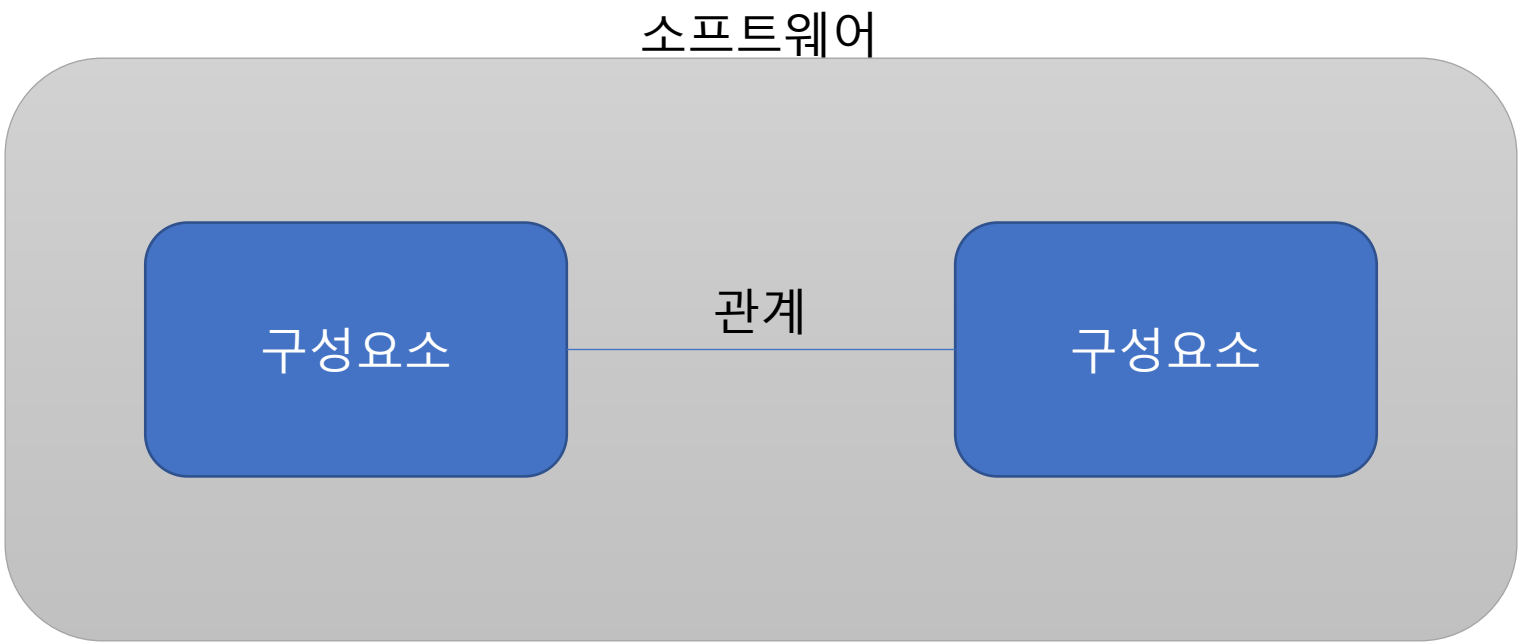
Software Architecture

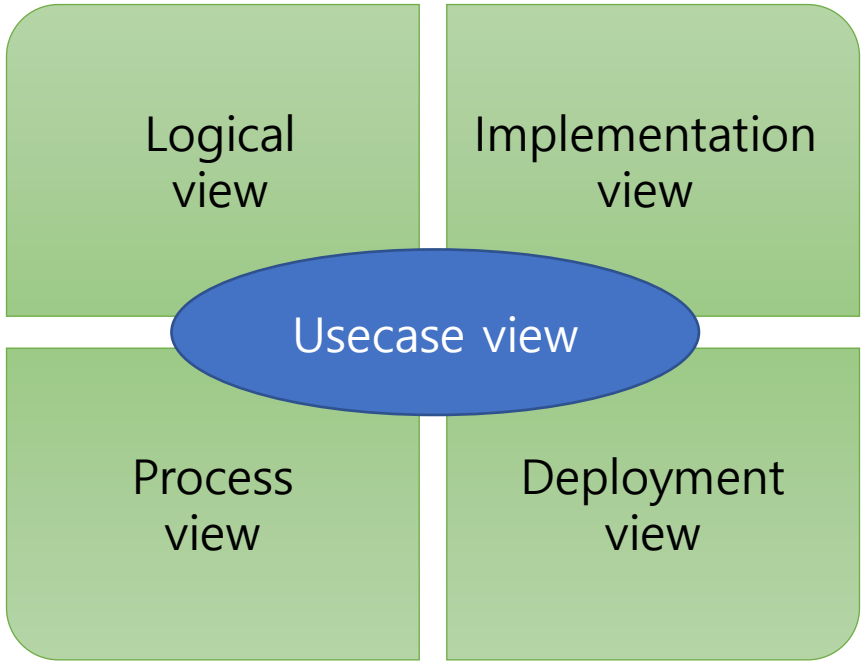
Software Architecture

- SW를 구성하는 요소와 요소 간의 관계 정의
  - 전체 구성 관계, 포함 관계, 호출 관계
  - SW 설계자, 개발, 사용자 등 이해관계자들간의 커뮤니케이션 도구



Software Architecture

- Architecture
  - 이해관계자들이 시스템을 이해하는 수준은 모두 다름 → 관점 → View
  - UML(Unified Modeling Language)



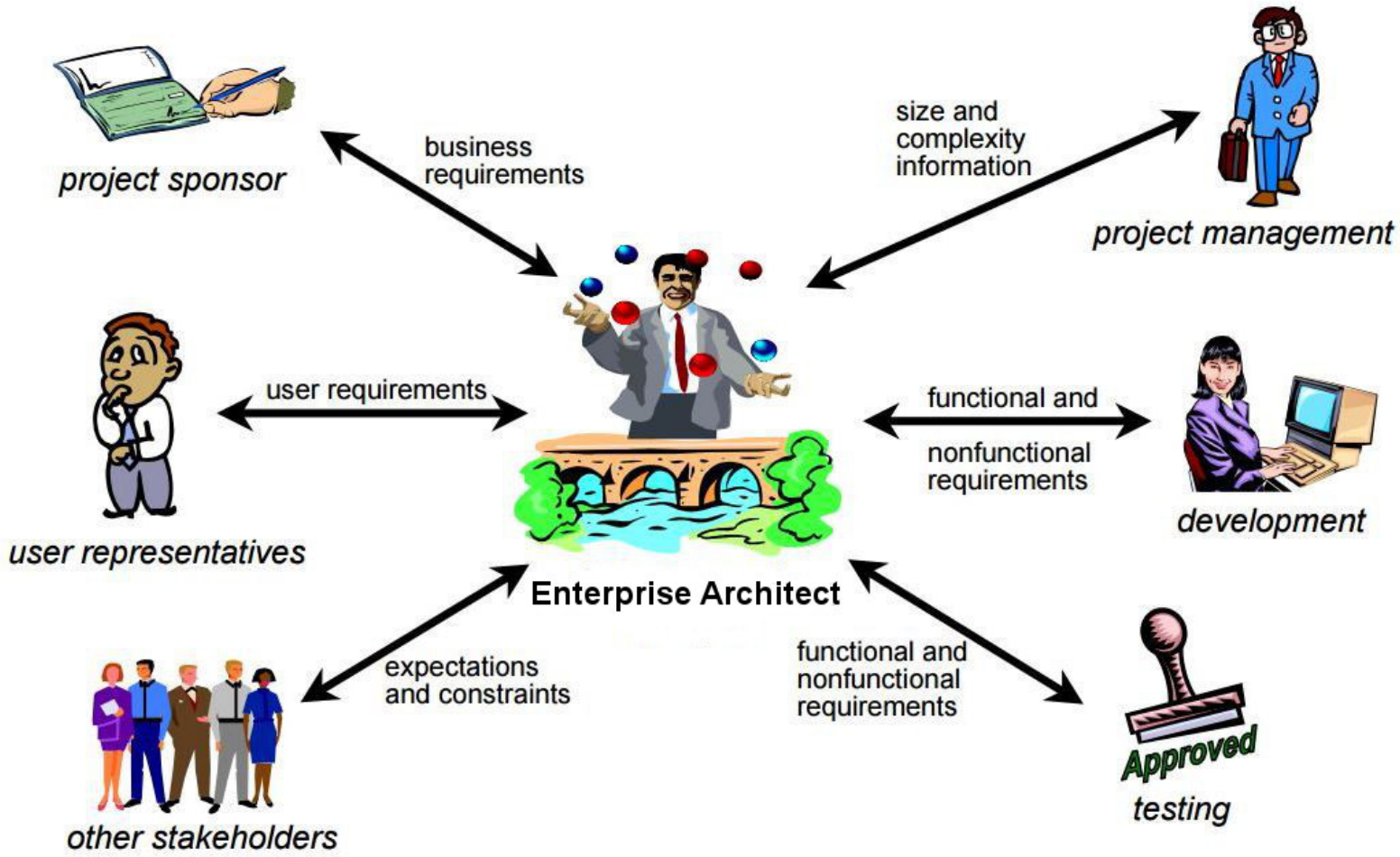
Software Architecture

- Architecture의 역할

"Architecture is both the ***process*** and the product of ***planning***, ***designing***, and ***constructing*** buildings or any other structures. Architectural works, in the material form of buildings, are often perceived as cultural symbols and as works of art. ***Historical civilizations*** are often identified with their surviving ***architectural achievements***. "

