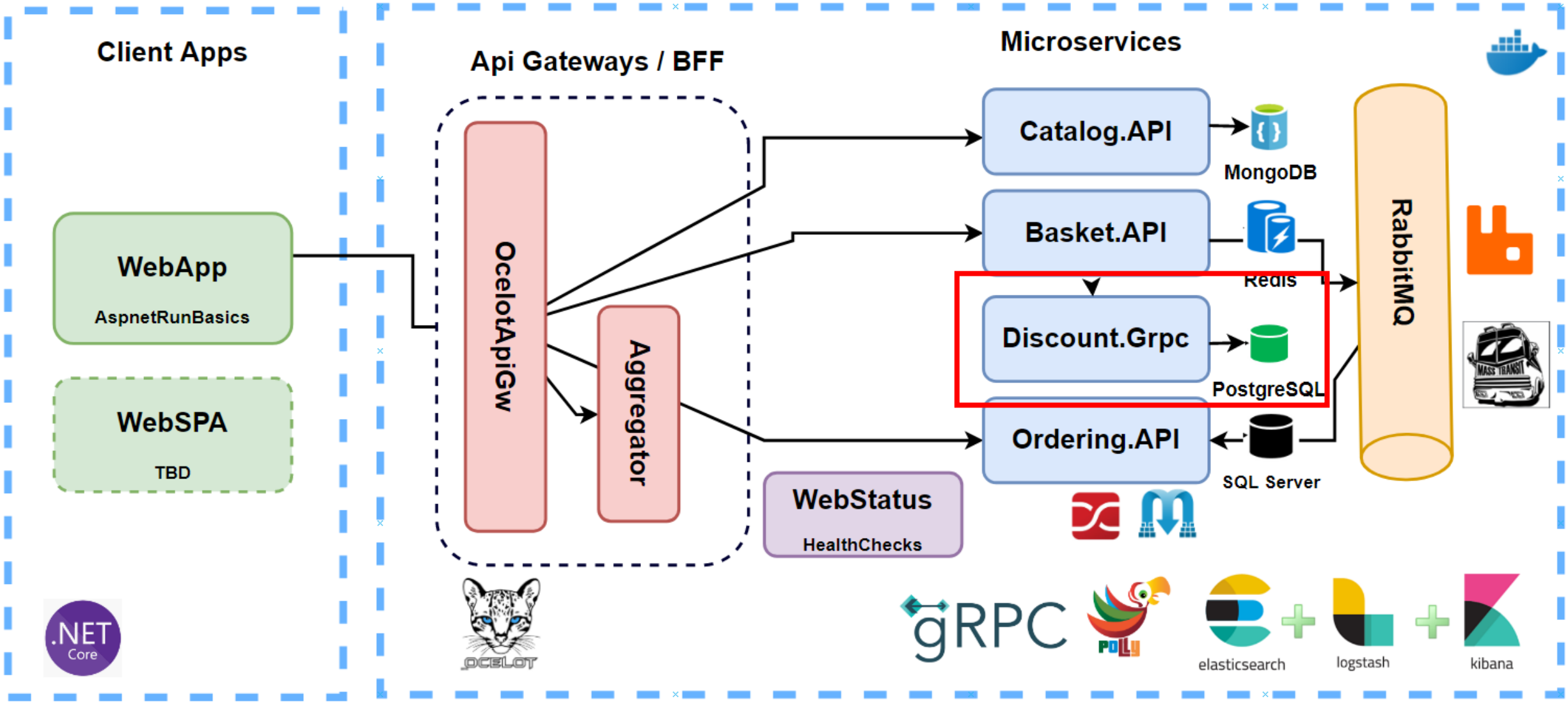
Container management with Portainer

- Open-source
- Managing container-based software application
- Kubernetes, Docker, Docker Swarm, Azure ACI and edge environments
- Manage environments, deploy applications, monitor app performance and triage problems

Section 4
Developing Discount.API Microservices with PostgreSQL

Discount.API with PostgreSQL

Big Picture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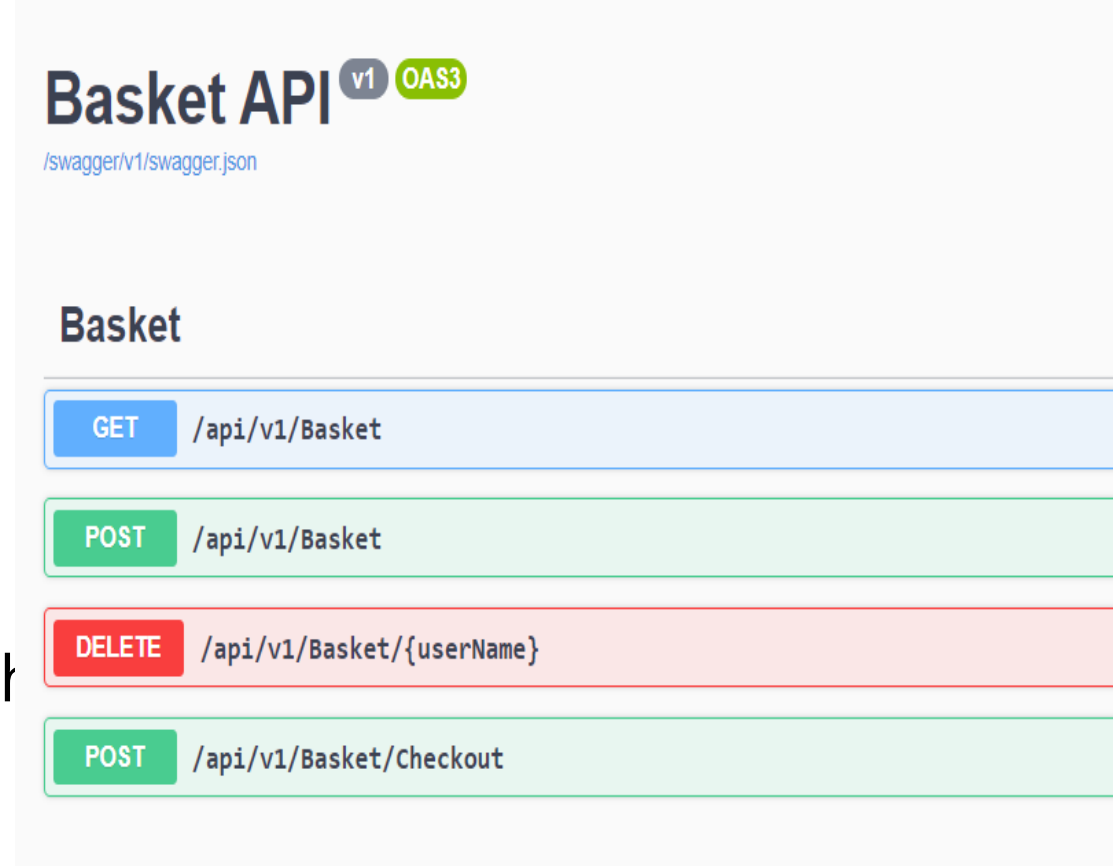
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

PostgreSQL in Discount Microservices

- Open-source Relational Database
- Security, storability and scalability
- Reliability and flexibility
- Successful Performance

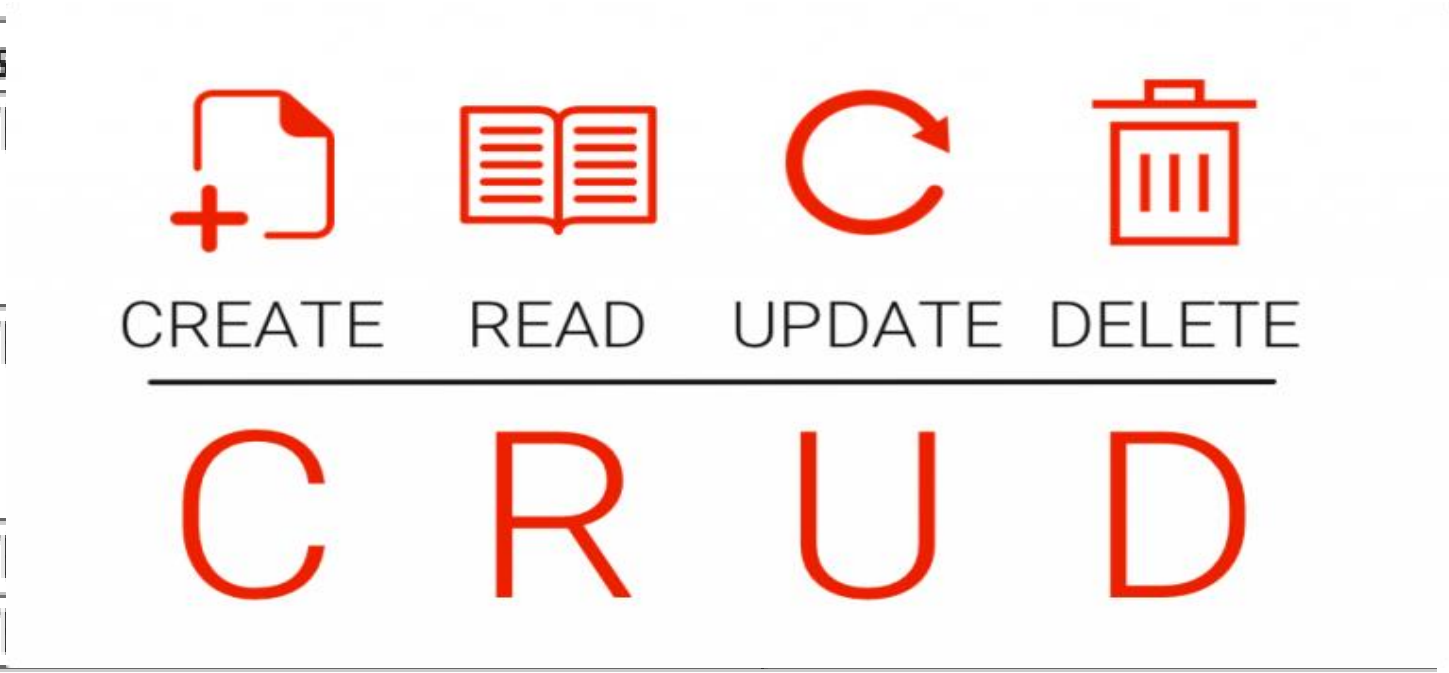
Discount API Microservices

- ASP.NET Core Web API application
- REST API principles, CRUD operations
- PostgreSQL database connection and containerization
- Repository Pattern Implementation
- Containerize Discount Microservices with PostgreSQL database using Docker Compose



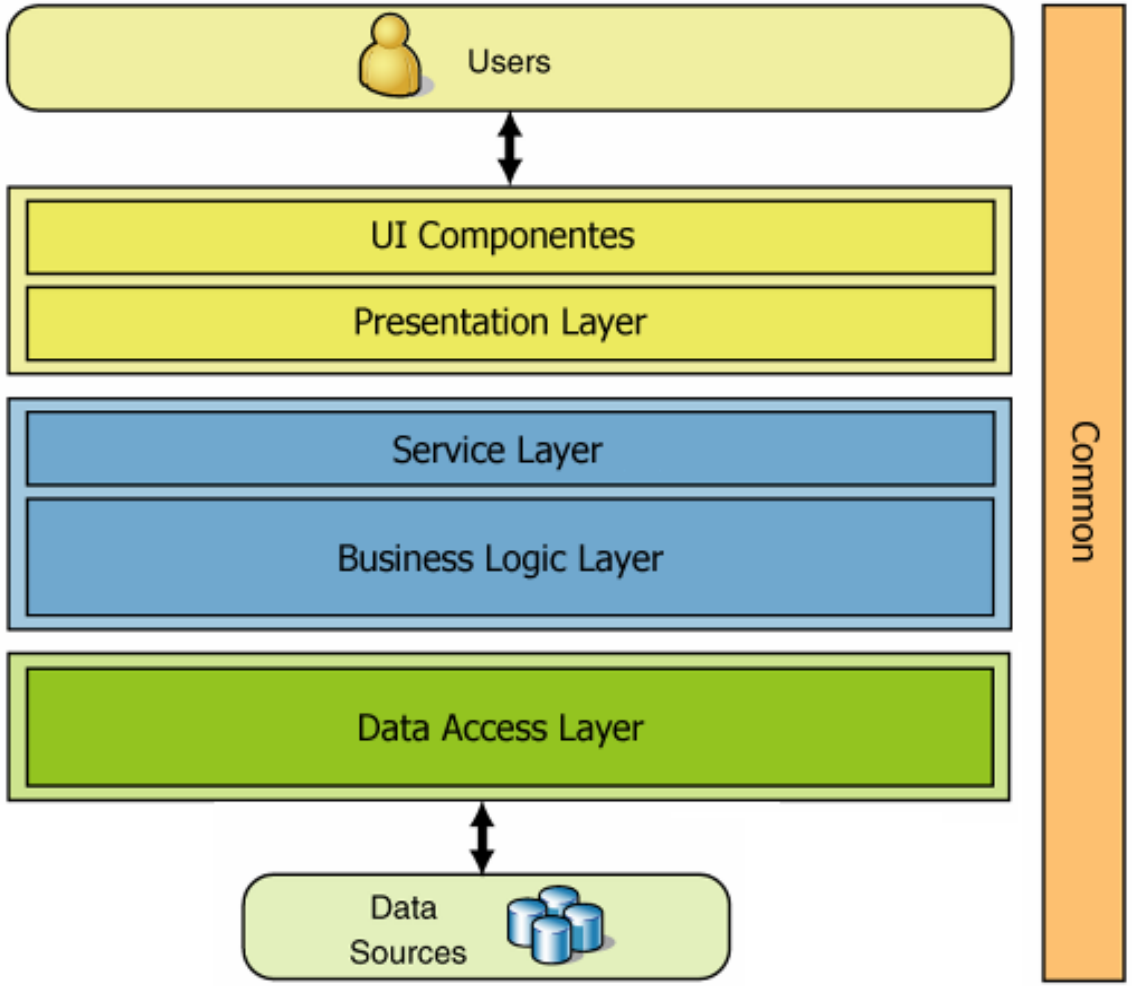
Discount REST Apis

Method	Reques
GET	api/v1/
POST	api/v1/
DELETE	api/v1/
POST	api/v1/

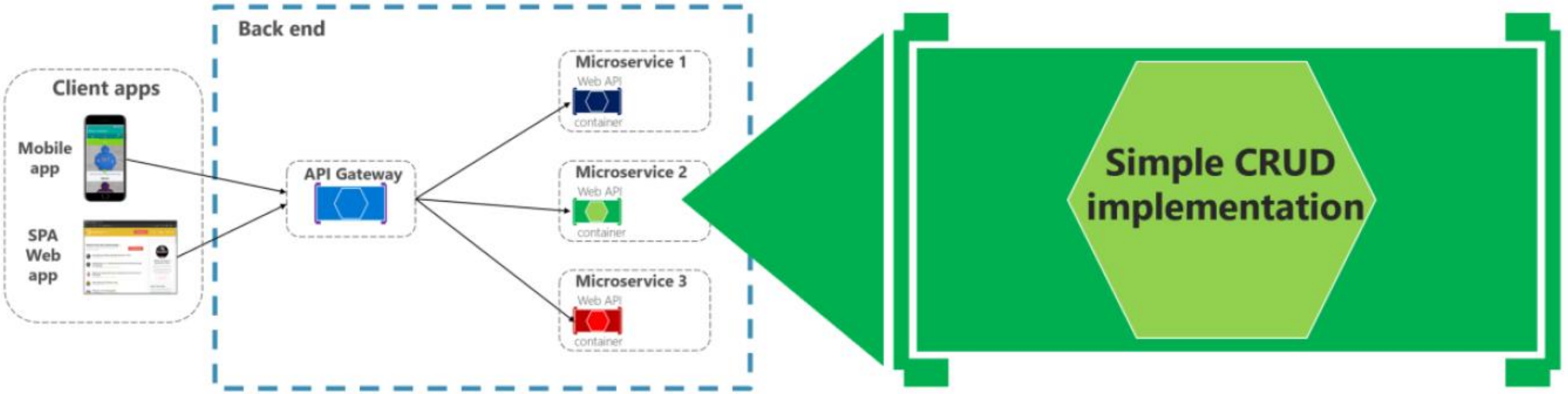


Discount Layered Archictecture

- Data Access Layer
- Business Logic Layer
- Presentation Layer



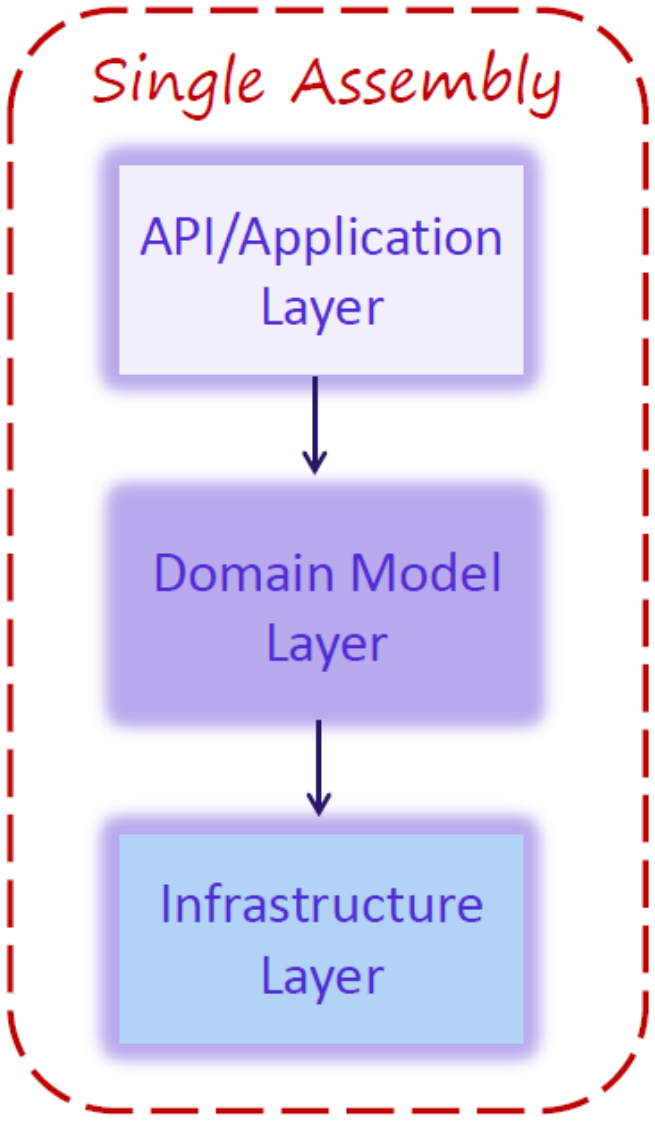
Discount API – Simple CRUD Microservices



- External microservice patterns
- API Gateway
- Resilient communication
- Pub/Sub and event driven

Internal design patterns per microservice

Simple Data-Driven, CRUD Microservice



API/Application Layer: Entry point into service. Exposes endpoints and enforces validation. No business logic.

Domain Layer: Heart of the software. Contains business rules and logic. Business operations are implemented here.

Infrastructure Layer: Provides infrastructure plumbing. Primary responsibility is persistence of business state.

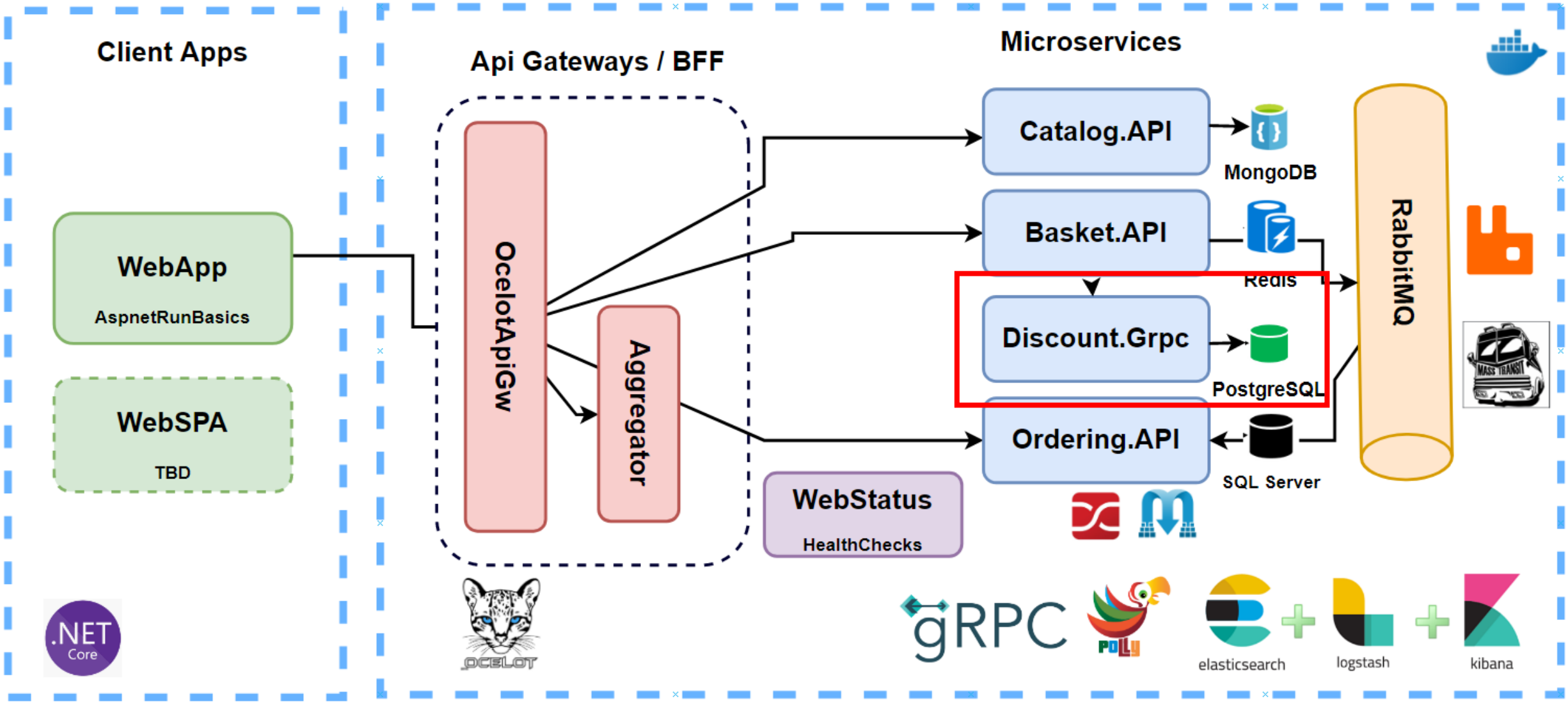
Discount Microservice Nuget Packages

- Npgsql
- Dapper
- Swashbuckle.AspNetCore

Section 5
Developing Discount.Grpc Microservices for Microservices Grpc Communication

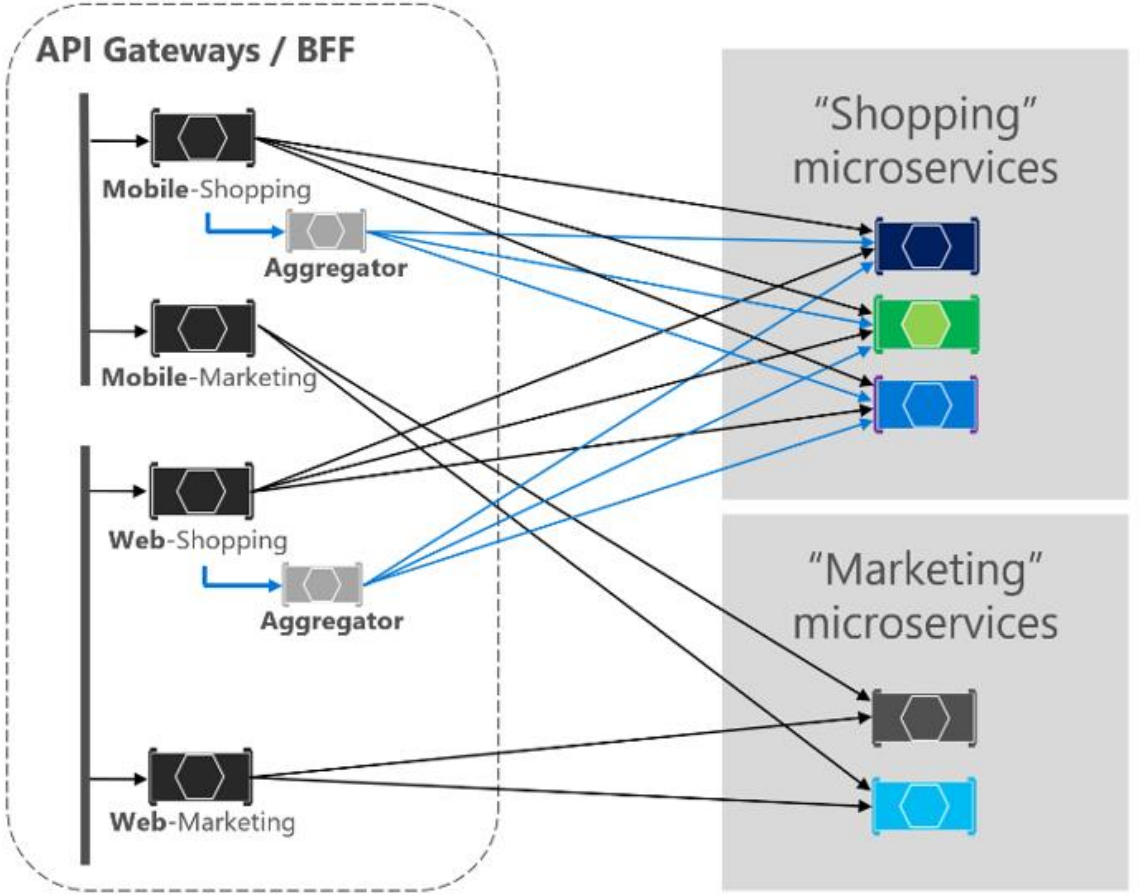
Discount.Grpc with PostgreSQL

Big Picture

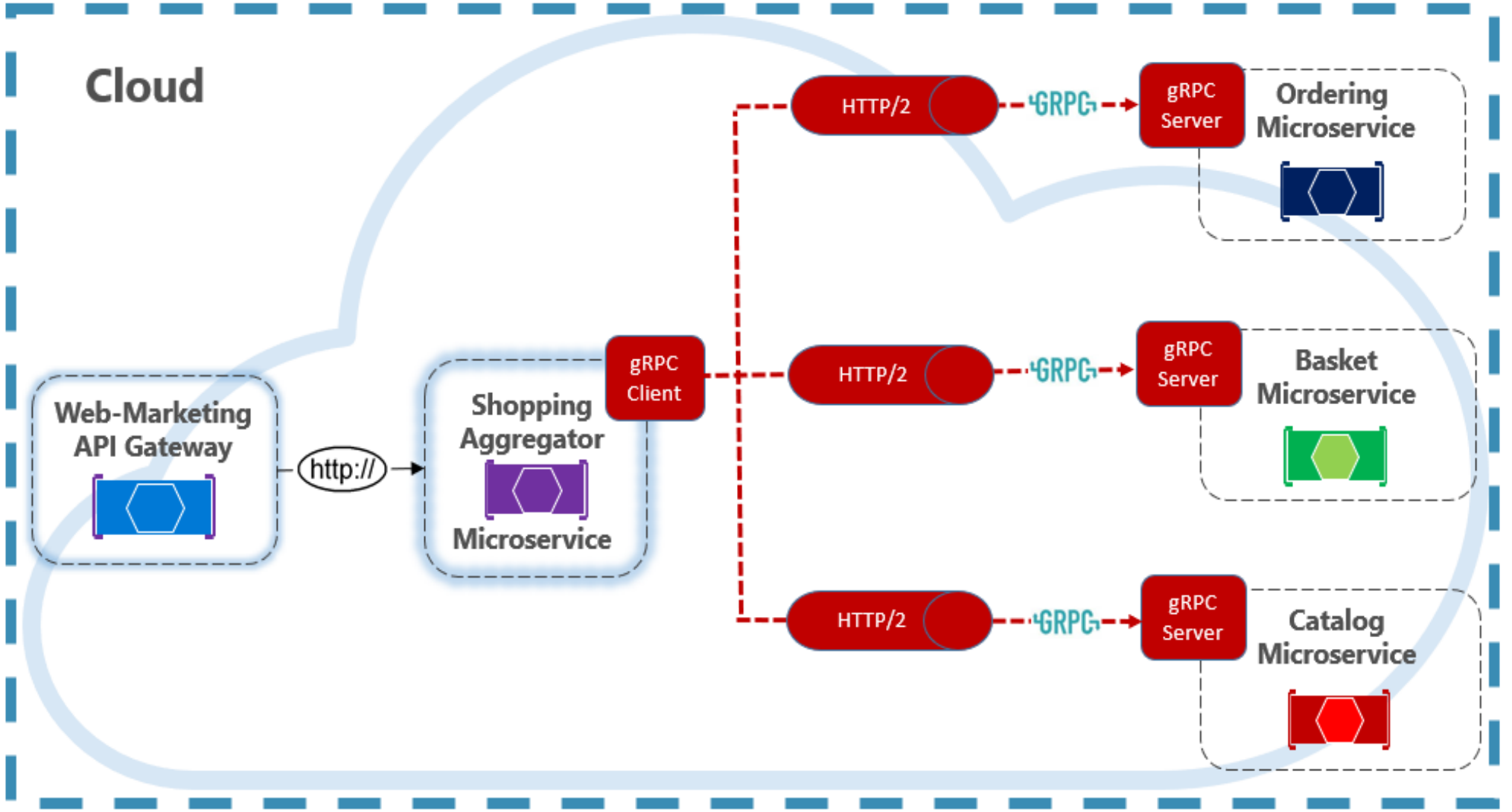

Client Apps
WebApp
AspnetRunBasics
WebSPA
TBD
Api Gateways / BFF
OcelotApiGw
Aggregator
WebStatus
HealthChecks
Microservices
Catalog.API
MongoDB
Basket.API
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

gRPC usage of Microservices Communication

- Synchronous backend microservice-to-microservice communication
- Polyglot environments
- Low latency and high throughput communication
- Point-to-point real-time communication
- Network constrained environments



Example of gRPC in Microservices



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Repositories 12 Packages People 1 Teams Projects 1 Settings

Pinned repositories

Customize pinned repositories

run-aspnetcore

Template

A starter kit for your next ASP.NET Core web application. Boilerplate for ASP.NET Core reference application, demonstrating a layered application architecture with applying Clean Architecture and D...

C# 223 55

run-aspnetcore-microservices

Microservices on .Net platforms which used Asp.Net Web API, Docker, RabbitMQ, MassTransit, Grpc, Ocelot API Gateway, MongoDB, Redis, PostgreSQL, SqlServer, Dapper, Entity Framework Core, CQRS and C...

C# 388 164

run-aspnetcore-realworld

E-Commerce real world example of run-aspnetcore ASP.NET Core web application. Implemented e-commerce domain with clean architecture for ASP.NET Core reference application, demonstrating a layered a...

SCSS 206 75

run-aspnet-identityserver4

Secure microservices with using standalone Identity Server 4 and backing with Ocelot API Gateway. Protect our ASP.NET Web MVC and API applications with using OAuth 2 and OpenID Connect in IdentityS...

C# 35 17

run-aspnet-grpc

Using gRPC in Microservices for Building a high-performance Interservice Communication with .Net 5. See gRPC Microservices and Step by Step Implementation on .NET Course w/ discount->

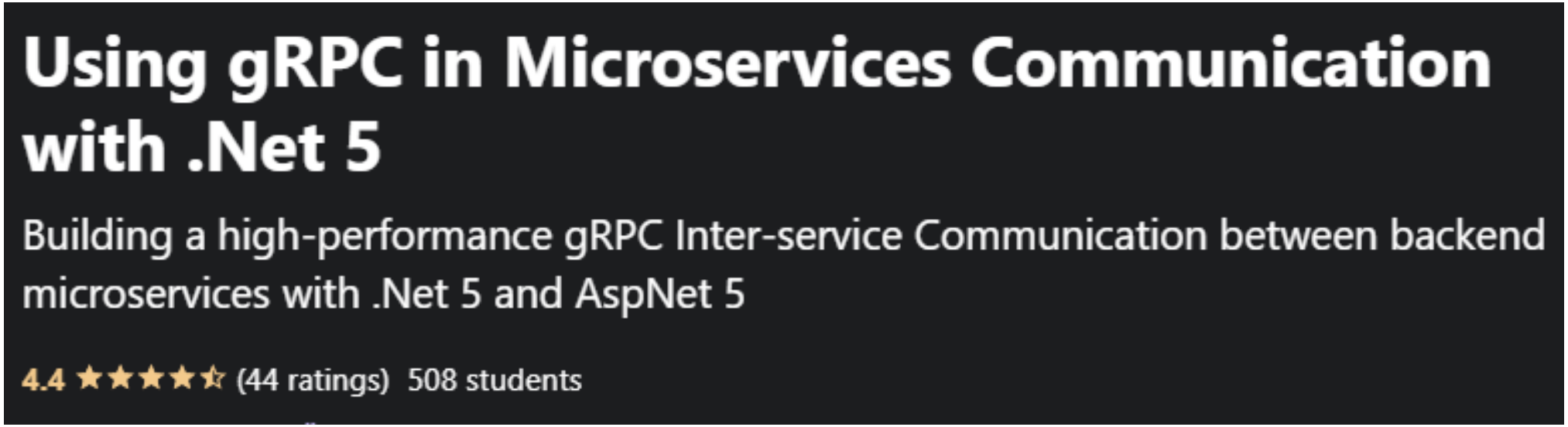
C# 33 10

run-devops

Deploying .Net Microservices into Kubernetes, and moving deployments to the cloud Azure Kubernetes Services (AKS) with using Azure Container Registry (ACR) and how to Automating Deployments with Az...

