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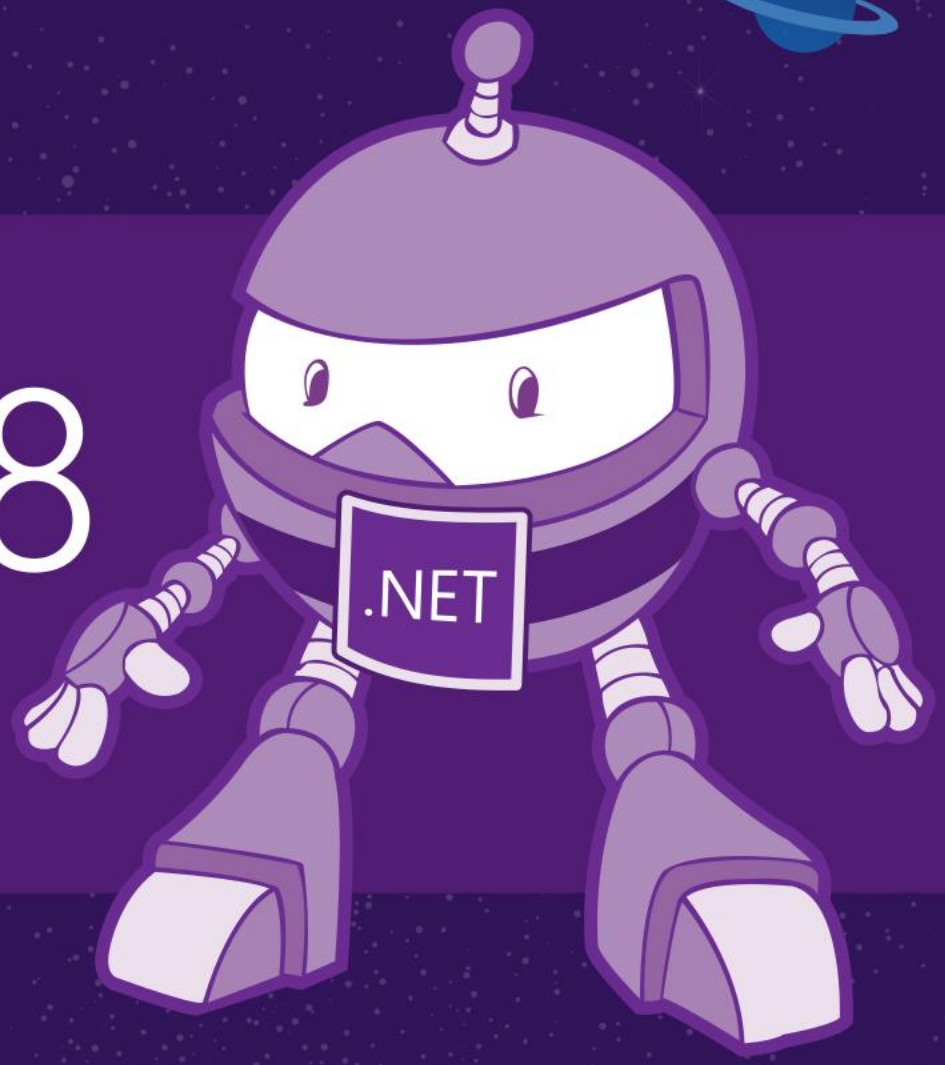

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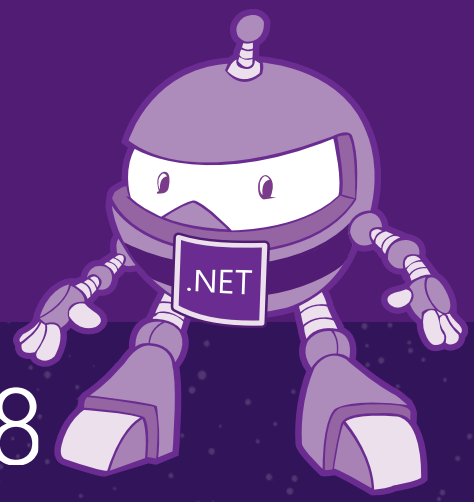
網關攻略
淺談 Open Source API Gateway Ocelot

Sky Chang
天空的垃圾場



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注意事項

- 結束後會提供投影片
- 沒有甚麼是蠢問題!!
- 若有問題，可以利用結束或休息時間討論
- 軟體架構的世界，沒有絕對
- 沒有銀彈，沒有最好，只有最適合

Agenda

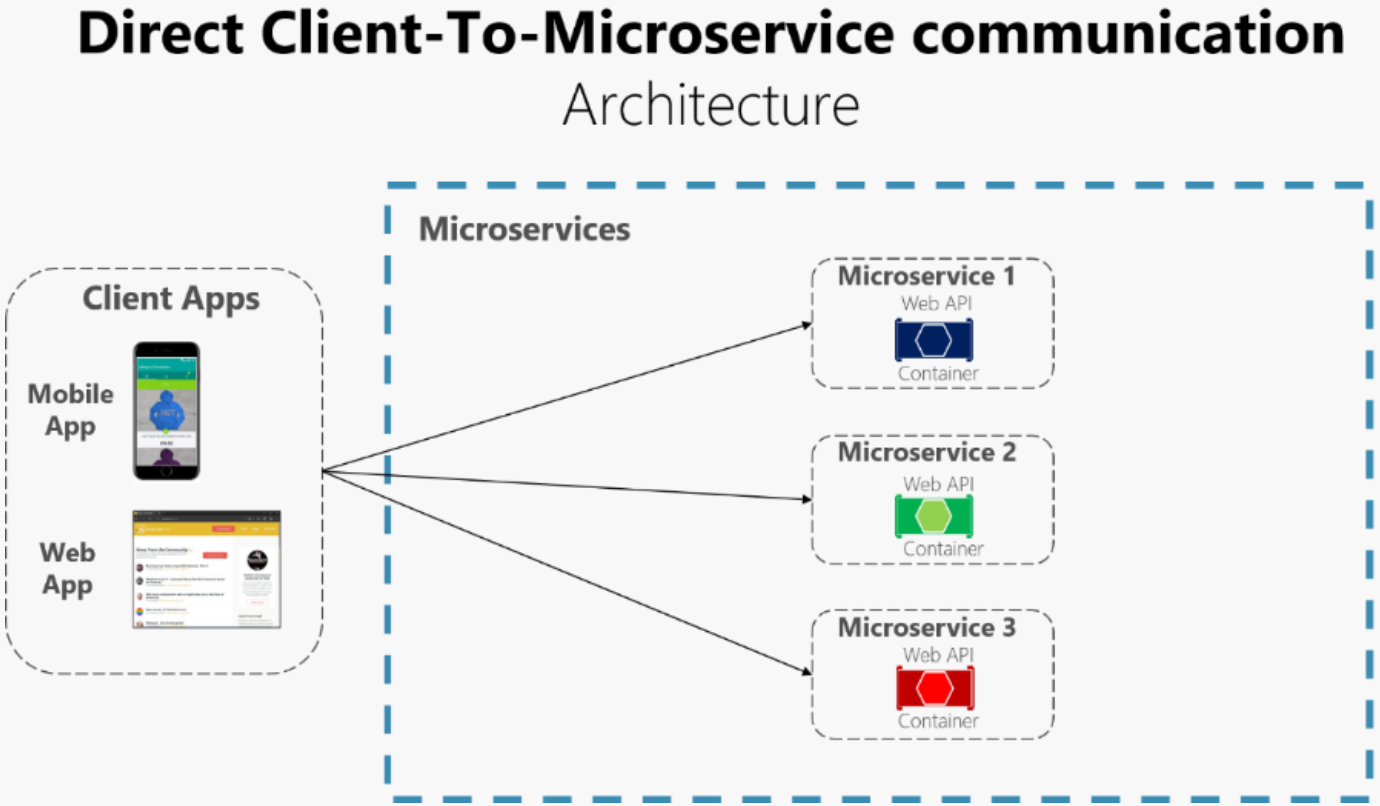
- 真實世界的問題!
- API Gateway Pattern
- Gateway Routing
- Request Aggregation
- Cross-cutting Concerns
- API Gateway 與開發技巧

網關攻略

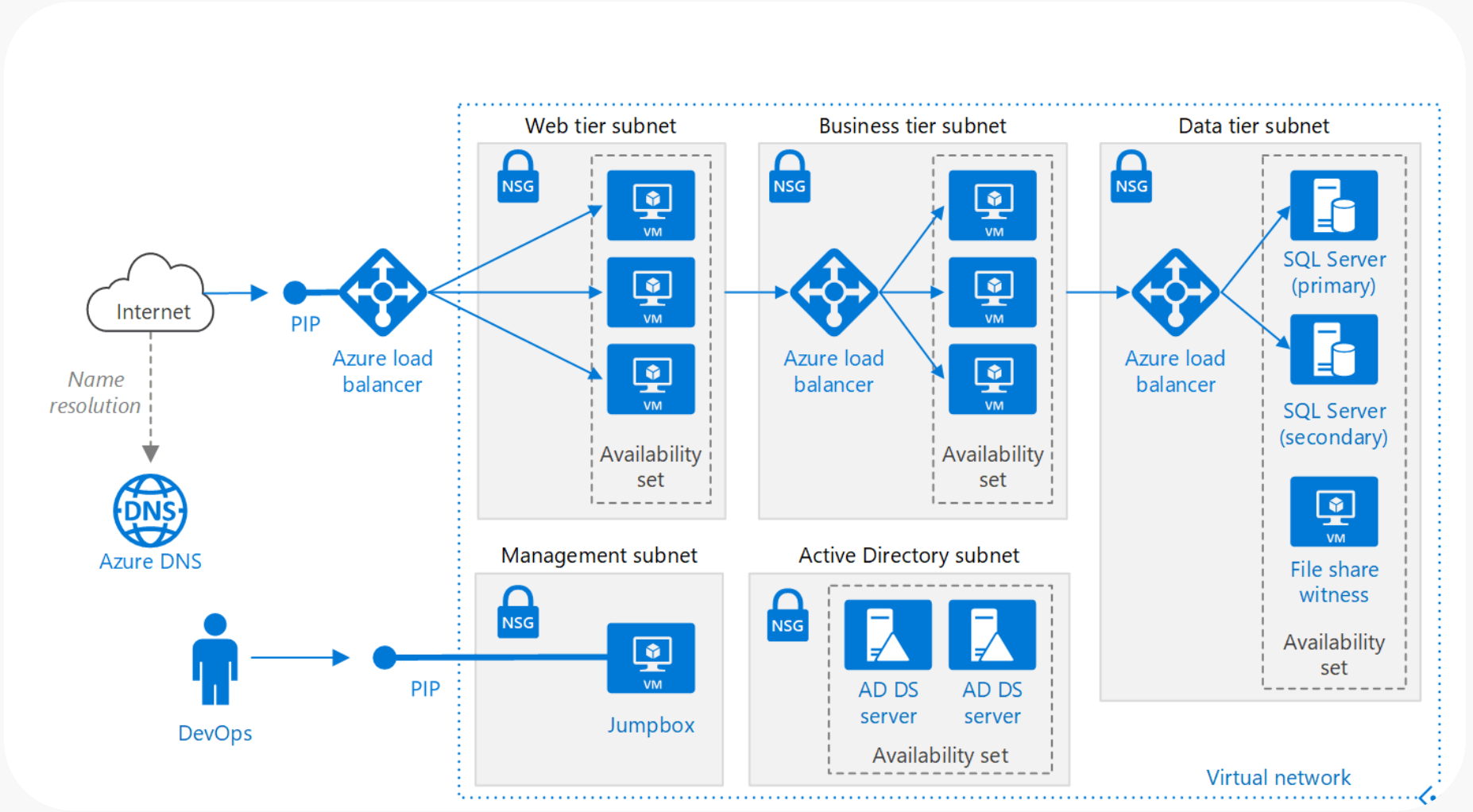
真實世界的問題!