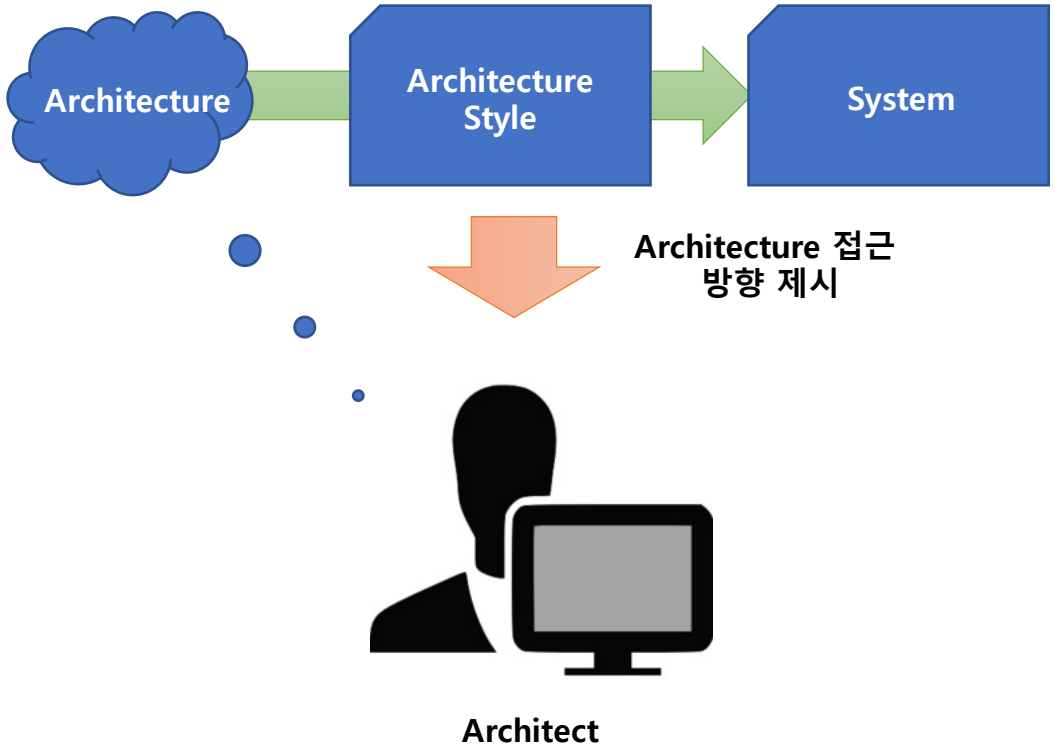
Software Architecture

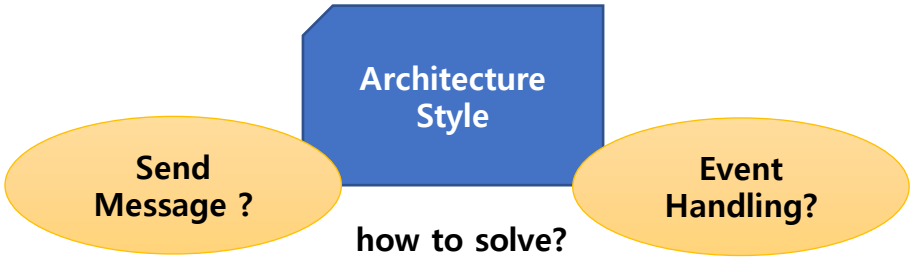
- Architecture의 역할
  - 무형의 지식 집합체(코드)
  - 기능적인 측면 보다는 안정적인 운영을 위한 전체적인 구조를 설계 ex) 오케스트라

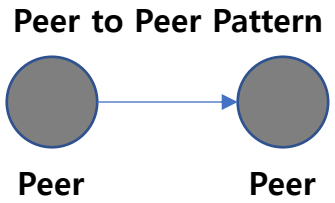


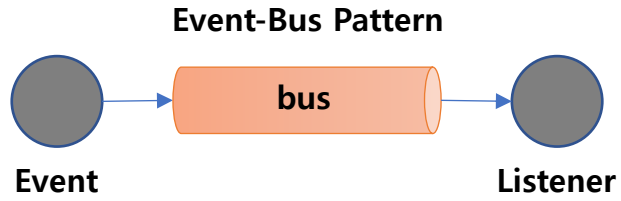
Software Architecture

- Architecture 스타일과 패턴



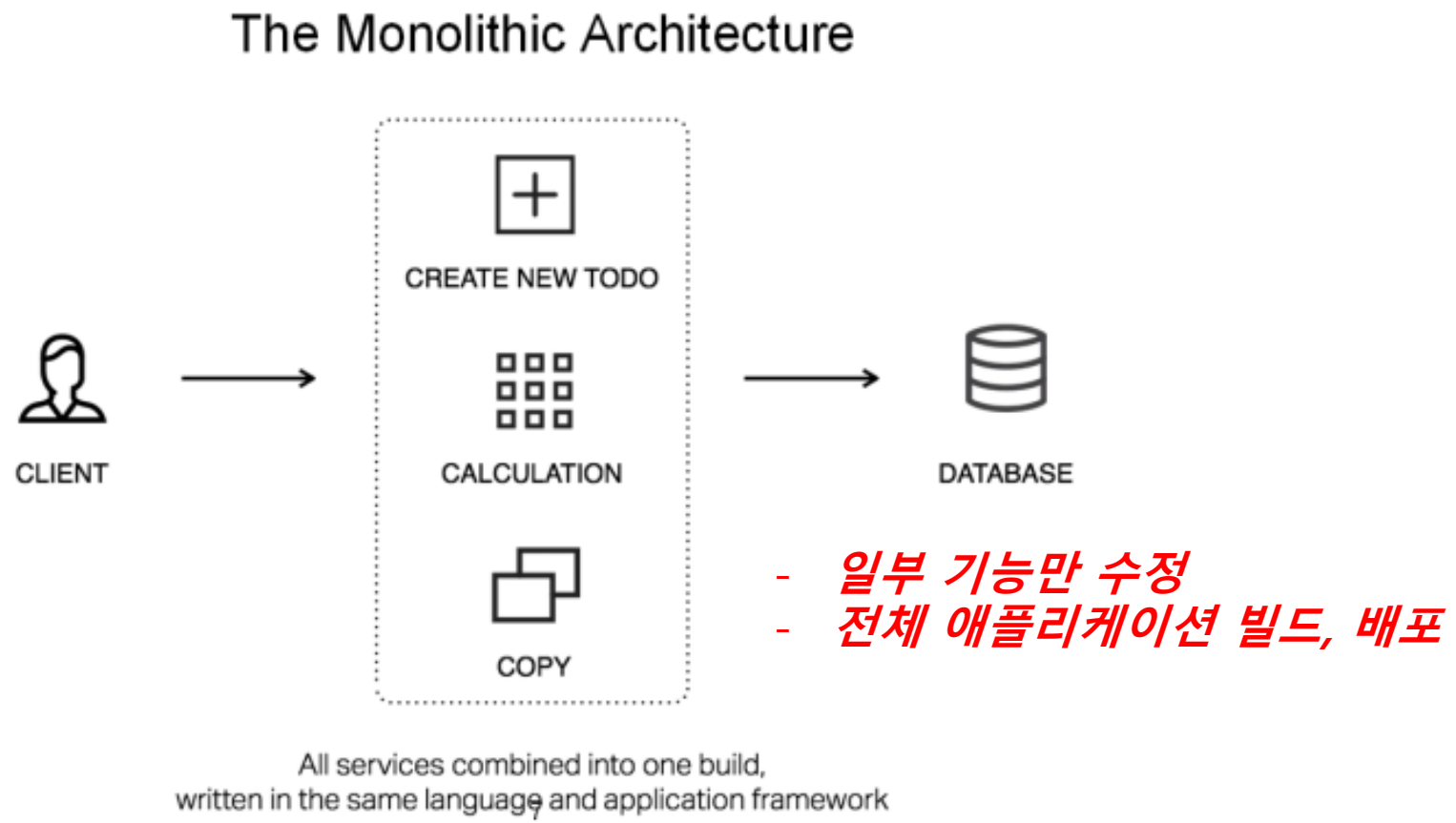






Software Architecture

- Monolith Architecture
  - 모든 업무 로직이 하나의 애플리케이션 형태로 패키지되어 서비스
  - 애플리케이션에서 사용하는 데이터가 한곳에 모여 참조되어 서비스되는 형태



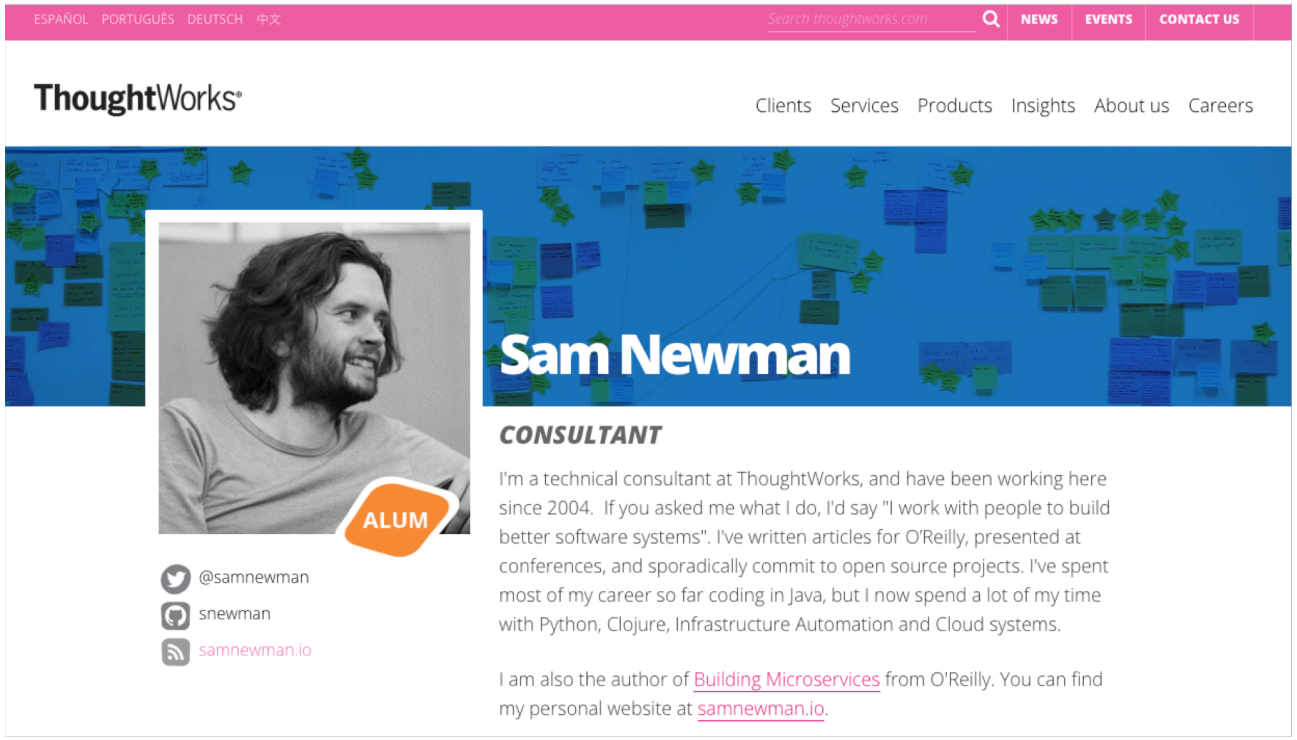
- ***일부 기능만 수정***
- ***전체 애플리케이션 빌드, 배포***

Software Architecture

- What is the Microservice?