C# 4 7

Using gRPC in Microservices for Building a high-performance

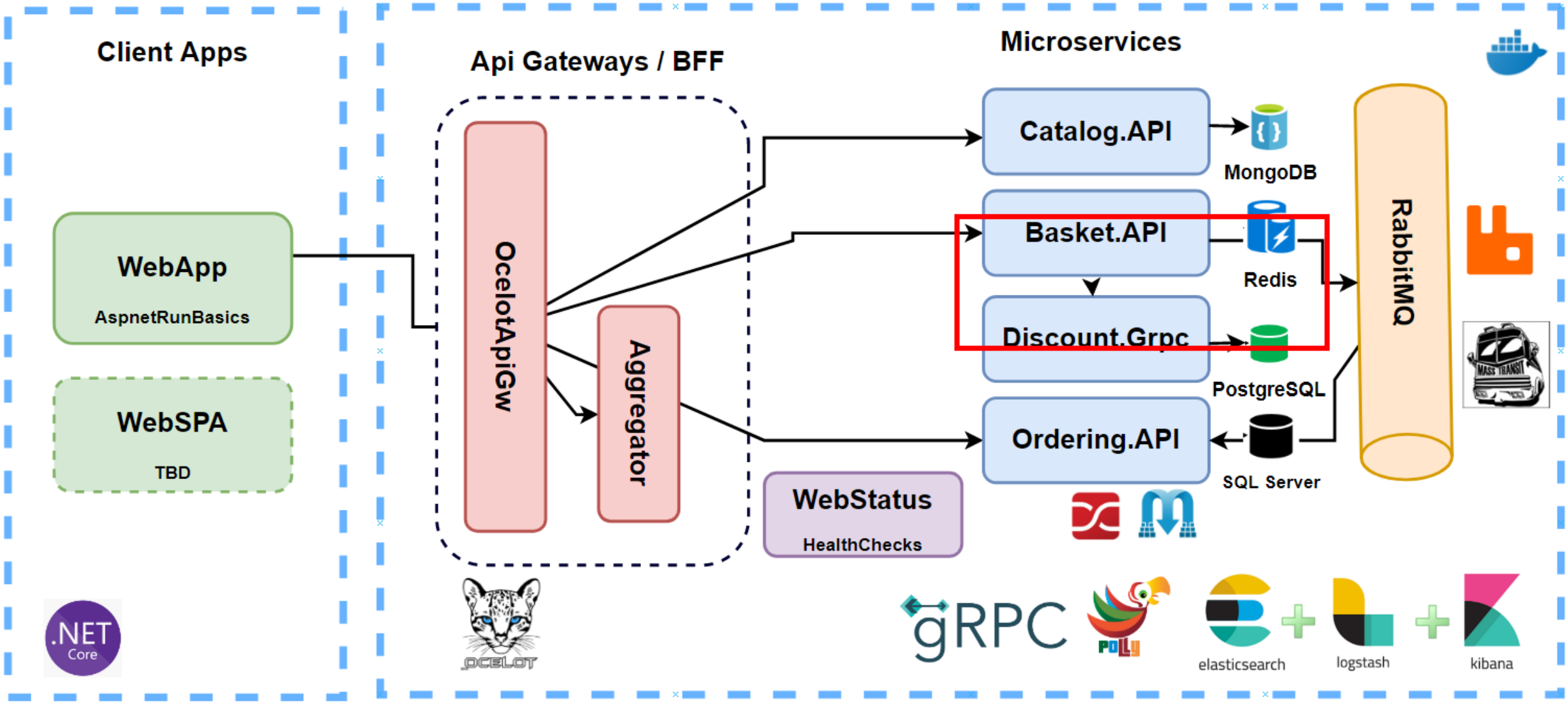


- Github Repository -> https://github.com/aspnetrun/run-aspnet-grpc

Section 6
Consuming Discount Grpc Service From Basket Microservice

When Adding Cart Item into Shopping Cart To Calculate Final Price

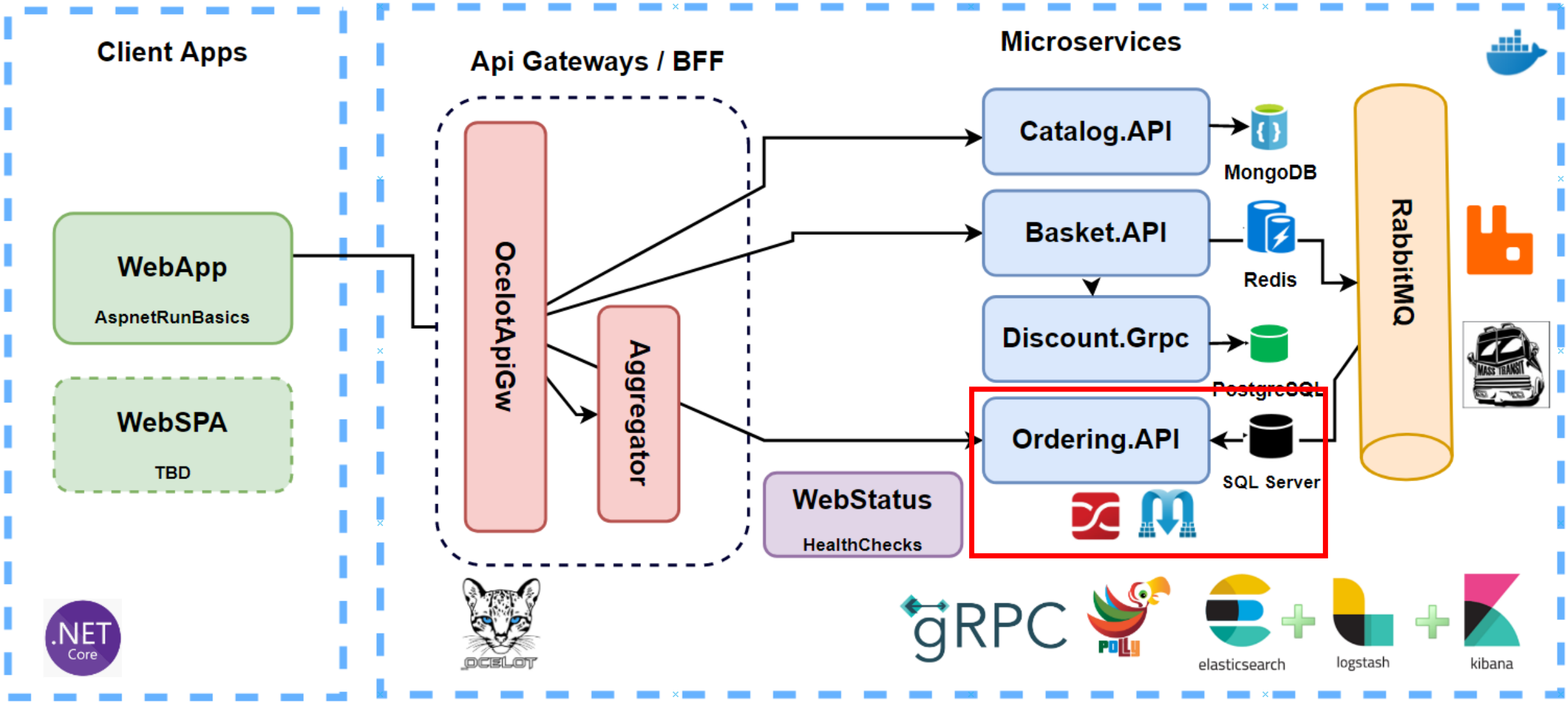
Big Picture


Client Apps
WebApp
AspnetRunBasics
WebSPA
TBD
Api Gateways / BFF
OcelotApiGw
Aggregator
WebStatus
HealthChecks
Microservices
Catalog.API
MongoDB
Basket.API
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

Section 7
Developing Ordering Microservices

with Clean Architecture and CQRS Implementation

Big Picture


Client Apps
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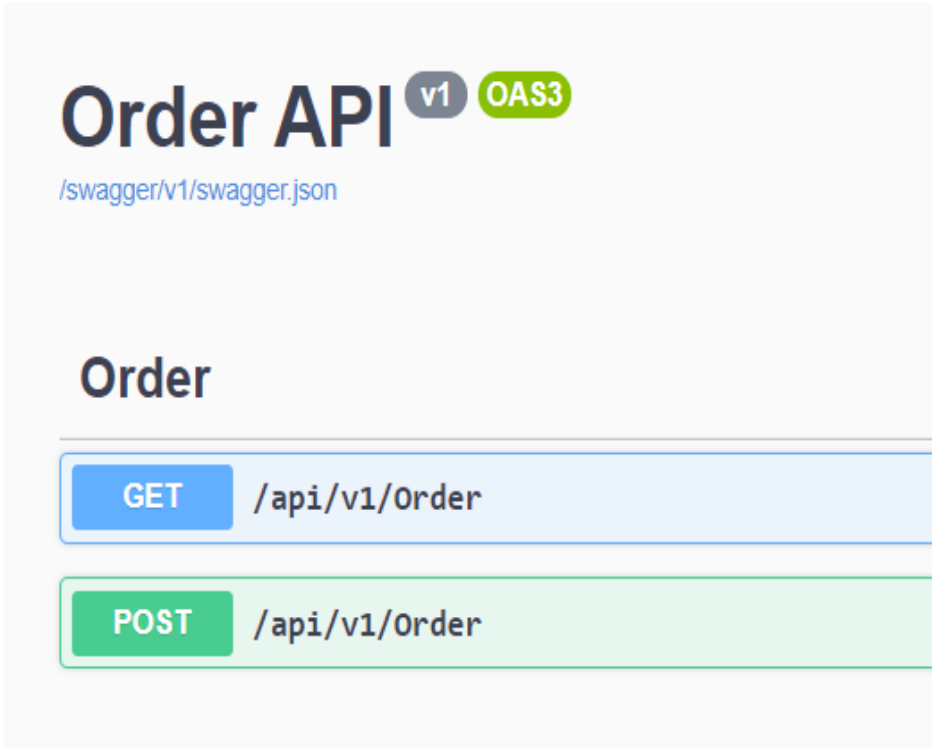
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
OCELOT
gRPC
POLLY
elasticsearch
logstash
kibana

Ordering API Microservices

- ASP.NET Core Web API application
- REST API principles, CRUD operations
- Implementing DDD, CQRS, and Clean Architecture with using Best Practices applying SOLID principles
- Developing CQRS implementation on commands and queries with using MediatR, FluentValidation and AutoMapper packages
- Entity Framework Core Code-First Approach

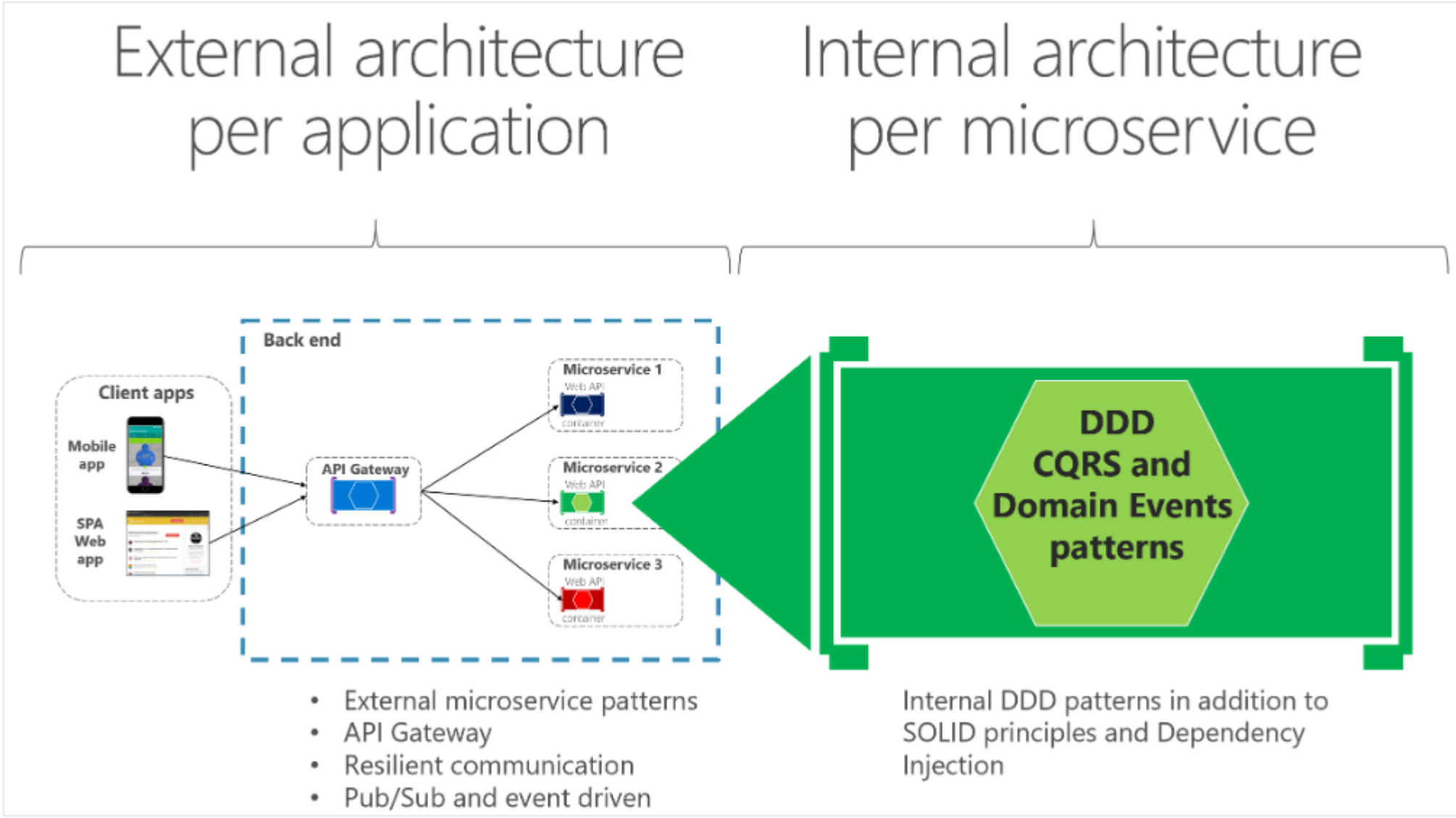


Ordering REST Apis

Method	Request URI	Use Case
GET	api/v1/Order	Get Orders with username

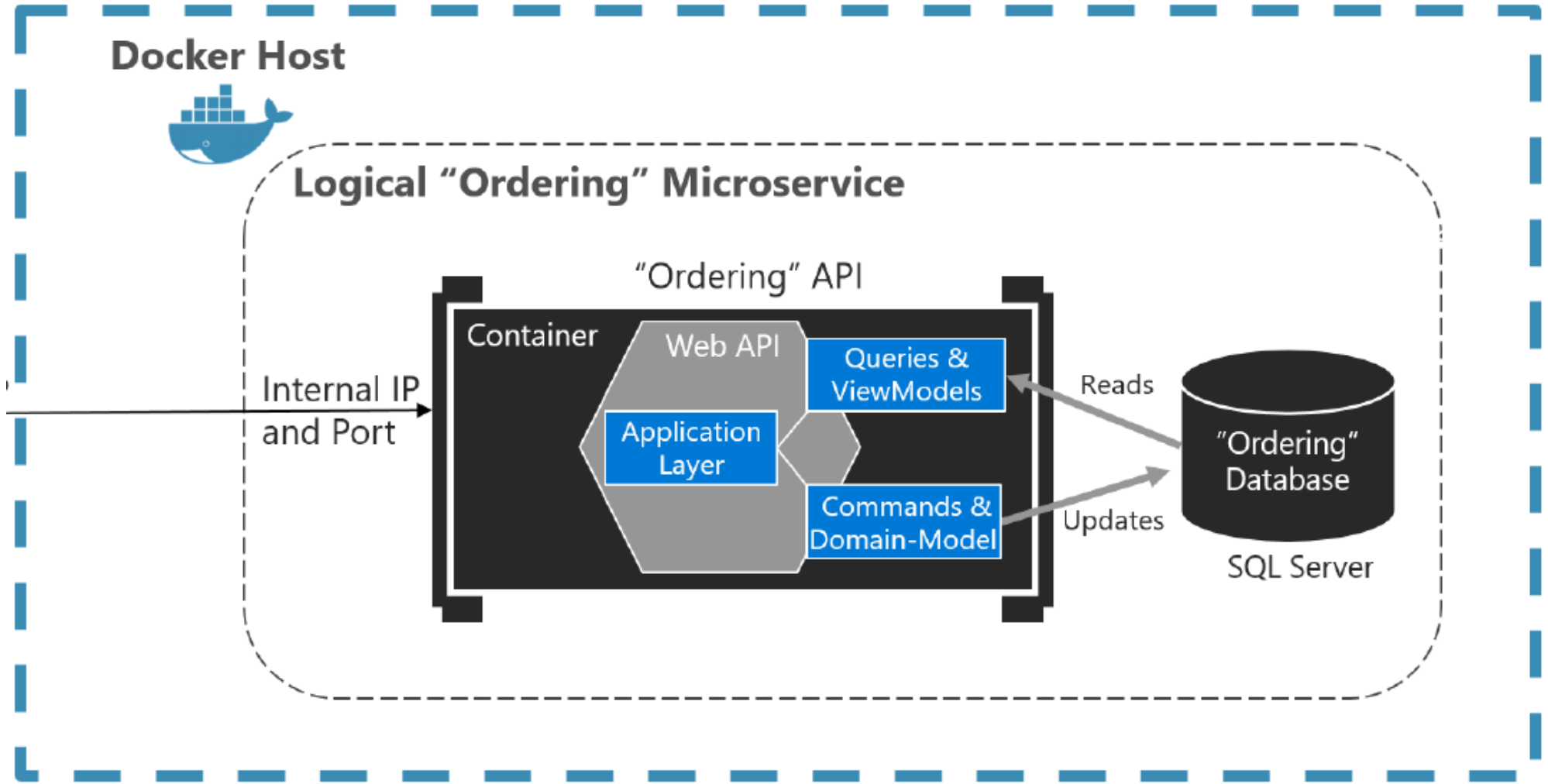
- Get Orders with username
- Consume basketCheckout event from RabbitMQ
- CQRS implementation with triggering OrderCommand to insert Order record

Ordering Archictecture



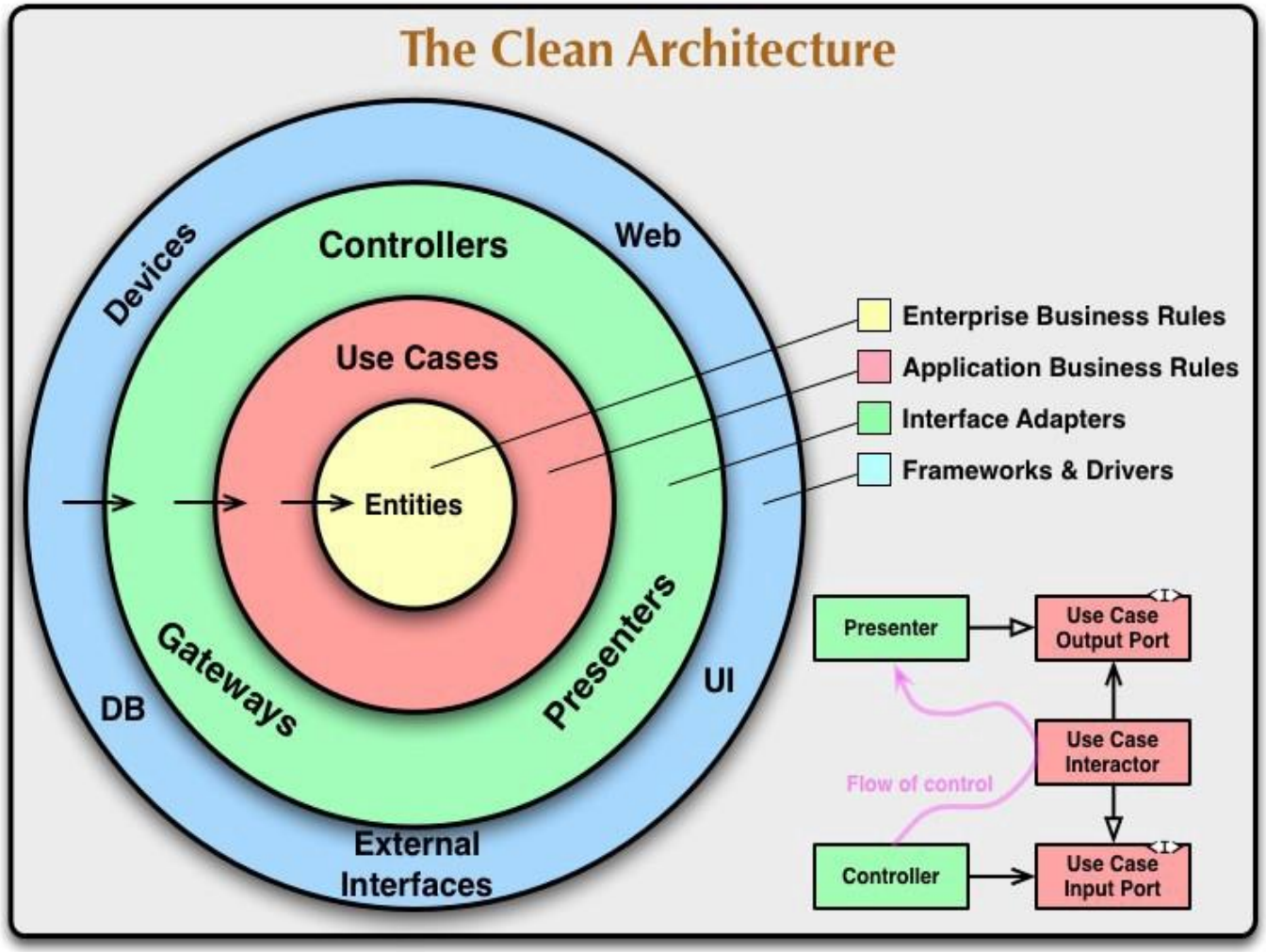
Simplified CQRS and DDD microservice

High level design

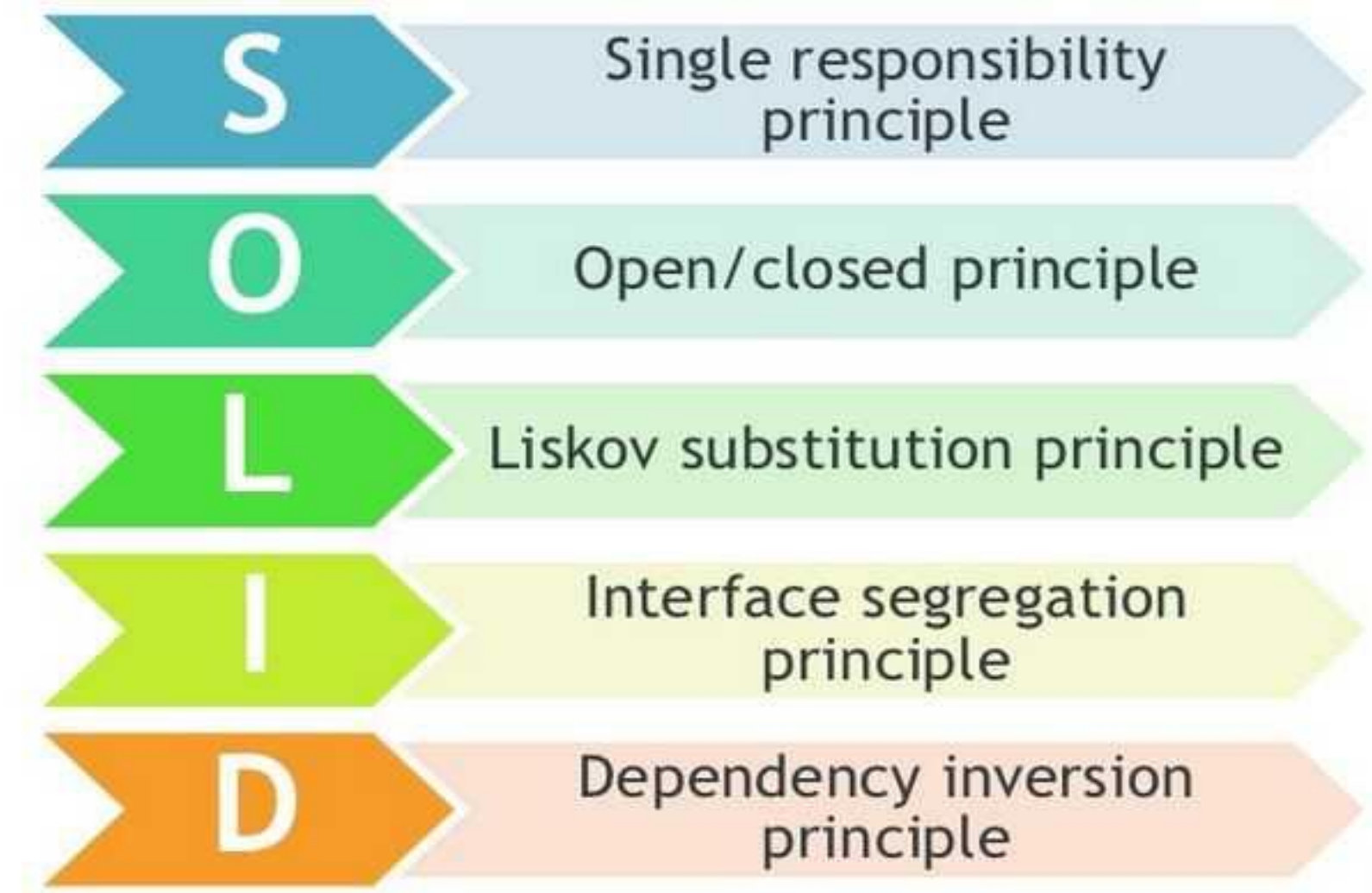


Architecture of Ordering Microservices

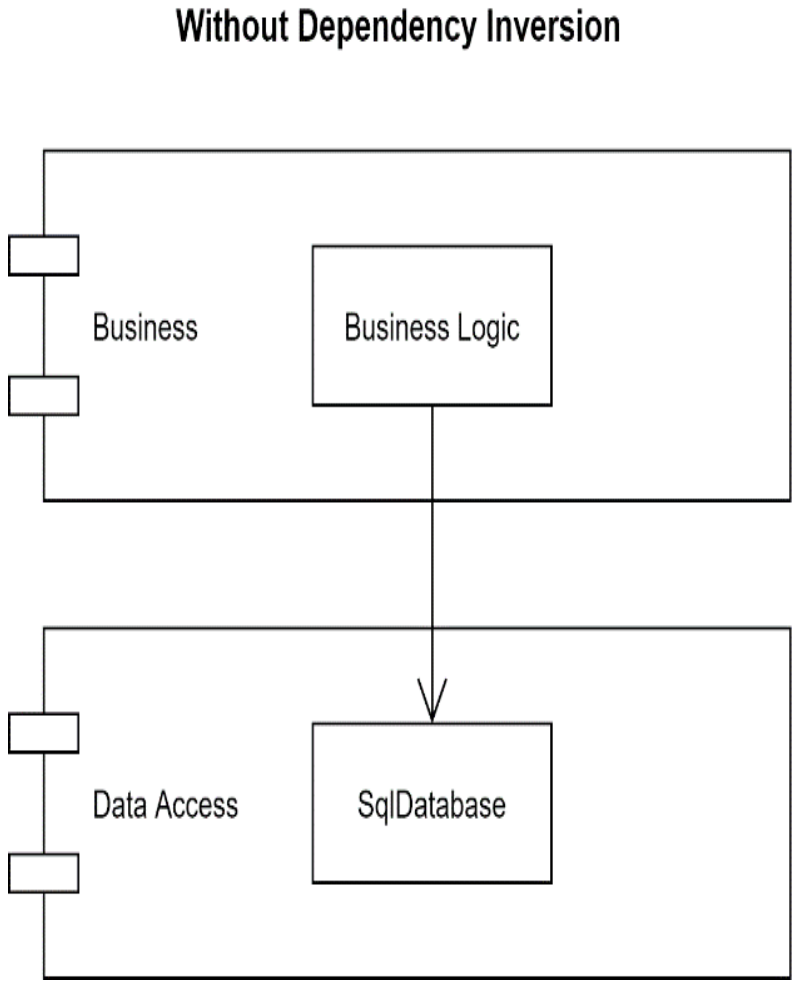
- SOLID Principles
- Domain Driven Design
- Clean Architecture
- Mediator Design Pattern
- CQRS Design Pattern
- CQRS & Event Sourcing

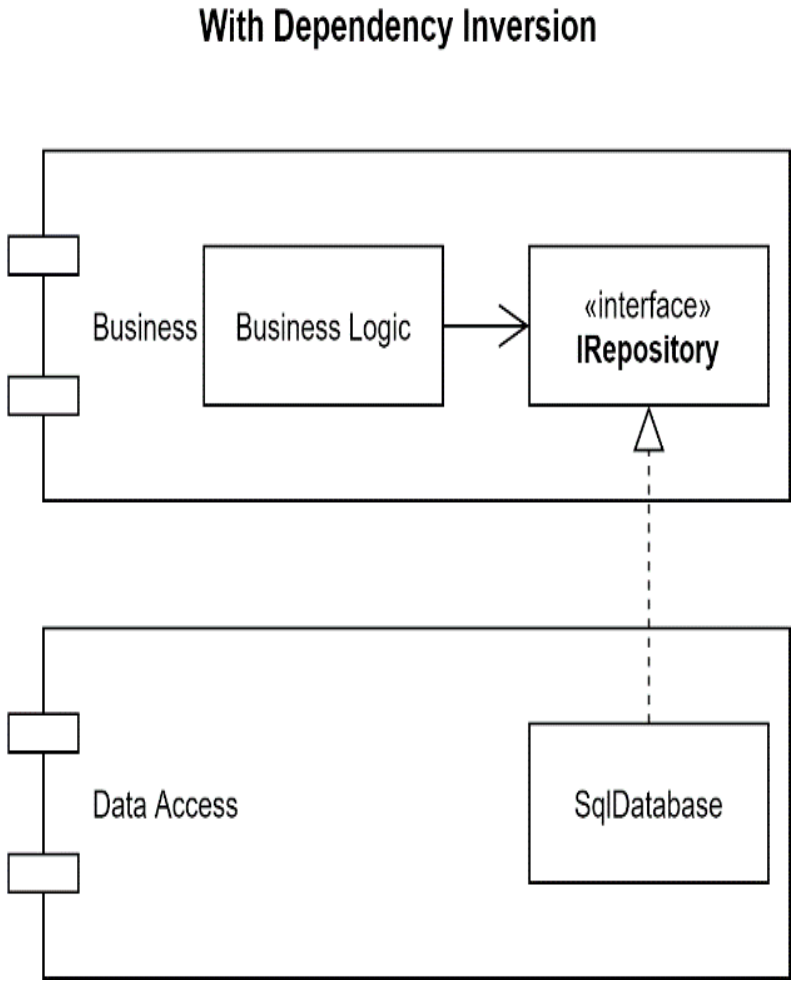


Design Principles - SOLID

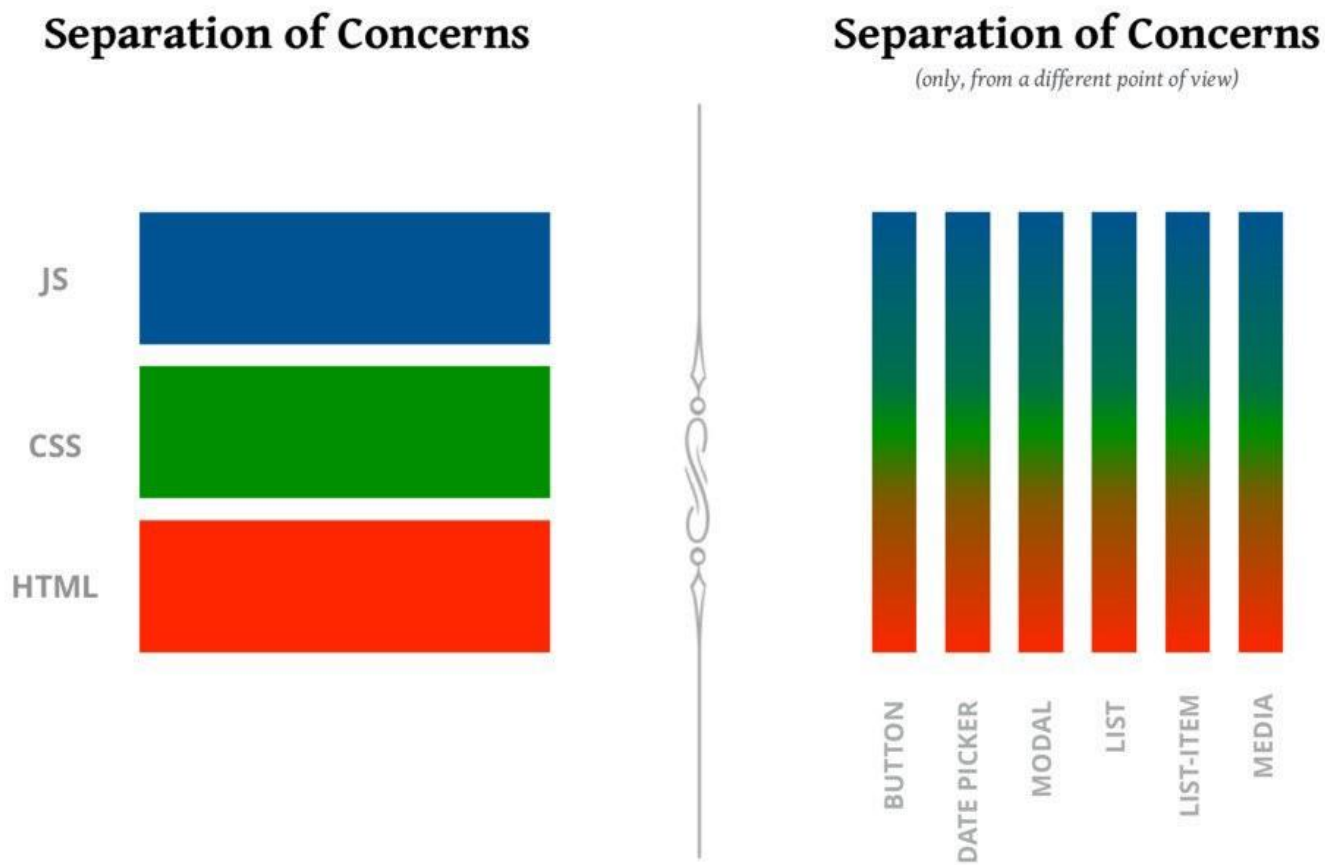


Dependency Inversion Principles (DIP)



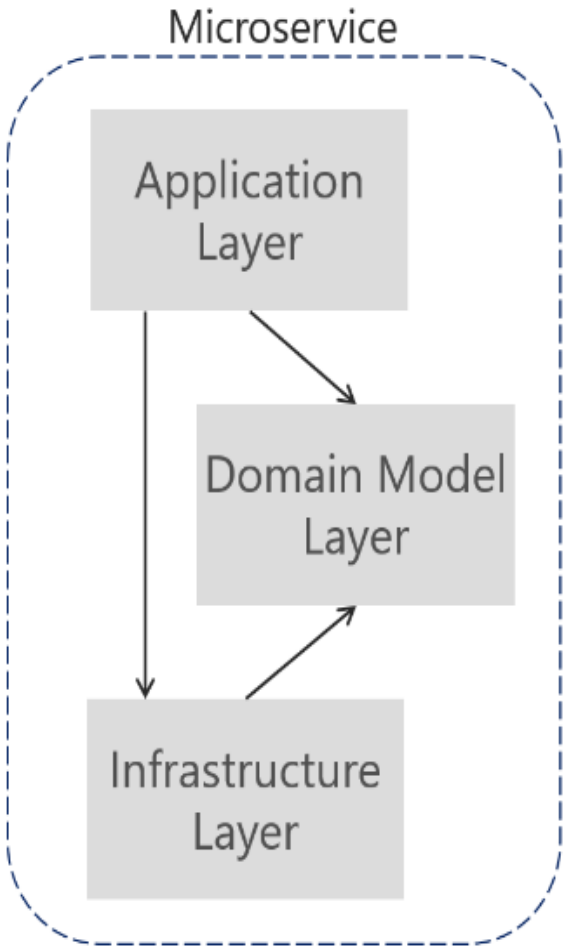


Separation of Concerns (SoC)