微服務遭遇的問題

- 微服務需要大量的通訊
- 耦合問題
  - Client 與內部交互太過頻繁
  - Client 需要知道內部的結構與 API
  - 後端重構，Client 也需要大幅度修改
- 往返次數問題
  - 造成過多的網路浪費
- 安全問題
  - API 暴露於外面
- 橫切面問題
  - 針對安全、Log 等需要進行很多措施

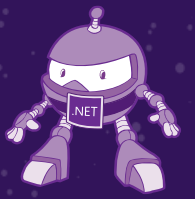


其實沒用微服務也一樣



API Gateway Pattern

.NET



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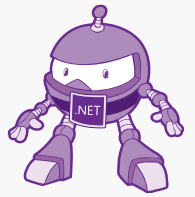
API Gateway Pattern

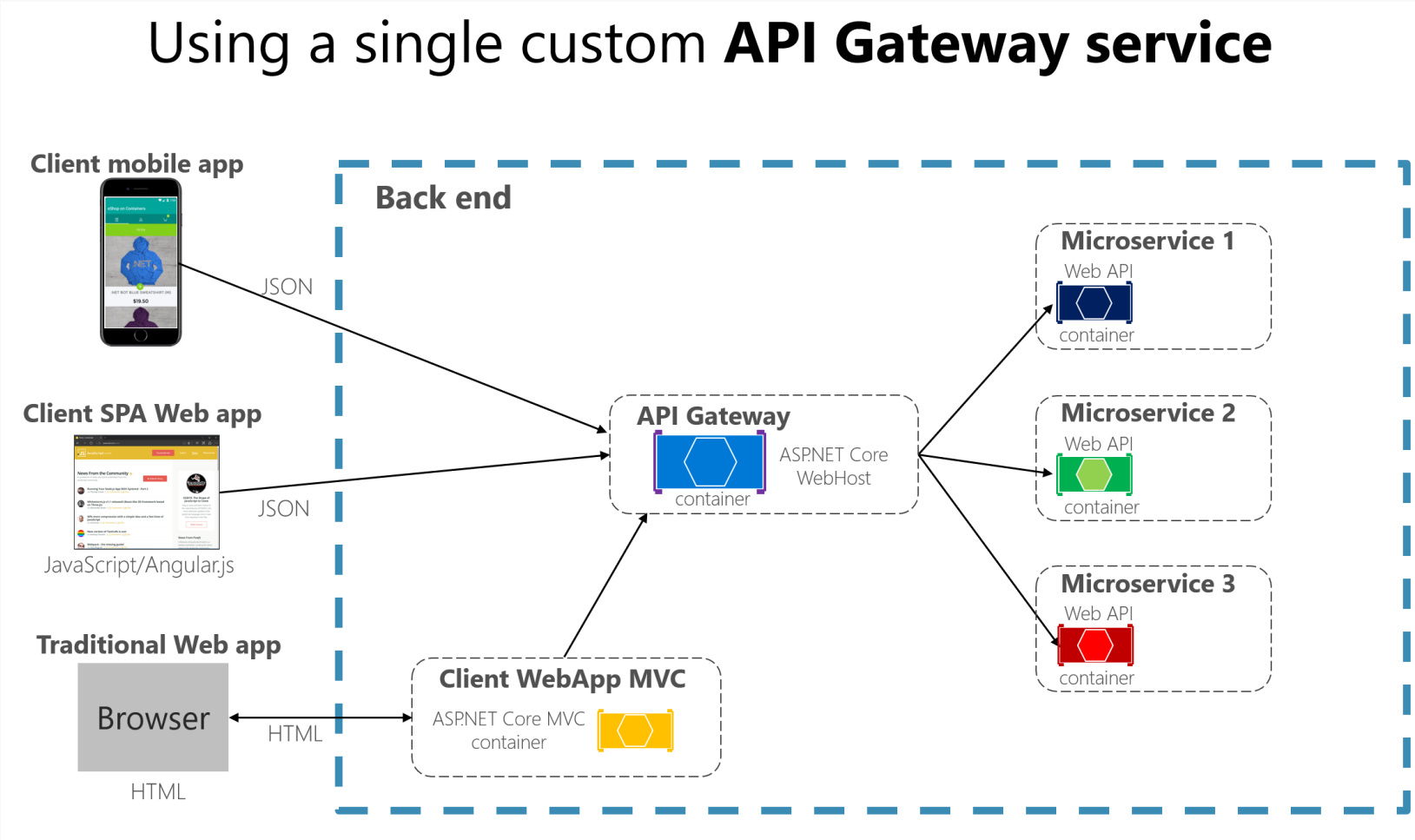
網關攻略

- 適合多 Client App 的應用情境
- 適合 microservice 情境
- 適合客戶一非常喜歡 N-Tier 的情慶
- 提供單一的入口給 Client 呼叫使用 (類似 Facade Pattern)
- 另外一種模式稱為 backend for frontend (BFF)
  - 提供不同的 Client ，建立不同的 Gateway
- 提供 Client 與 Service 的溝通橋樑
- 通常可能會包含身分驗證、SSL 終止、Cache、Log 等功能



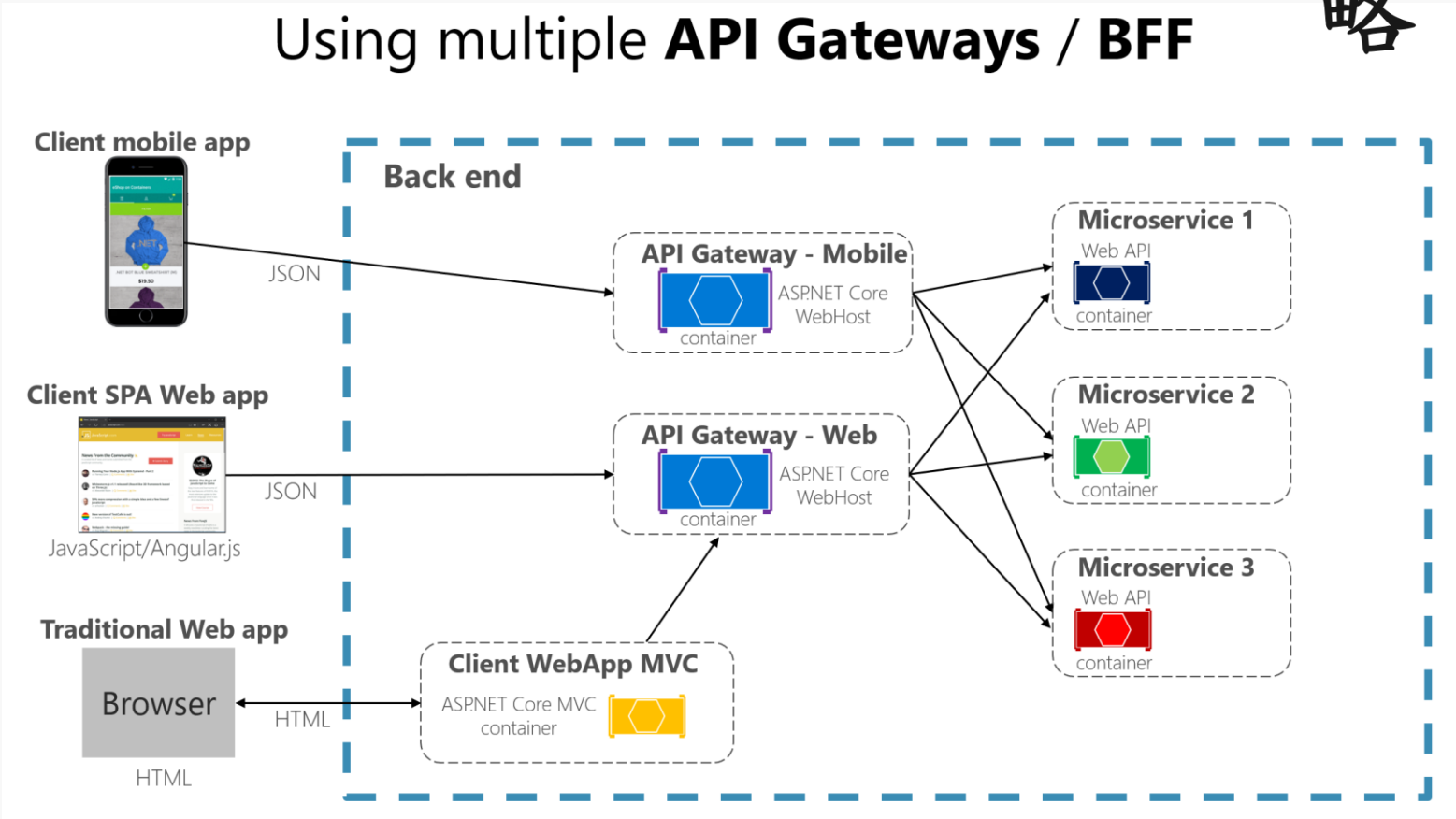
Single API Gateway

如果太多 Client ，可能會過於壅擠



Multiple API Gateways / BFF

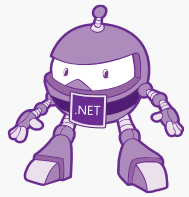
- 提供前端所需的 Service
- 可以簡化龐大
- 前端要甚麼，再給甚麼



API Gateway – 注意事項

網關攻略

- 確保 API Gateway 具有高可用性
  - 可通過運行多個 API Gateway 來避免單點故障
- 確保 API Gateway 的設計可滿足應用程式和端點的容量與擴展
  - 不會成為應用程式的瓶頸，並且具有足夠的可擴展性
- 對網關執行負載測試，以確保不會導致服務的串聯故障
- 如果需要追踪，請考慮為記錄目的與相關 ID
- 如有需要，監控 Request 和 Response 大小
- 考慮將 Cache 作為故障轉移策略來處理故障



Ocelot

網關攻略

- 輕量級 Open Source Gateway
- 輕巧、快速、簡單，由 .NET Core 撰寫而成
- 主要透過 ASP.NET Core Middleware 實現

Open Source .NET Core API Gateway

GET STARTED

https://github.com/ThreeMammals/Ocelot

Ocelot 安裝與設定

- NuGet - Install-Package Ocelot
- 建立設定檔 ocelot.json
- 調整 Program.cs
  - 設定多環境
- Startup.cs 設定

```
{
    "ReRoutes": [],
    "GlobalConfiguration": {
        "BaseUrl": "https://api.mybusiness.com"
    }
}
```

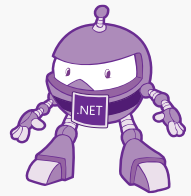
```
1 reference
public static IWebHostBuilder CreateWebHostBuilder(string[] args) =>
    WebHost.CreateDefaultBuilder(args)
    .ConfigureAppConfiguration((hostingContext, config) => {
        config
            .AddJsonFile("ocelot.json")
            .AddJsonFile($"configuration.{hostingContext.HostingEnvironment.EnvironmentName}.json");
    })
    .UseStartup<Startup>();
```