Small autonomous services that work together

- Sam Newman



Software Architecture

- What is the Microservice?

In short, the microservice ***architectural style*** is an approach to developing a single application as a suite of ***small services***, each running in its own process and communicating with lightweight mechanisms, on an HTTP resource API....contd

Software Architecture

- What is the Microservice?

These services are built around ***business capabilities*** and ***independently deployable*** by fully **automated deployment** machinery...contd

Software Architecture

- What is the Microservice?

There is a bare minimum of ***centralized management*** of these services, which may be written in ***different programming languages*** and use ***different data storage*** technologies

- James Lewis and Martin Fowler

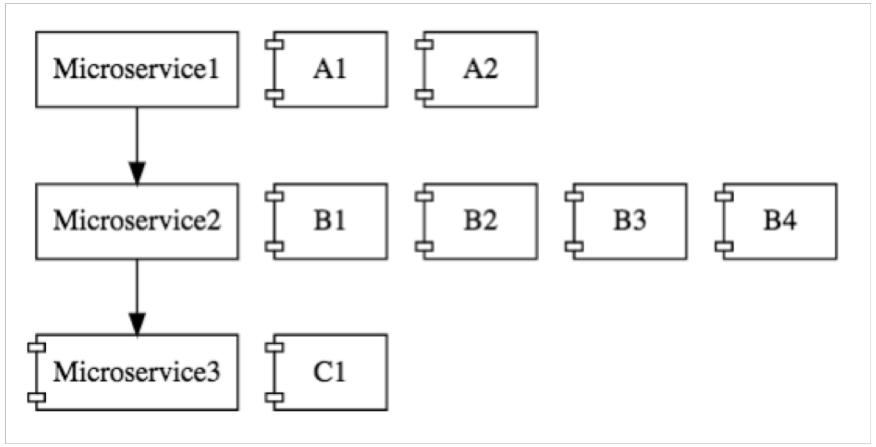
Software Architecture

- What is the Microservice?