Domain Driven Design - DDD

Dependencies between Layers in a Domain-Driven Design service

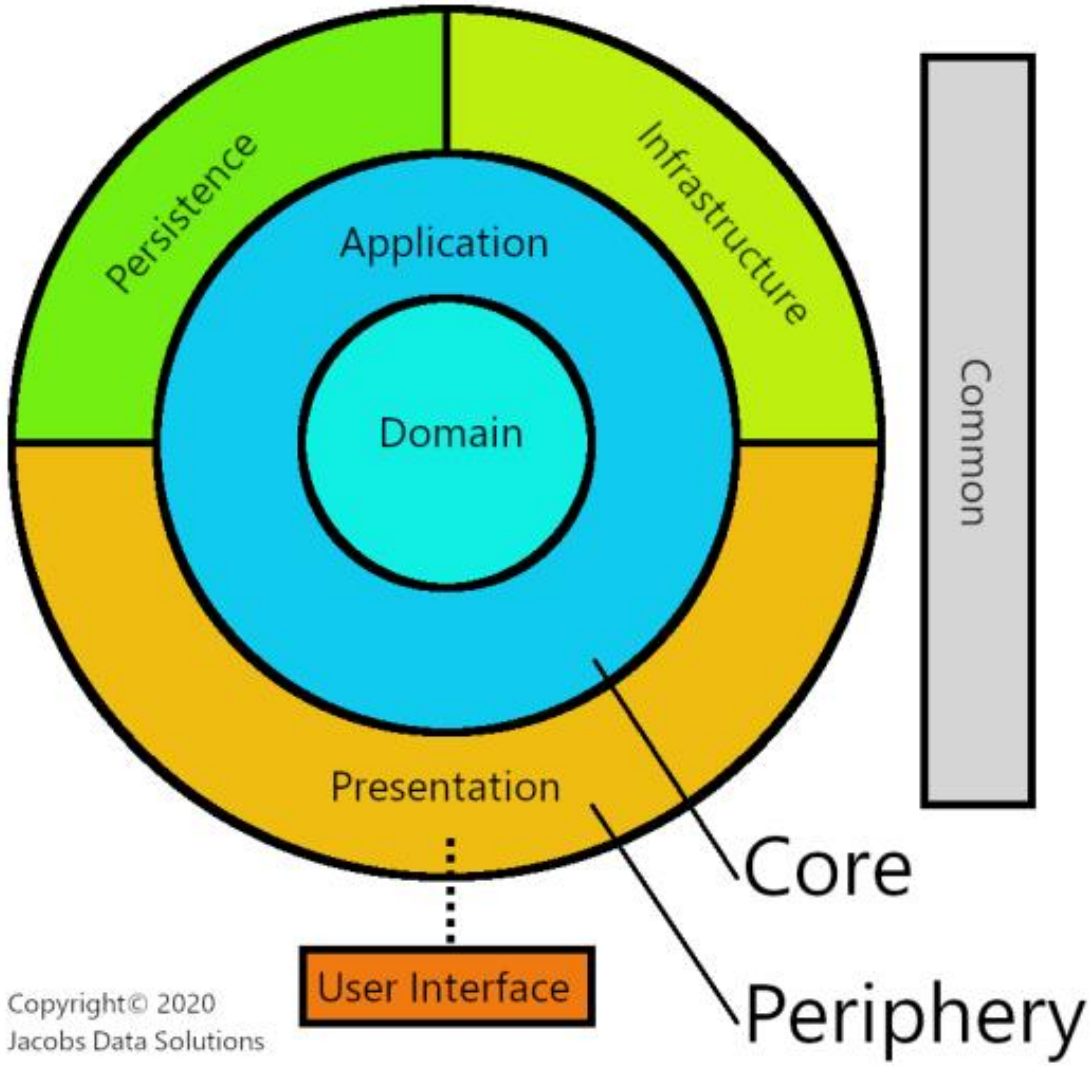


- Depends on the Domain-Model Layer so it can:
  - Use entity objects
  - Use Repository Interfaces/Contracts
- Depends on the Infrastructure Layer (thru DI) so it can:
  - Use Repository implementation classes, ideally through DI

- Ideally, it must NOT take dependency on any other layer
- It implements:
  - Domain Entities, Aggregate-Roots and Value-Objects
  - Repository Contracts/Interfaces (to be used in DI)

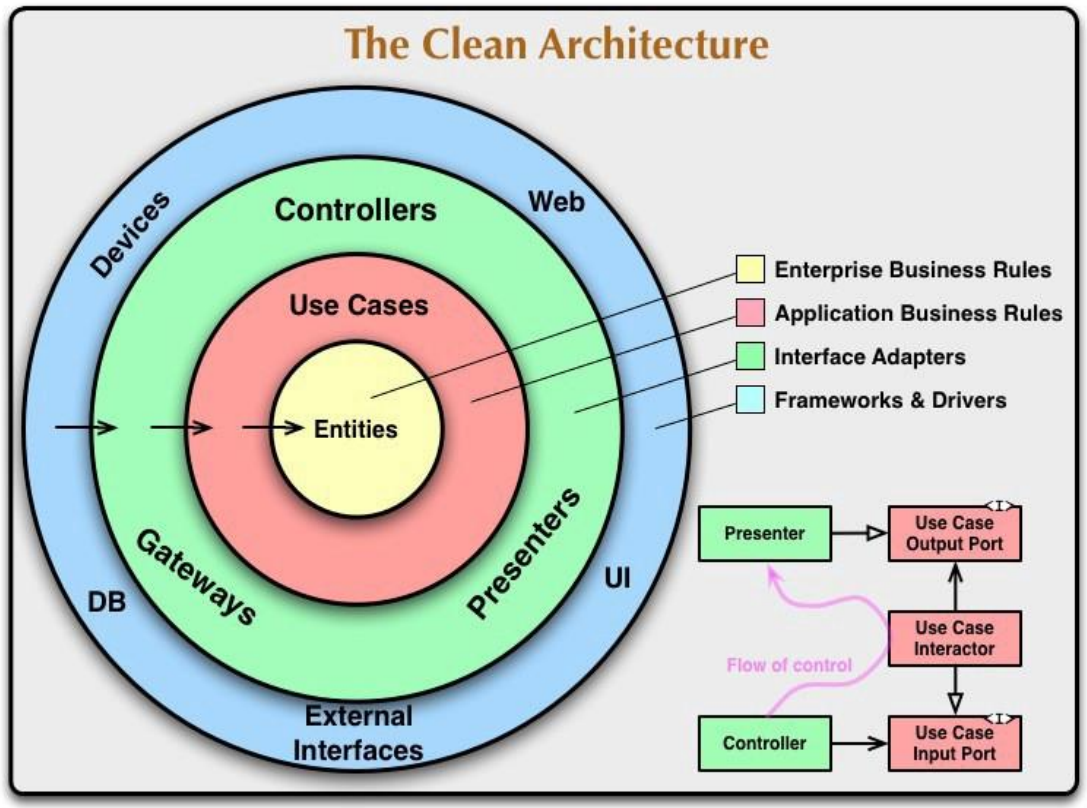
- Depends on the Domain-Model Layer so it can:
  - Use entity objects.
    - Like EF updating a database through mapped entities
- Direct dependency on infrastructure frameworks like EF Core or any other database, cache or infrastructure API

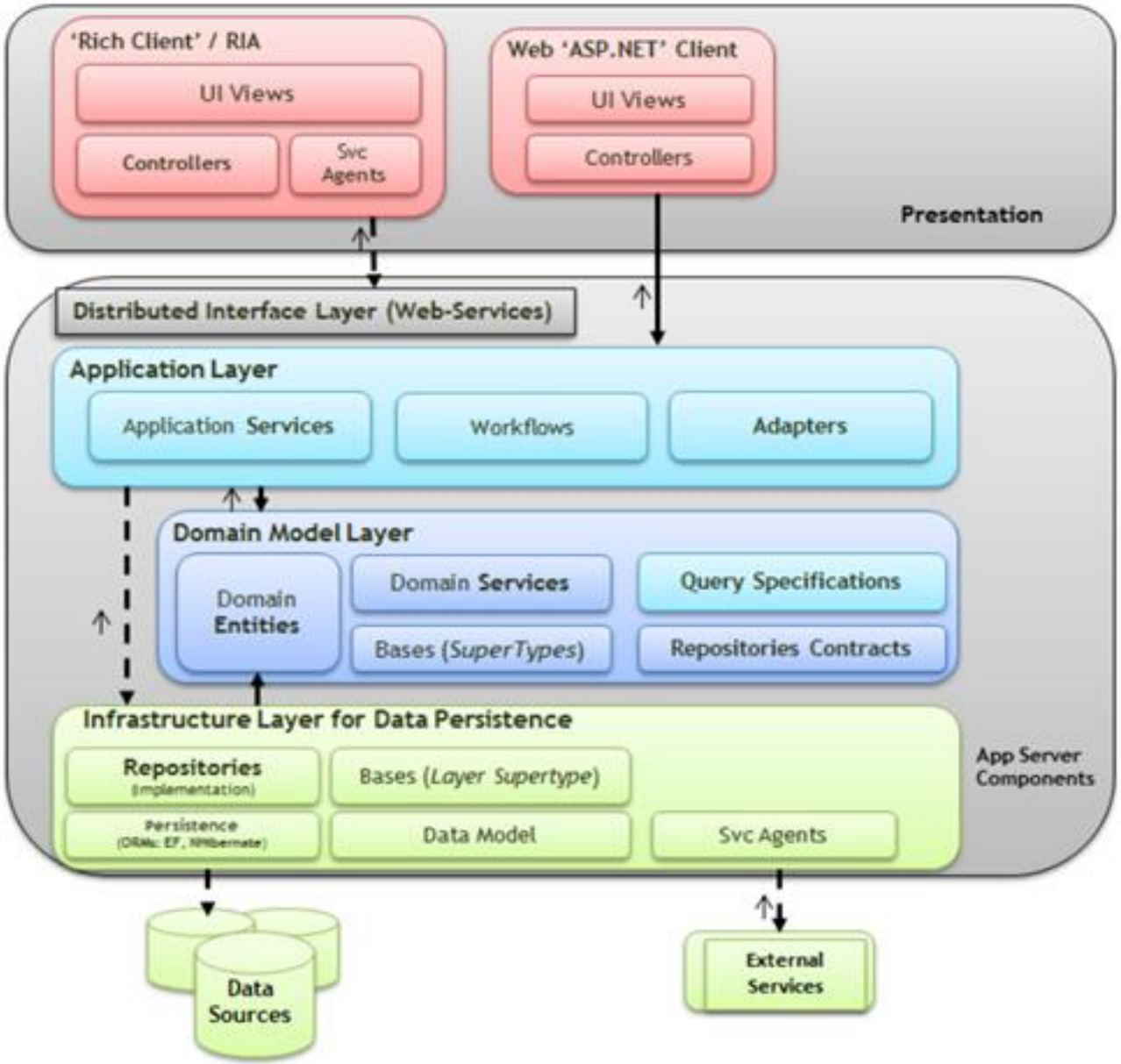
Clean Architecture



https://medium.com/software-alchemy/a-brief-intro-to-clean-architecture-clean-ddd-and-cqrs-23243c3f31b3

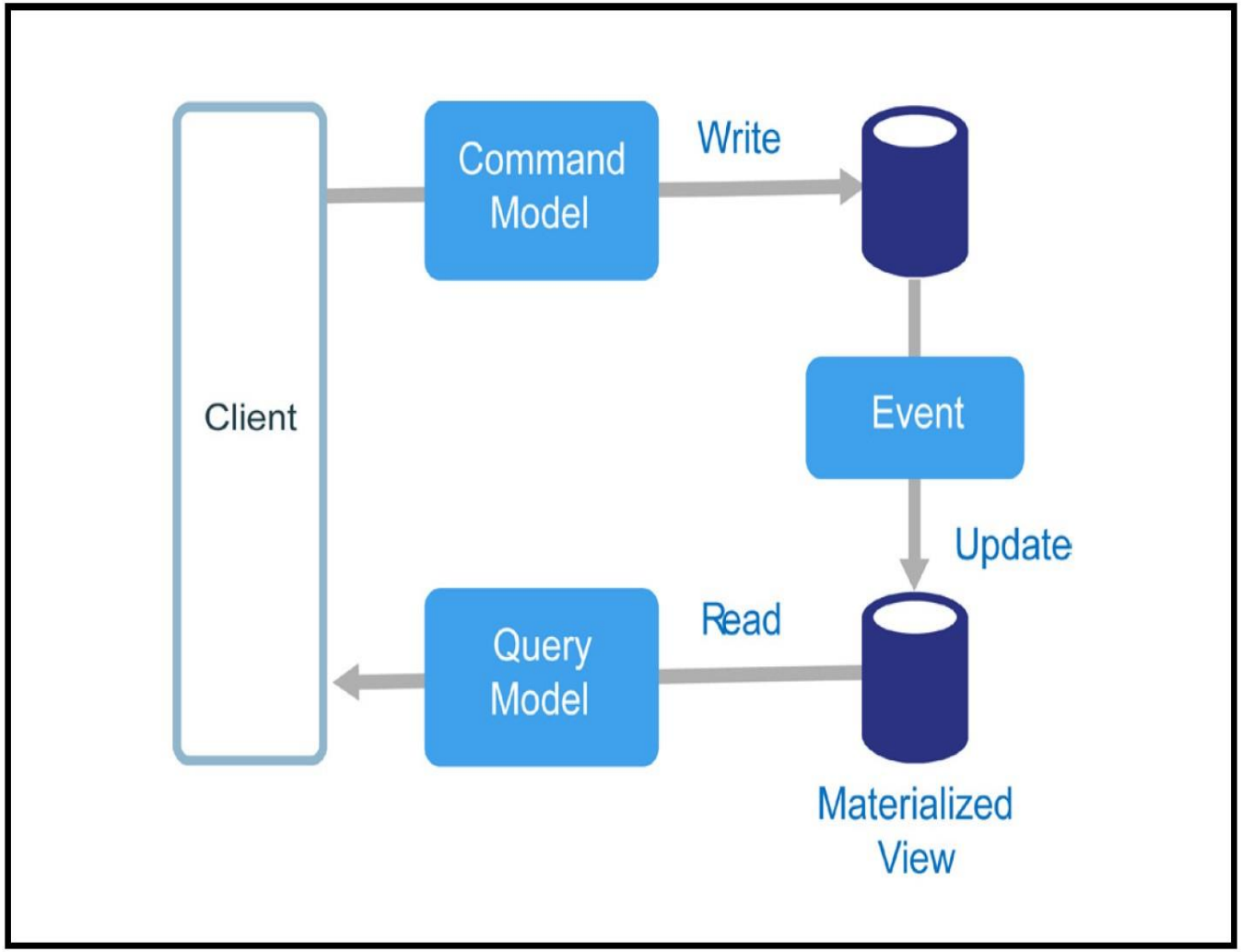
Clean Architecture





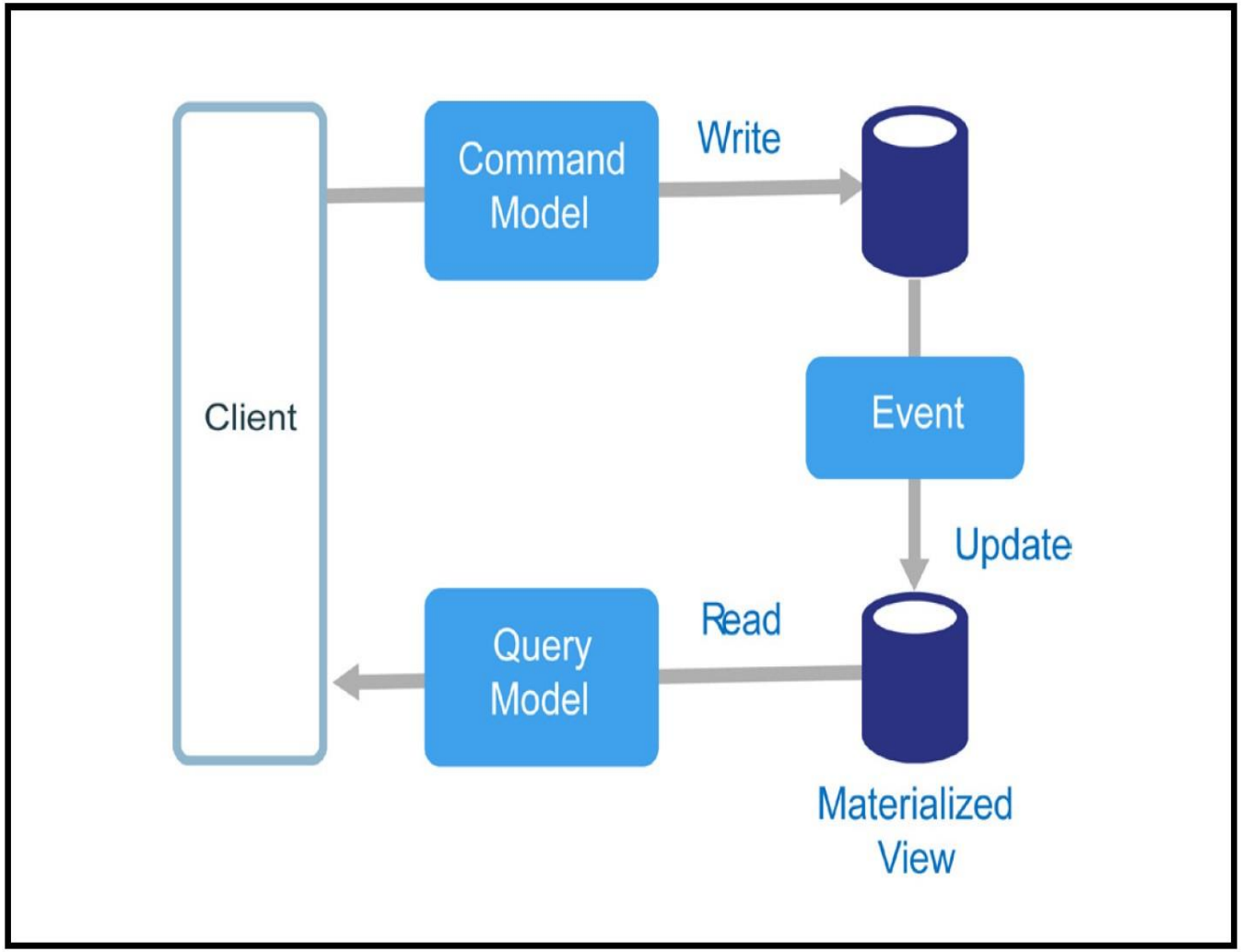
CQRS (Command Query Responsibility Segregation) Design Pattern

- Separation of Commands and Query Responsibility
- CQS (Command Query Separation)
- Commands – CommandHandlers
- Query – QueryHandlers



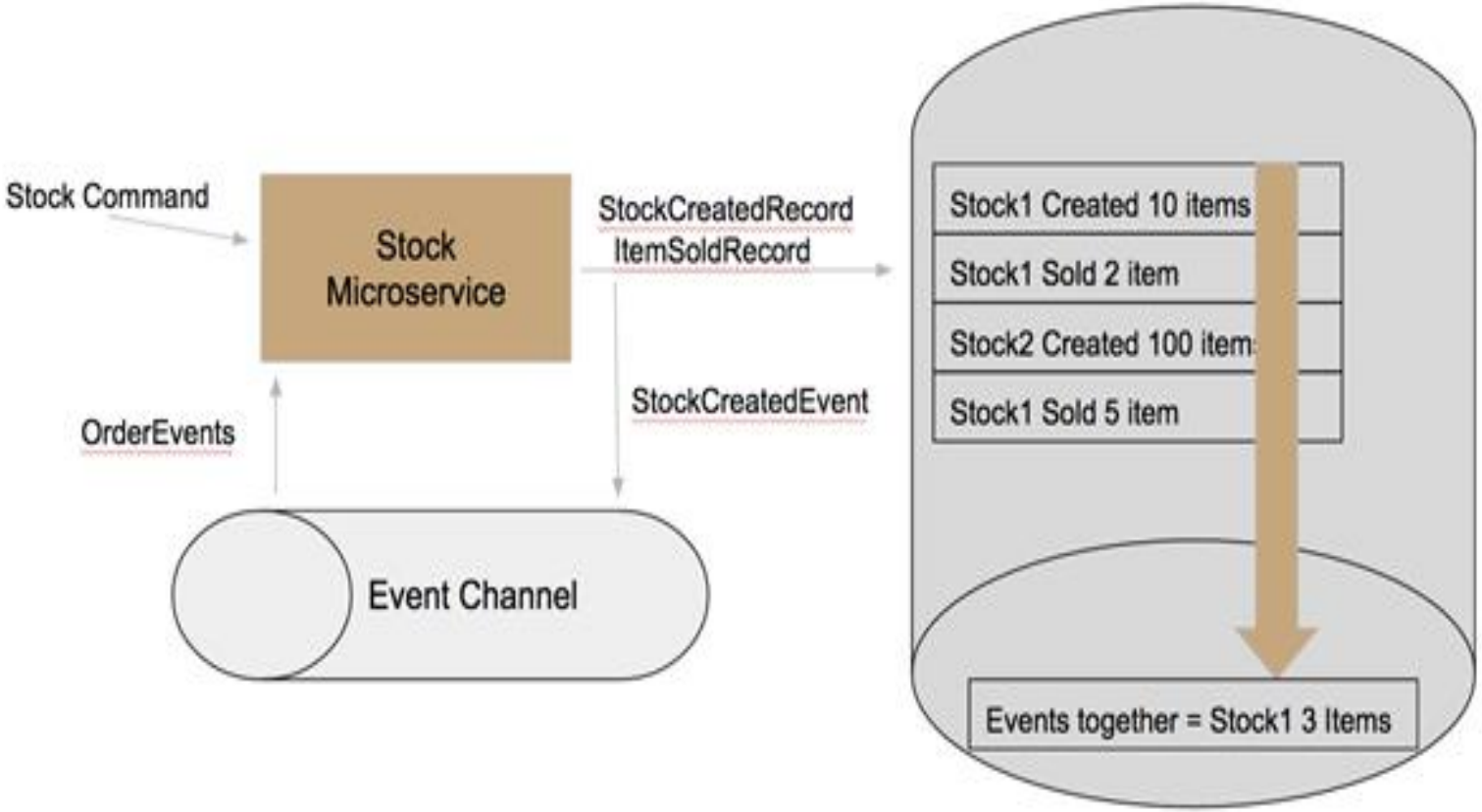
Eventual Consistent

- Inconsistent for a while
- CQRS software pattern
- Asynchronous processes
- No Transactional dependency



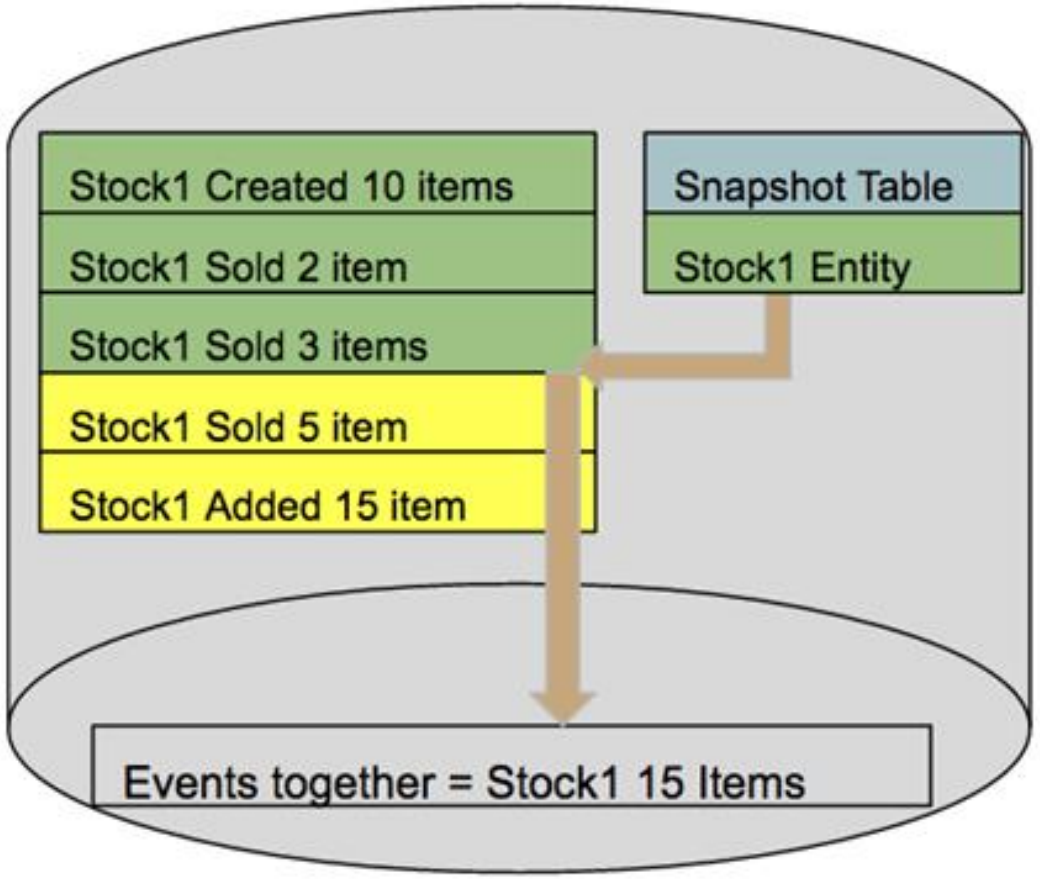
Event Sourcing

- Accumulating events
- Assets are not recorded
- Events Recording
- Generating state from the events



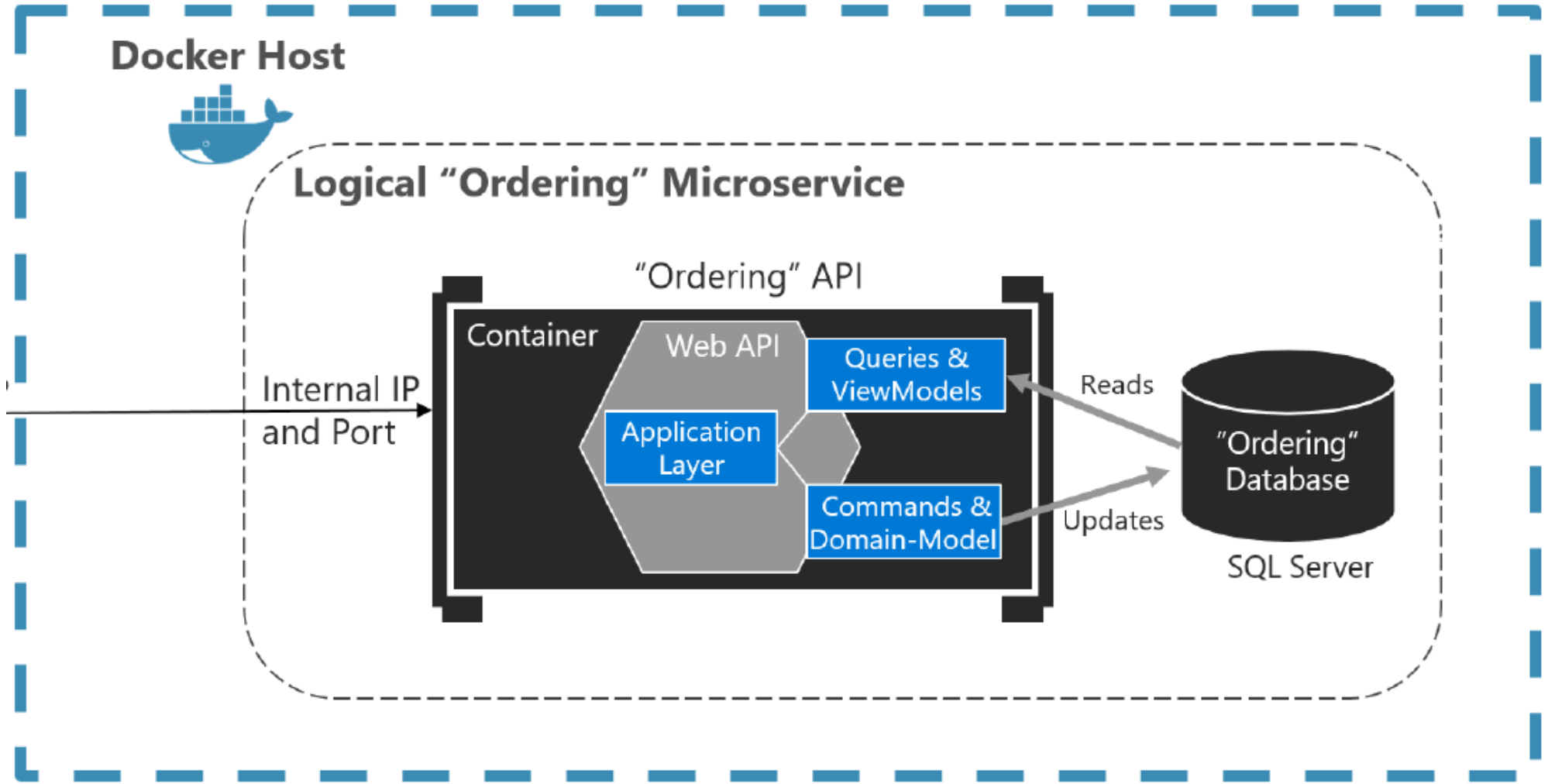
CQRS and Event Sourcing

- Writing models on the CQRS Design Pattern
- Final state of our existence
- Event information generated as a result
- Triggered and our reading model