ConfigureServices

```
services.AddOcelot(Configuration);
```

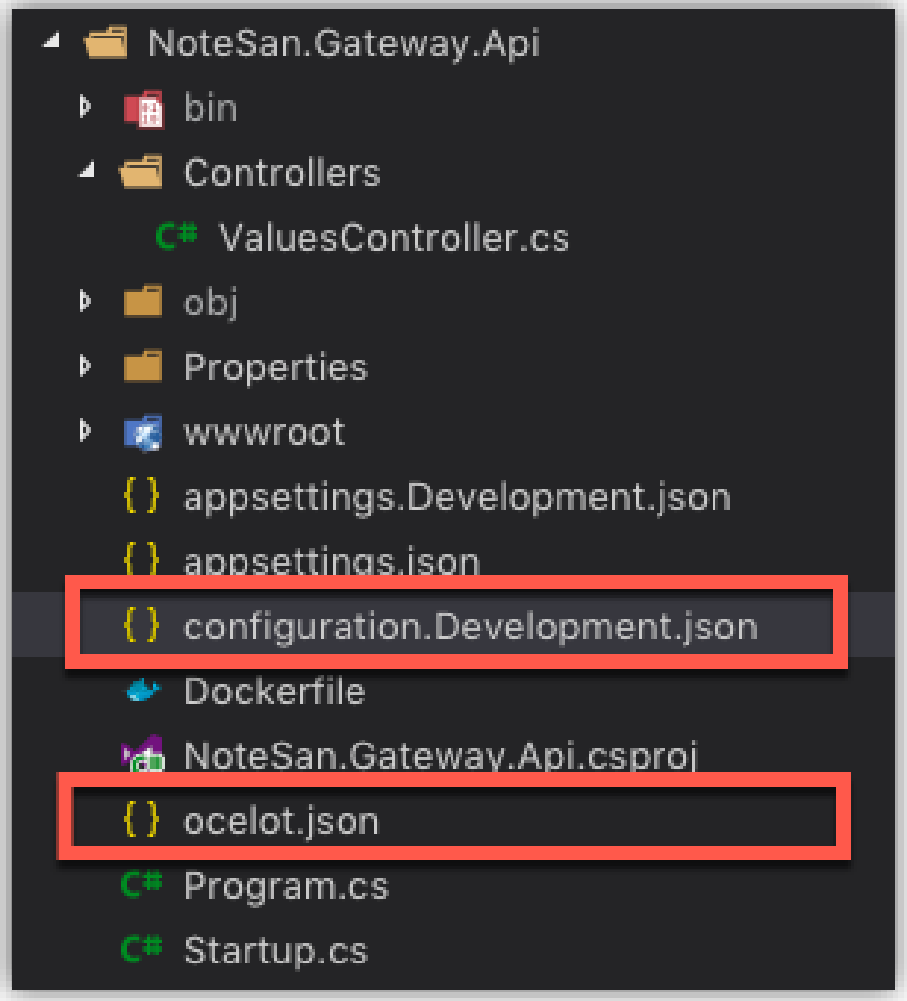
Configure

```
app.UseOcelot().Wait();
```

Ocelot 多環境設定

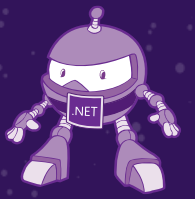
- 與 ASP.NET Core 多環境設定相同
- Configuration.Development.json
  - 表示 Development 環境
  - 根據 Program.cs 設定
- 若找不到環境 Config 則使用原始的
  - 根據 Program.cs 設定
- 也可以設定覆蓋



https://ocelot.readthedocs.io/en/latest/features/configuration.html

Reverse Proxy / Gateway Routing

.NET



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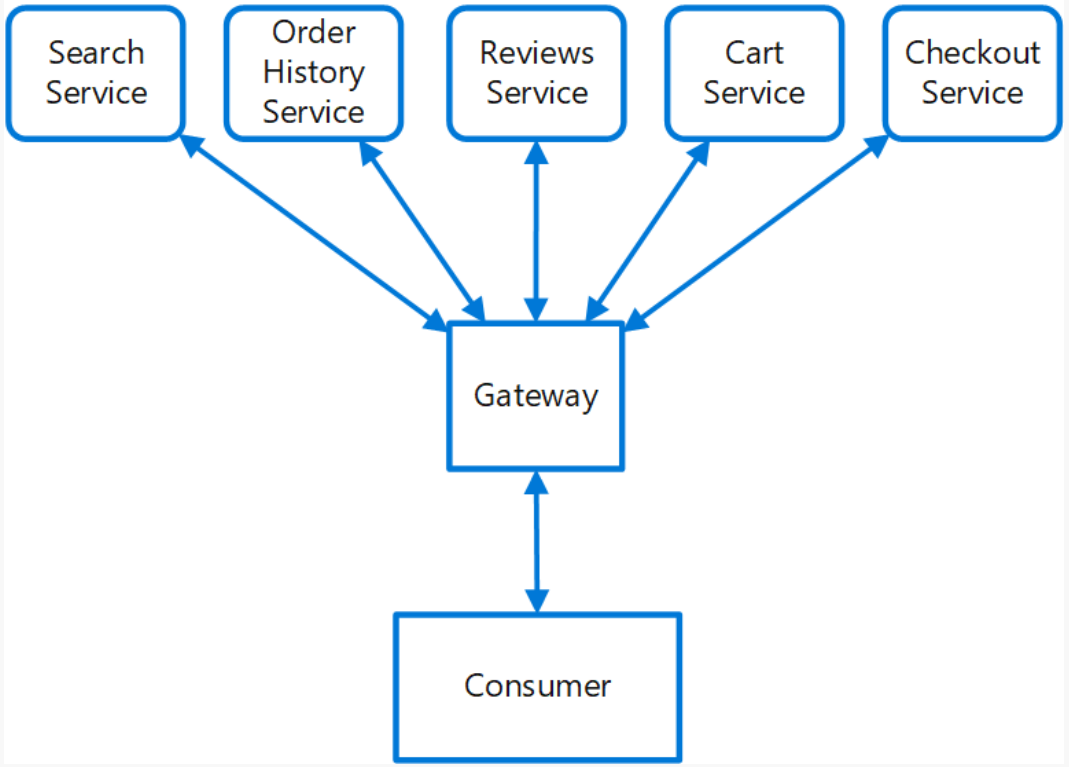
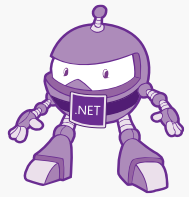
Reverse Proxy / Gateway Routing – 路由重導

- 通常為第七層（HTTP）
- 負責重新導向到後端
  - 可能是 URL 的重新調整
  - 可提供單點的 URL 給前端
  - 可調整不同的通訊協定
- 協助提供前後端的分離
  - 更改後面的 URL 不會影響到前端



Reverse Proxy / Gateway Routing – 注意事項

- 若後端只有一兩個 API，那可能不適用



Ocelot - Routing – 路由

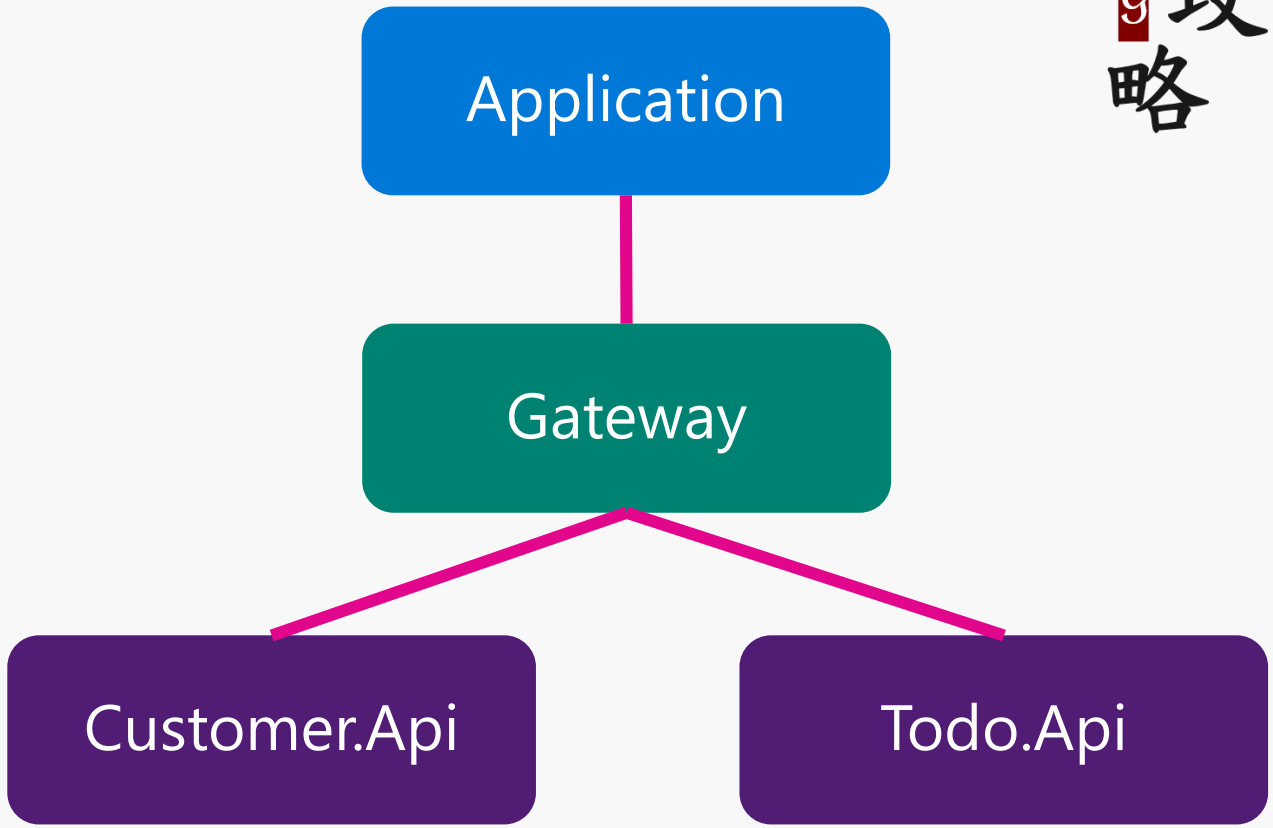
- 提供上下路由的關係與設定
- Priority
  - 優先級
- DownstreamPathTemplate
  - 下游，表示要導向的網址
- DownstreamScheme
  - http / https
- DownstreamHostAndPorts
  - Host 位置 & Port
- UpstreamPathTemplate
  - 上游，表示 Gateway 提供的網址
- UpstreamHttpMethod
  - 提供的 http 方法

```
{
    "ReRoutes": [
        {
            "Priority": 0,
            "DownstreamPathTemplate": "/api/{everything}",
            "DownstreamScheme": "https",
            "DownstreamHostAndPorts": [
                {
                    "Host": "localhost",
                    "Port": 7010
                }
            ],
            "UpstreamPathTemplate": "/customer/{everything}",
            "UpstreamHttpMethod": [ "Get", "Post", "Put", "Delete" ]
        }
    ],
    "GlobalConfiguration": {

    }
}
```

Ocelot - Routing – 路由

- UpstreamPathTemplate
  - /Customer/Customers
- UpstreamHttpMethod
  - Get , Post , Put , Delete
- DownstreamPathTemplate
  - /api/{everything}
- DownstreamScheme
  - https
- DownstreamHostAndPorts
  - localhost , 7010



網關攻略

Ocelot - Routing – 路由

- Catch All – 全部捕獲
- Priority – 優先集
- Dynamic Routing – 動態路由
  - 可搭配 Service-discovery
- Query Strings – 查詢字串匹配