1) RESTful

2) Small Well Chosen Deployable Units

3) Cloud Enabled

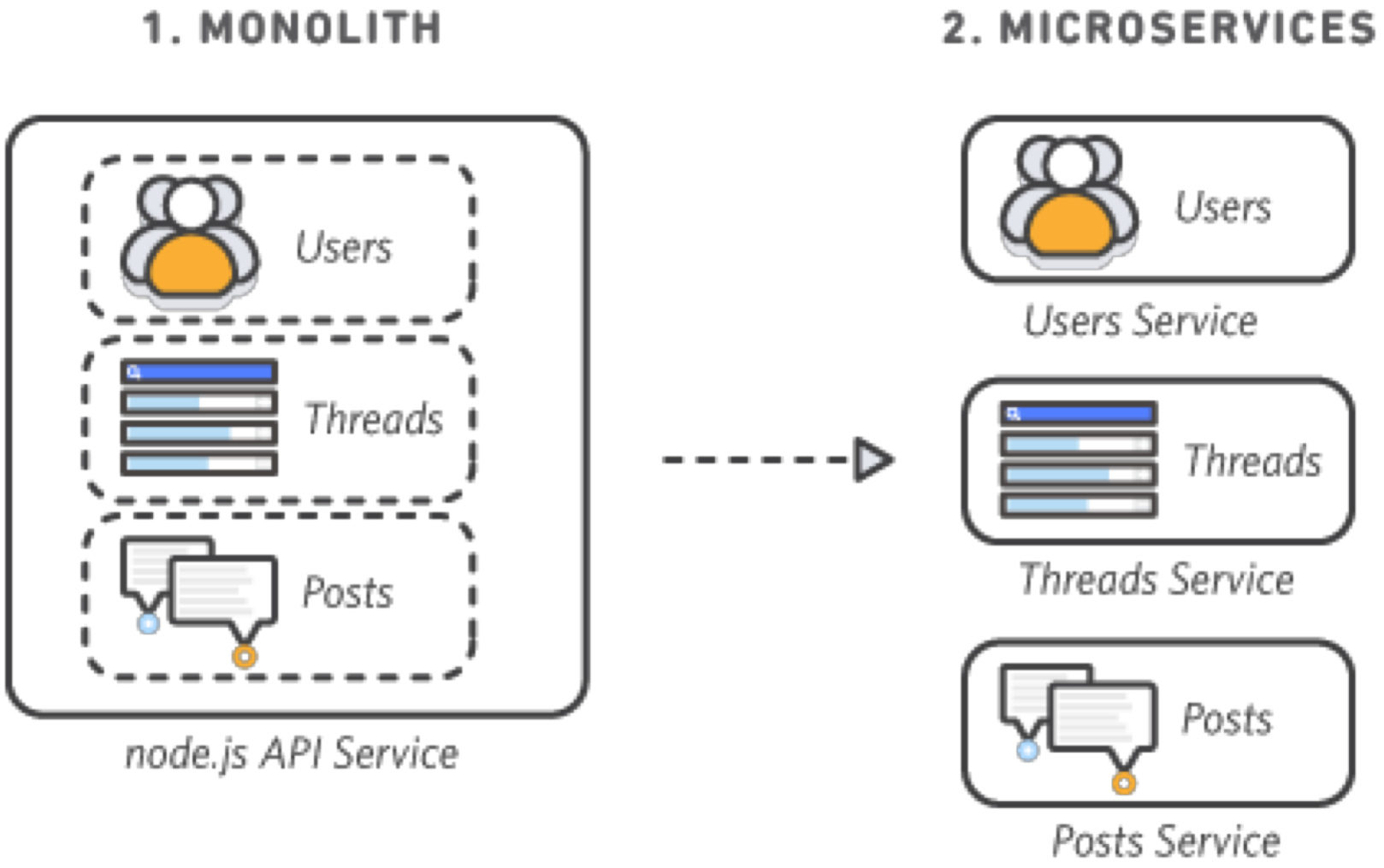


Software Architecture

- Monolith vs Microservice Architecture

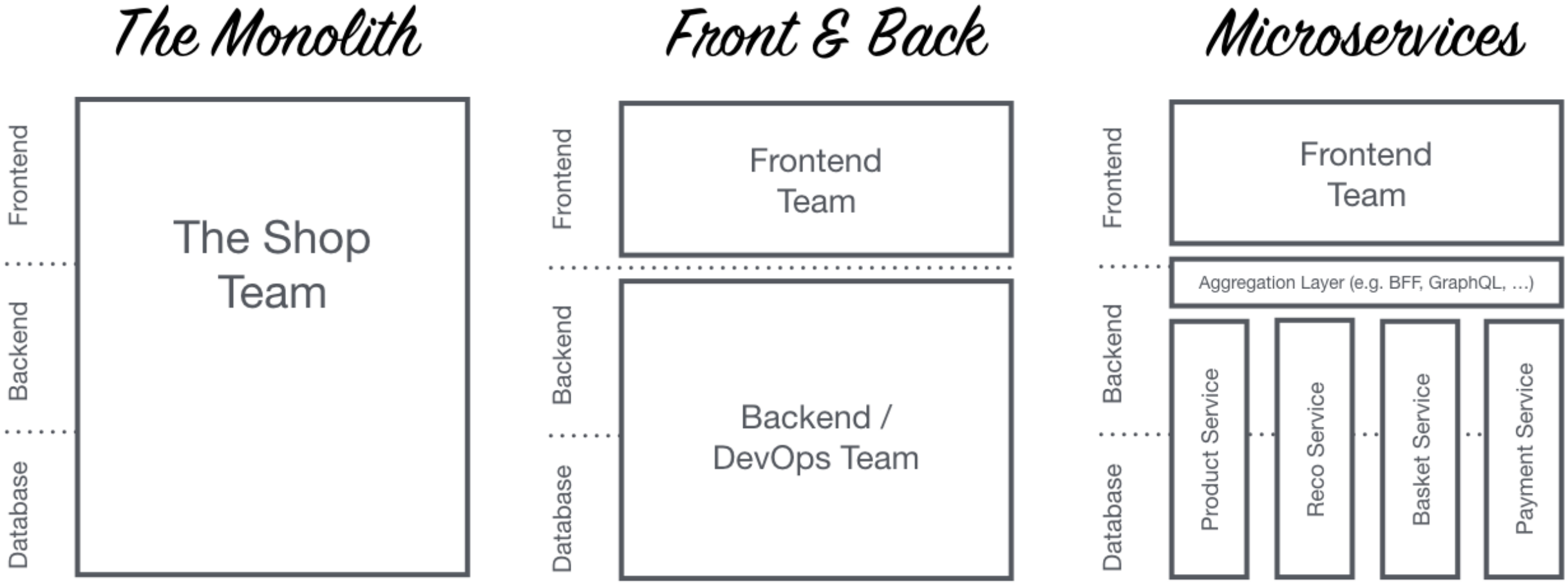
Software Architecture

- Monolith vs Microservice Architecture



Software Architecture

- Monolith vs Front & Back vs Microservice Architecture



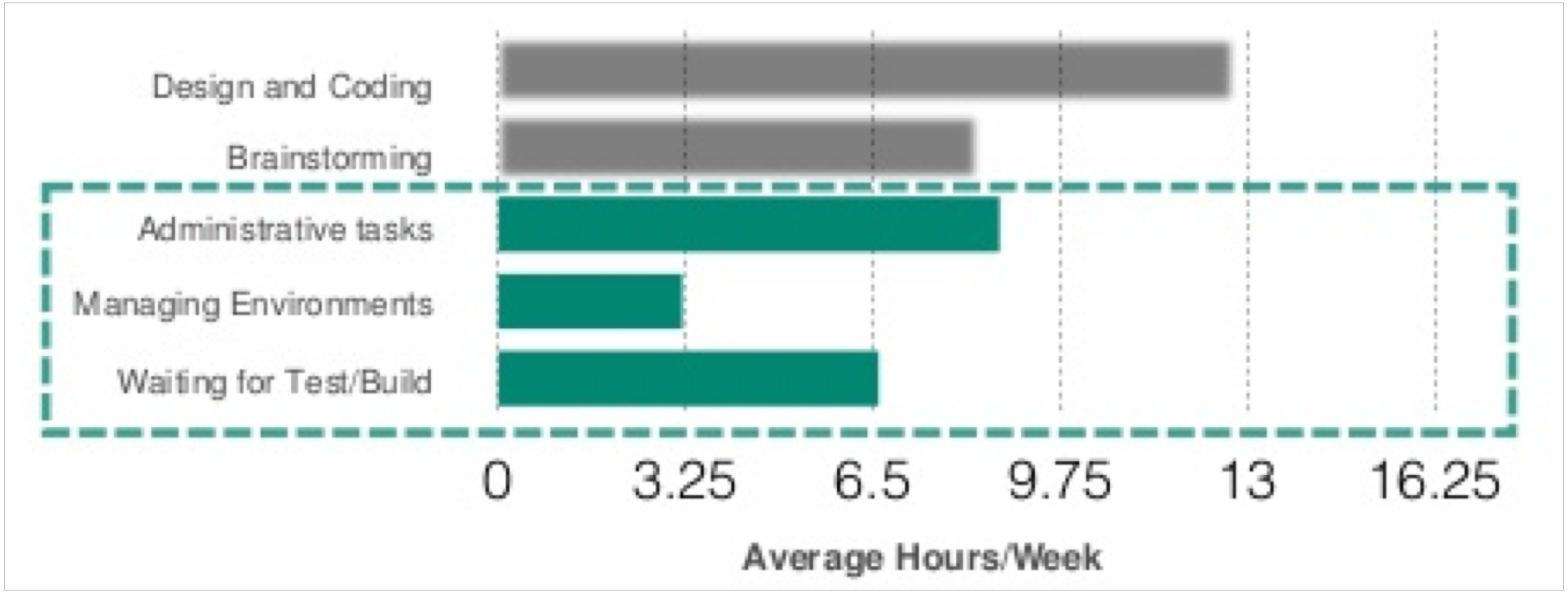
Software Architecture

- How Regular is Regular for High Performing Cloud Native Enterprise?

Company	Deploy Frequency	Deploy Lead Time
Amazon	23,000 / day	MINUTES
Google	5,500 / day	MINUTES
Netflix	500 / day	MINUTES
Facebook	1 / day	HOURS
Twitter	3 / week	HOURS
Typical Enterprise	**Once every 9+ months**	**MONTHS or QUARTERS**

Software Architecture

- Software developers spend too much time ***NOT writing software***



Software Architecture

- Microservice 특징

1) Challenges

2) Bounded Context

3) Configuration Management

4) Dynamic Scale Up And Scale Down

5) Visibility

Software Architecture

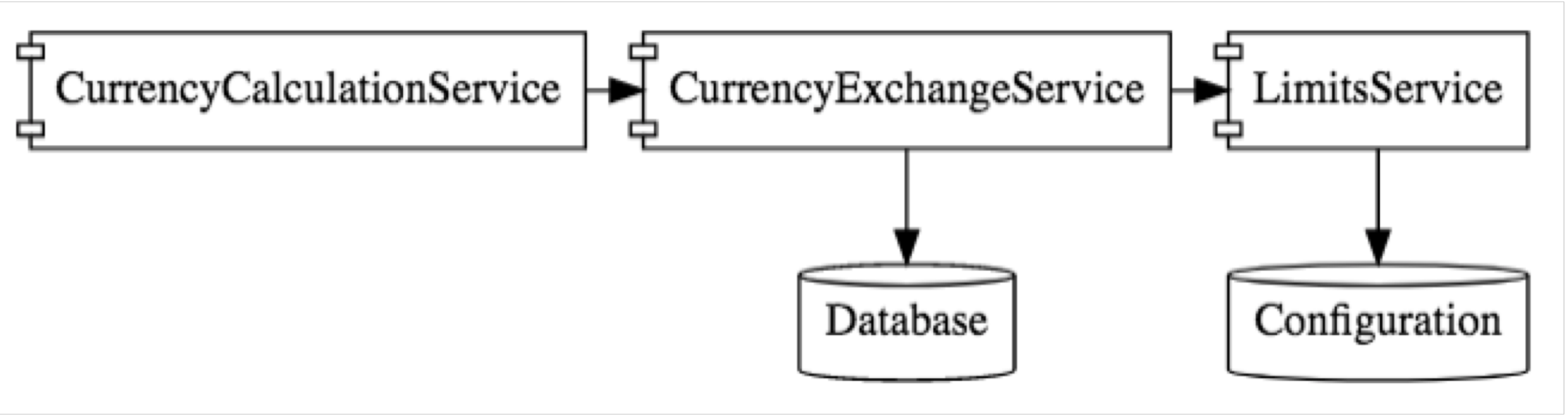
- Microservice 특징

6) Solution

- Centralized configuration management
  - Spring Cloud Config Server
- Location transparency
  - Naming Server (Eureka)
- Load Distribution
  - Ribbon (Client Side)
- Visibility and monitoring
  - Zipkin Distributed Tracing
  - Netflix API gateway
- Fault Tolerance
  - Hystrix