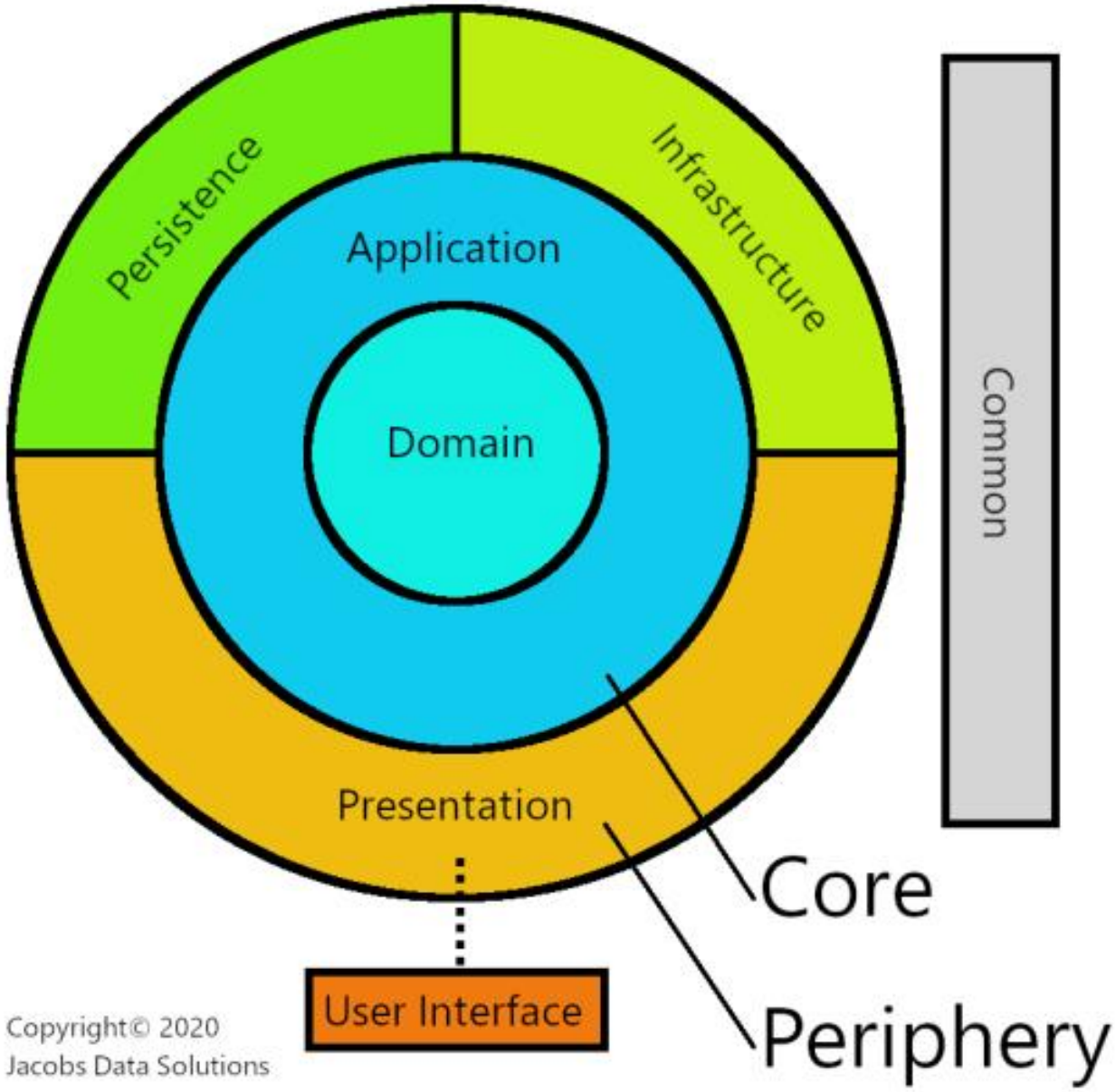
Simplified CQRS and DDD microservice

High level design

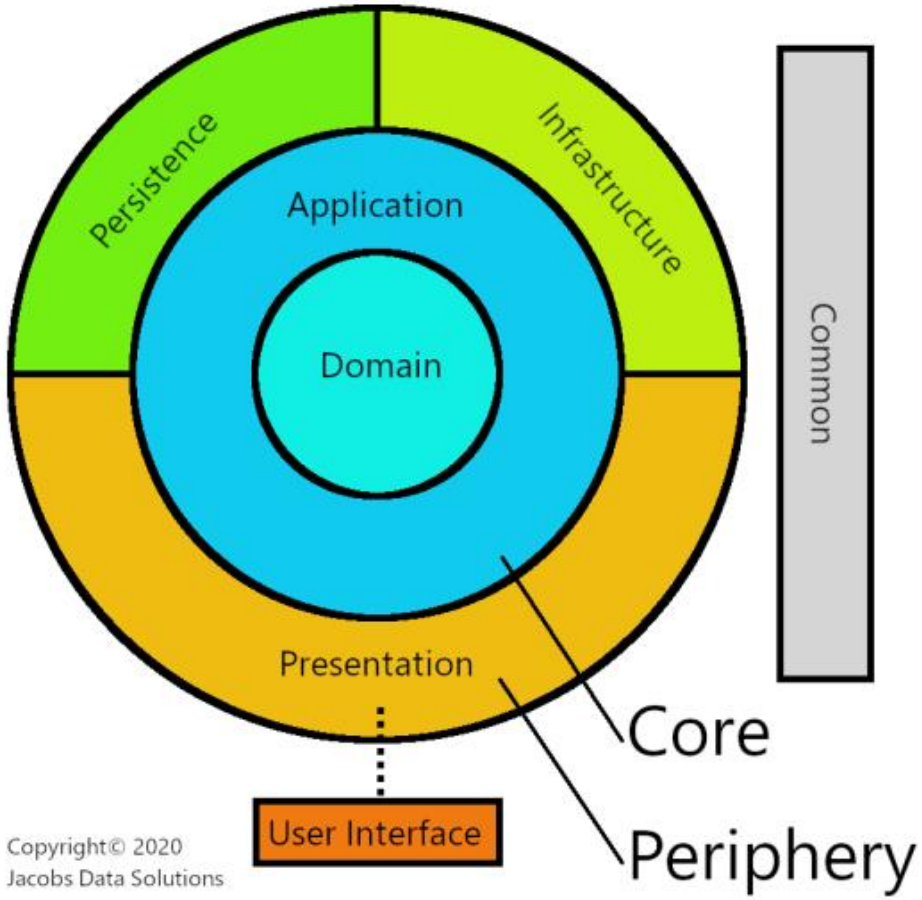


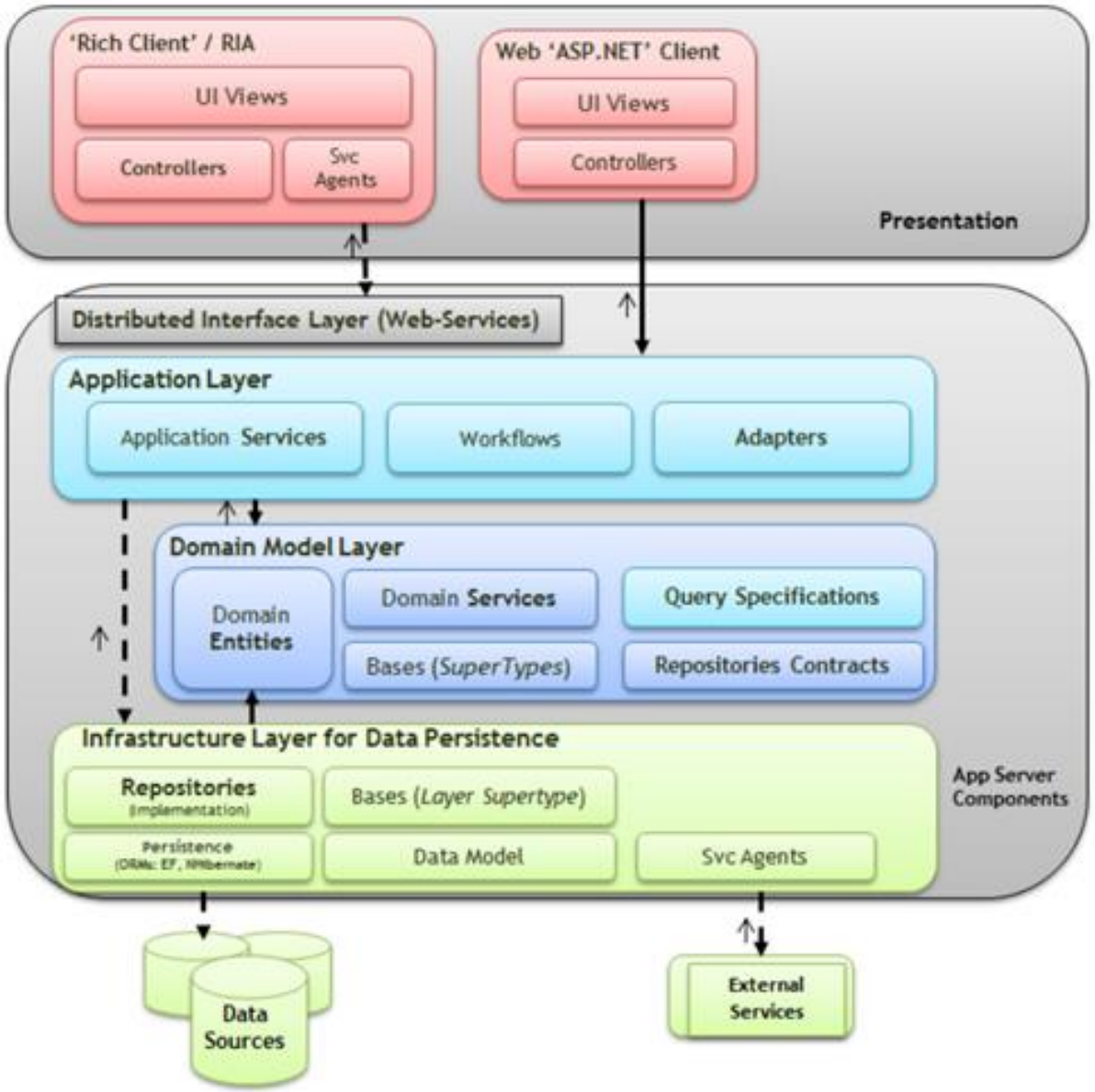
Code Structure of Ordering Microservices

- Ordering.Domain Layer
- Ordering.Application Layer
- Ordering.API Layer
- Ordering.Infrastructure Layer



Ordering Layers





Ordering.Domain Nuget Packages

- Ordering.Domain – No Dependecy

Ordering. Application Nuget Packages

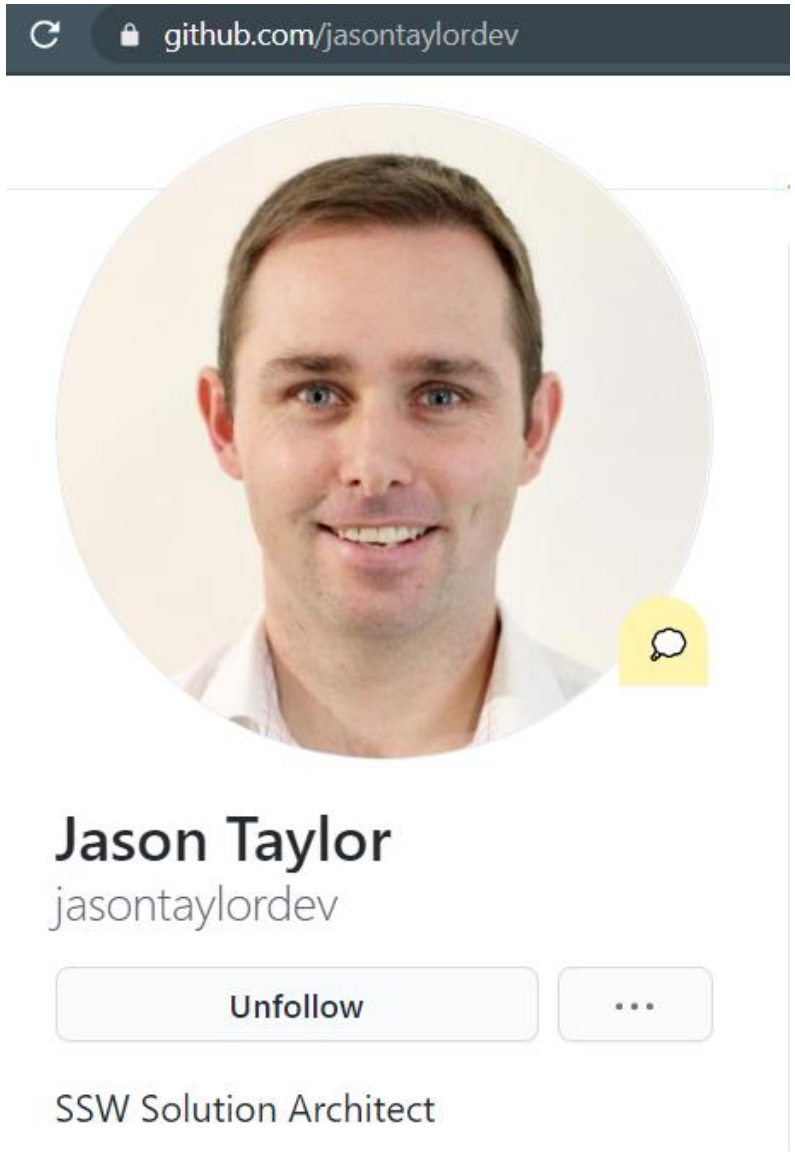
- MediatR.Extensions.Microsoft.DependencyInjection
- FluentValidation
- FluentValidation.DependencyInjectionExtensions
- AutoMapper
- AutoMapper.Extensions.Microsoft.Dependency
- Microsoft.Extensions.Logging.Abstractions
- **ProjectReference - Ordering.Domain**

Ordering. Infrastructure Nuget Packages

- Microsoft.EntityFrameworkCore.SqlServer
- SendGrid
- **ProjectReference - Ordering. Application**

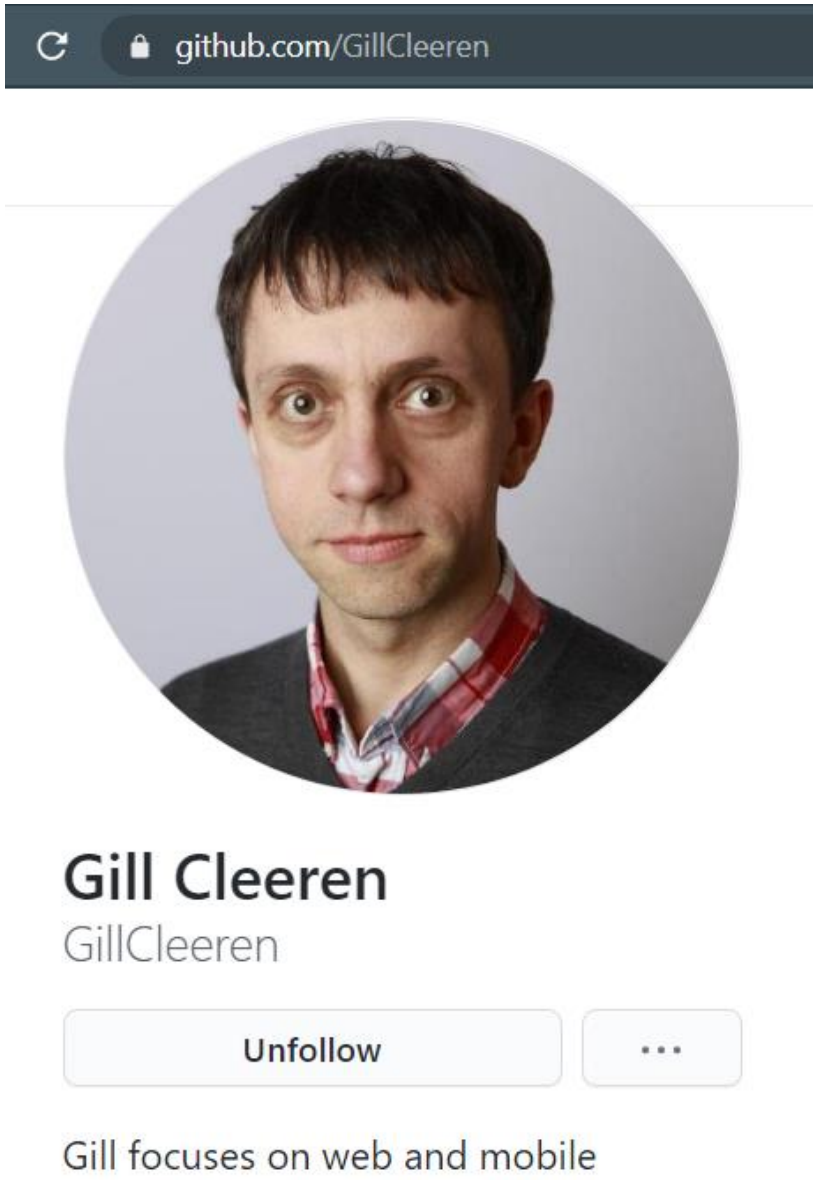
Ordering.API Nuget Packages

- Microsoft.EntityFrameworkCore.Tools
- **ProjectReference - Ordering. Application**
- **ProjectReference - Ordering. Infrastructure**



https://github.com/jasontaylordev/CleanArchitecture

https://www.youtube.com/watch?app=desktop&v=5OtUm1BLmG0



https://twitter.com/gillcleeren/status/1367863587163766

https://www.youtube.com/watch?v=BxtHt7tsX-c

Code Structure of Ordering Microservices

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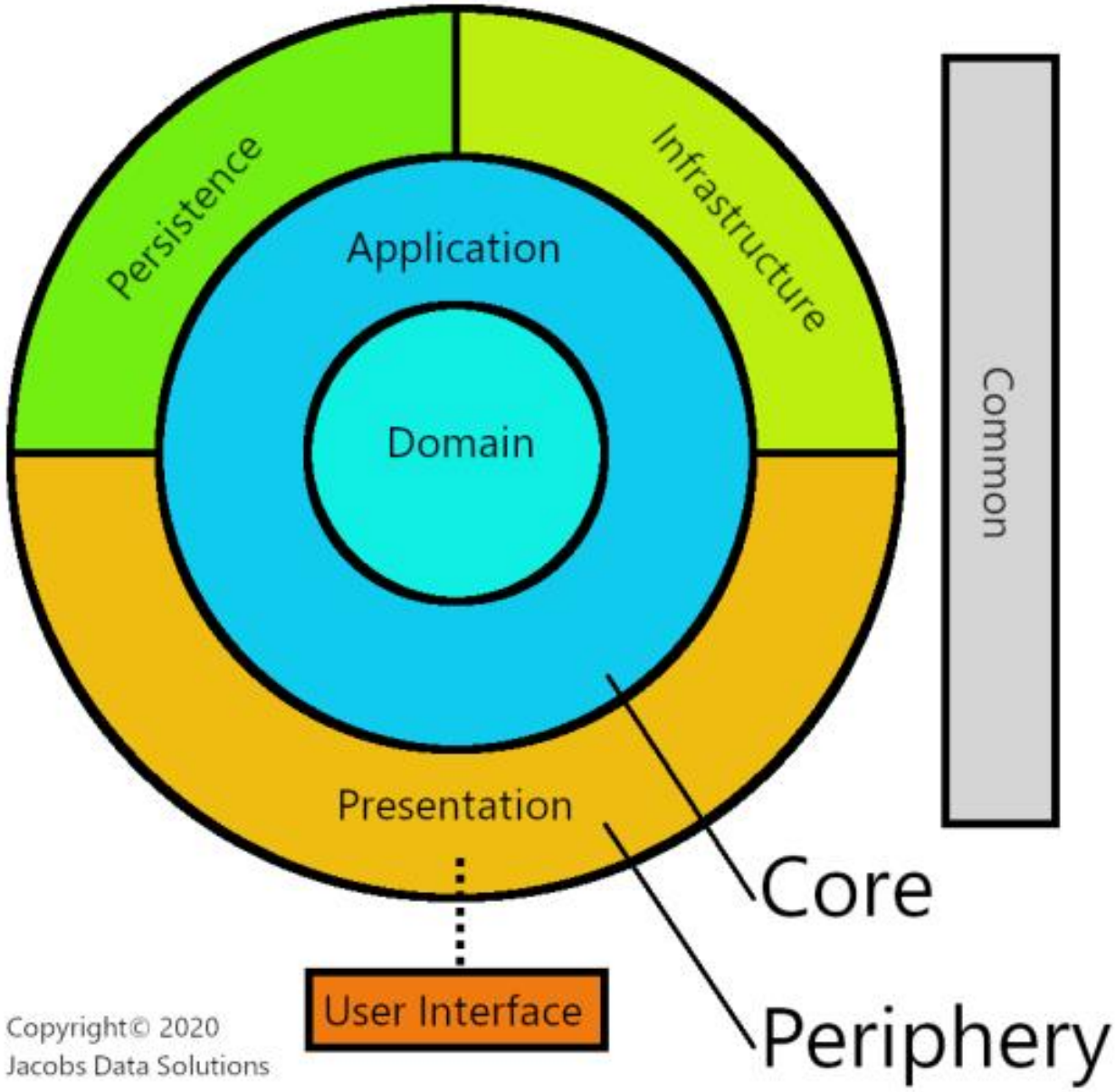
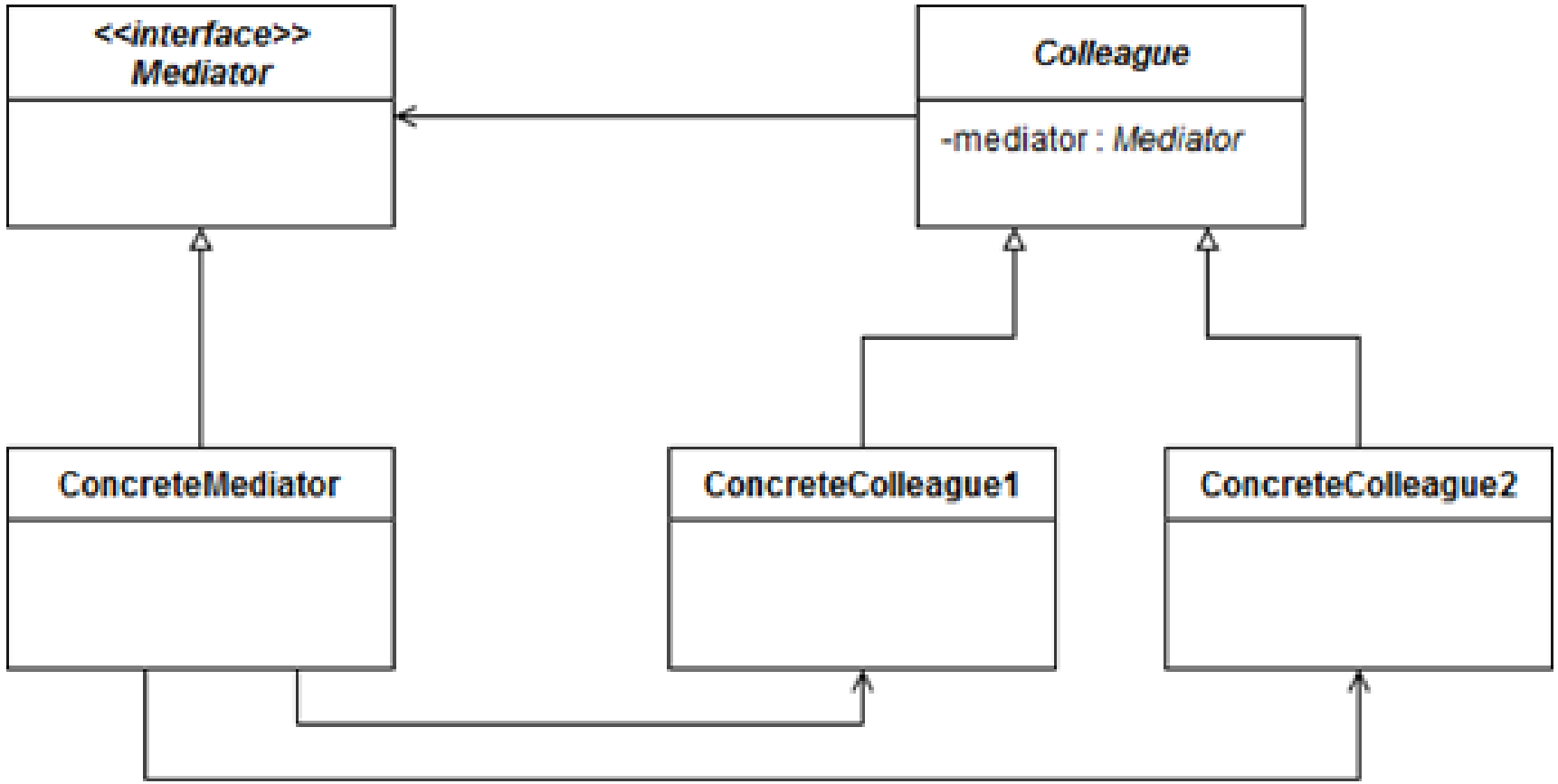
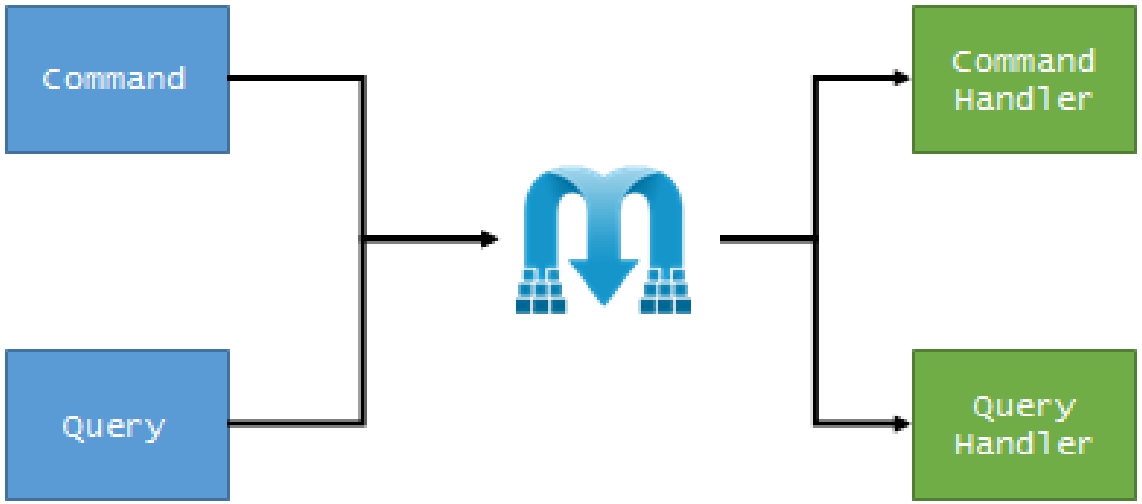
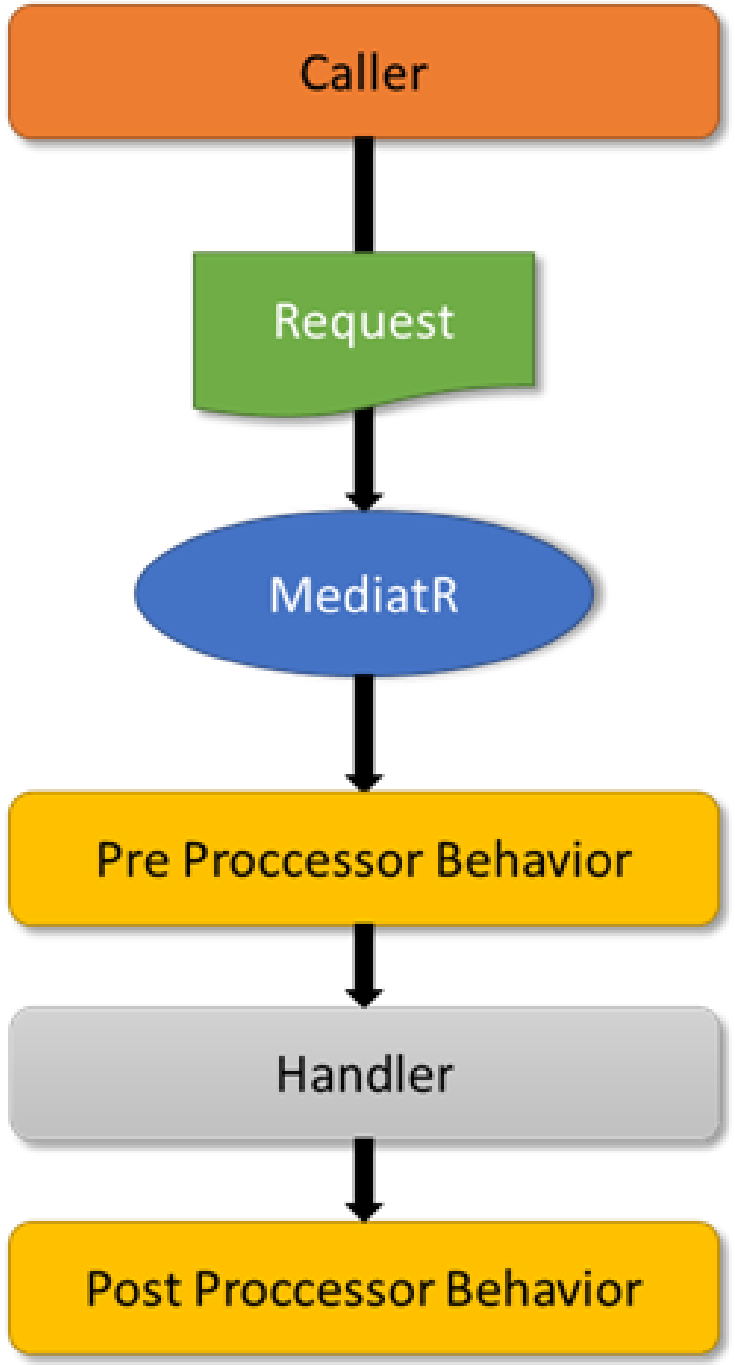