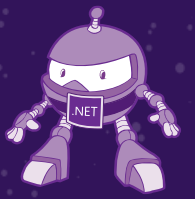
```
{
    "ReRoutes": [
        {
            "Priority": 0,
            "DownstreamPathTemplate": "/api/{everything}",
            "DownstreamScheme": "https",
            "DownstreamHostAndPorts": [
                {
                    "Host": "localhost",
                    "Port": 7010
                }
            ],
            "UpstreamPathTemplate": "/customer/{everything}",
            "UpstreamHttpMethod": [ "Get", "Post", "Put", "Delete" ]
        }
    ],
    "GlobalConfiguration": {

    }
}
```

Demo
Routing

Requests Aggregation

.NET



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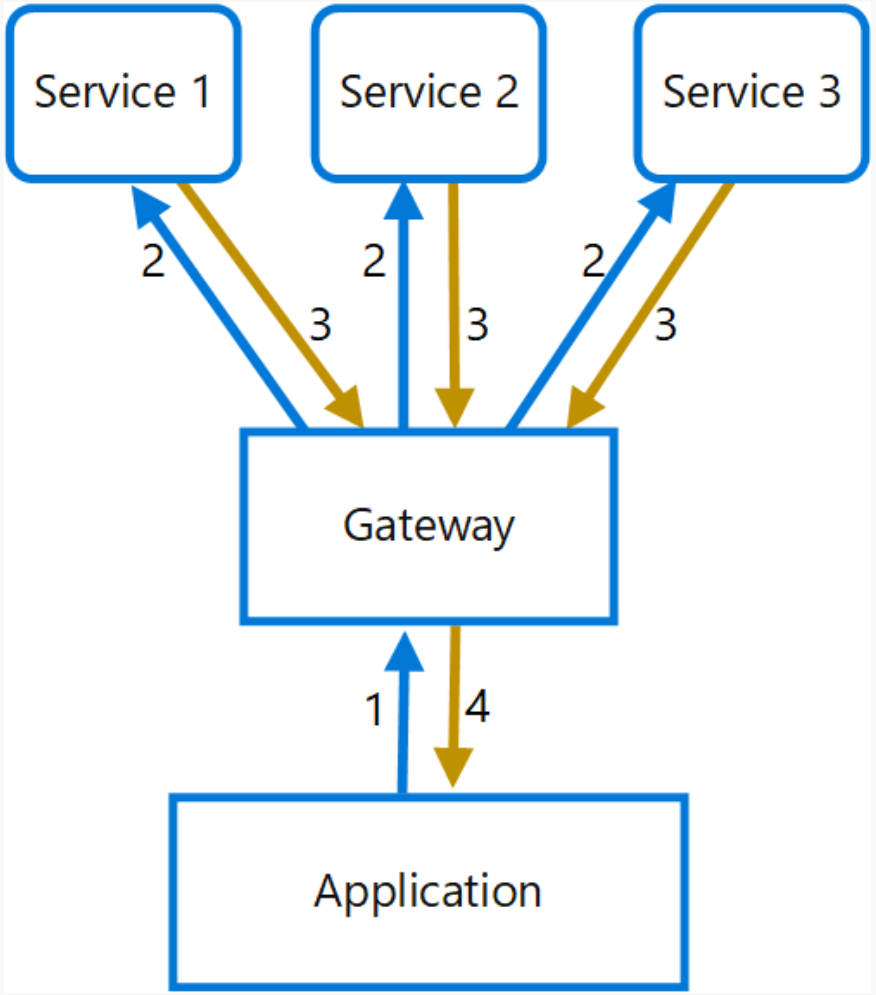
Requests Aggregation – 請求聚合

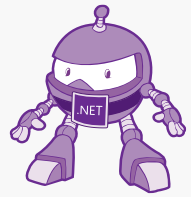
- 提供將多個呼叫，整合為一
- 減少 Client 與後端的干擾
- 若是 Server Site 的網頁處理，可能不會那麼明顯
  - ASP.NET MVC
- 通常 Gateway 產品會提供，但多半還是要自己刻 Code
  - 請放於 Gateway 之後



Requests Aggregation – 注意事項

網關攻略

- API Gateway 不應該引入服務耦合
- API Gateway 應位於後端服務附近，以減少延遲
- 內部呼叫使用隔離、斷路、重試、超時等處理技術
  - 如果一個或多個服務花費的時間太長，則可以考慮超時時返回部分數據集
- 使用 Async I / O 確保後端延遲不會導致應用程式出現性能問題
- 不要將聚合構建到 API Gateway，而是在 Gateway 後面放置聚合服務
  - 請求聚合可能具有與 Gateway 不同的資源要求，並且可能影響 Gateway 的路由和卸載功能

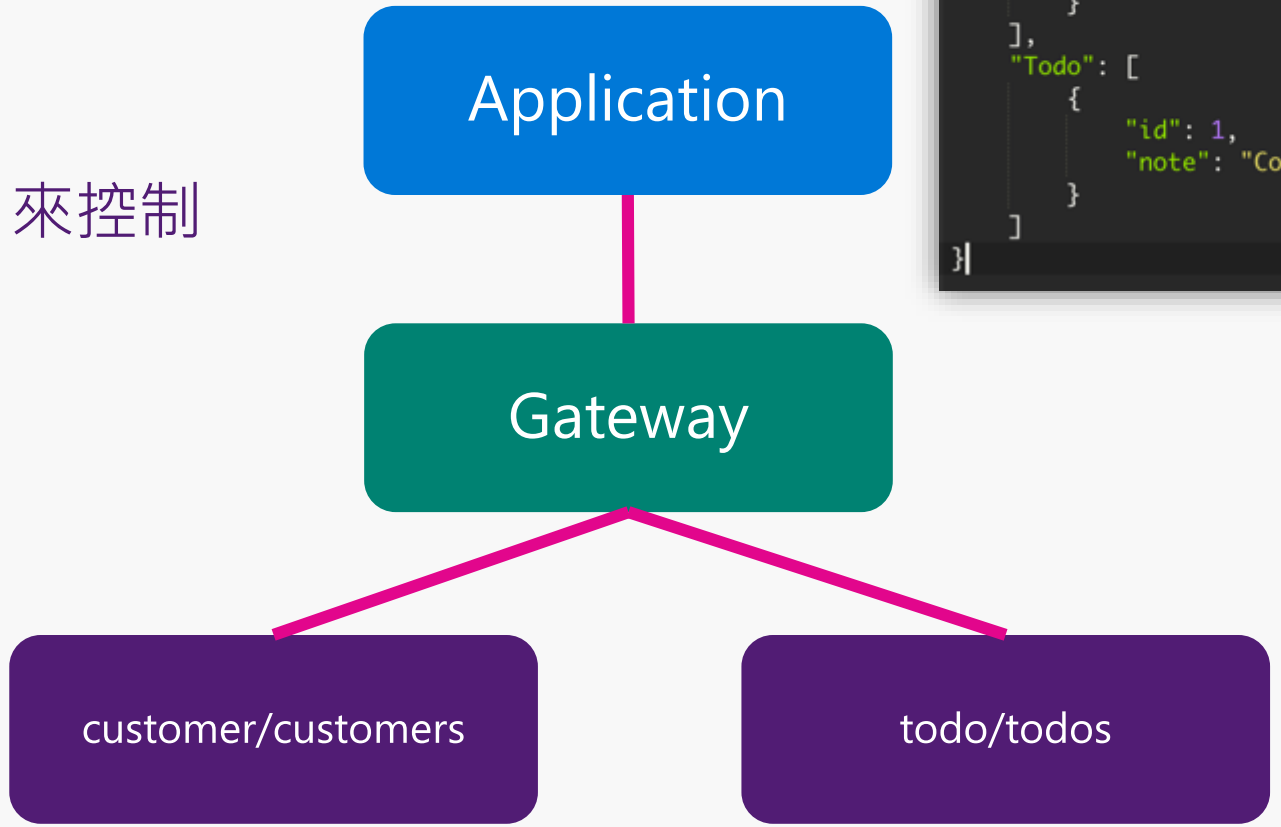


Ocelot - Requests Aggregation

- 將兩個請求合併
- 要指定明確的位置
- 透過 Key 來整合

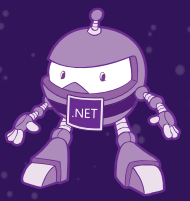
Ocelot - Requests Aggregation

- 聚合異常的時候，會沒有回應
- 回應的訊息為 JSON，
  就算是 404 也是 JSON
  - 無資料
- 可自行實作 IDefinedAggregator 來控制
  回應方法



https://ocelot.readthedocs.io/en/latest/features/requestaggregation.html

Demo
Requests Aggregation



Cross-cutting Concerns / Gateway Offloading

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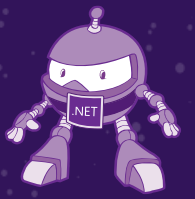

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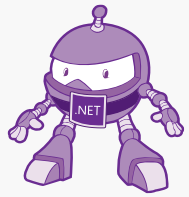
Cross-cutting Concerns / Gateway Offloading
橫切關注 / 集中功能

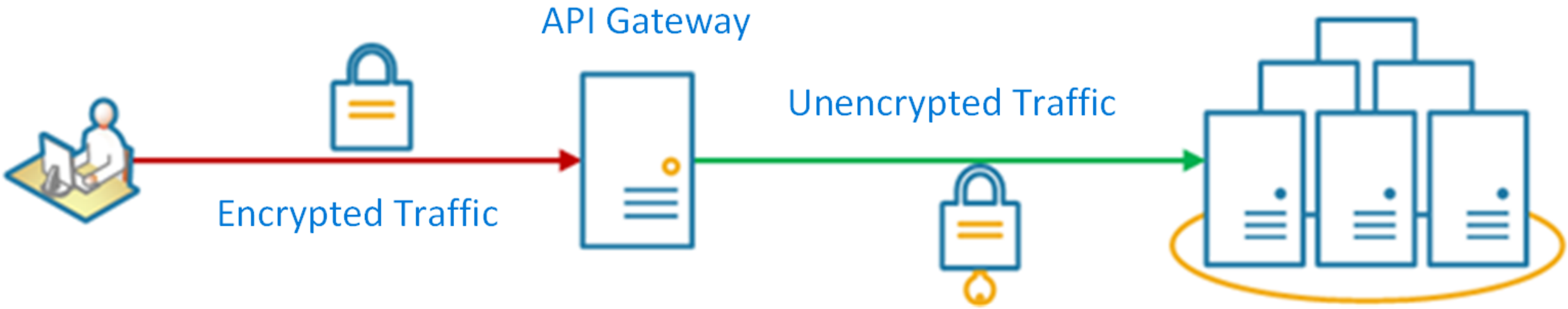
- 將原本在 API 層級的功能，轉移到 API Gateway
  - Authentication and authorization - 身份驗證和授權
  - Service discovery integration – 整合服務發現
  - Response caching - 響應緩存
  - Retry policies, circuit breaker and QoS - 重試策略，斷路器和QoS
  - Rate limiting and throttling - 速率限制和節流
  - Load balancing - 負載均衡
  - Logging, tracing, correlation - 記錄，跟踪，關聯
  - Headers, query strings and claims transformation - 標題、查詢字串、聲明轉換
  - IP whitelisting - IP白名單



Gateway Offloading - 優點

網關攻略

- 降低維護成本，簡化服務開發、配置與管理，提高升級容易度
  - Web服務器證書和安全網站配置
- 允許專門的團隊實施需要專業知識的功能
  - 安全性交給安全專家，內部人員專注於邏輯開發
- 為請求 / 回應記錄 / 監視提供一致性
  - 即使未正確檢測服務，也可以確保最低級別的監視和日誌記錄