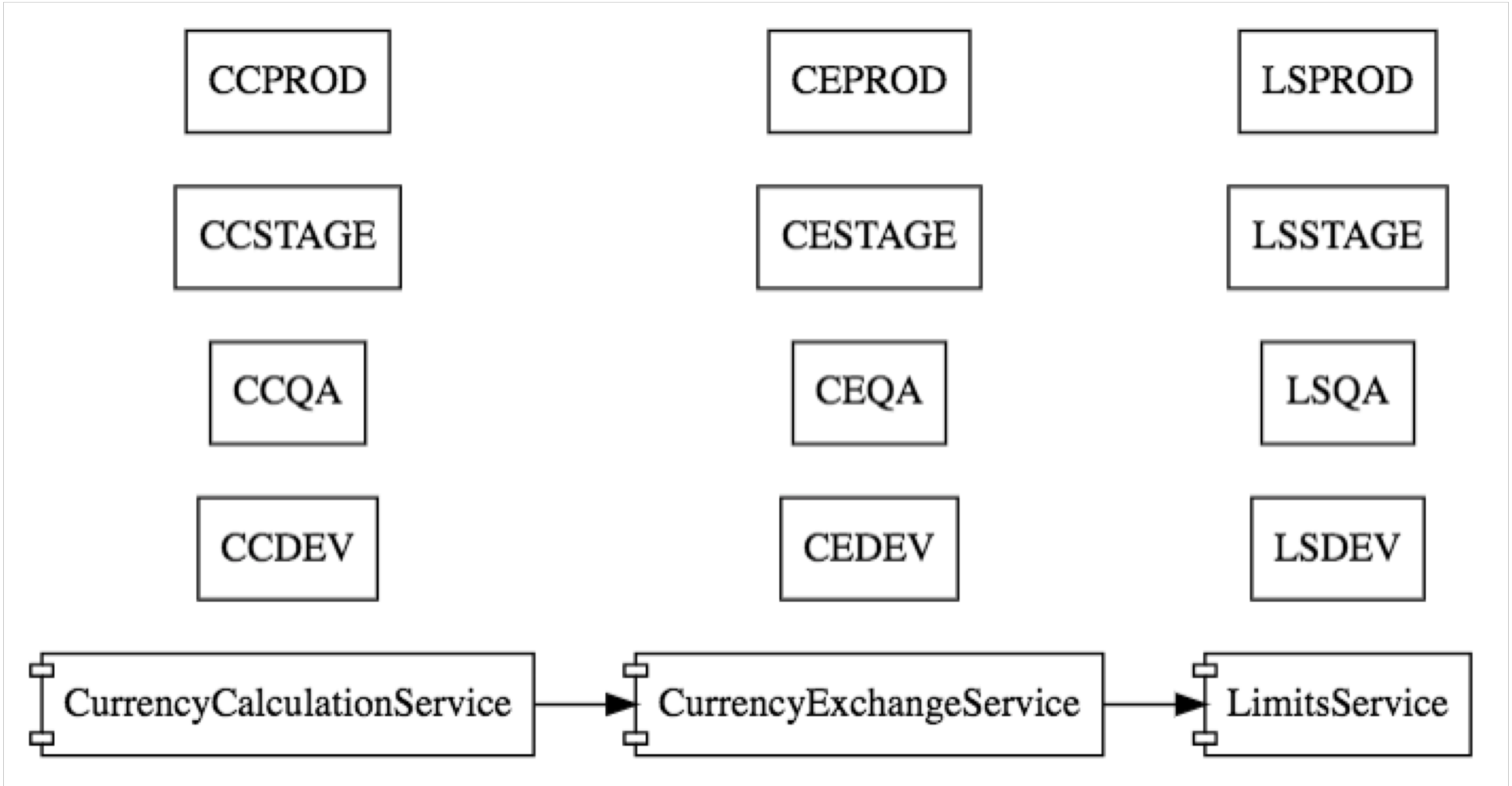
Software Architecture

- Microservice



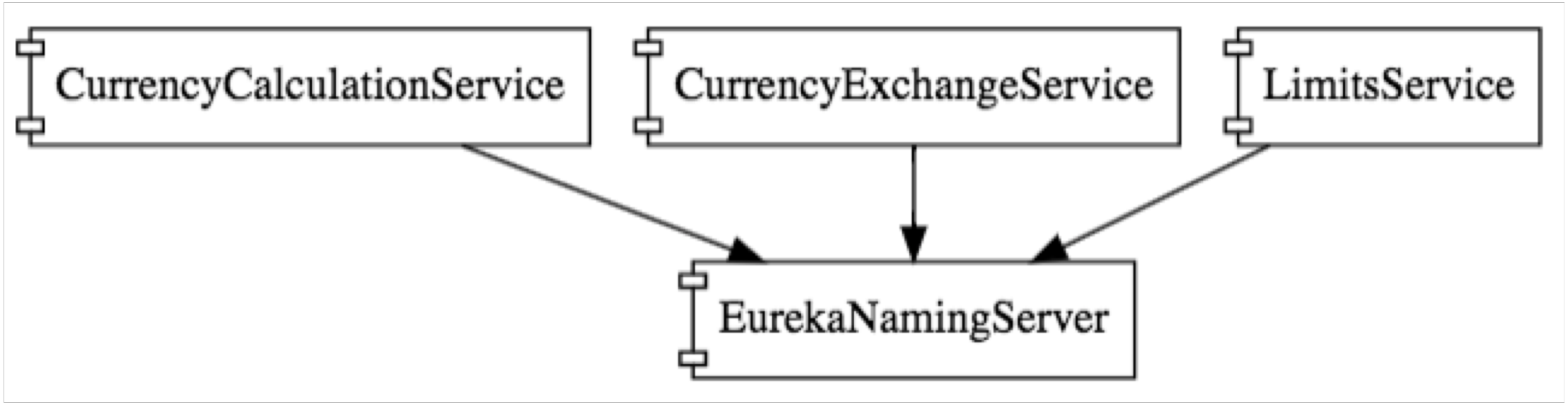
Software Architecture

- Microservice Environments



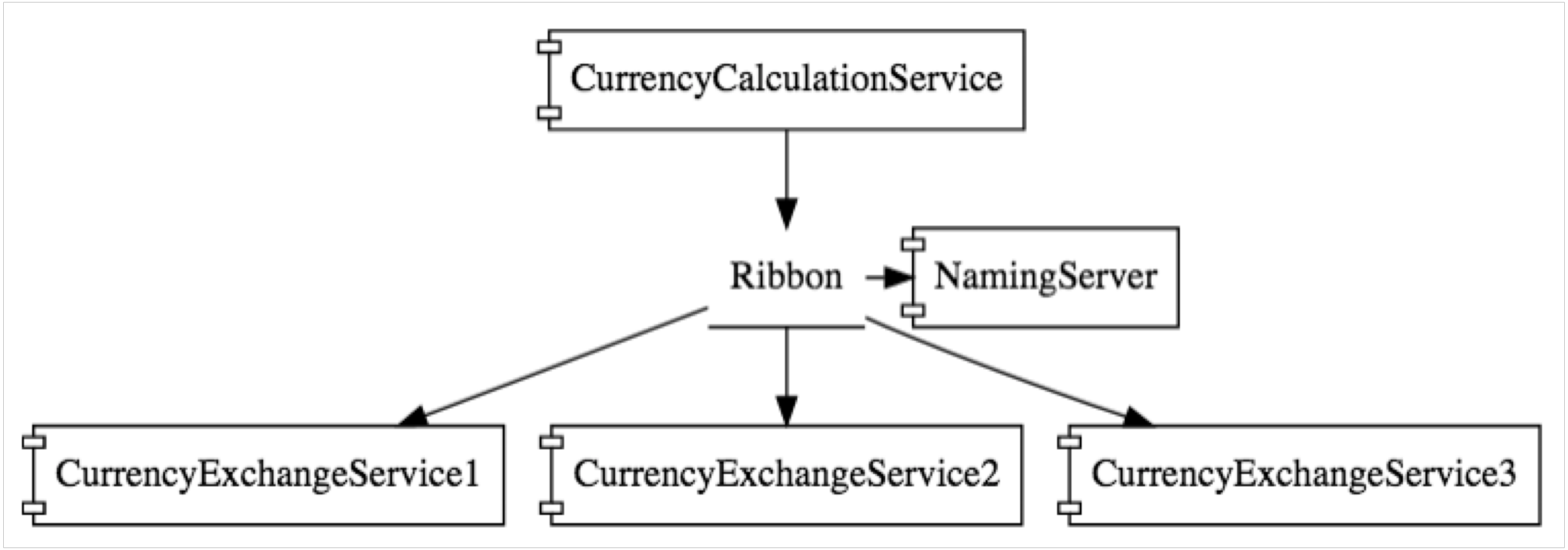
Software Architecture

- Microservice – Eureka Naming Server



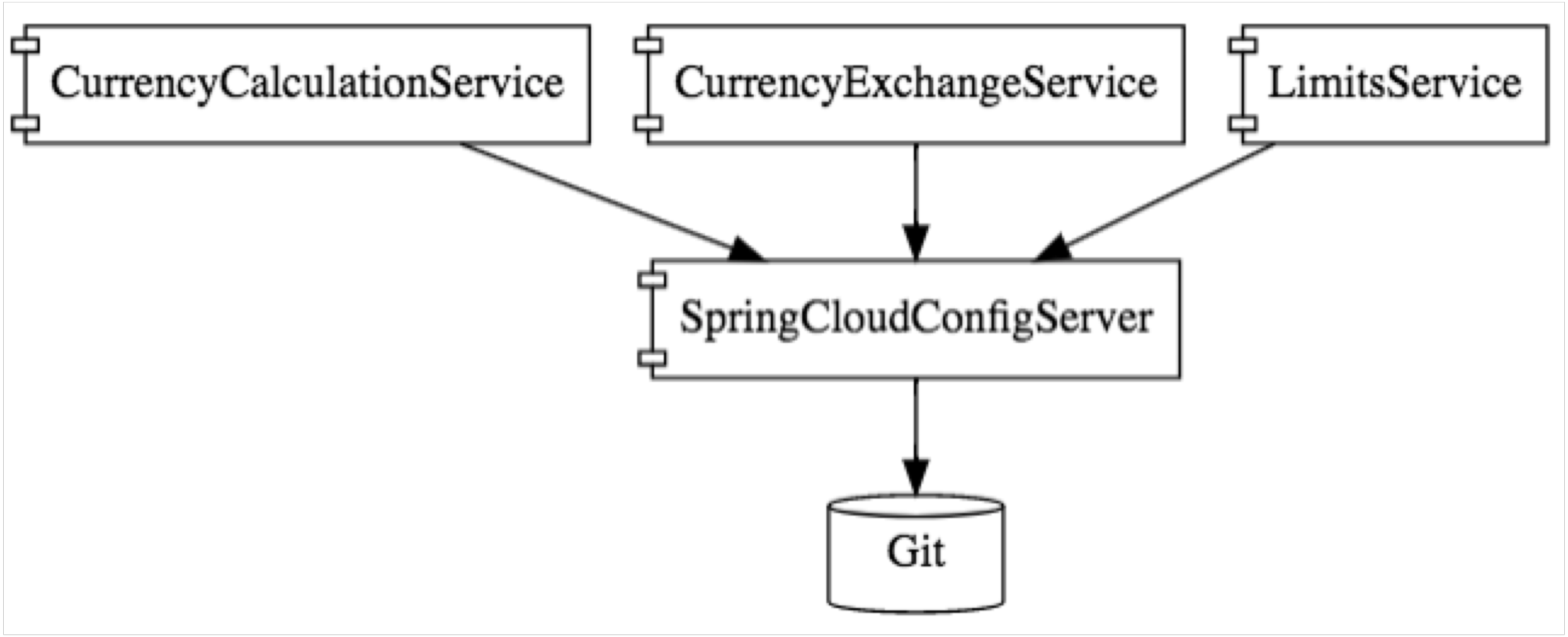
Software Architecture

- Microservice – Ribbon Load Balancing



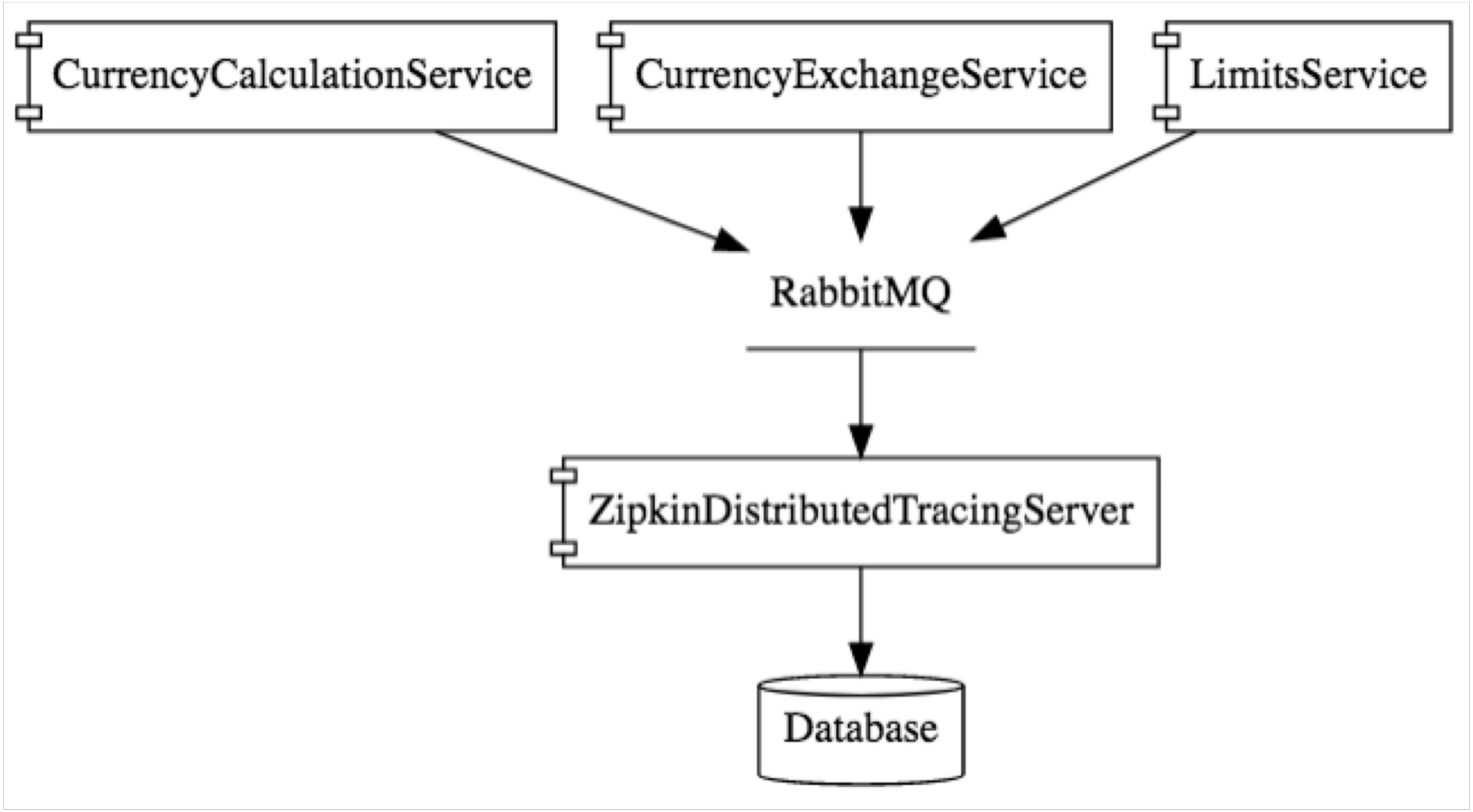
Software Architecture

- Microservice – Spring Cloud Config Server



Software Architecture

- Microservice – Zipkin Distributed Tracing



Software Architecture

- Microservice – API Gateways
  - Authentication, Authorization and Security
  - Rate Limits
  - Fault Tolerance
  - Service Aggregation