Mediator Design Pattern

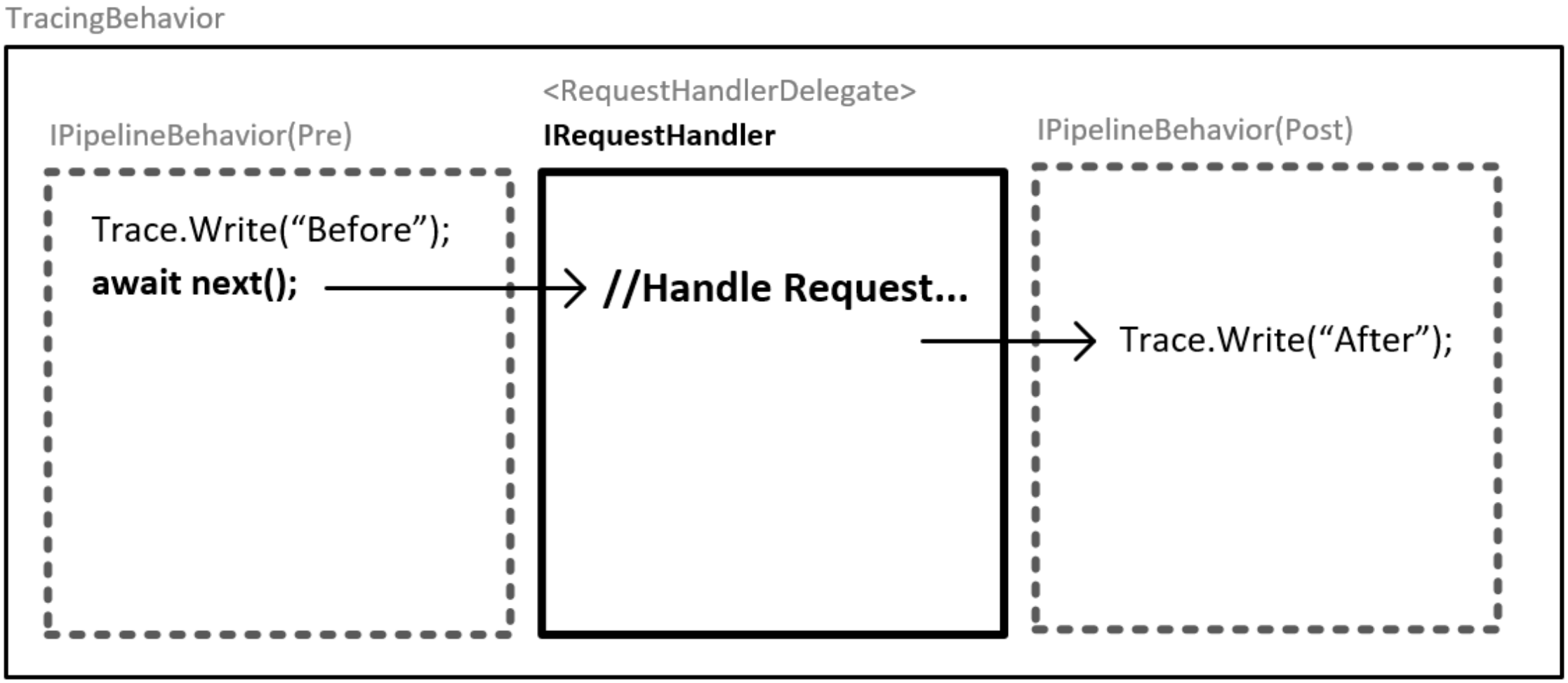


MediatR Nuget Package

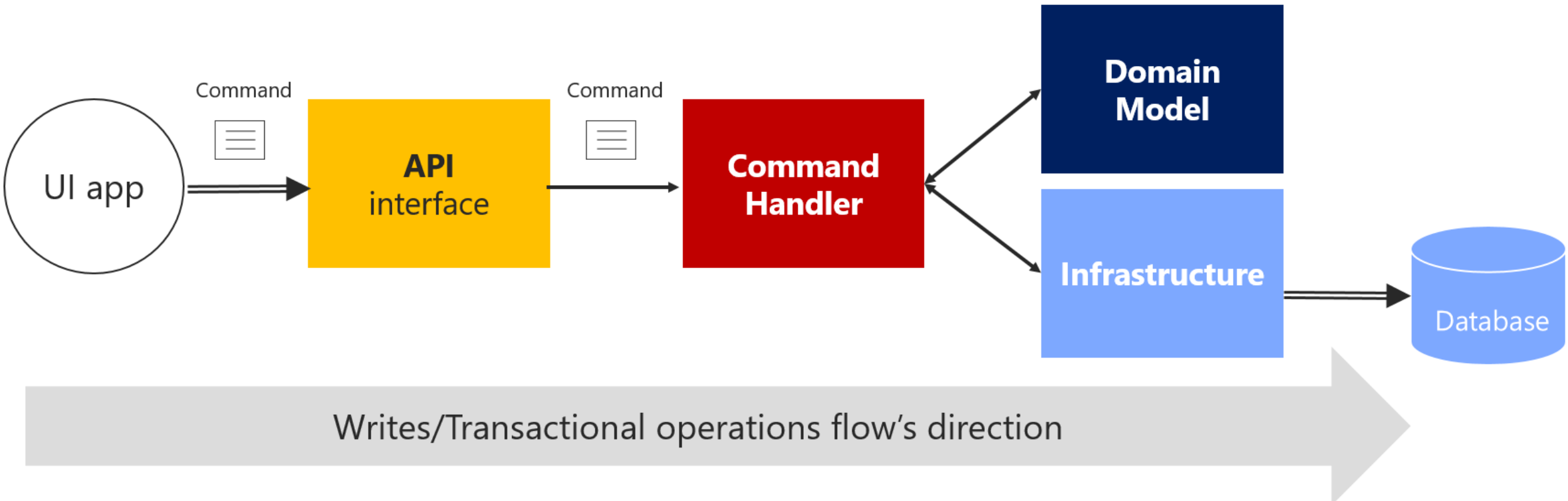




MediatR Pipeline Behavior



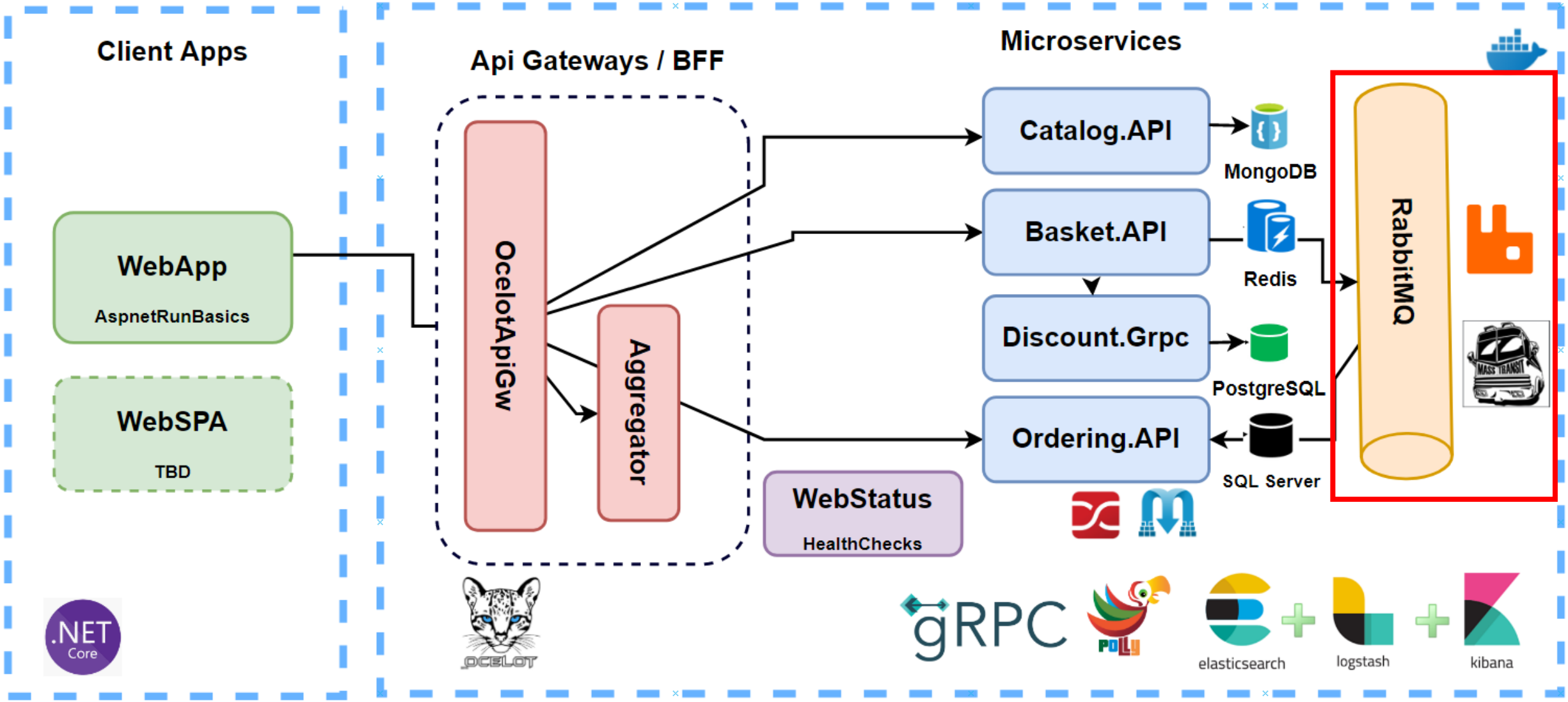
High level “Writes-side” in CQRS



Section 8
Microservices Async Communication w/ RabbitMQ & MassTransit

for Checkout Order Between Basket-Ordering Microservices

Big Picture


Client Apps
WebApp
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TBD
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OcelotApiGw
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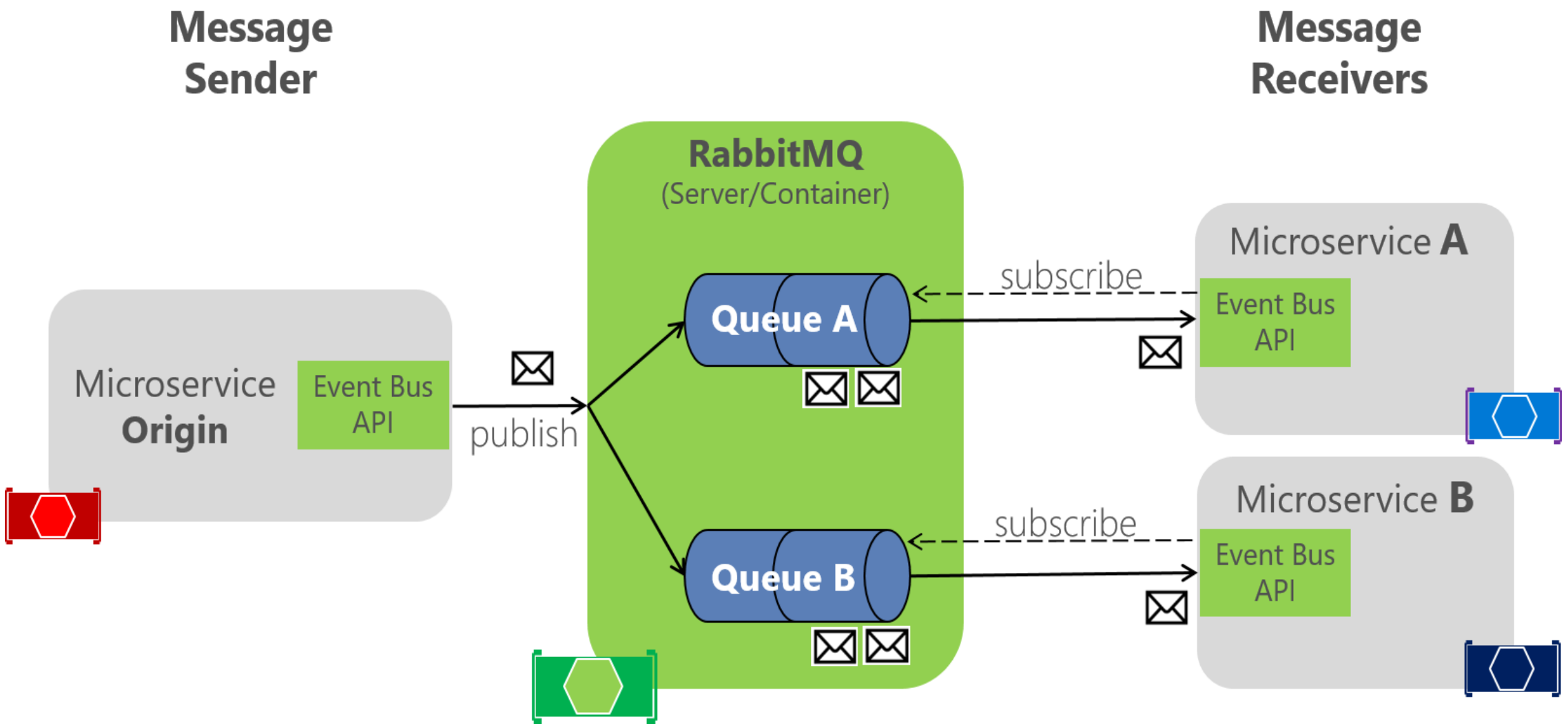
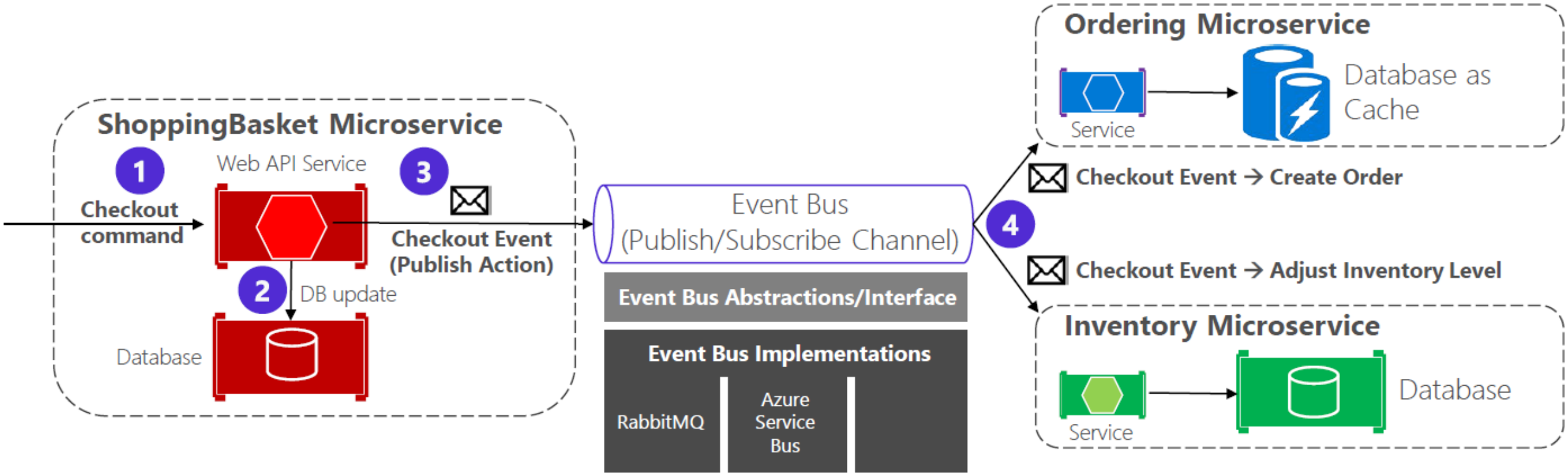
Ordering.API
SQL Server
RabbitMQ
.NET Core
OCELOT
gRPC
POLLY
elasticsearch
logstash
kibana

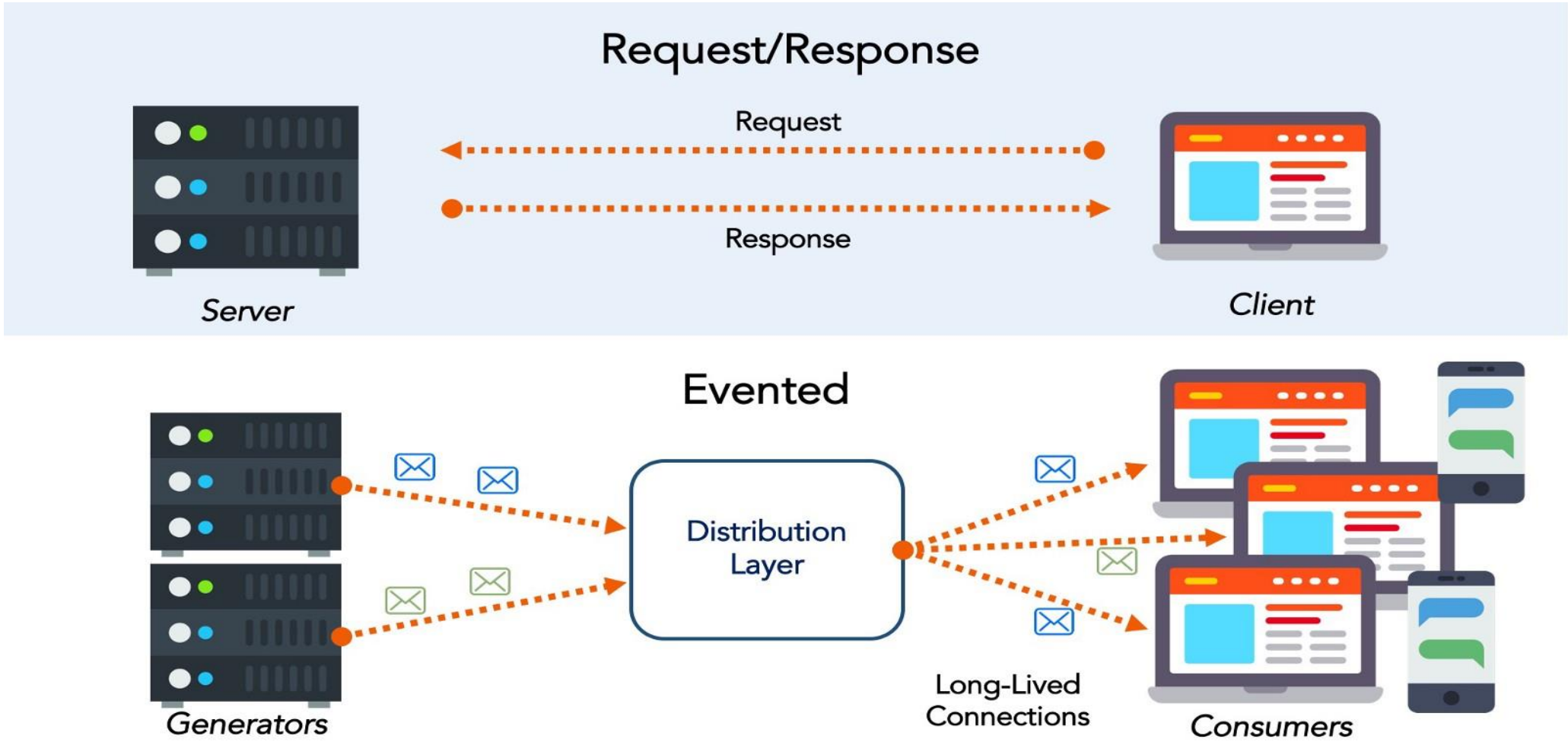
Pub/Sub RabbitMQ Architecture



Publisher/Subscriber of BasketCheckout Event w/ Basket and Ordering Microservices

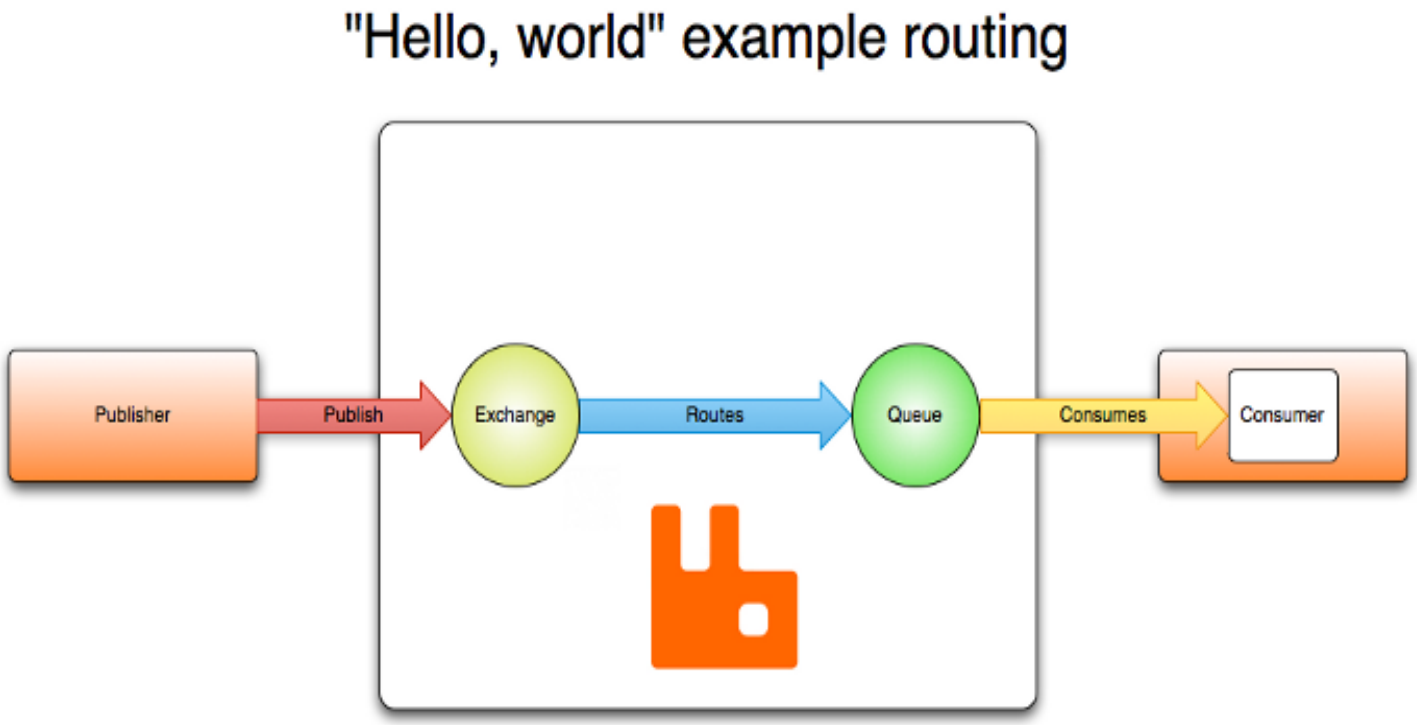


Microservices Communication Types

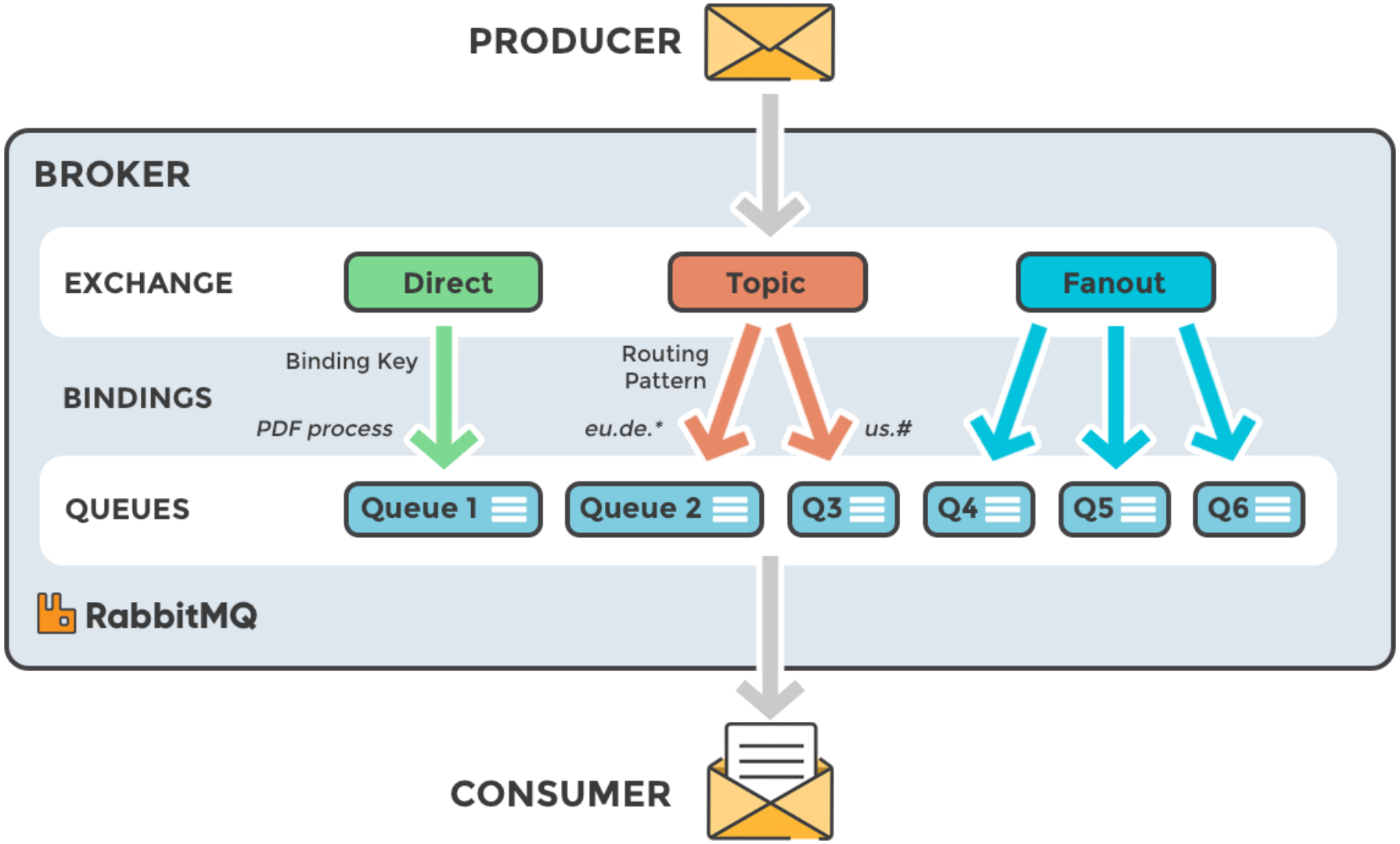


What is RabbitMQ ?

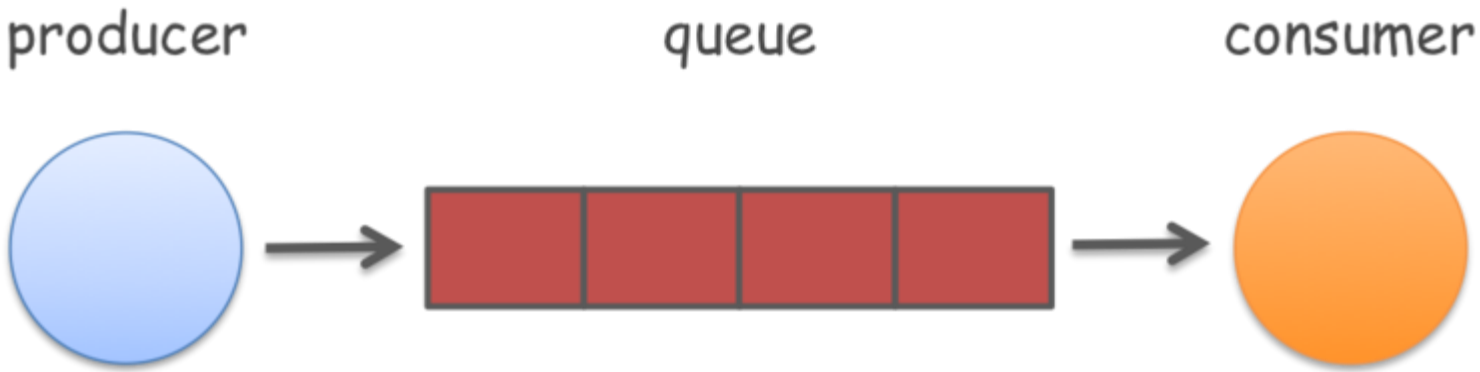
- Message Queue System
- Event-Driven Architecture
- Apache Kafka, Msmq, Microsoft Azure Service Bus, Kestrel, ActiveMQ



Main Components of RabbitMQ

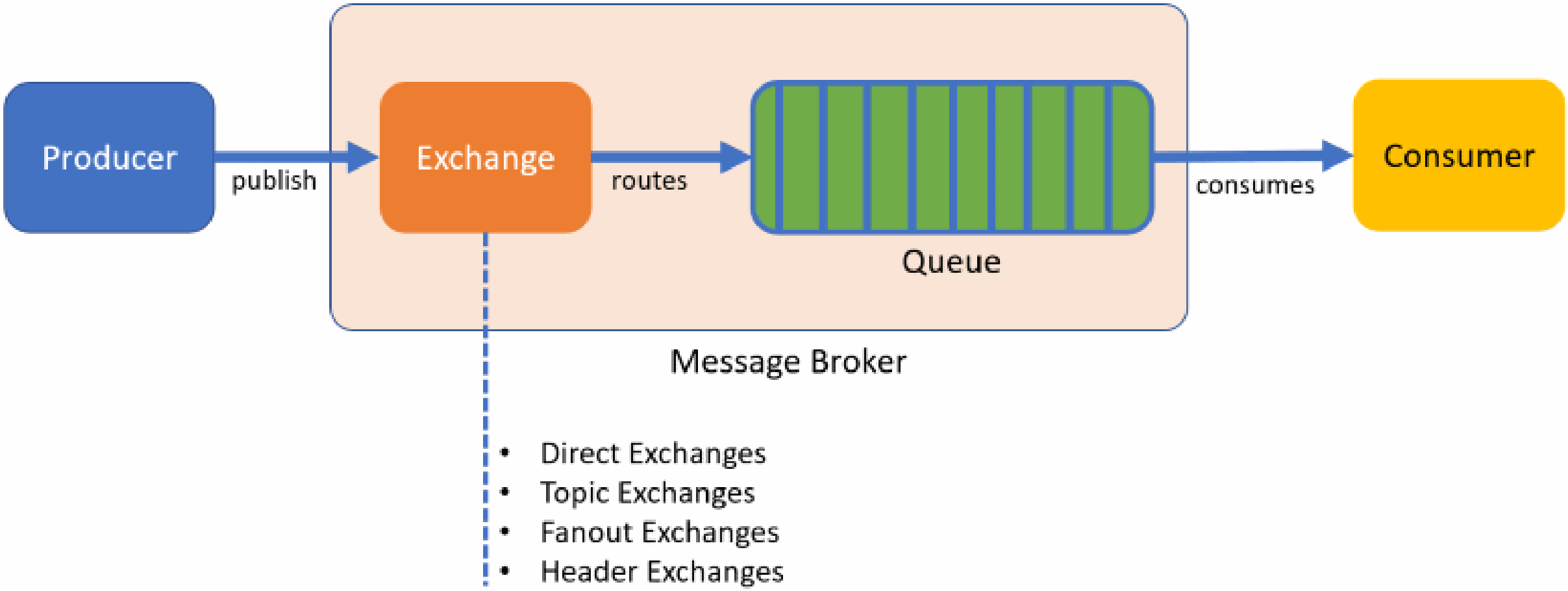


RabbitMQ Queue Properties

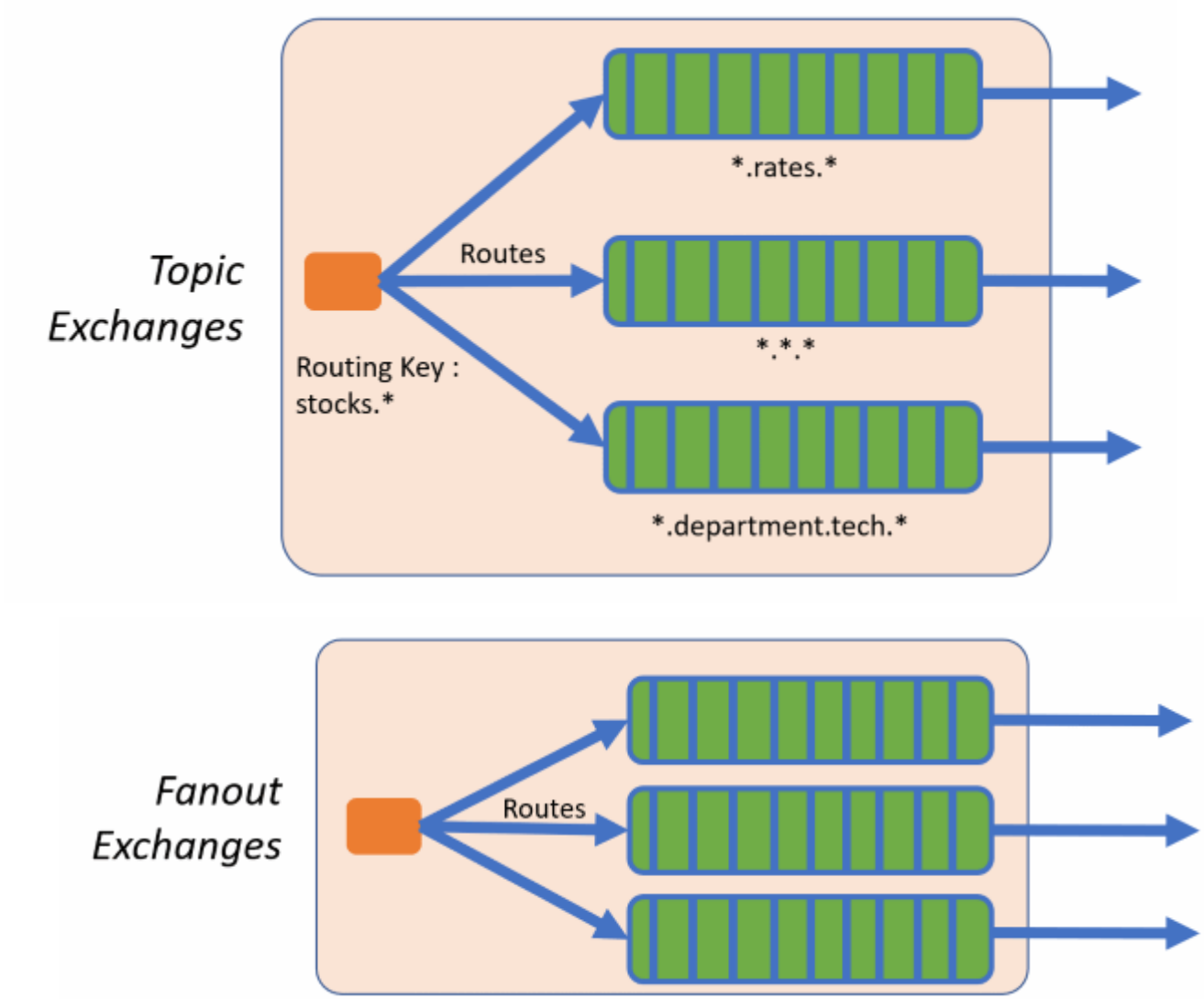


- Name
- Durable
- Exclusive
- AutoDelete

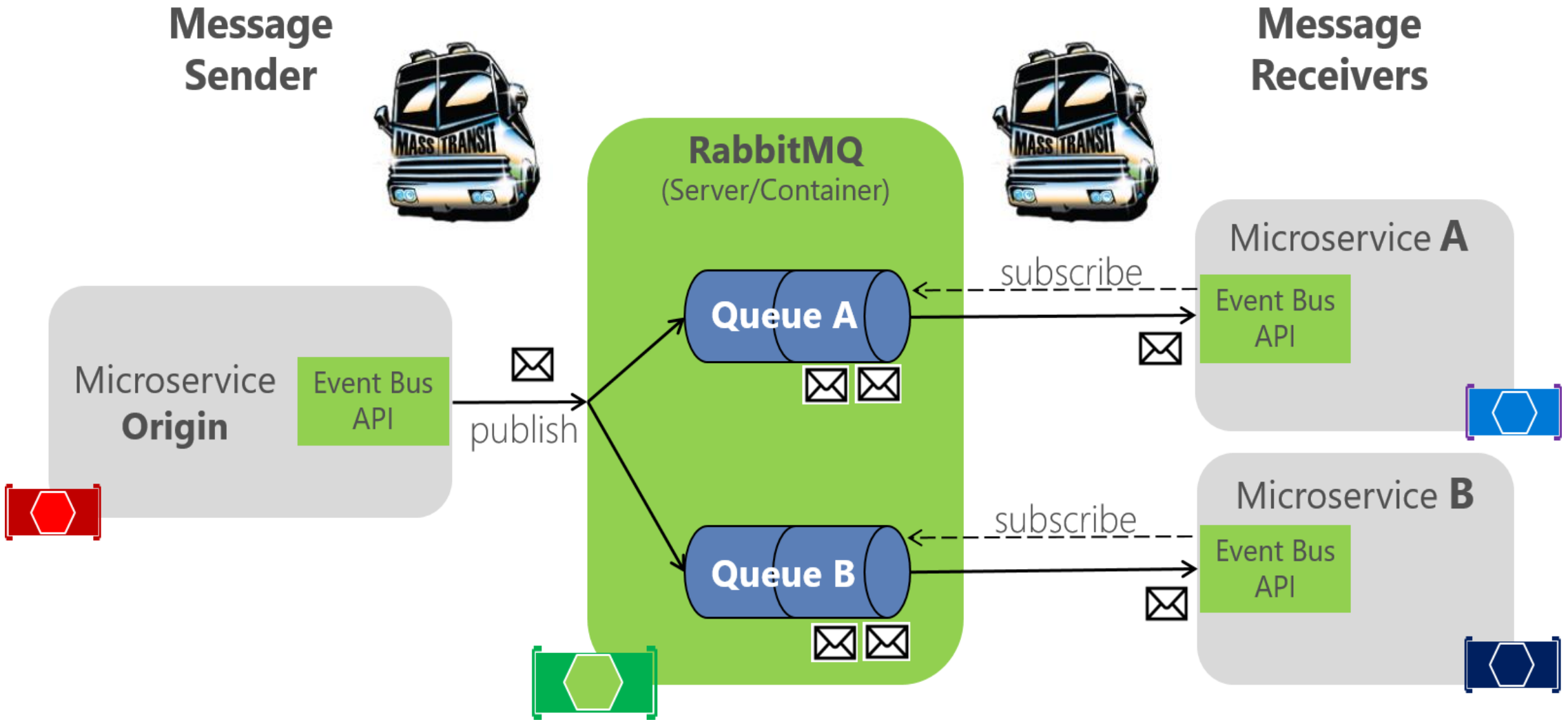
RabbitMQ Exchange Types



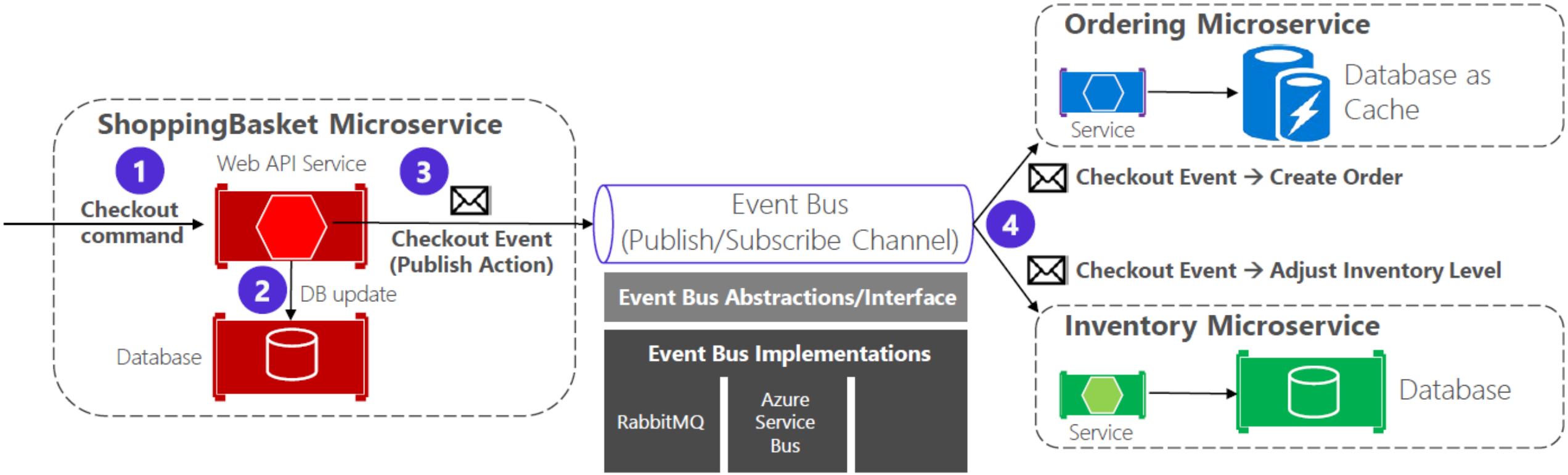
RabbitMQ Topic & Fanout Exchange Types



Analysis & Design RabbitMQ & BuildingBlocks EventBus.Messages



Publisher/Subscriber of BasketCheckout Event



RabbitMQ Nuget Packages

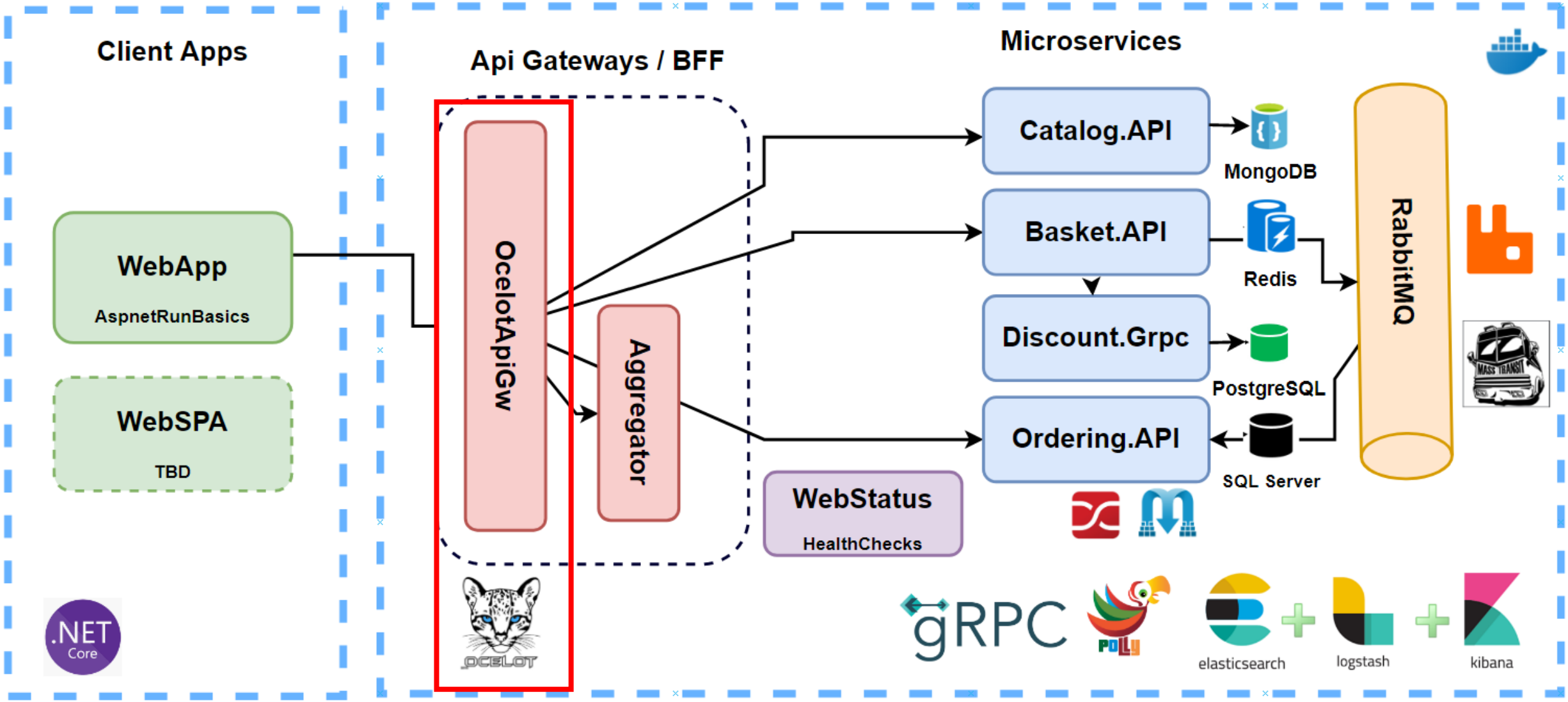
- Install-Package MassTransit
- Install-Package MassTransit.RabbitMQ
- Install-Package MassTransit.AspNetCore
- REST API principles, CRUD operations
- **Add Project Reference - EventBus.Messages**