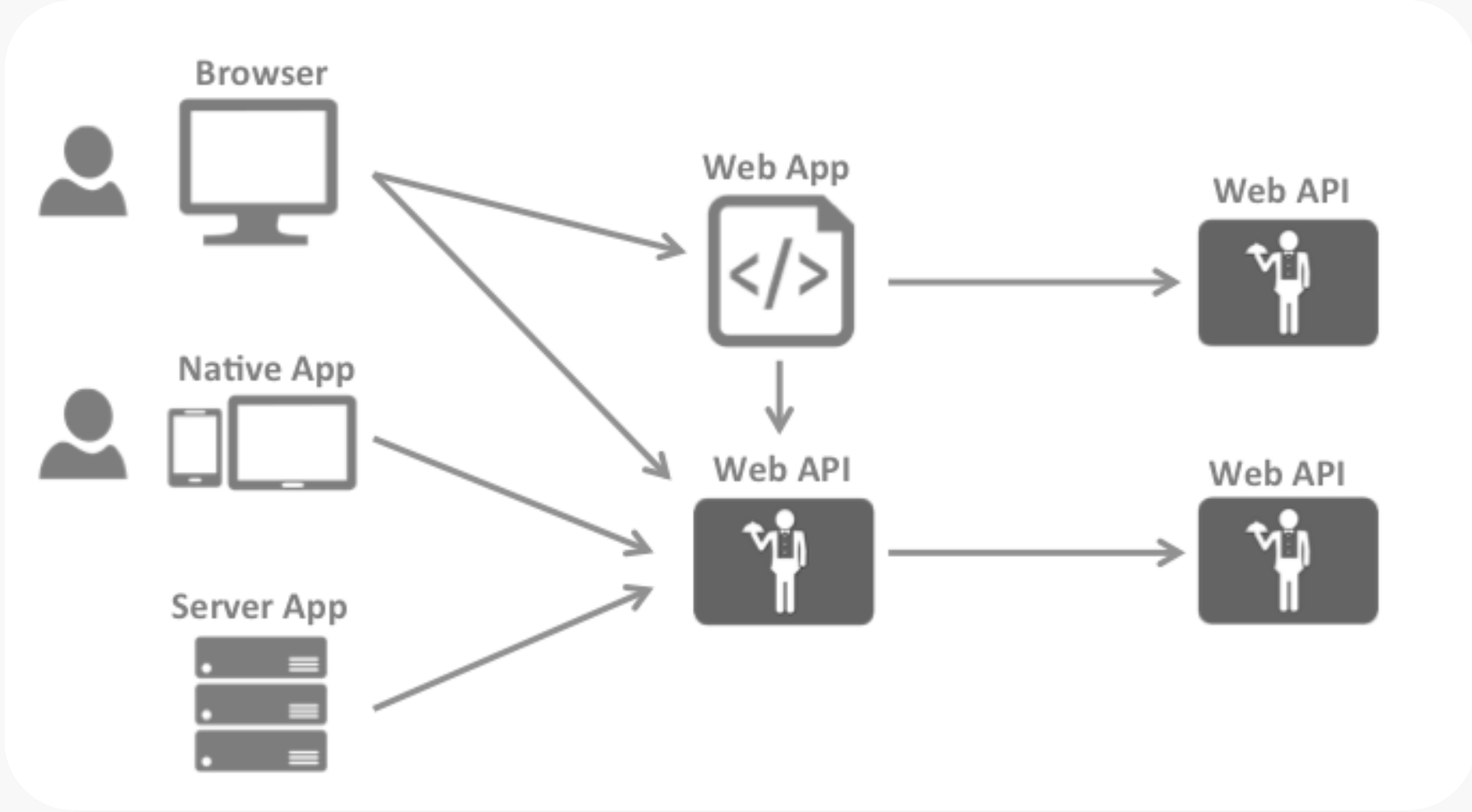


Gateway Offloading – 注意事項

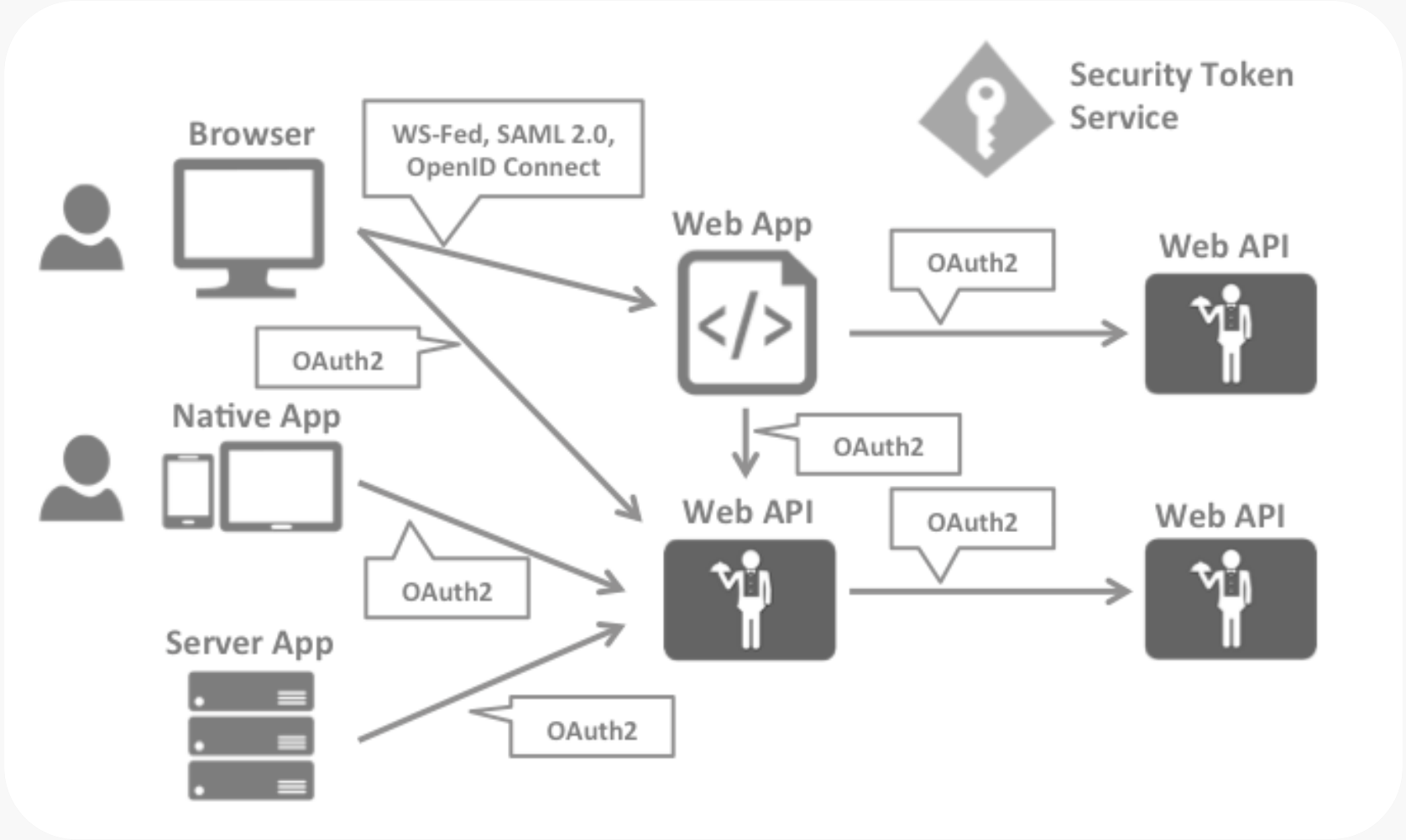
- 永遠不應將業務邏輯卸載到 API Gateway

網關攻略

一般應用程式情境

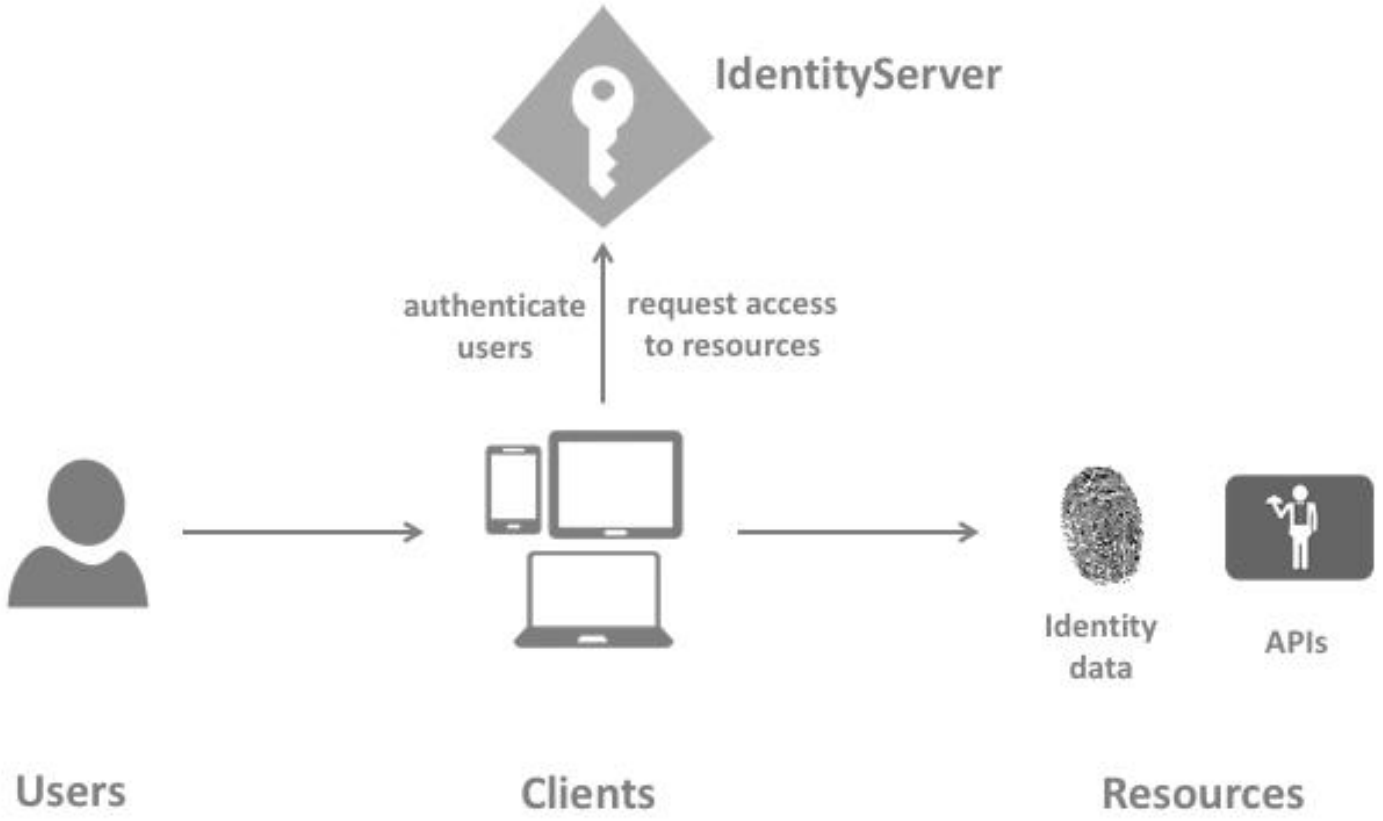


一般應用程式情境 – 加上授權

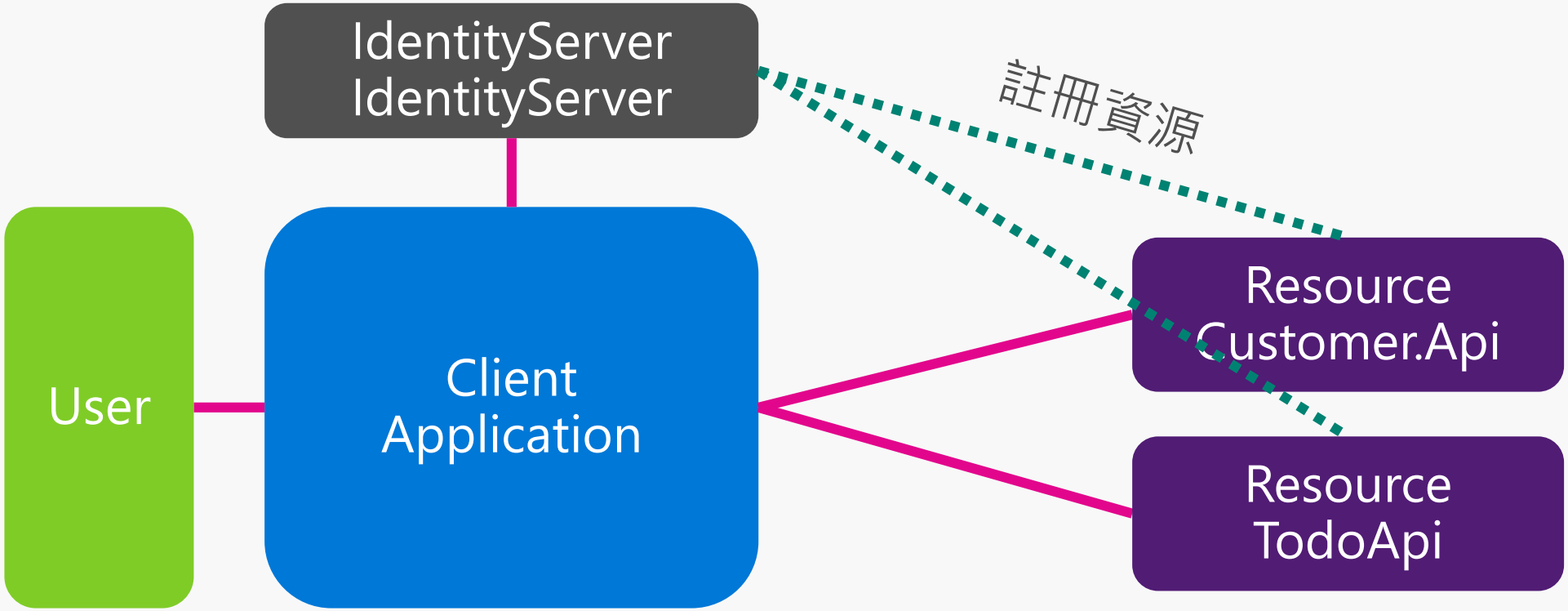


驗證授權架構

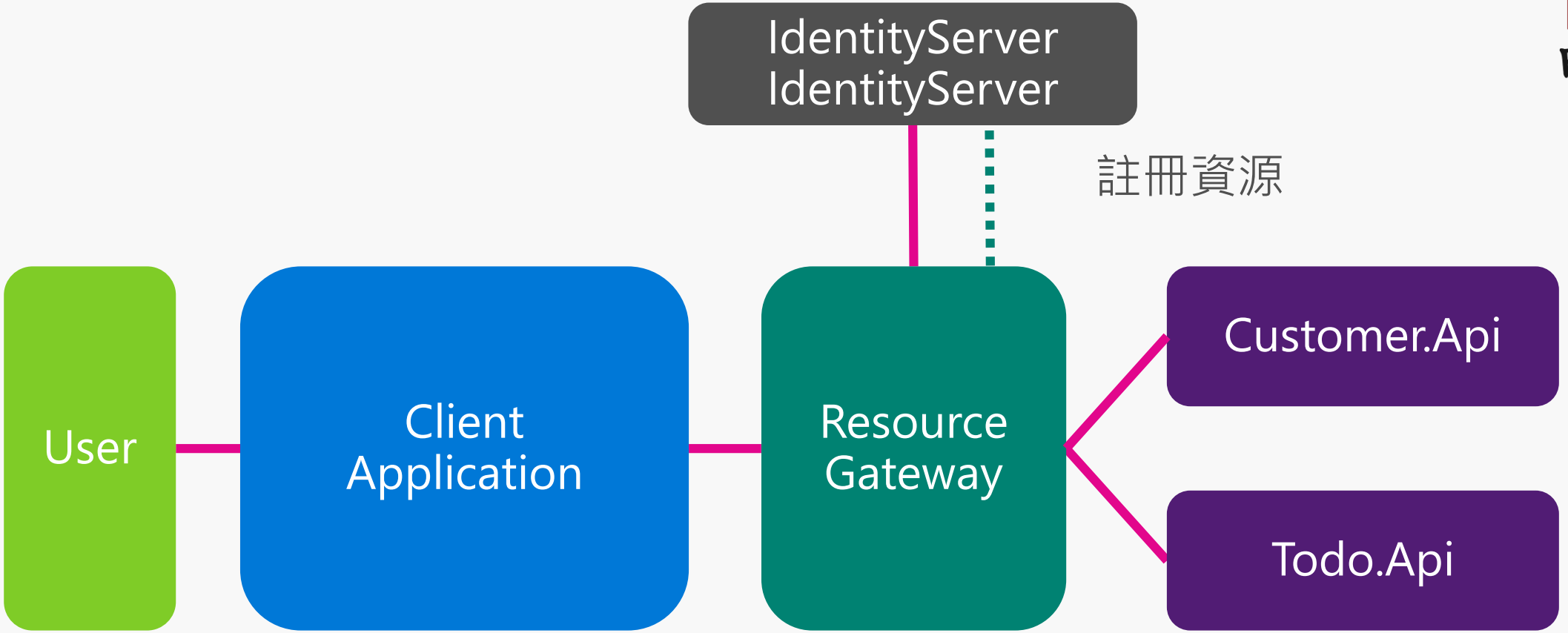
- IdentityServer
  - 驗證授權伺服器
  - 提供發放 Token
  - 註冊 Client
- Client
  - 應用程式
    - ASP.NET MVC 網站