Software Architecture

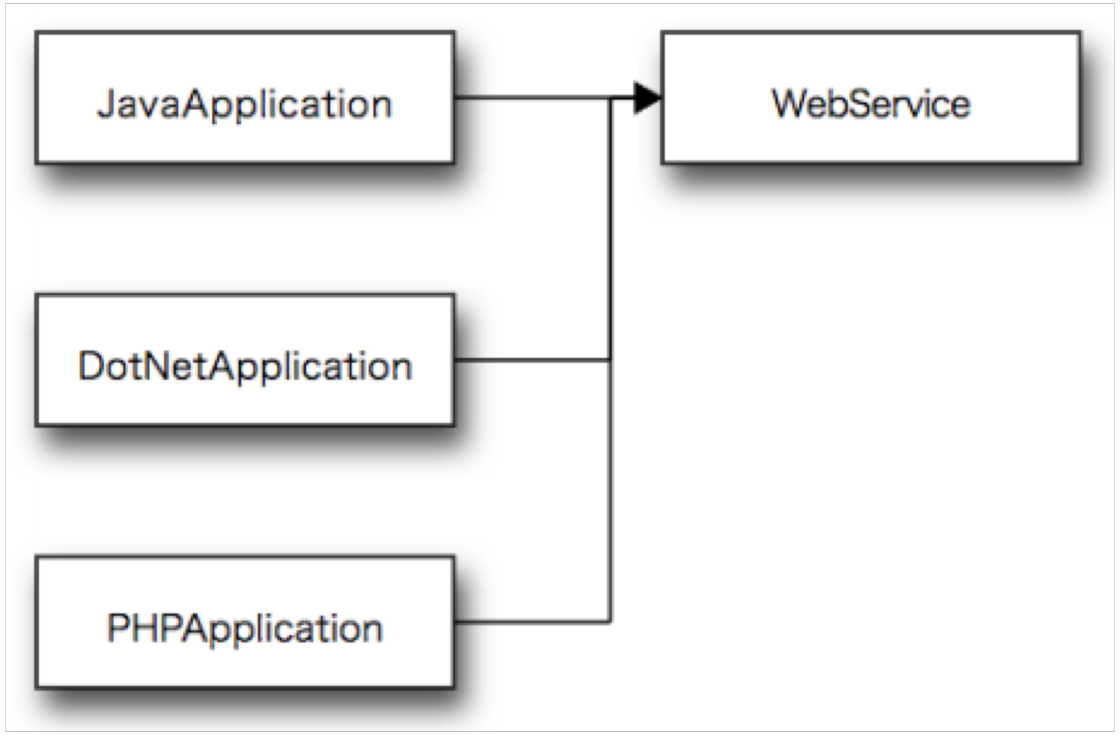
- Microservice – Web Services
  - Service delivered over the web?
  - Is the Todo Management Application a Web Service?
  - Can I reuse the Business Layer by creating a JAR?
  - How can I make my Todo application consumable by other applications?

Software Architecture

- Web Services – 3 KEYS
  - Designed for machine-to-machine (or application-to-application) interaction
  - Should be interoperable - Not platform dependent
  - Should allow communication over a network

Software Architecture

- Web Services
  - How does data exchange between applications take place?
  - How can we make web services platform independent?



Software Architecture

- Web Services
  - Data Format
    - XML

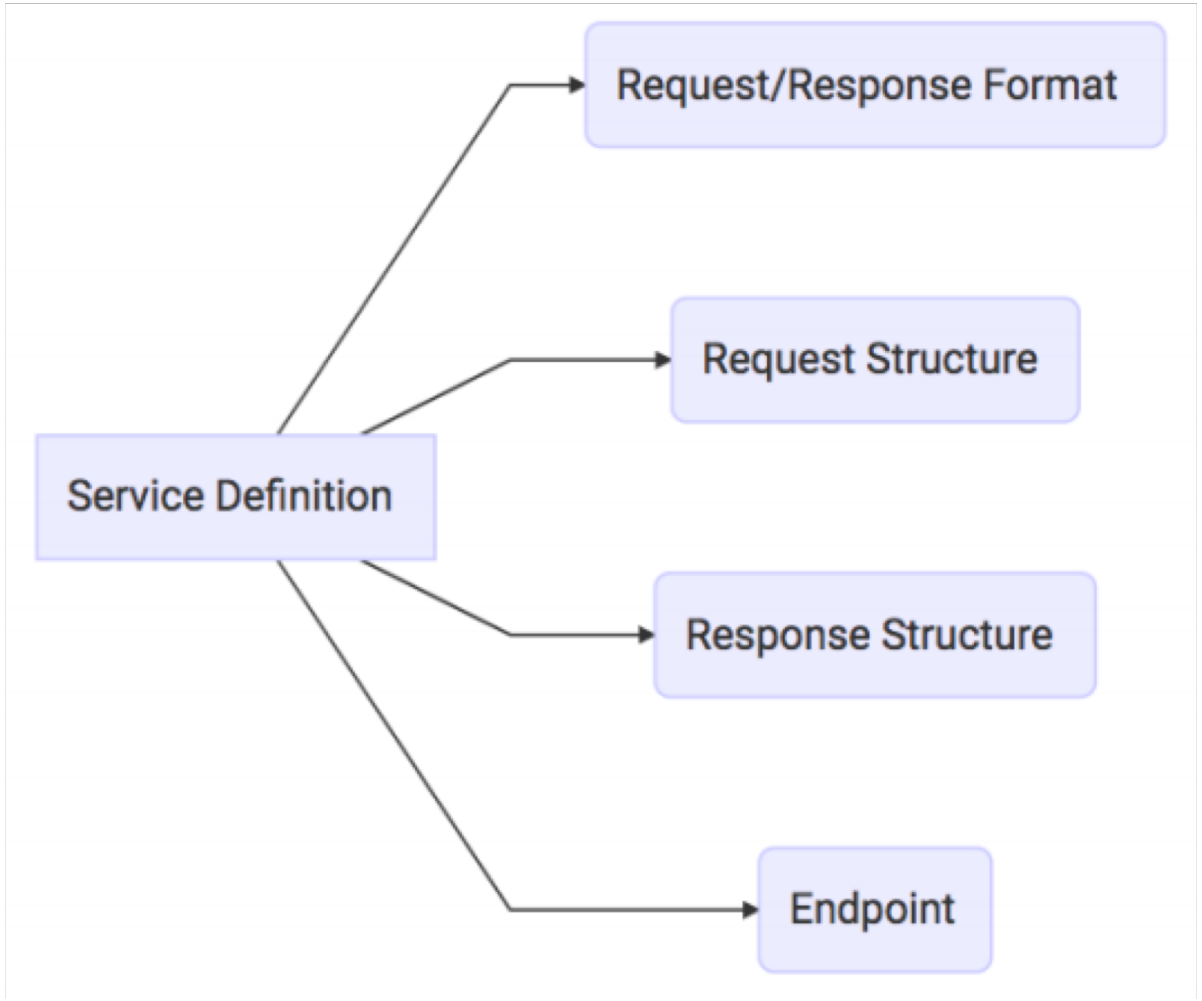
```
<getCourseDetailsRequest>
    <id>Course1</id>
</getCourseDetailsRequest>
```

    - JSON

```
[
  {
    "id": 1,
    "name": "Even",
    "birthDate": "2017-07-10T07:52:48.270+0000"
  },
  {
    "id": 2,
    "name": "Abe",
    "birthDate": "2017-07-10T07:52:48.270+0000"
  }
]
```

Software Architecture

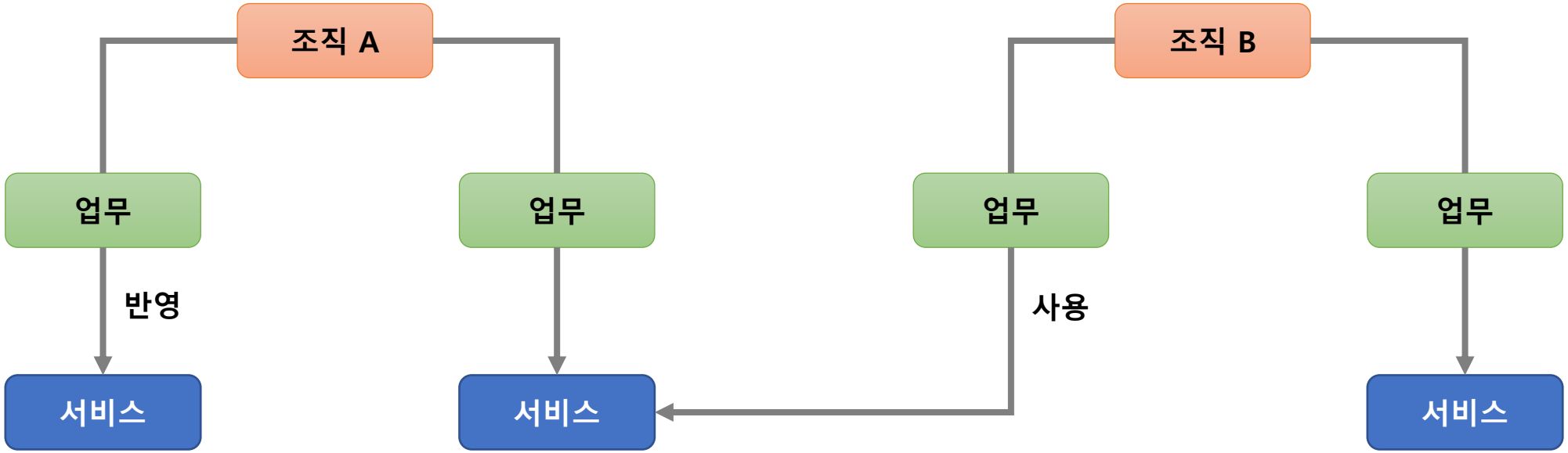
- Web Services
  - How does the Application A know the format of Request and Response?
  - How does Application A and Web Service convert its internal data to (XML or JSON)