RabbitMQ

Section 9
Building API Gateways with Ocelot

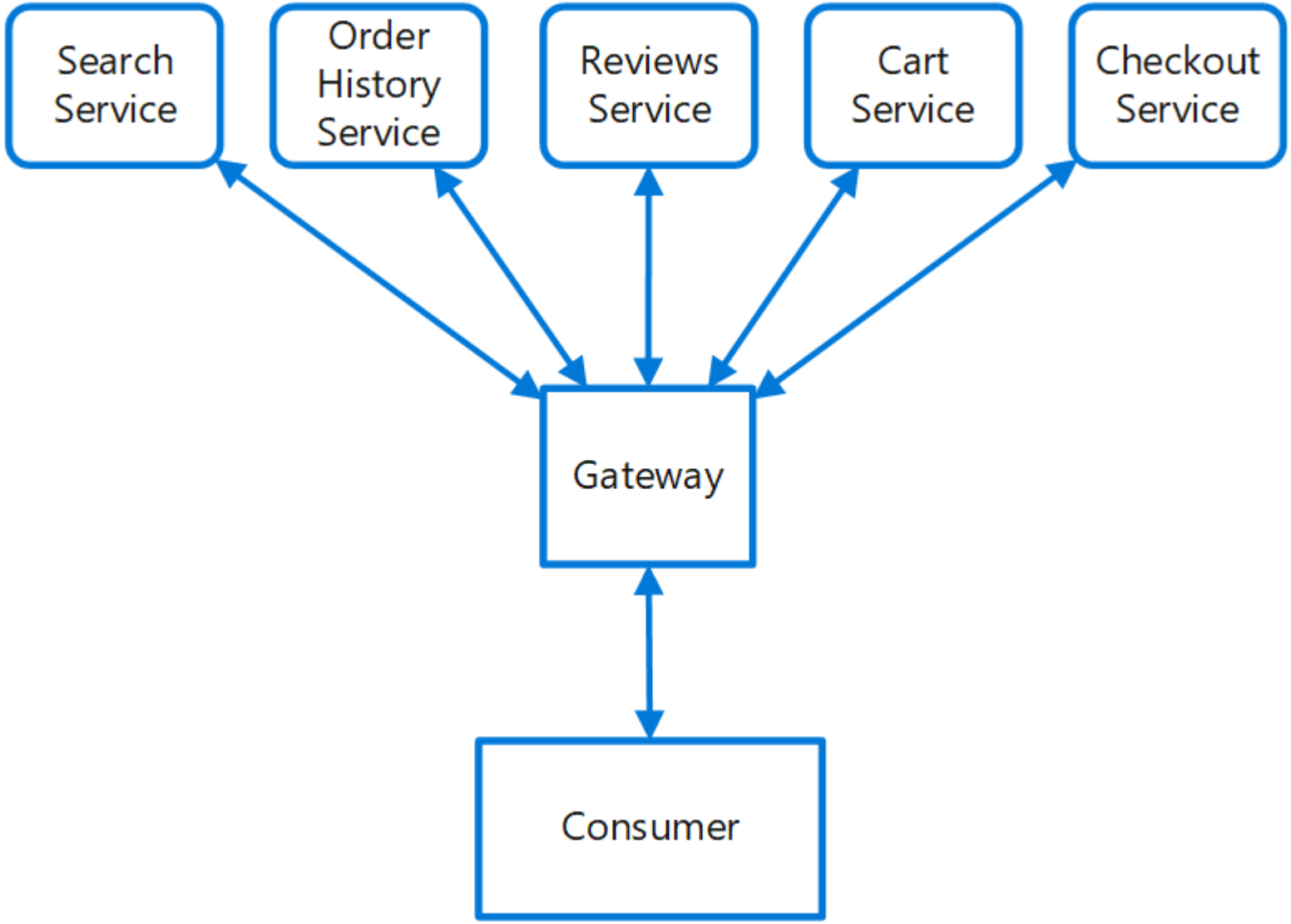
Applying Gateway Routing Pattern

Big Picture


Client Apps
WebApp
AspnetRunBasics
WebSPA
TBD
Api Gateways / BFF
OcelotApiGw
Aggregator
WebStatus
HealthChecks
Microservices
Catalog.API
MongoDB
Basket.API
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

Gateway Routing pattern

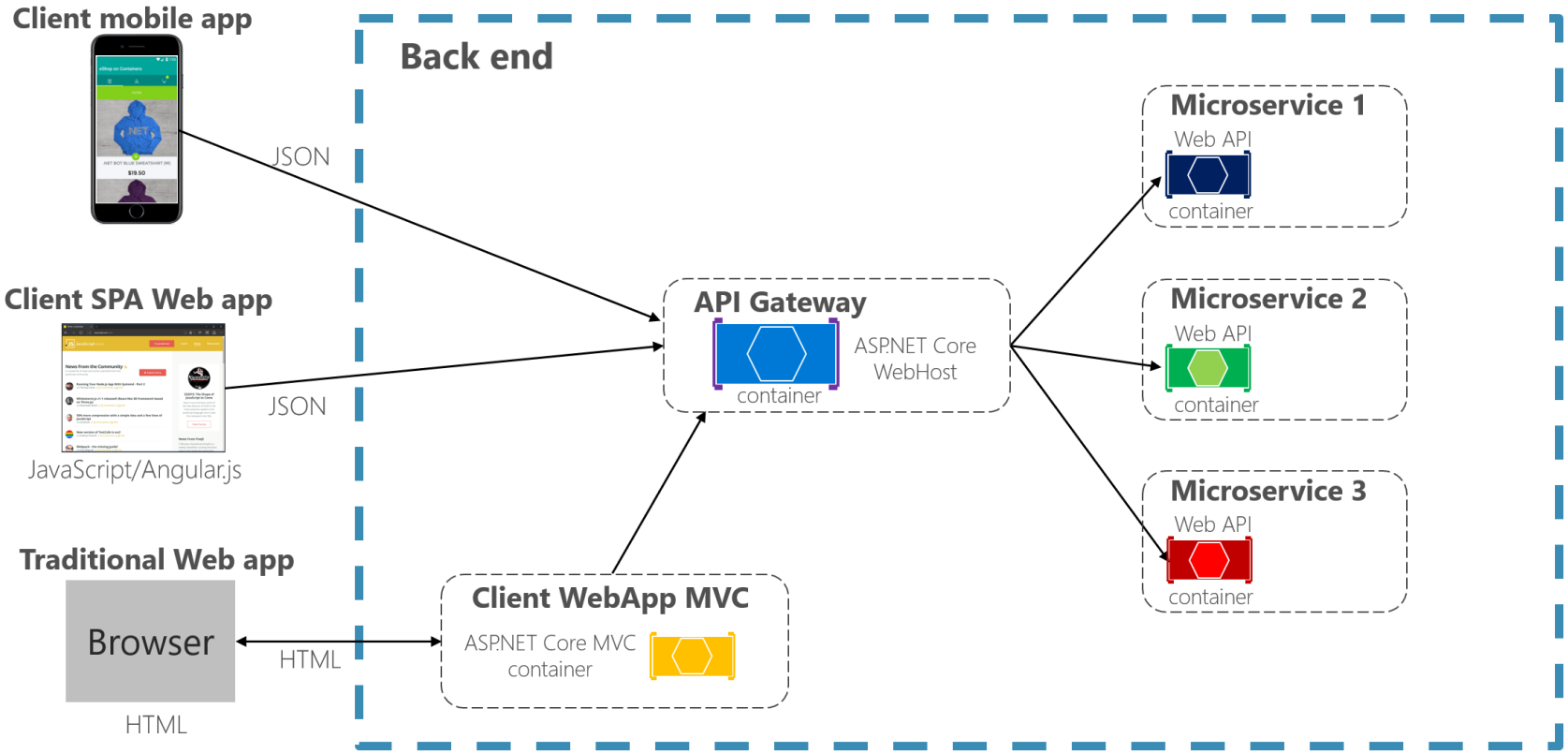
- Routing
- Data Aggregator
- Protocol Abstraction
- Centralized Error Management



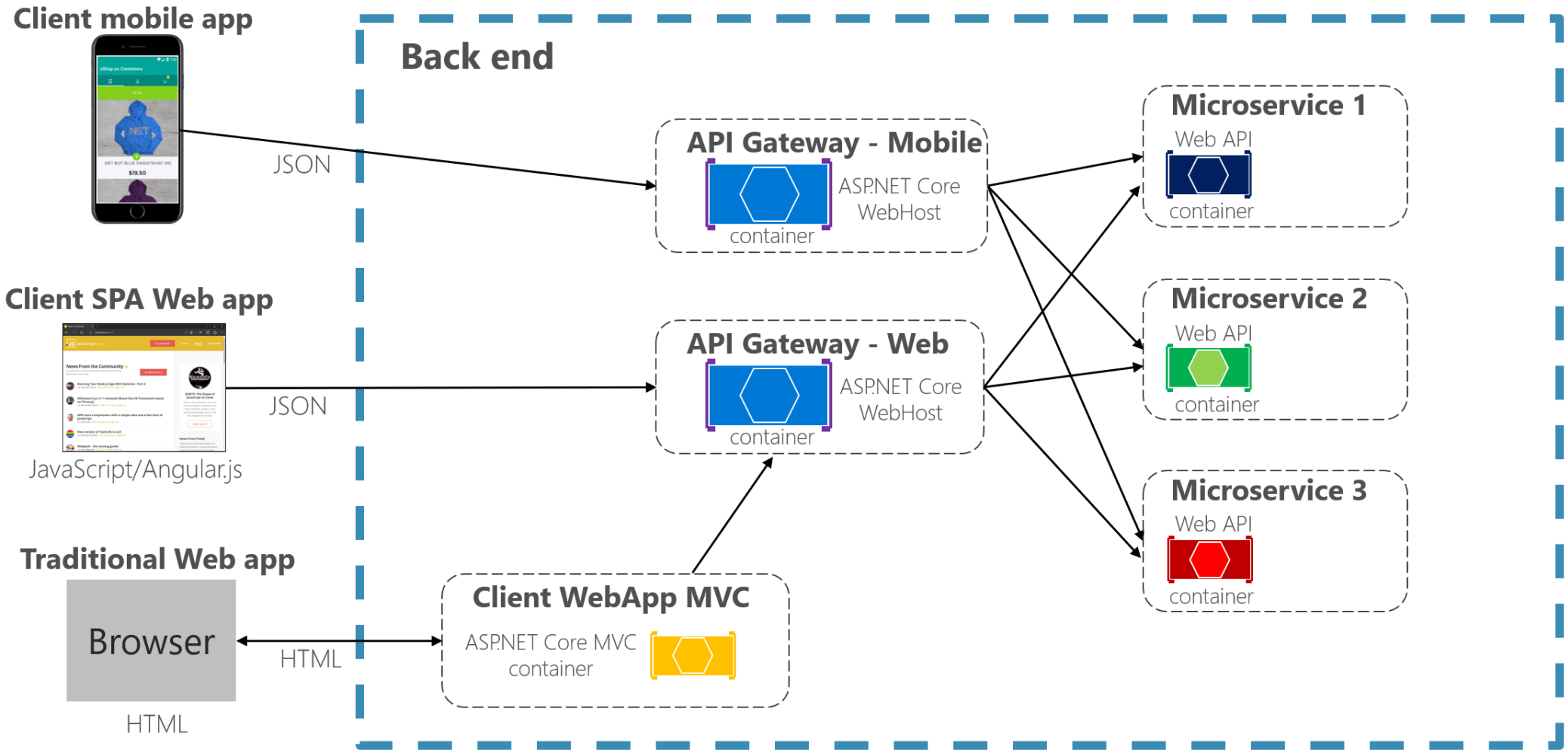
API Gateway Pattern

- Reverse proxy
- Gateway routing
- Requests aggregation
- Cross-cutting concerns or gateway offloading

Using a single custom **API Gateway service**



Using multiple **API Gateways / BFF**

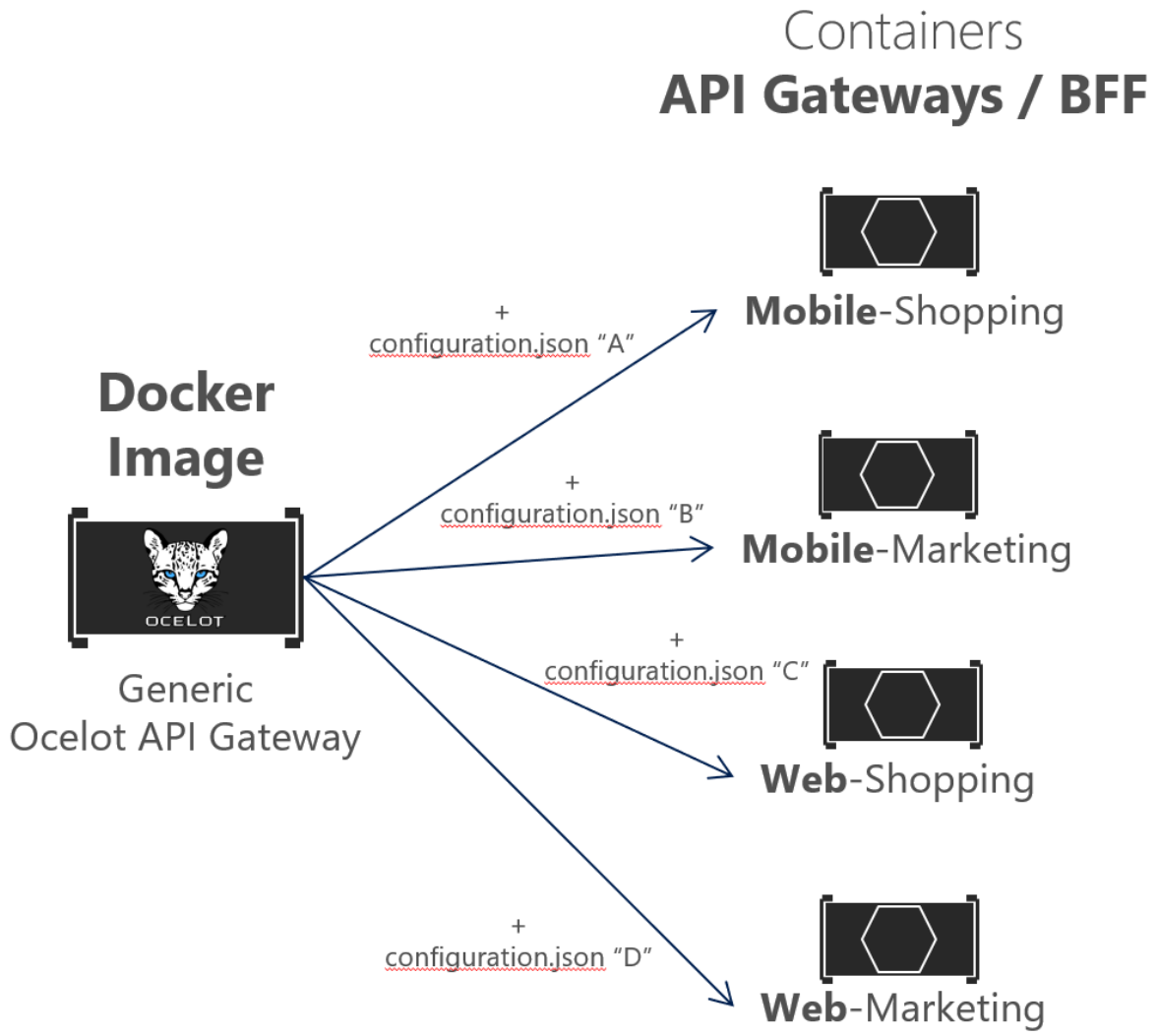


Main features in the API Gateway pattern

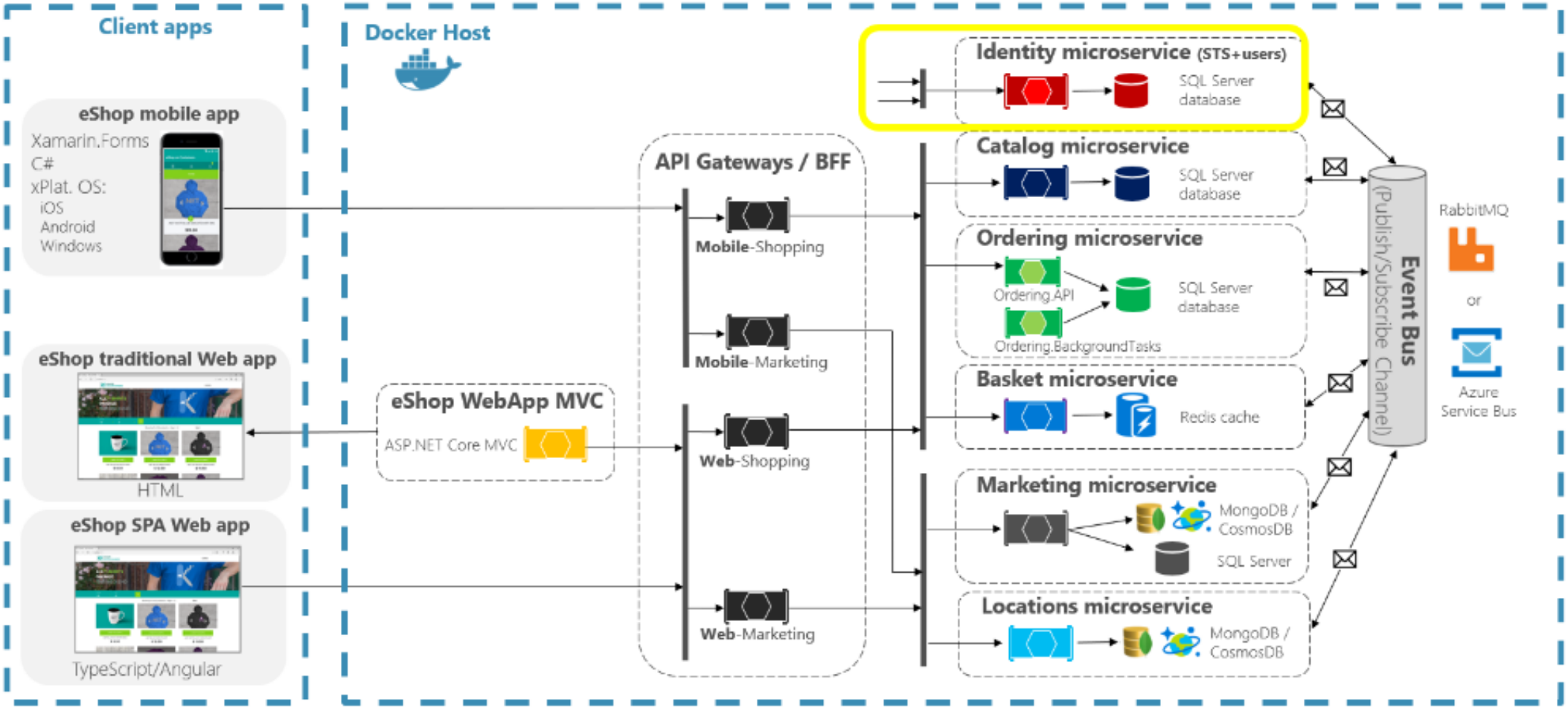
Ocelot Features	
Routing	Authentication
Request Aggregation	Authorization
Service Discovery with Consul & Eureka	Throttling
Load Balancing	Logging, Tracing
Correlation Pass-Through	Headers/Query String Transformation
Quality of Service	Custom Middleware

Ocelot API Gateway

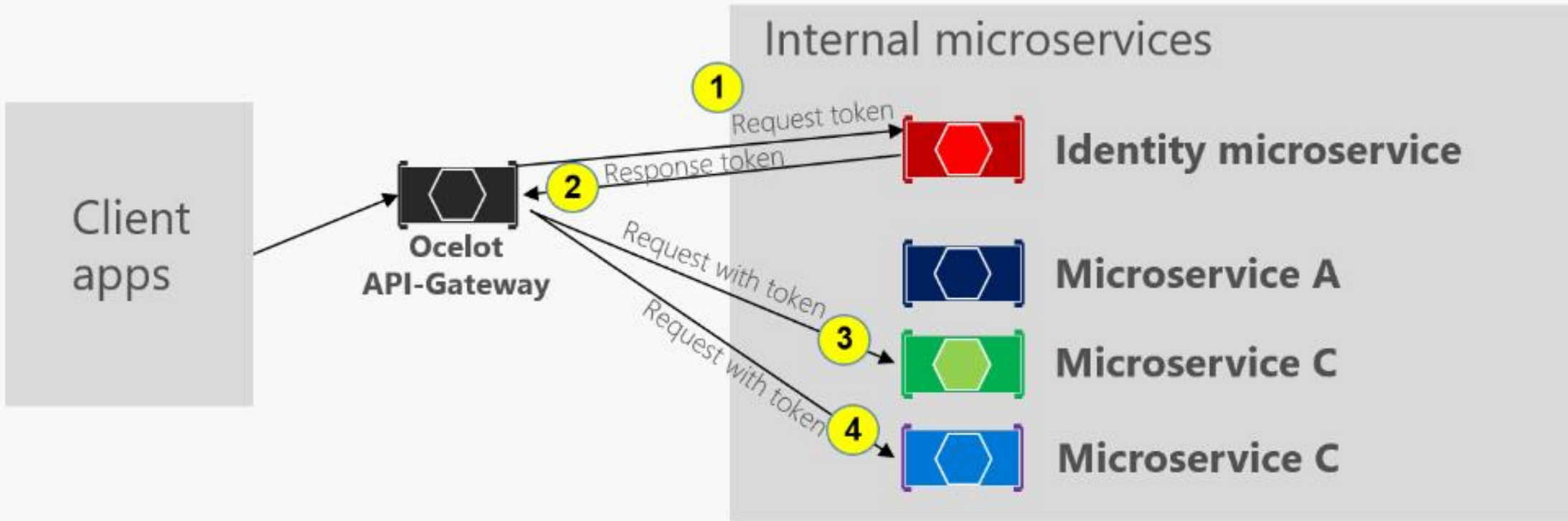
- Lightweight API Gateway
- .NET Core based API Gateway
- Open Source
- Fast & Scalable



Authentication and Authorization in Ocelot



Authentication in Ocelot API Gateway



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A starter kit for your next ASP.NET Core web application. Boilerplate for ASP.NET Core reference application, demonstrating a layered application architecture with applying Clean Architecture and D...

C# 223 55

run-aspnetcore-microservices

Microservices on .Net platforms which used Asp.Net Web API, Docker, RabbitMQ, MassTransit, Grpc, Ocelot API Gateway, MongoDB, Redis, PostgreSQL, SqlServer, Dapper, Entity Framework Core, CQRS and C...

C# 388 164

run-aspnetcore-realworld

E-Commerce real world example of run-aspnetcore ASP.NET Core web application. Implemented e-commerce domain with clean architecture for ASP.NET Core reference application, demonstrating a layered a...

SCSS 206 75

run-aspnet-identityserver4

Secure microservices with using standalone Identity Server 4 and backing with Ocelot API Gateway. Protect our ASP.NET Web MVC and API applications with using OAuth 2 and OpenID Connect in IdentityS...

C# 35 17

run-aspnet-grpc

Using gRPC in Microservices for Building a high-performance Interservice Communication with .Net 5. See gRPC Microservices and Step by Step Implementation on .NET Course w/ discount->

C# 33 10

run-devops

Deploying .Net Microservices into Kubernetes, and moving deployments to the cloud Azure Kubernetes Services (AKS) with using Azure Container Registry (ACR) and how to Automating Deployments with Az...

C# 4 7

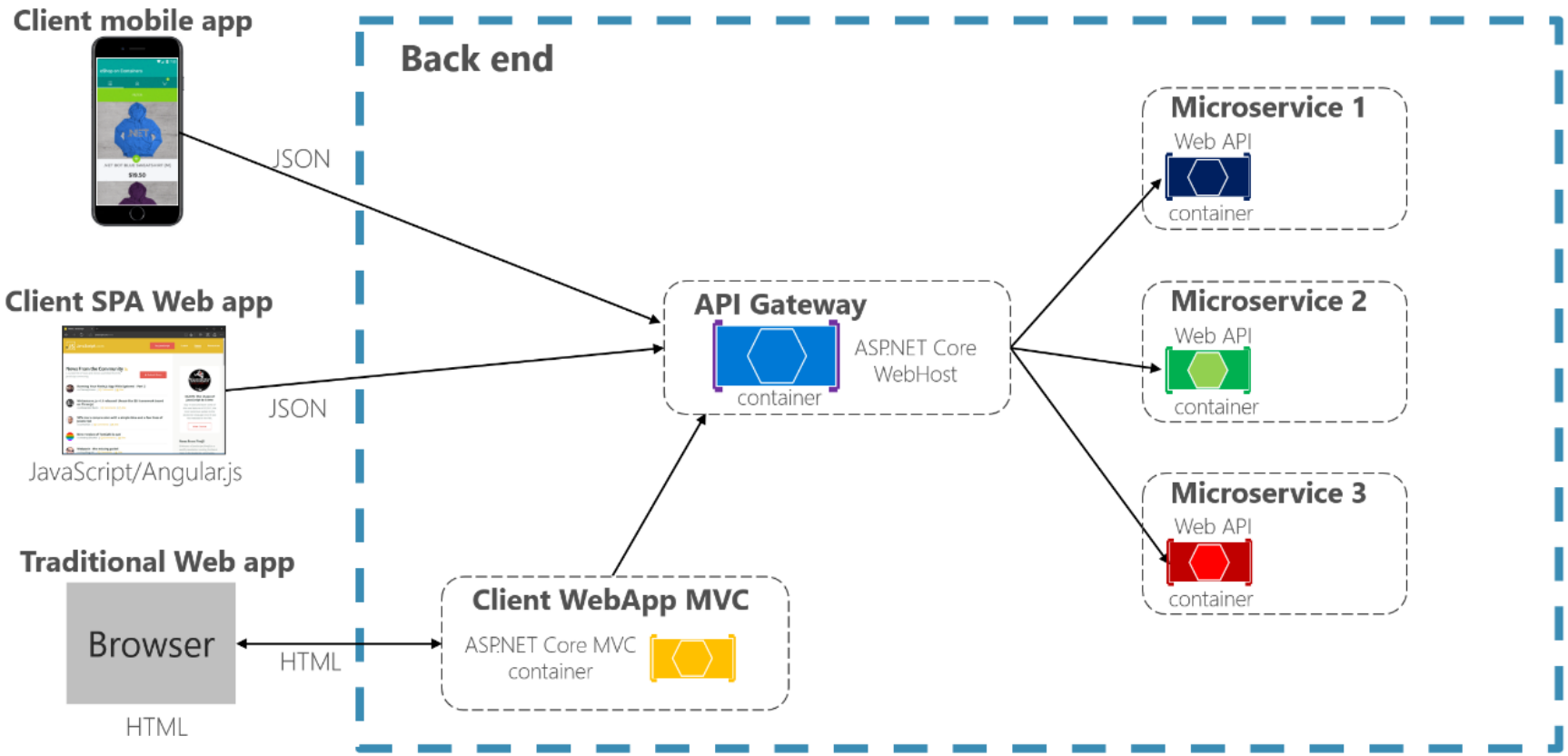
Analysis & Design of API Gateway

- Route Catalog APIs with /Catalog path
- Route Basket APIs with /Basket path
- Route Ordering APIs with /Ordering path

Method	Request URI	Use Case
GET/POST	/Catalog	Route /api/v1/Catalog apis
GET	/Catalog/{id}	Route /api/v1/Catalog apis
GET/POST	/Basket	Basket /api/v1/Basket apis
POST	/Basket/Checkout	Basket /api/v1/Basket apis
GET	/Order	Order /api/v1/Order apis

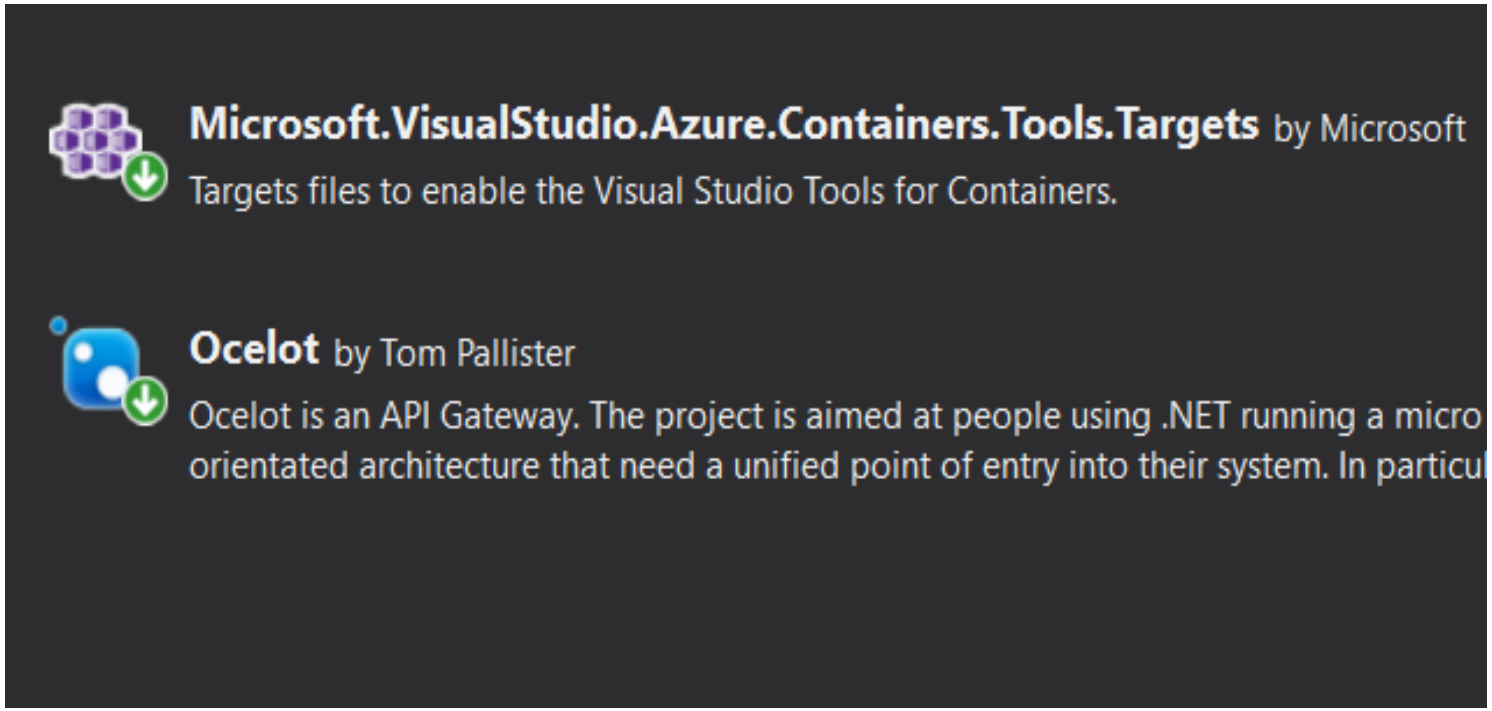
Architecture of API Gateway Microservices