    - Web API
    - SPA
- Resources
  - 被保護的資源
    - Web API



沒有 API Gateway 的時候..

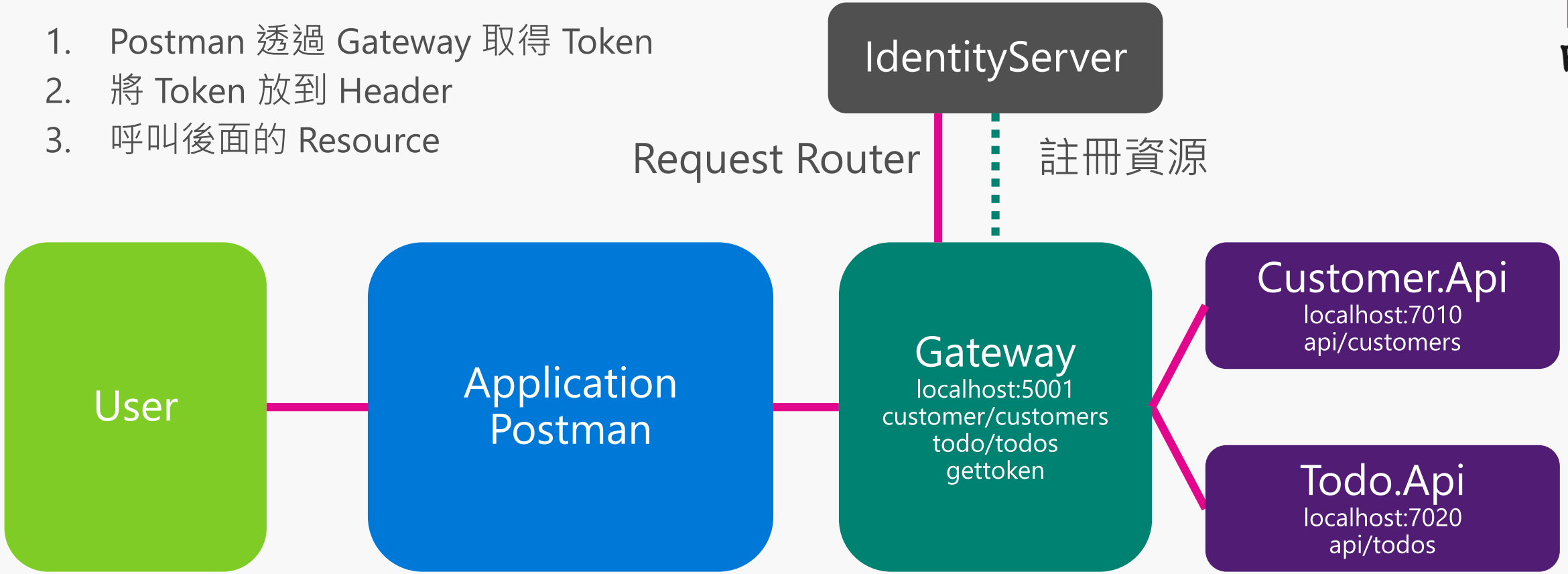


Ocelot + IdentityServer 方案一（不推薦）



Ocelot + IdentityServer Detail (不推薦)

1. Postman 透過 Gateway 取得 Token
2. 將 Token 放到 Header
3. 呼叫後面的 Resource



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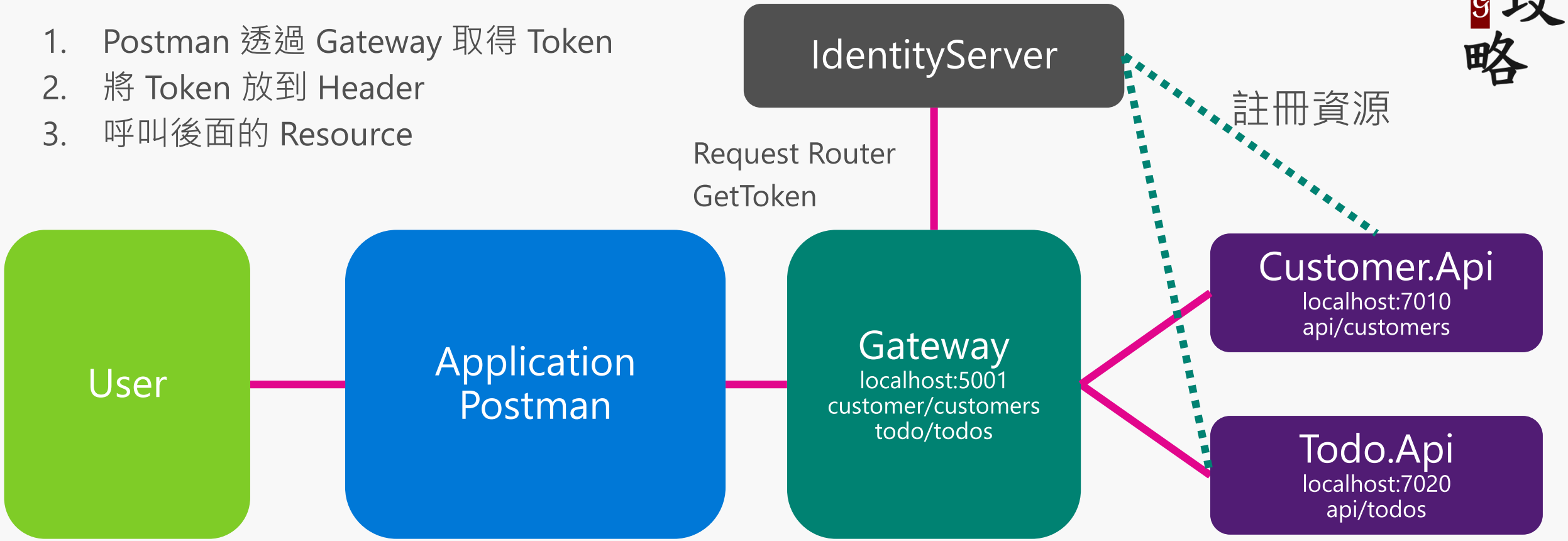
Ocelot + IdentityServer 方案二 - Demo