Service Oriented Architecture

Service Oriented Architecture

- SOA
  - 업무 처리 단위를 각각의 서비스로 반영
  - 데이터 중심 → 서비스 중심 설계
  - 서비스를 통해 비즈니스 환경 변화와 업무 변화에 대응



Service Oriented Architecture

- SOA 특징

  1) 서비스 계약

  2) 서비스 가용성

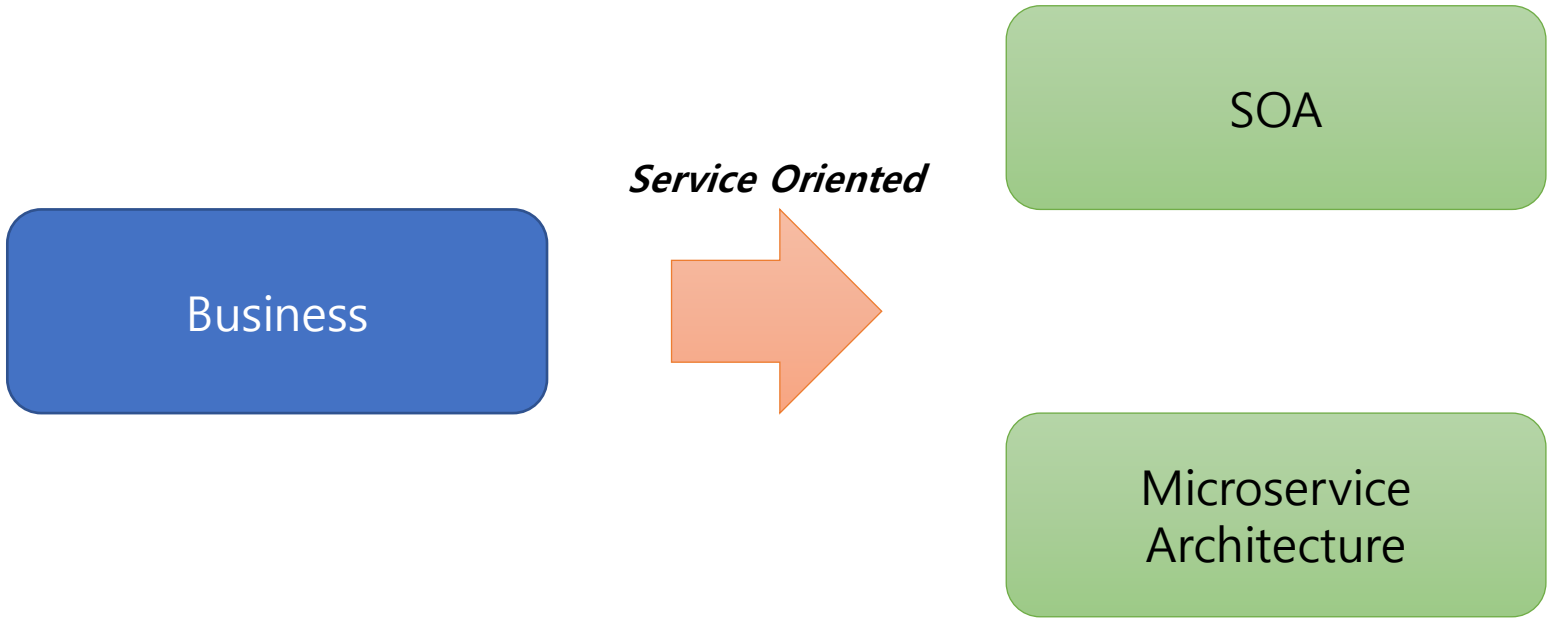
  3) 서비스 권한

  4) 트랜잭션

  5) 서비스 관리

Service Oriented Architecture

- SOA와 Microservice Architecture와의 차이점
  - ***공통점: 비즈니스 변화 대응을 위한 서비스 중심의 아키텍쳐***
  - ***서비스의 상대적 크기와 관심사, Ownership, 기술 구조***



Service Oriented Architecture

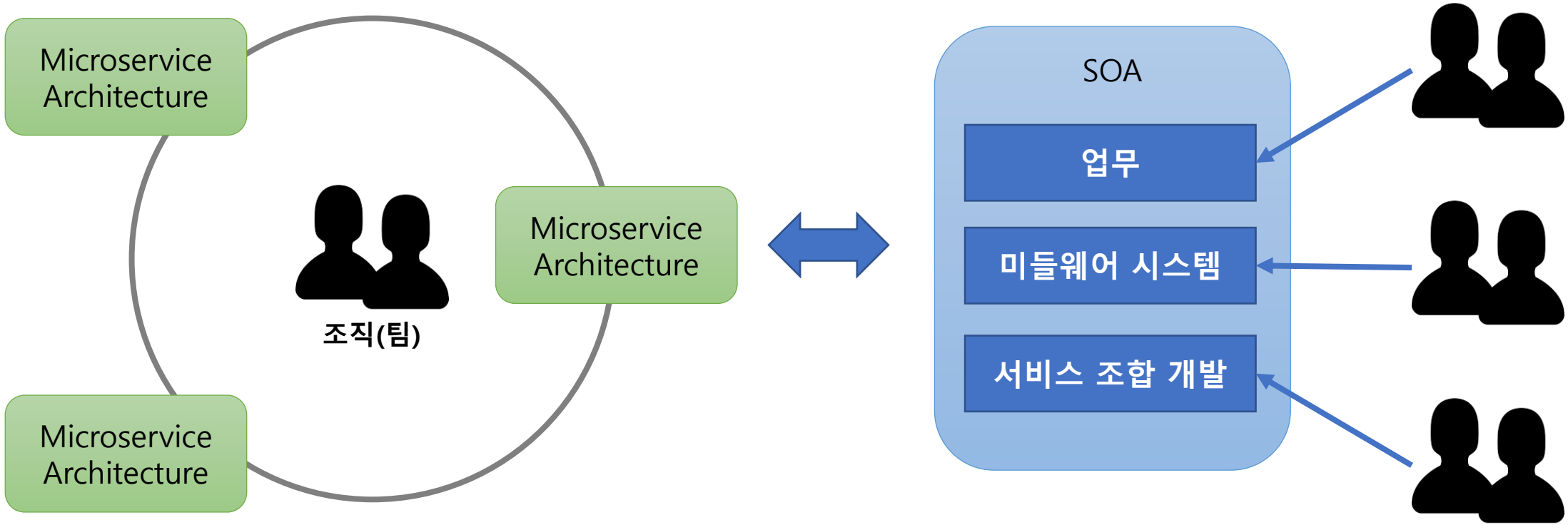
- SOA와 Microservice Architecture와의 차이점
  - SOA
    - *비즈니스 측면에서의 서비스 재사용성*
    - *ESB(Enterprise Service Bus)라는 서비스 채널 이용 → 서비스 공유, 재사용*
  - MSA
    - *한 가지 작은 서비스에 집중*
    - *서비스 공유하지 않고 독립적 실행*