Using a single custom **API Gateway service**



Nuget Packages of API Gateway

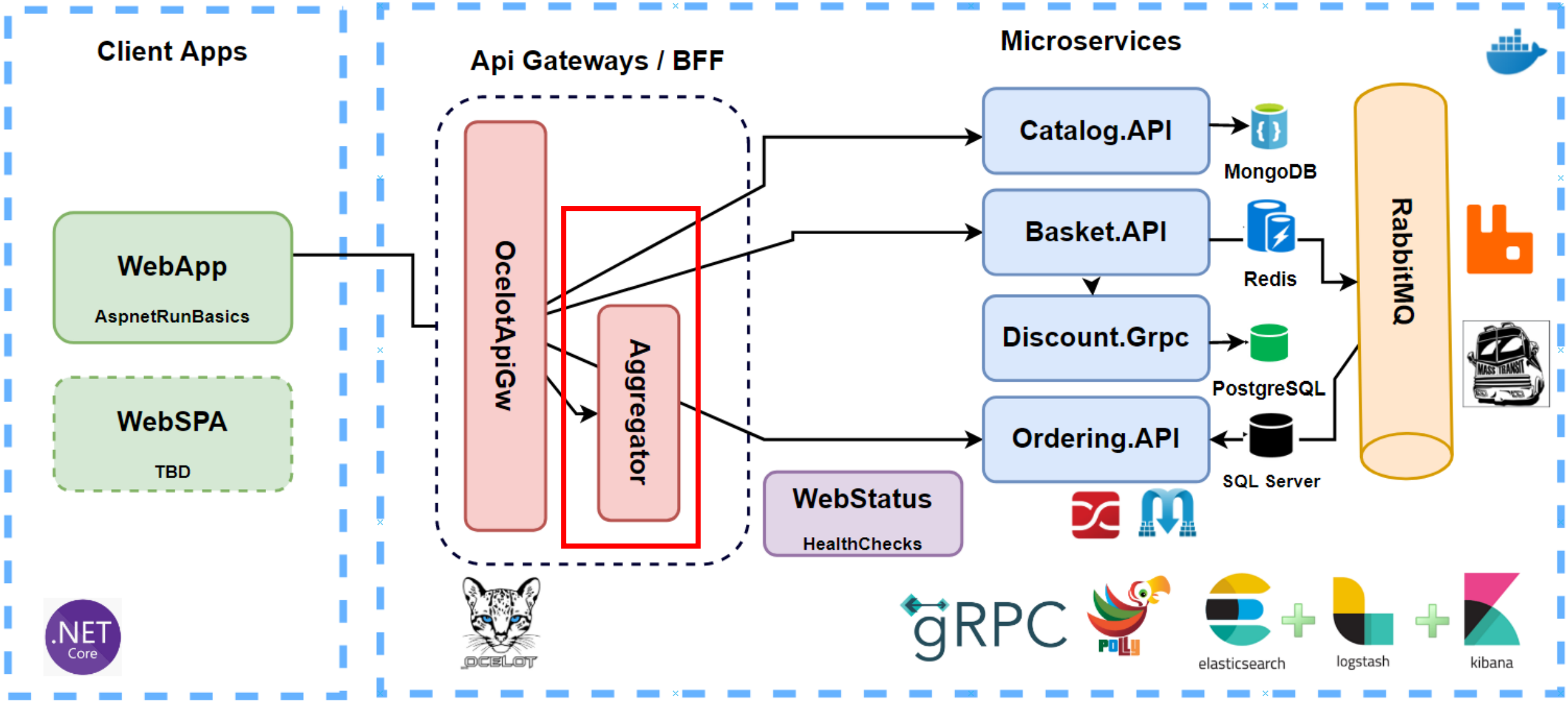
- Ocelot Nuget Package



Section 10
Api Gateway - Requests Aggregation Pattern

Developing Shopping.Aggregator

Big Picture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OcelotApiGw
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WebStatus
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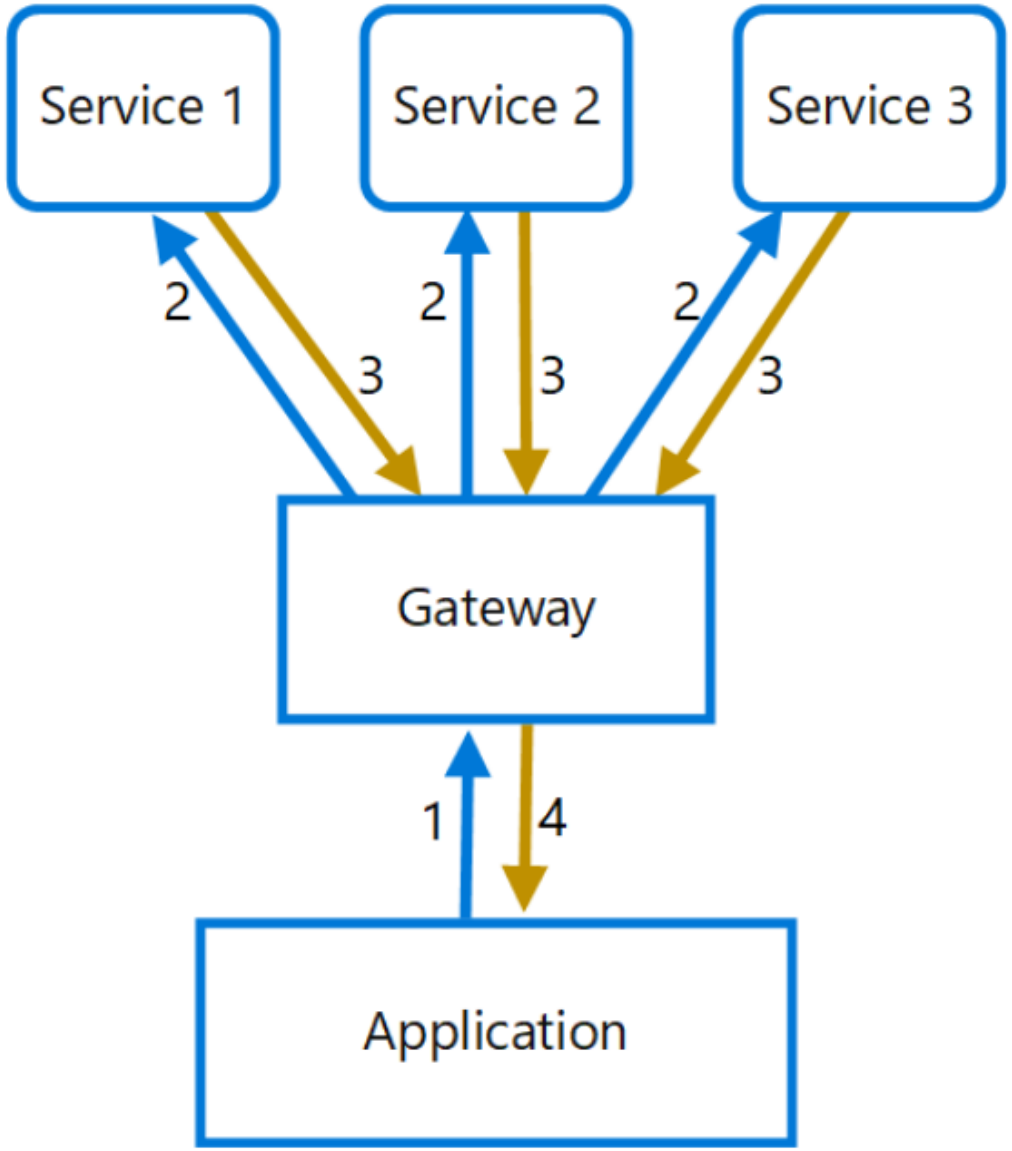
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
OCELOT
gRPC
POLLY
elasticsearch
logstash
kibana

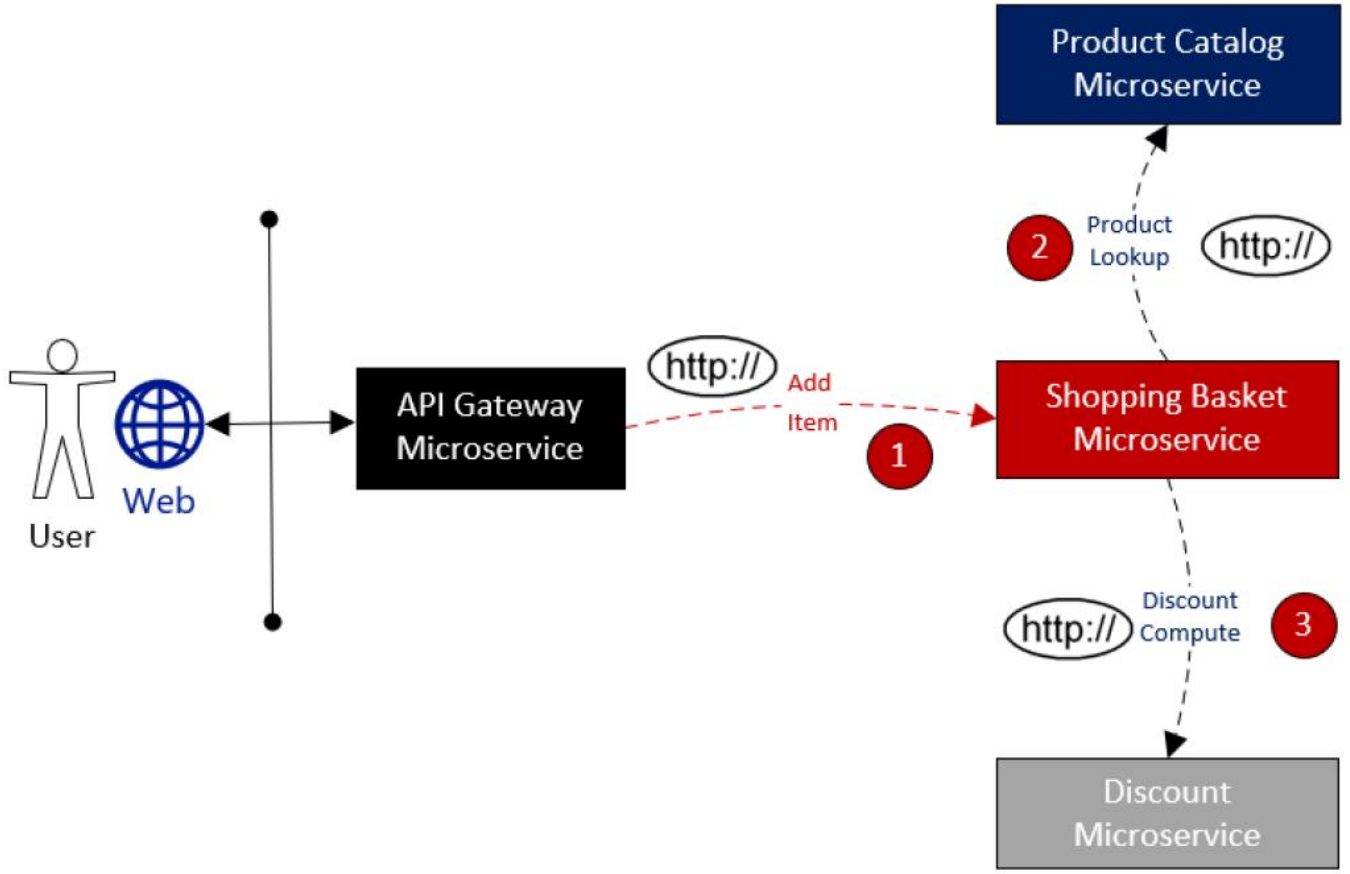
Gateway Aggregation pattern

- Single request
- Multiple calls to different backend systems
- Dispatches requests to the various backend systems
- Reduce chattiness between the client and the services



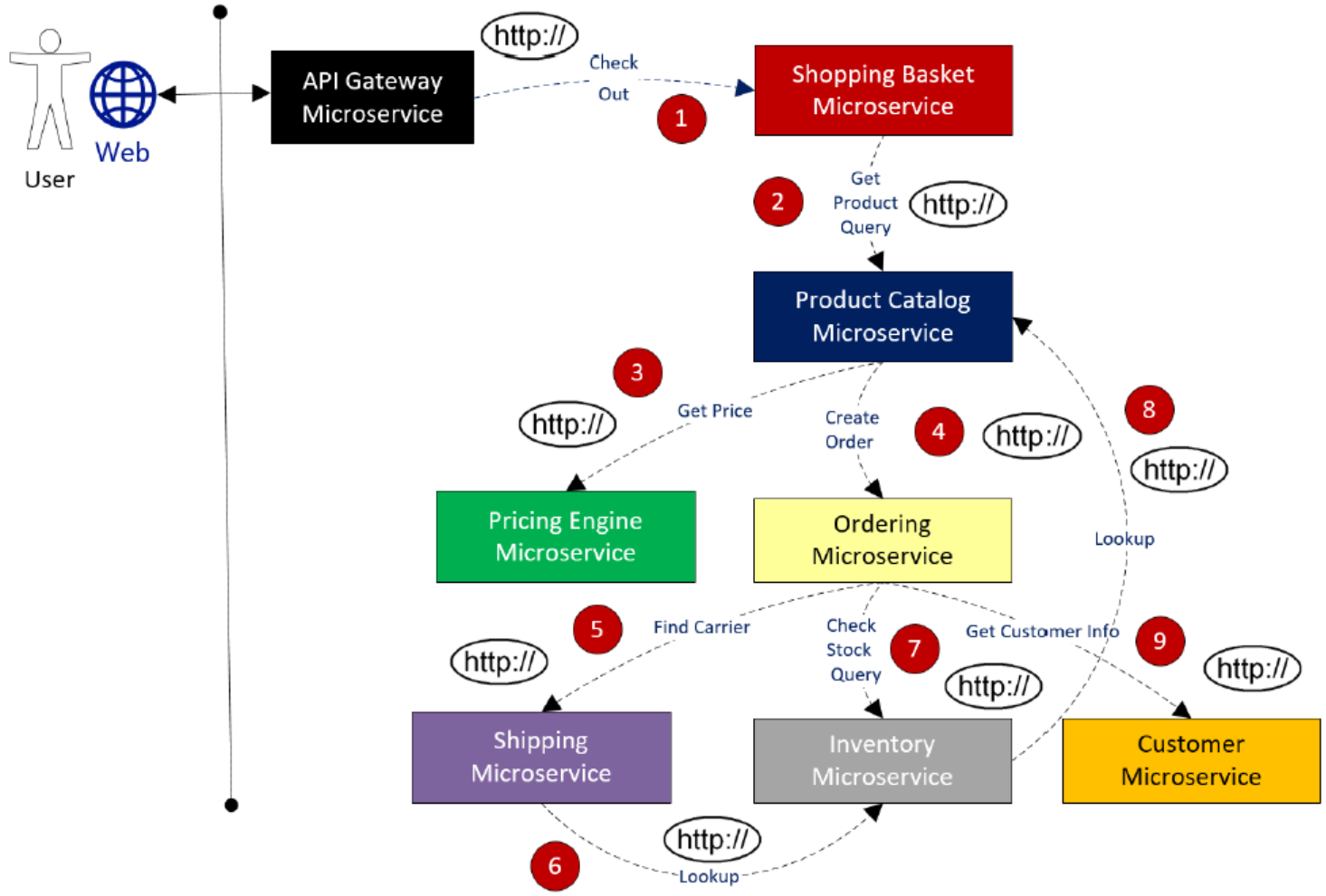
Direct Synchronous Communication

- Impact performance – each call adds latency
- •Impact reliability –an unresponsive service can impact entire operation

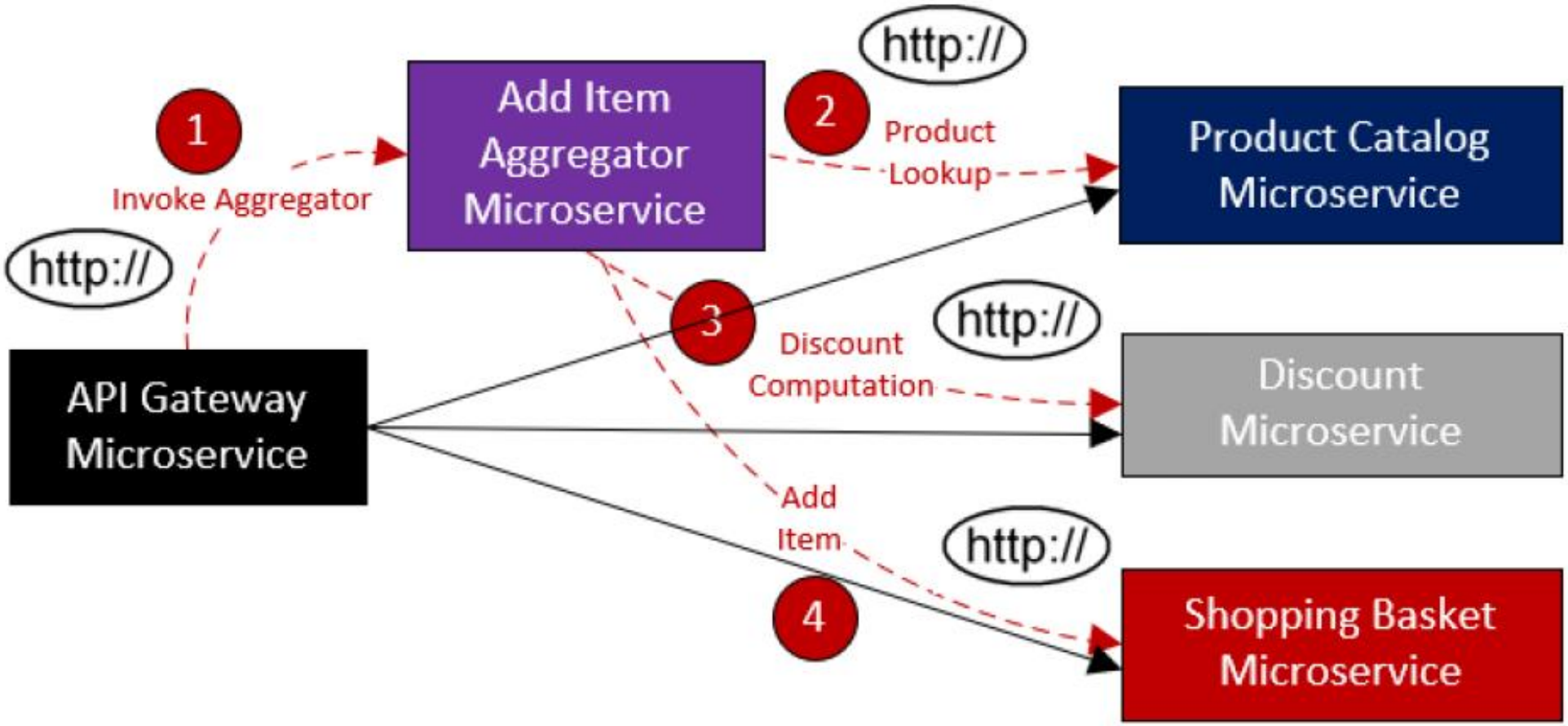


Chaining HTTP Calls

- Deep chaining or nesting of HTTP calls - simple to implement, but an antipattern

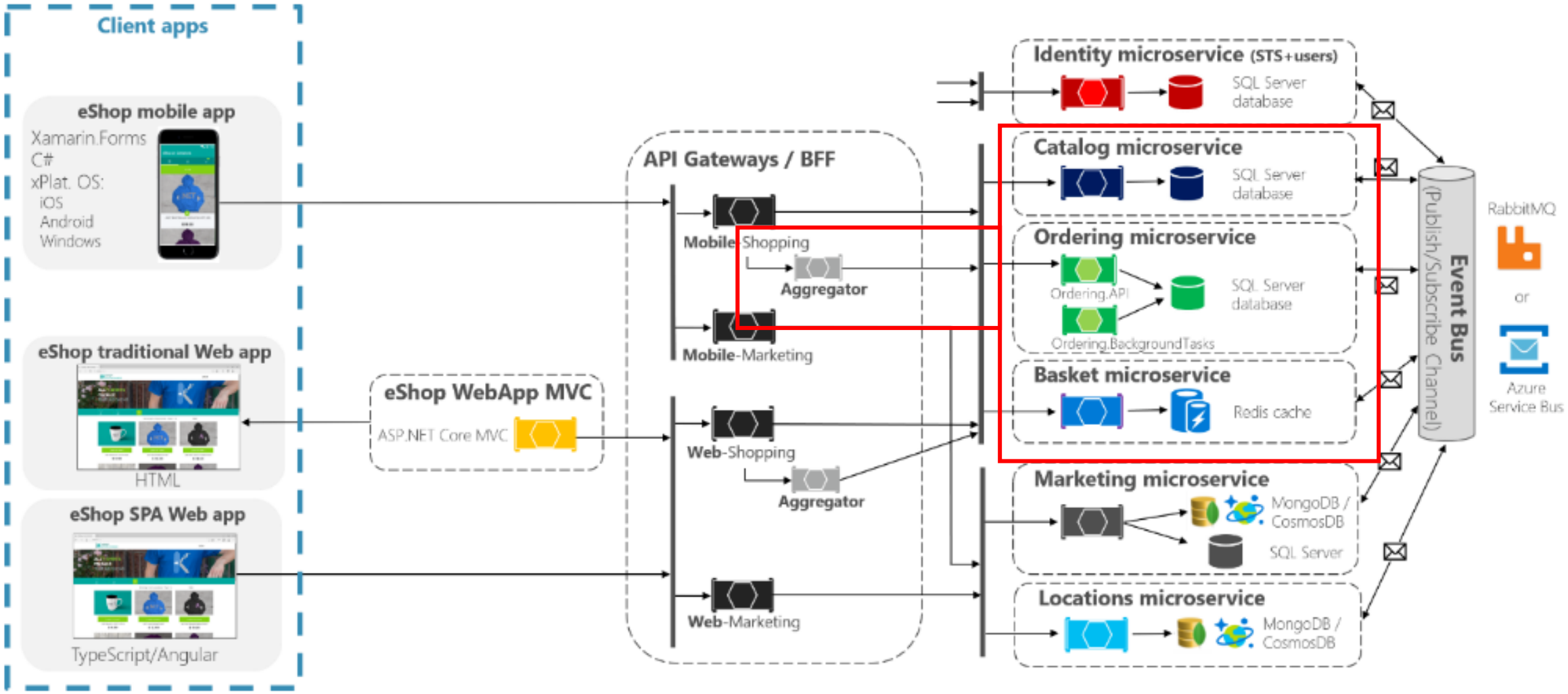


Gateway Aggregation pattern



Architecture of Shopping.Aggregator

(API Gateways / BFF and Aggregator-services details)

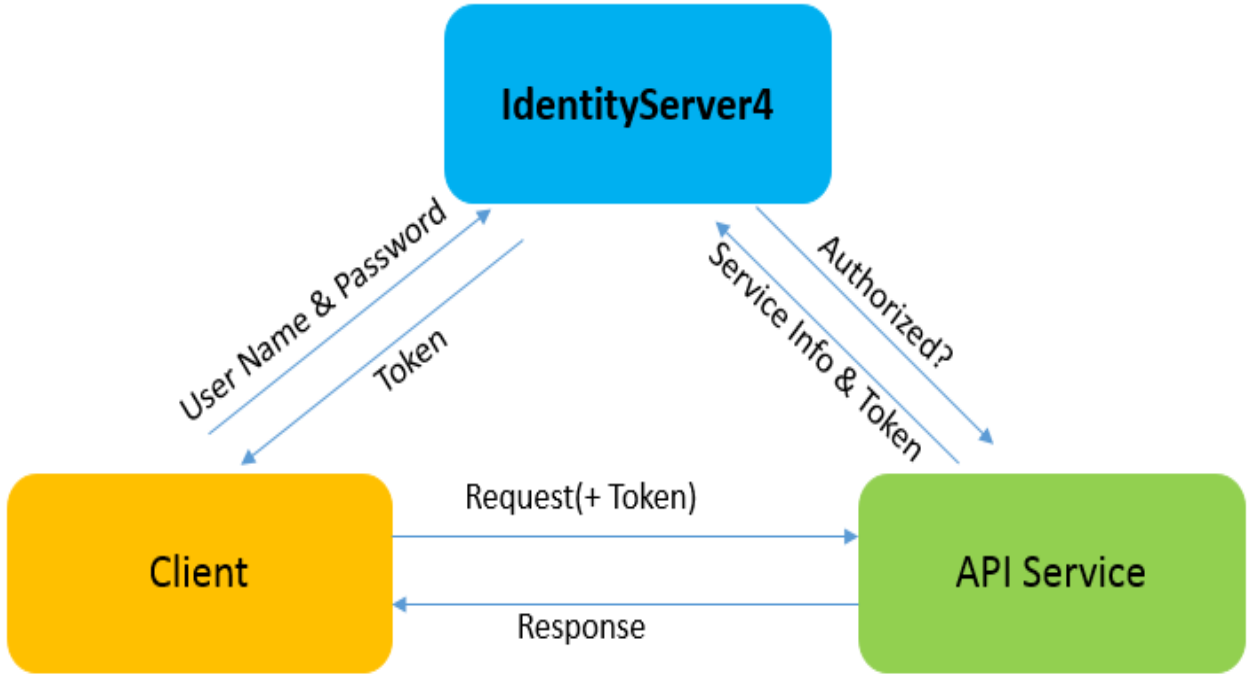


Section 11
Securing Microservices with IdentityServer4 and Ocelot

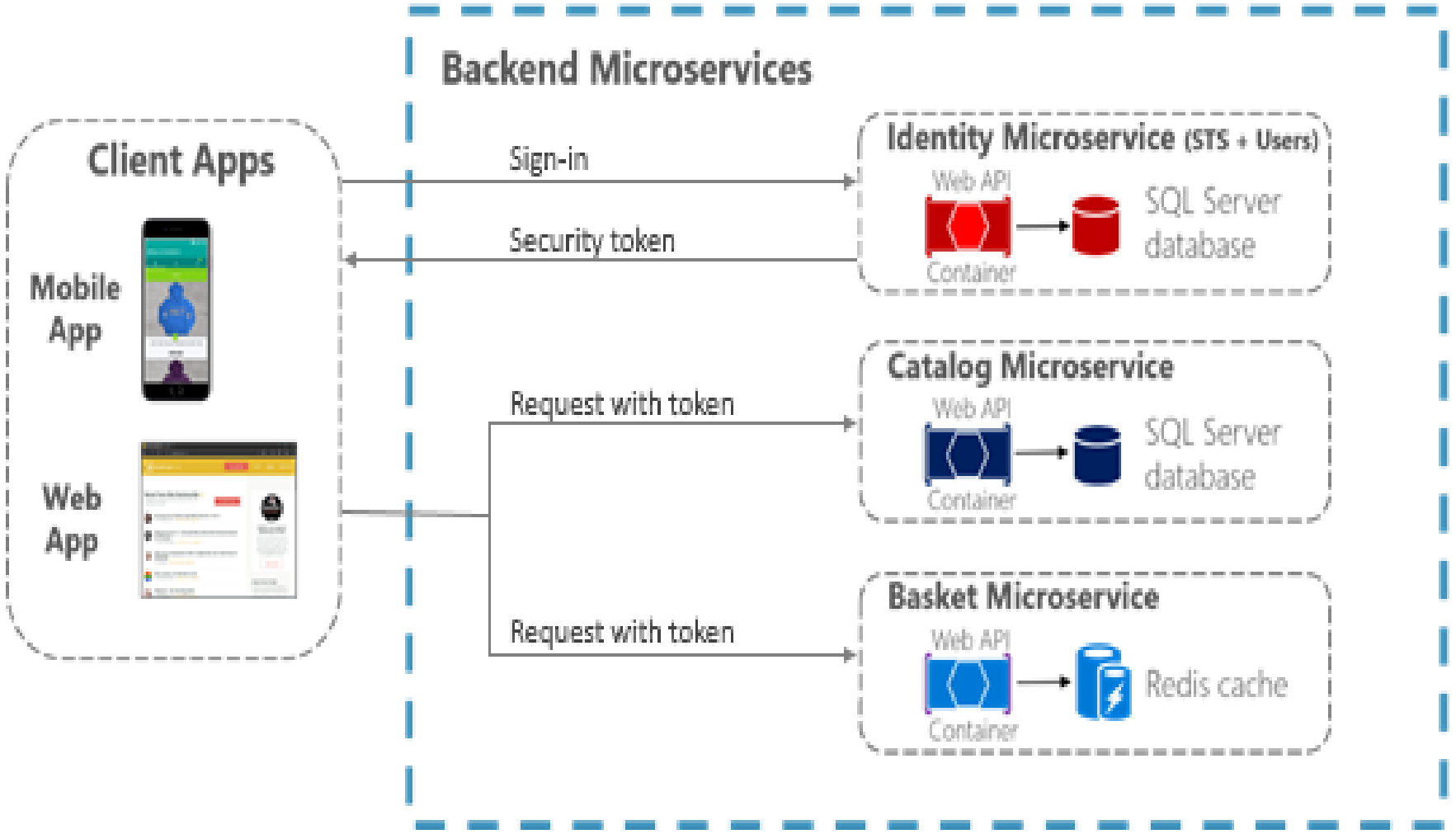
Cross-Cutting Concerns of Security

Microservices Security with IdentityServer4

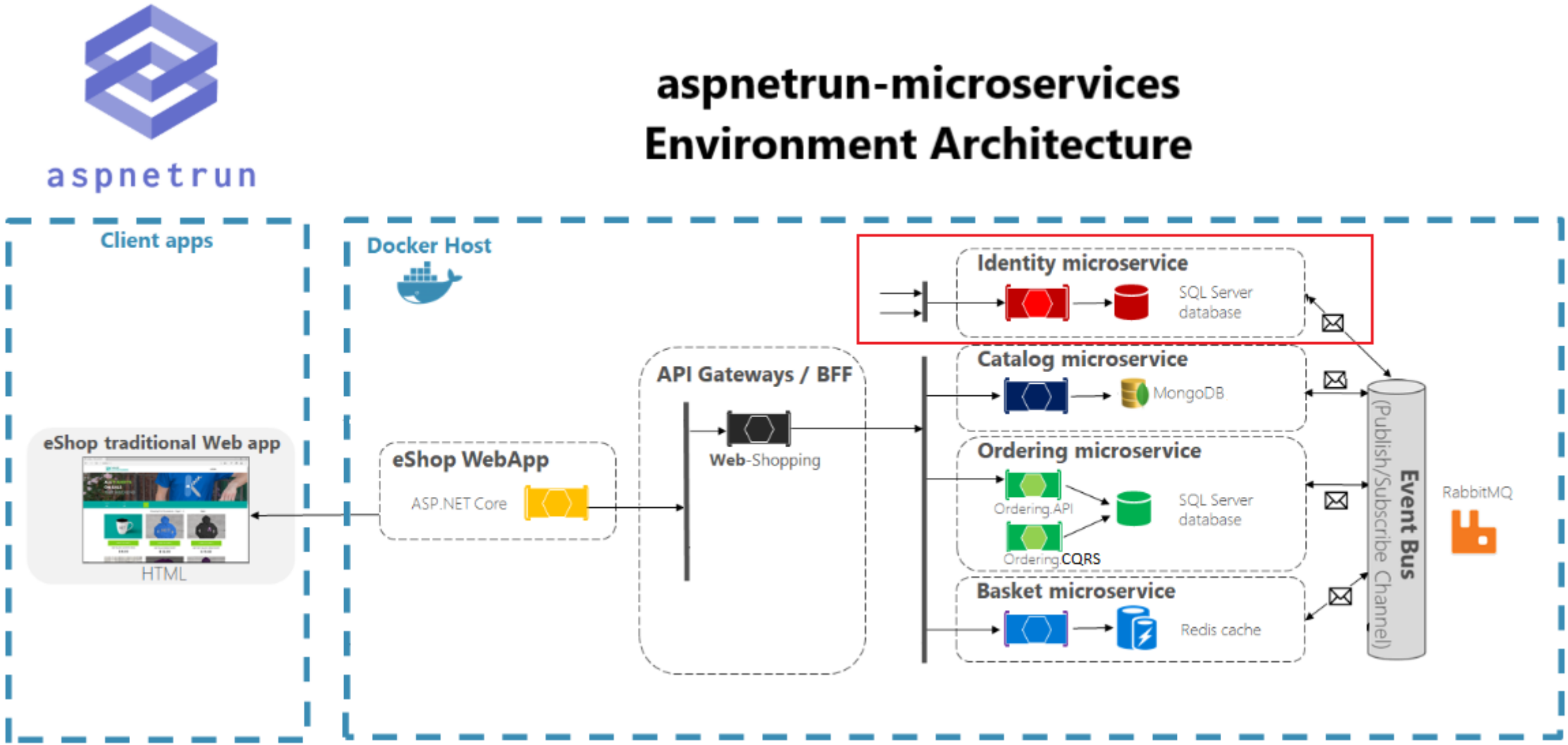
- IdentityServer4 - Authentication as a Service
- Protected API Resources with OAuth 2.0
- OpenID Connect for MVC Interactive Client Apps
- Backing with Ocelot API Gateway



Identity Server 4 in Microservices World



Identity Server in Microservices Architecture



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run-aspnetcore-realworld

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run-aspnet-grpc

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run-devops

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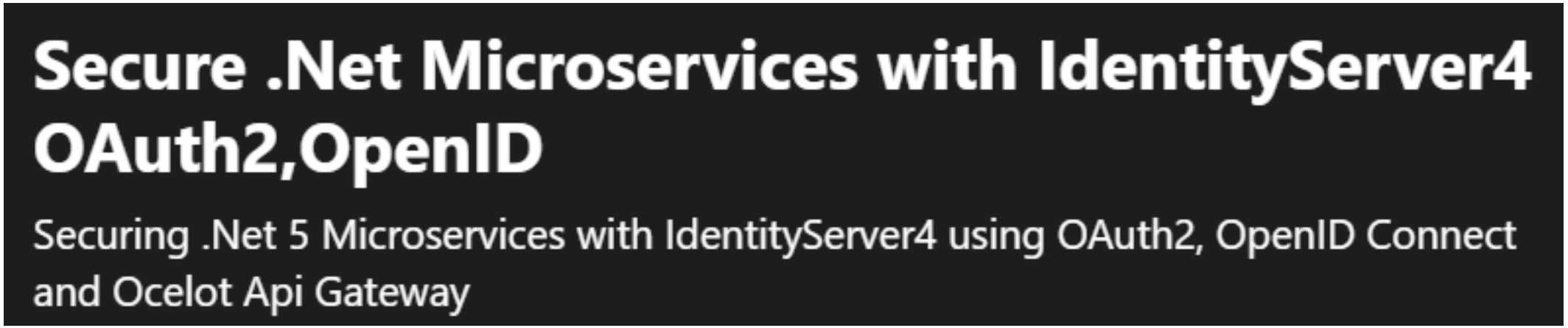
Securing Microservices with IdentityServer4 and Ocelot