1. Postman 透過 Gateway 取得 Token
2. 將 Token 放到 Header
3. 呼叫後面的 Resource



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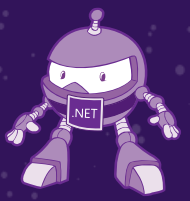
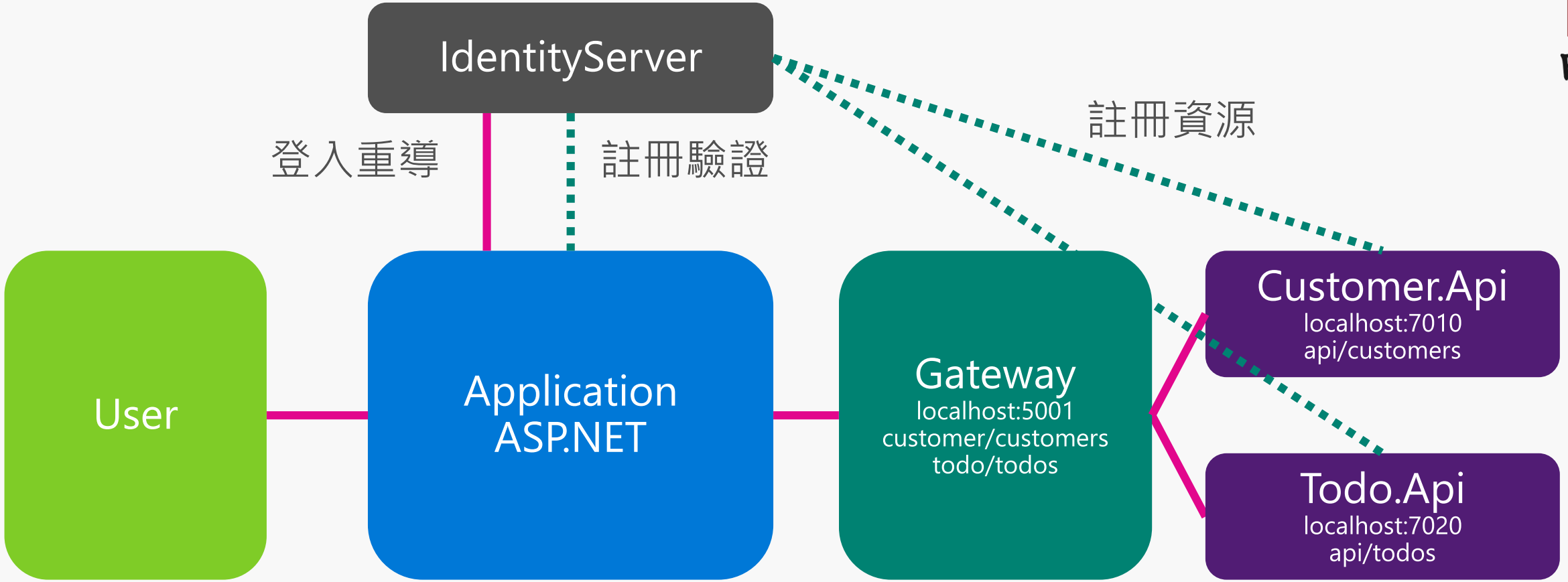
Demo
Cross-cutting Concerns



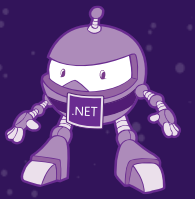
Ocelot + IdentityServer 方案二 for ASP.NET



1. ASP.NET 進行登入
2. 導向至 IdentityServer 進行登入
3. 導回 ASP.NET，並取得 Token
4. 將 Token 放到 Header
5. 呼叫後面的 Resource

API Gateway 與 Microservice 開發

.NET



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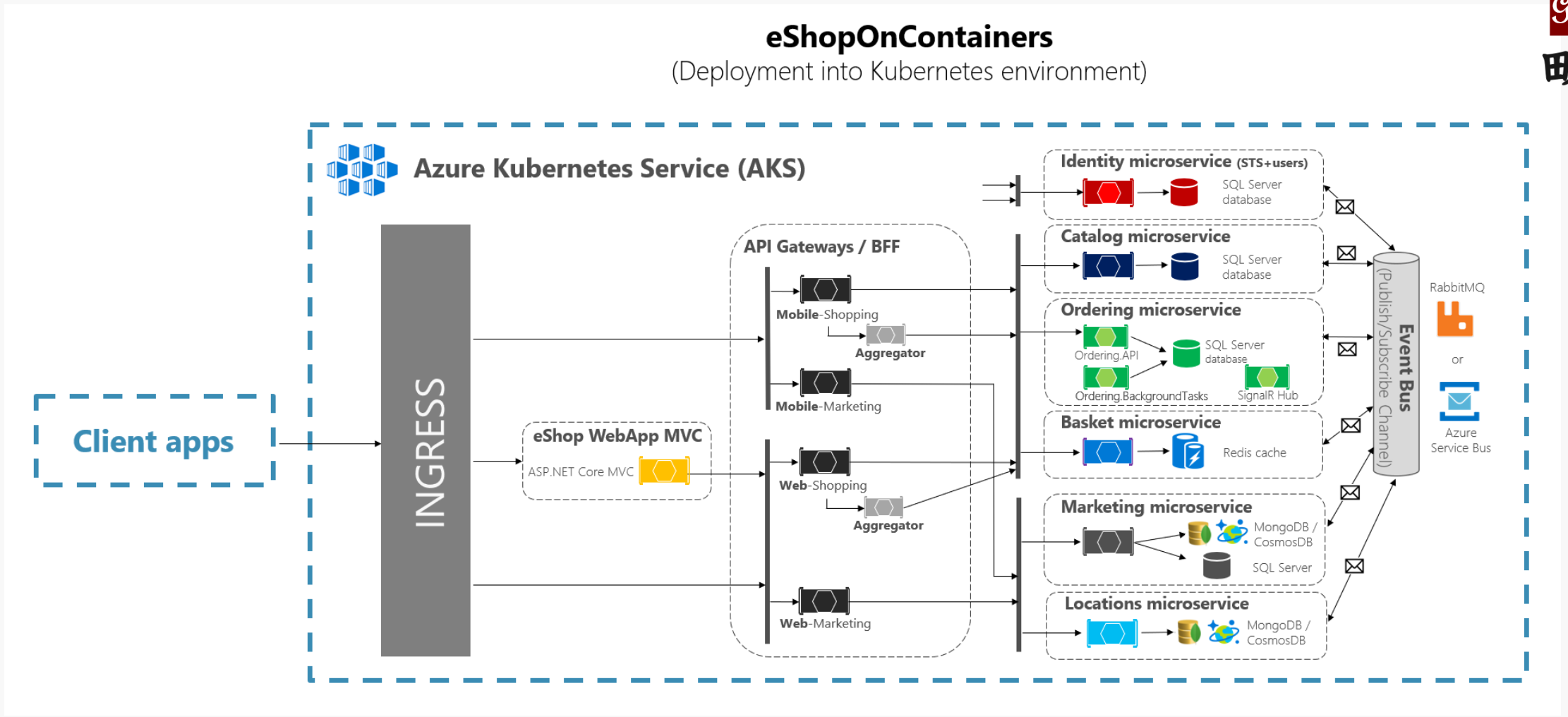
官方 Microservice 架構



API Gateway 與 Microservice 開發

- 透過 dockerfile 定義每一個站台

```
FROM microsoft/aspnetcore:2.0.5 AS base
WORKDIR /app
EXPOSE 80
```

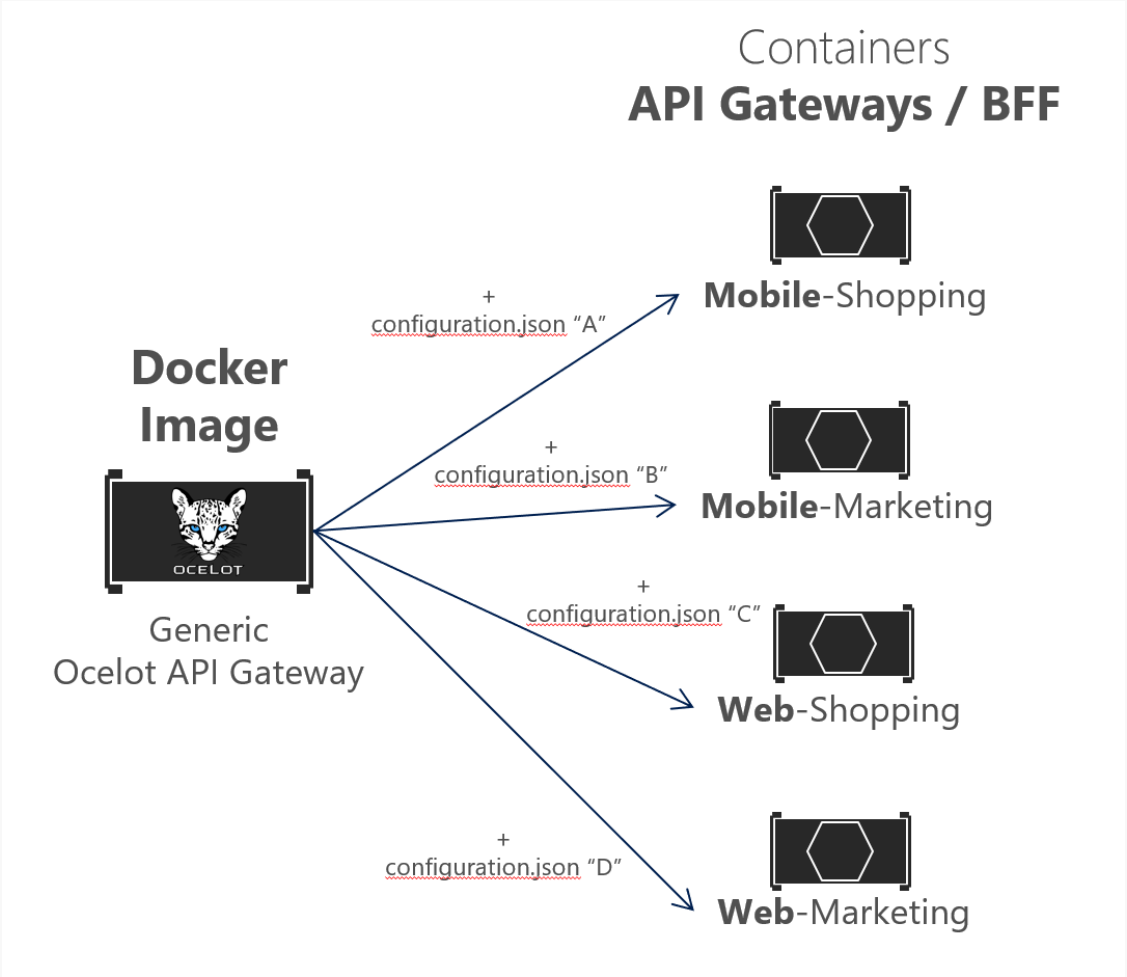
- 使用 docker-compose 定義開發時期對外的 Port

```
catalog.api:
  environment:
    - ASPNETCORE_ENVIRONMENT=Development
    - ASPNETCORE_URLS=http://0.0.0.0:80
    - ConnectionString=YOUR_VALUE
    - ... Other Environment Variables
  ports:
    - "5101:80"   # Important: In a production environment you should remove the ex
                  # The API Gateway redirects and access through the internal port
```