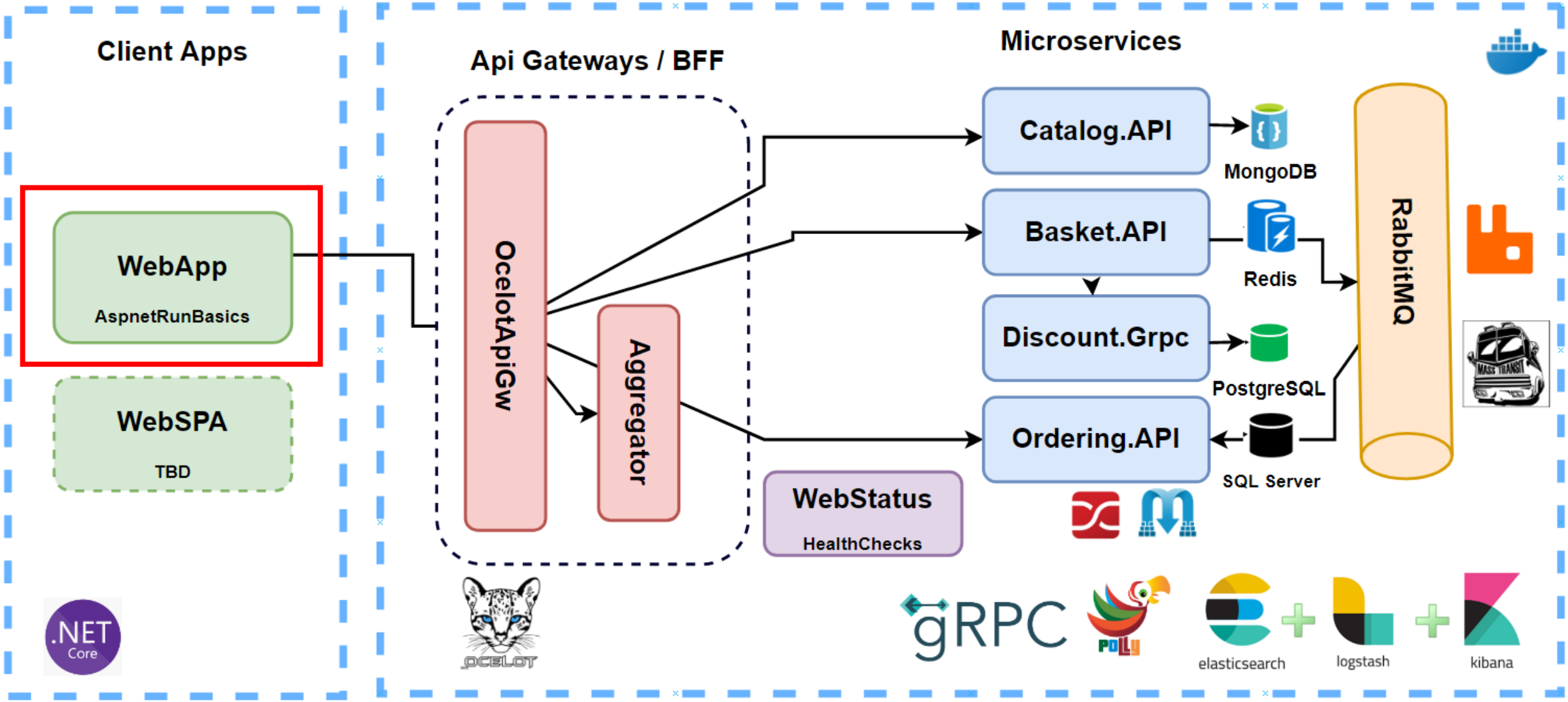


- Github Repository -> https://github.com/aspnetrun/run-aspnet-identityserver4

Section 12
Building Shopping Web Application Microservices

With AspnetBasics repository

Big Picture


Client Apps
WebApp
AspnetRunBasics
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TBD
Api Gateways / BFF
OcelotApiGw
Aggregator
WebStatus
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Microservices
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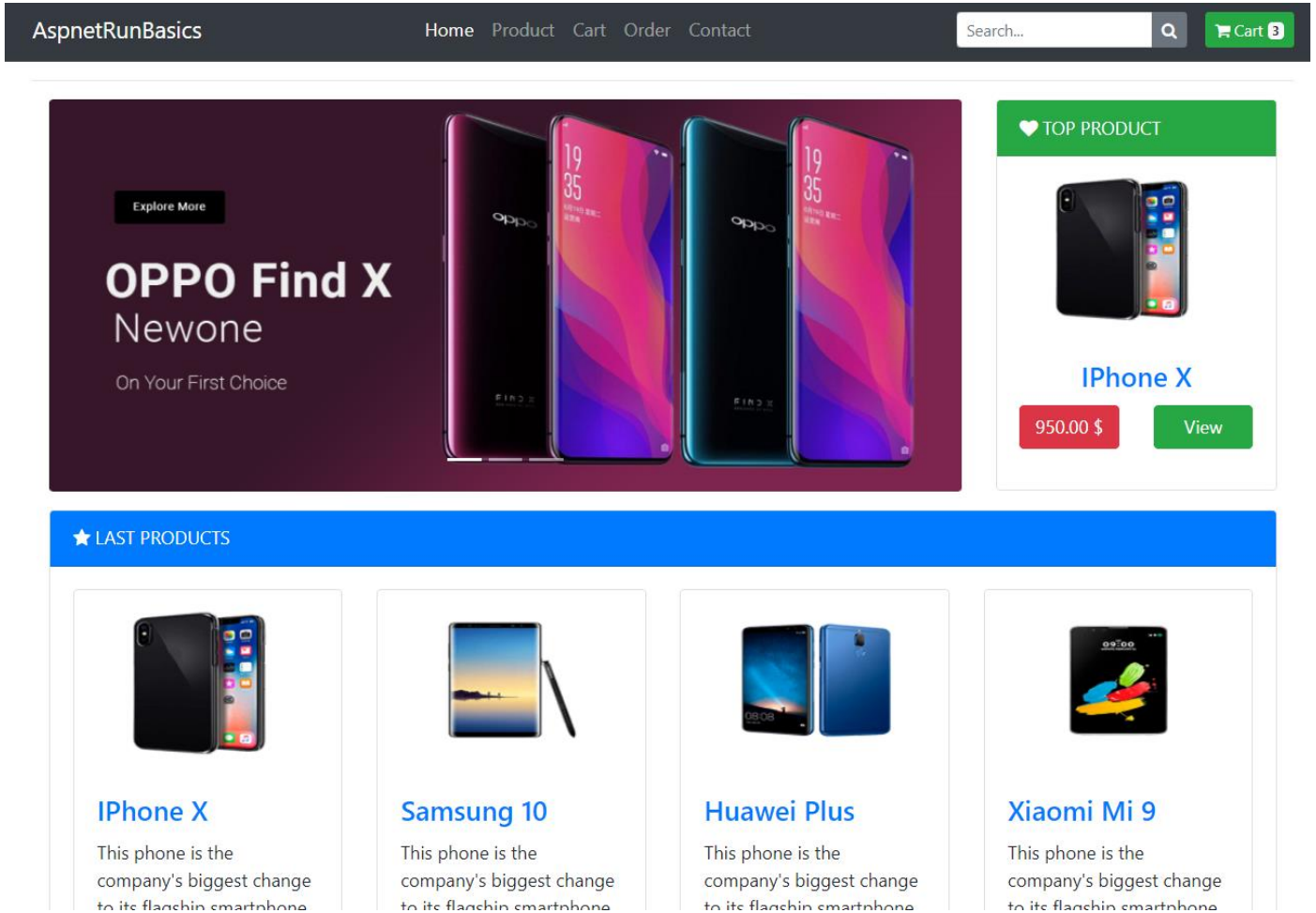
MongoDB
Basket.API
Redis
Discount.Grpc
PostgreSQL
Ordering.API
SQL Server
RabbitMQ
.NET Core
gRPC
elasticsearch
logstash
kibana

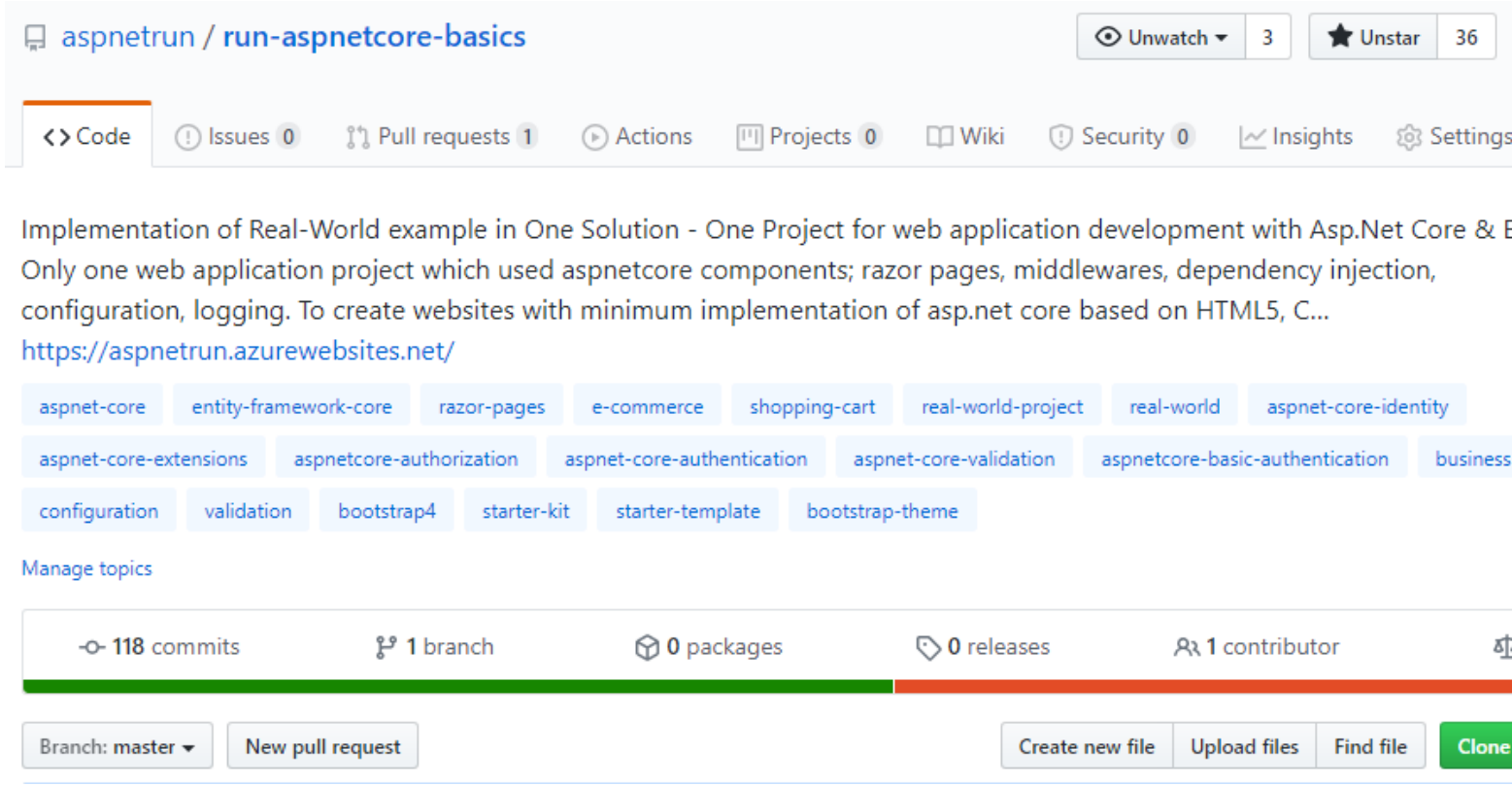
Shopping Web Application Microservices

- Default Web Application
- Razor Templates
- HttpClientFactory
- Consume Ocelot API Gateway



Base Repository of Shopping App

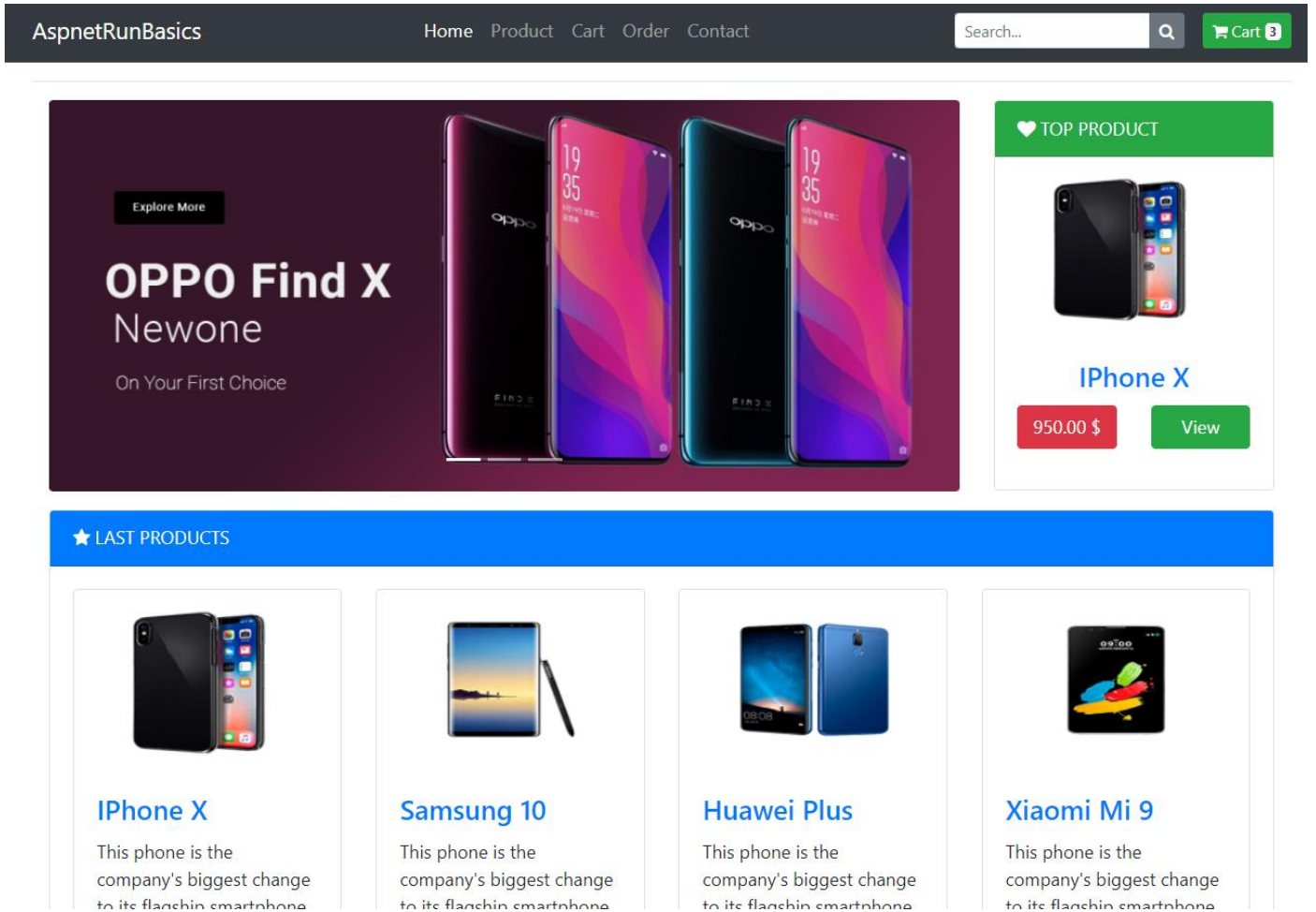
- Base Application
- Github Repository of aspnetcore-basics
- Razor Pages
- Bootstrap4



https://github.com/aspnetrun/run-aspnetcore-basics

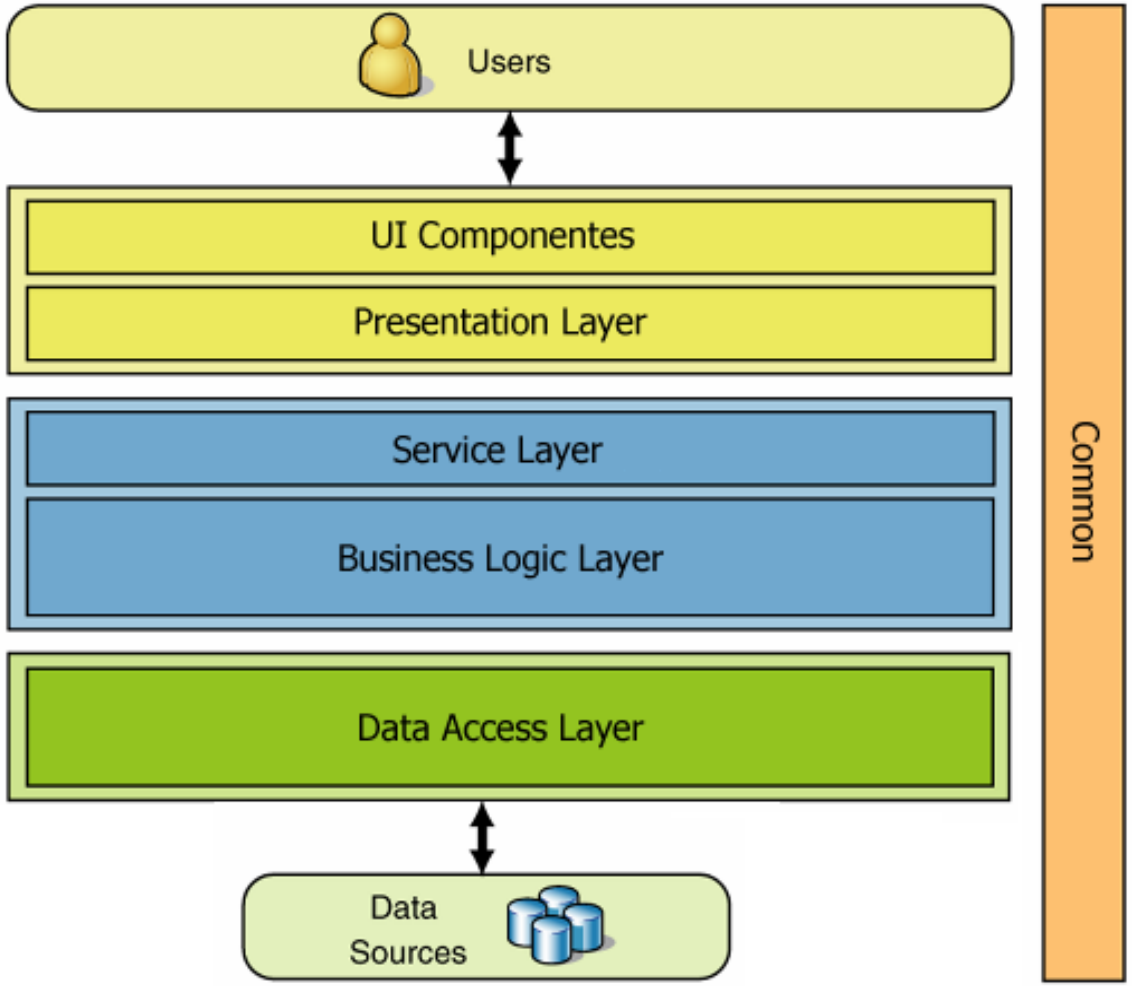
Analysis & Design of Shopping Web App

- Listing Products and Categories
- Add Product to Shopping Cart
- Checkout Order



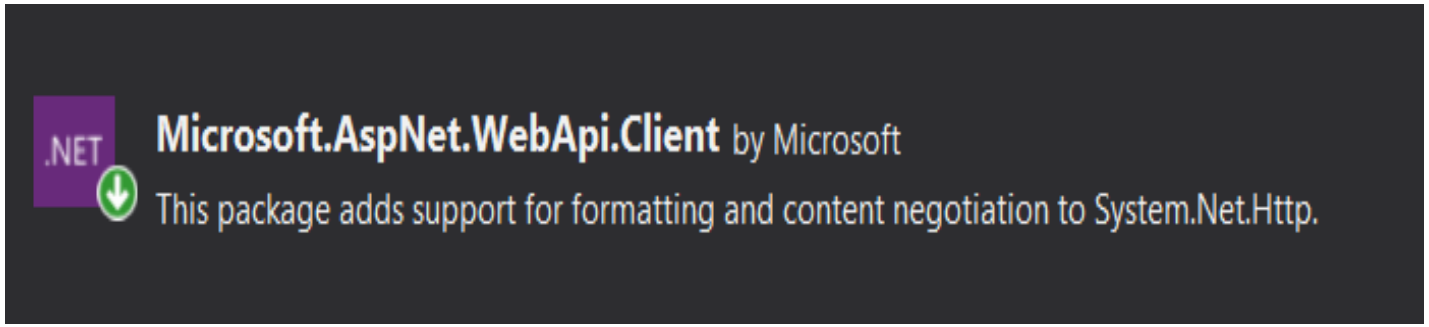
Shopping Microservices Archictecture

- Data Access Layer
- Business Logic Layer
- Presentation Layer



Nuget Packages of Shopping Microservices

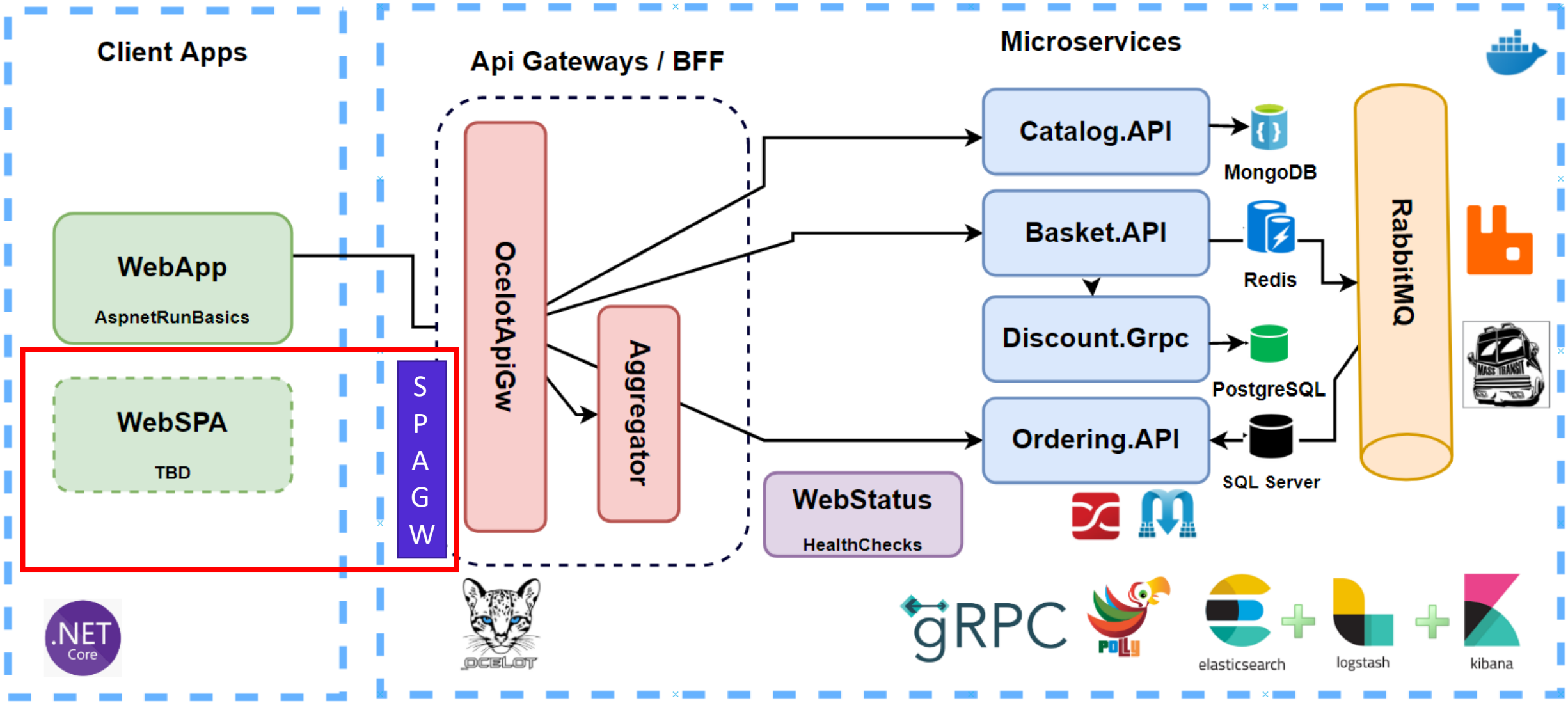
- WebApi.Client
- HTTPClientFactory



Section 13
Assignment - Developing Blazor Single Page Application with Custom Api Gateway

for performing CRUD Operations over Catalog, Discount, Basket and Ordering microservices

Big Picture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OcelotApiGw
Aggregator
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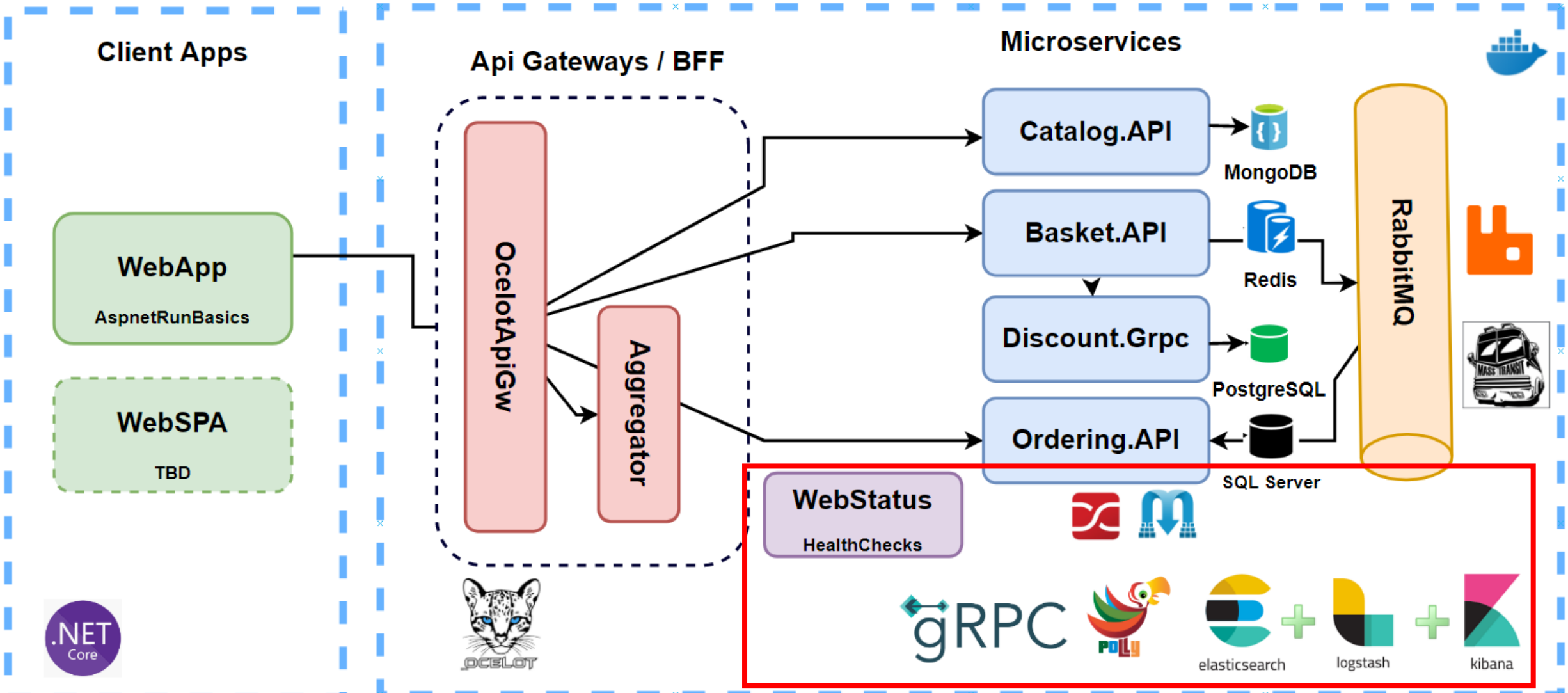
Catalog.API
Basket.API
Discount.Grpc
Ordering.API
MongoDB
Redis
PostgreSQL
SQL Server
RabbitMQ
.NET Core
OCELOT
gRPC
POLLY
elasticsearch
logstash
kibana

Section 14
Cross-Cutting Concerns - Microservices Observability with Distributed Logging

And Health Monitoring, Resilient and Fault Tolerance with using Polly

Big Picture


Client Apps
WebApp
AspnetRunBasics
WebSPA
TBD
Api Gateways / BFF
OcelotApiGw
Aggregator
Microservices
Catalog.API
MongoDB
Basket.API
Redis
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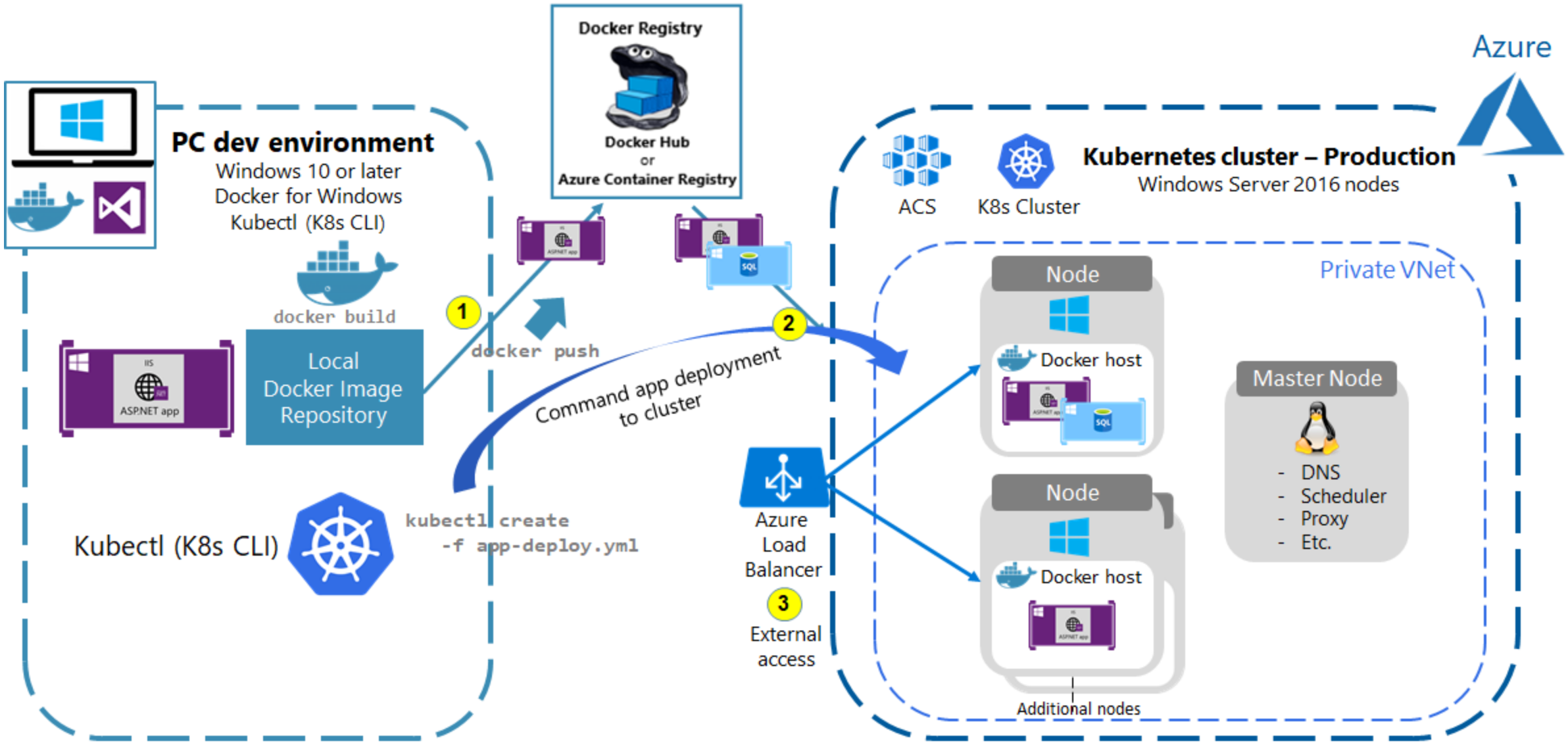
Section 15
Deploying Microservices to Kubernetes, Automating with Azure DevOps into AKS

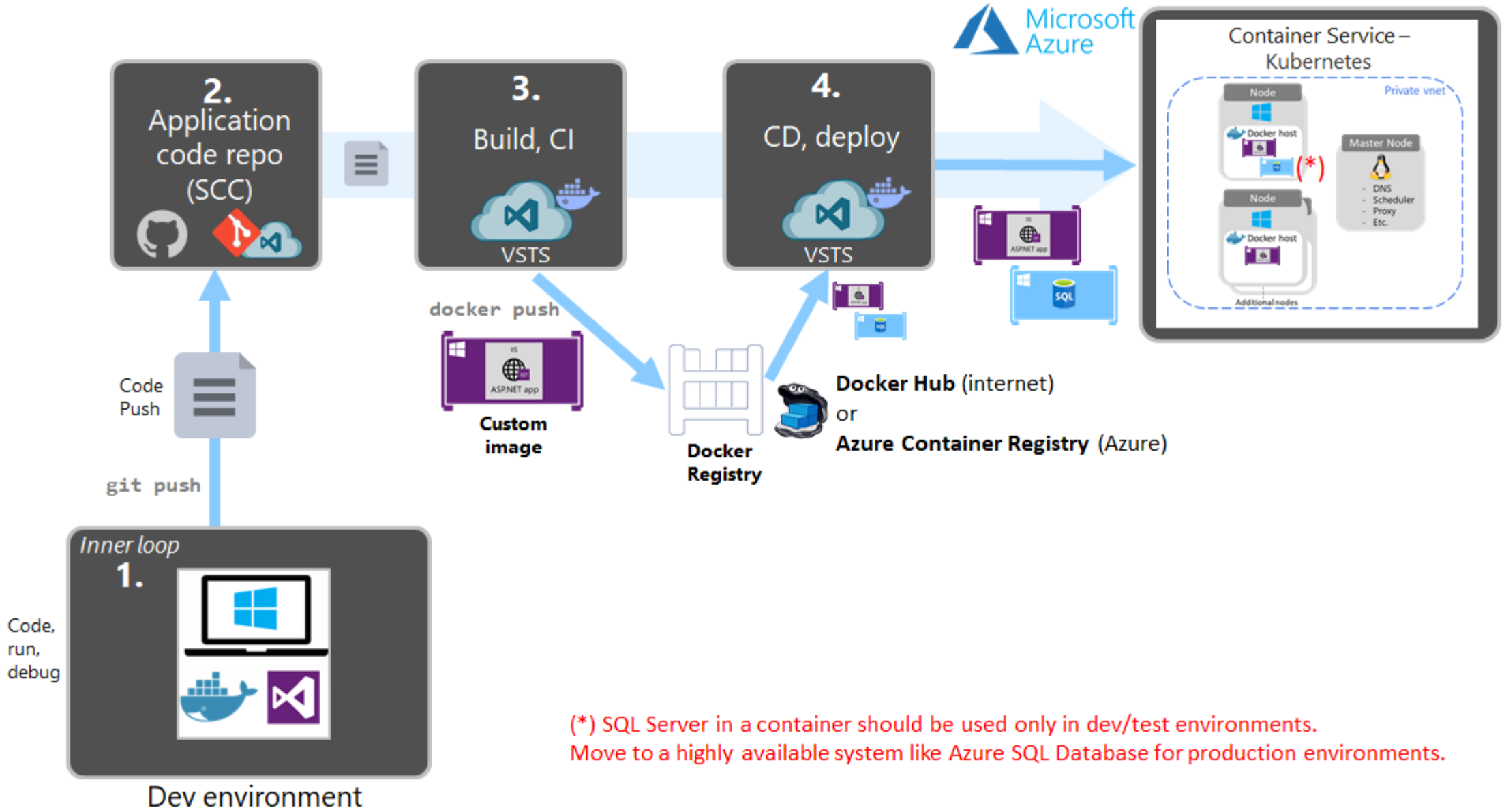
Using Azure Pipelines with Azure Kubernetes Services (AKS)

Scenario: Direct deployment to a Kubernetes cluster in Azure Container Service



(*) SQL Server in a container should be used only in dev/test environments.
Move to a highly available system like Azure SQL Database for production environments.

Scenario: Deploy to Kubernetes through CI/CD pipelines



(*) SQL Server in a container should be used only in dev/test environments.
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Deploying Microservices to Kubernetes, Automating with Azure DevOps into AKS

- Github Repository -> https://github.com/aspnetrun/run-devops

Thanks!

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