- 正式環境透過 API Gateway 進行存取 (K8S)

API Gateway 與 Microservice 開發

- 使用一個 API Gateway Image
- 提供多個 API Gateway / BFF



API Gateway 與 Microservice 開發

- 指向不同的設定檔

```
mobileshoppingapigw:
  image: eshop/ocelotapigw:${TAG:-latest}
  build:
    context: .
    dockerfile: src/ApiGateways/ApiGw-Base/Dockerfile

mobilemarketingapigw:
  image: eshop/ocelotapigw:${TAG:-latest}
  build:
    context: .
    dockerfile: src/ApiGateways/ApiGw-Base/Dockerfile

webshoppingapigw:
  image: eshop/ocelotapigw:${TAG:-latest}
  build:
    context: .
    dockerfile: src/ApiGateways/ApiGw-Base/Dockerfile

webmarketingapigw:
  image: eshop/ocelotapigw:${TAG:-latest}
  build:
    context: .
    dockerfile: src/ApiGateways/ApiGw-Base/Dockerfile
```

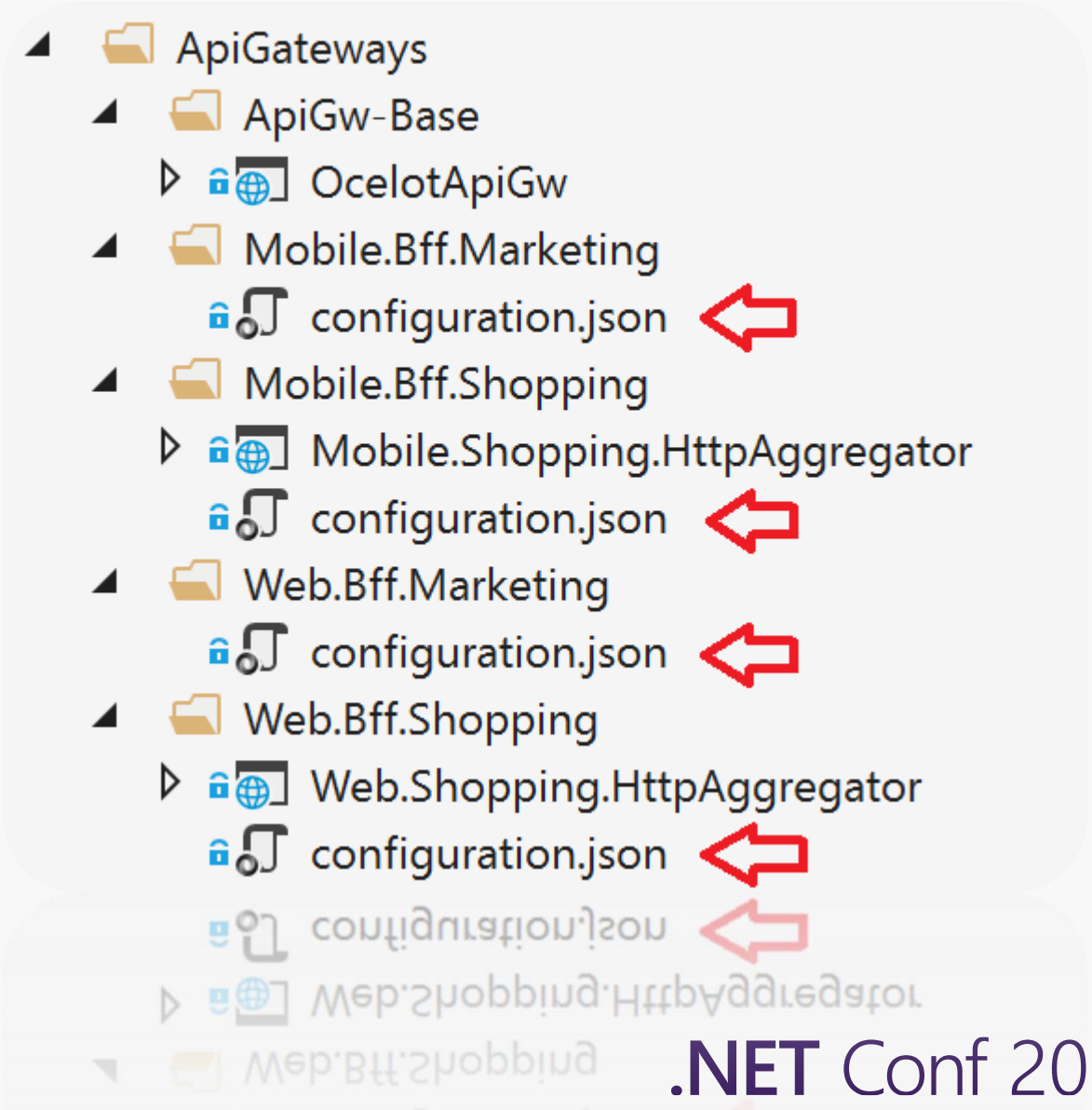
docker-compose.yml

```
mobileshoppingapigw:
  environment:
    - ASPNETCORE_ENVIRONMENT=Development
    - IdentityUrl=http://identity.api
  ports:
    - "5200:80"
  volumes:
    - ./src/ApiGateways/Mobile.Bff.Shopping/apigw:/app/configuration

mobilemarketingapigw:
  environment:
    - ASPNETCORE_ENVIRONMENT=Development
    - IdentityUrl=http://identity.api
  ports:
    - "5201:80"
  volumes:
    - ./src/ApiGateways/Mobile.Bff.Marketing/apigw:/app/configuration

webshoppingapigw:
  environment:
    - ASPNETCORE_ENVIRONMENT=Development
    - IdentityUrl=http://identity.api
  ports:
    - "5202:80"
  volumes:
    - ./src/ApiGateways/Web.Bff.Shopping/apigw:/app/configuration

webmarketingapigw:
  environment:
    - ASPNETCORE_ENVIRONMENT=Development
    - IdentityUrl=http://identity.api
  ports:
    - "5203:80"
  volumes:
    - ./src/ApiGateways/Web.Bff.Marketing/apigw:/app/configuration
```

docker-compose.override.yml

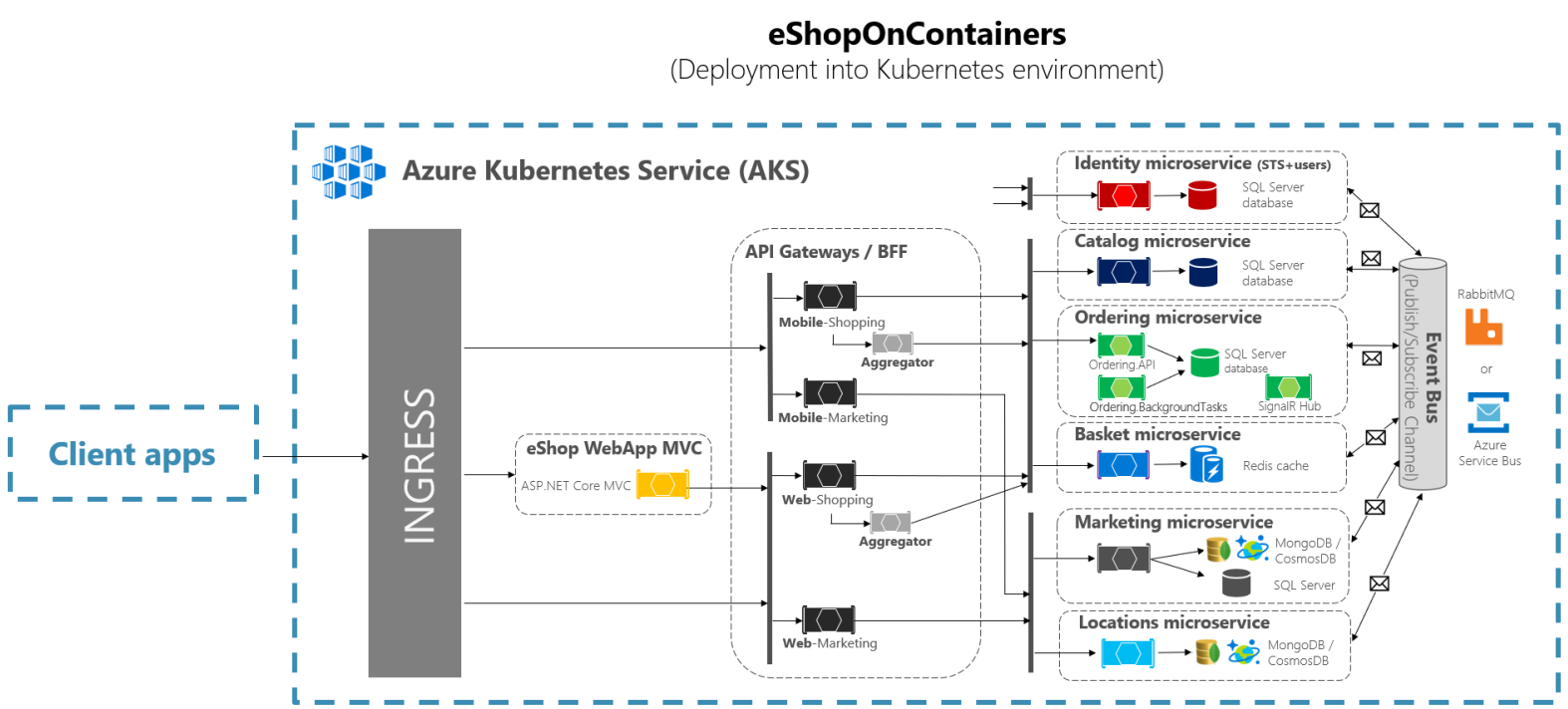
API Gateway 與 Microservice 開發

- 差異是設定檔



最終架構與回顧

- 搭配 K8S，可以方便快速的管理與擴展 Container
- 基礎設施架構，建議移出到高可用環境 (DB)
- API Gateway 可以分開或合併
  - 合併只須關注其中一個點
  - 分開可以依據商業邏輯自行發展
- 將部分功能轉移至 Gateway
- 透過 Queue 進行資料交換



More.

- 整合 Consul 服務探索
  - http://ocelot.readthedocs.io/en/latest/features/servicediscovery.html
- 快取
  - http://ocelot.readthedocs.io/en/latest/features/caching.html
- 記錄
  - http://ocelot.readthedocs.io/en/latest/features/logging.html
- 服務品質 (重試和斷路器)
  - http://ocelot.readthedocs.io/en/latest/features/qualityofservice.html
- 速率限制
  - http://ocelot.readthedocs.io/en/latest/features/ratelimiting.html

網關攻略

Thank You

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