Service Oriented Architecture

- SOA와 Microservice Architecture와의 차이점
  - 서비스의 상대적 크기와 관심사

Service Oriented Architecture

- SOA와 Microservice Architecture와의 차이점
  - 서비스의 Ownership

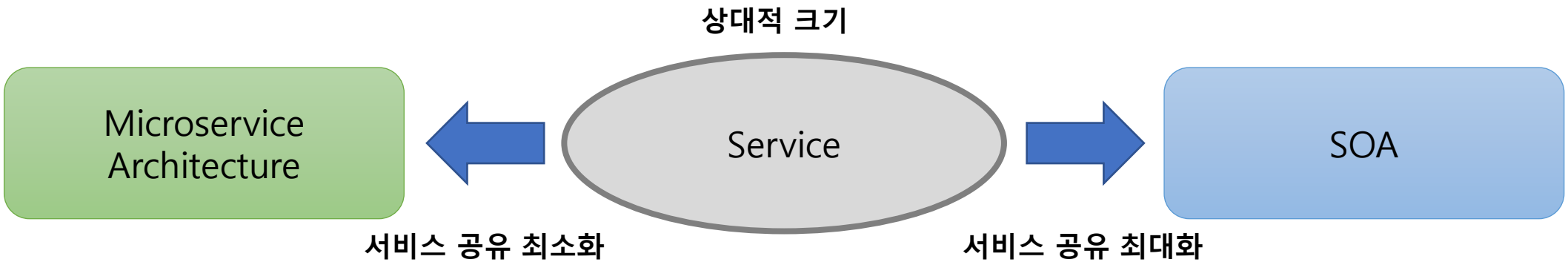


하나의 팀에서 개발 및 관리

업무/기술/개발 조직이 다름

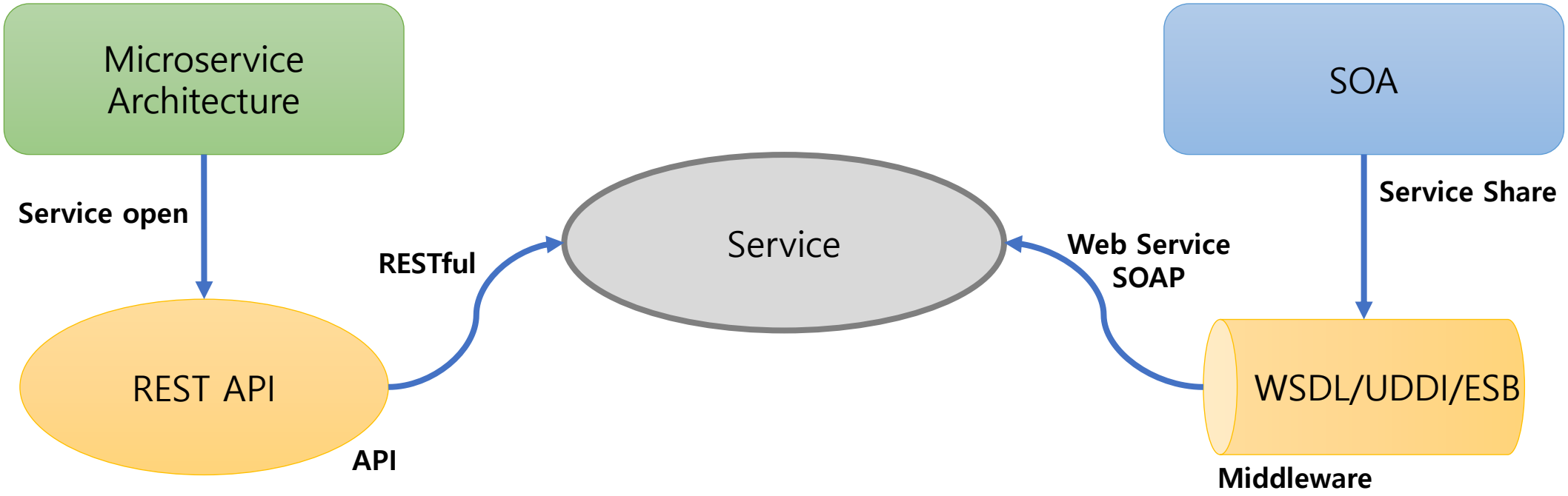
Service Oriented Architecture

- SOA와 Microservice Architecture와의 차이점
  - 서비스의 공유 지향점
    - *SOA - 재사용을 통한 비용 절감*
    - *MSA - 서비스 간의 결합도를 낮추어 변화에 능동적으로 대응*



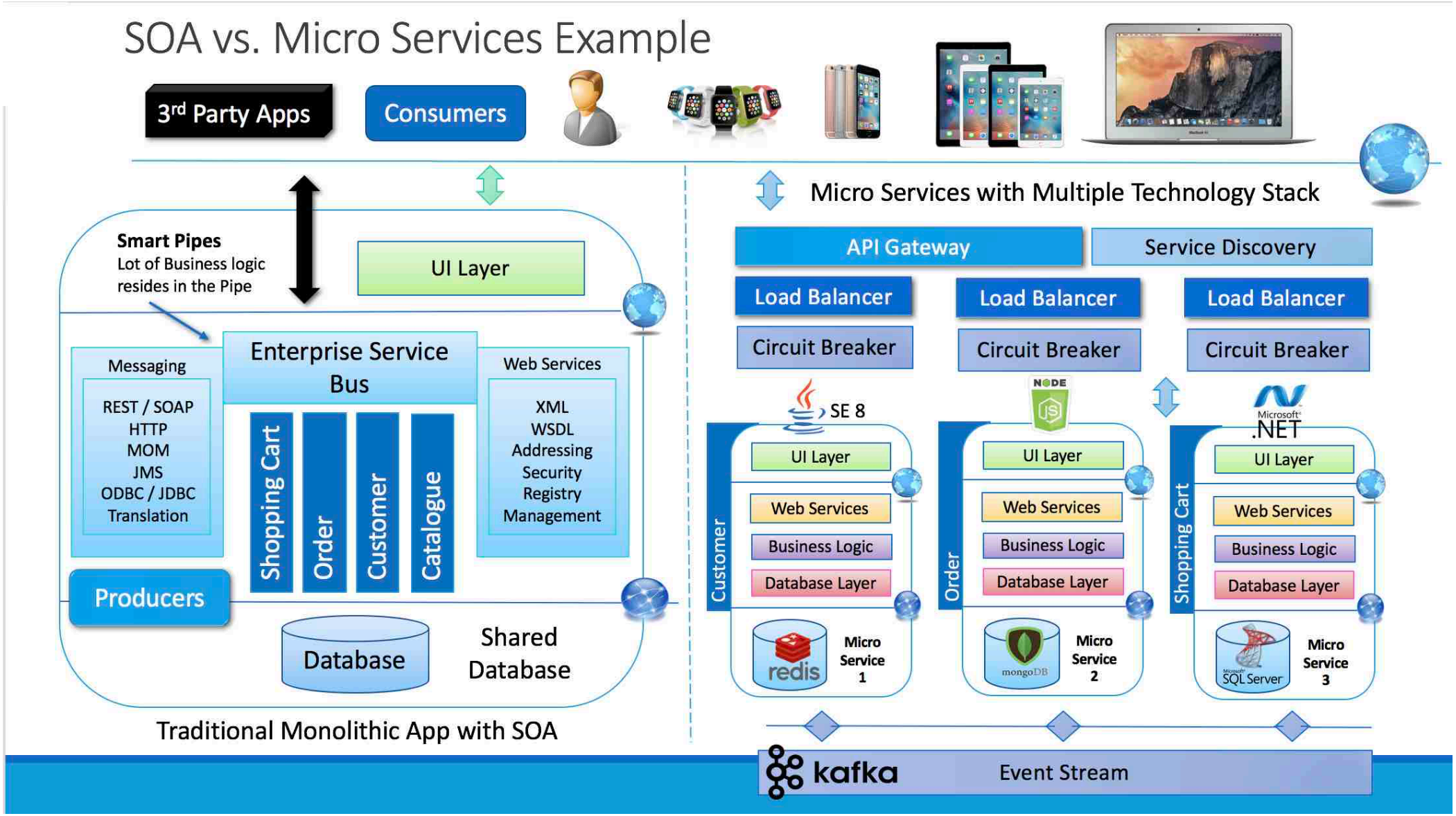
Service Oriented Architecture

- SOA와 Microservice Architecture와의 차이점
  - 기술 방식
    - *SOA - 공통의 서비스를 ESB에 모아 사업 측면에서 공통 서비스 형식으로 서비스 제공*
    - *MSA - 각 독립된 서비스가 노출된 REST API를 사용*



Service Oriented Architecture

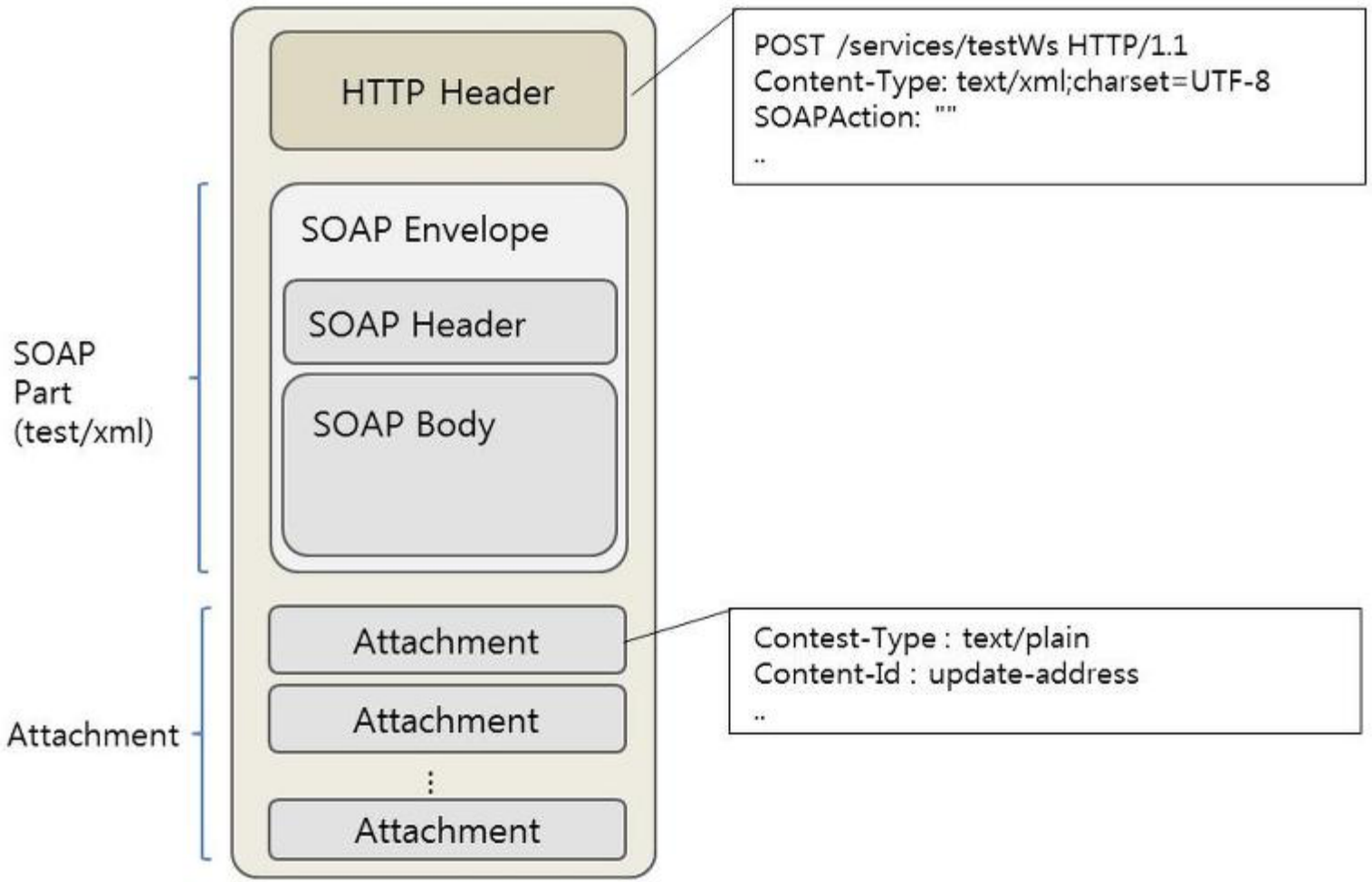
- SOA와 Microservice Architecture와의 차이점



- ***민첩한 서비스***
- ***유연한 인프라***
- ***Happy Path***

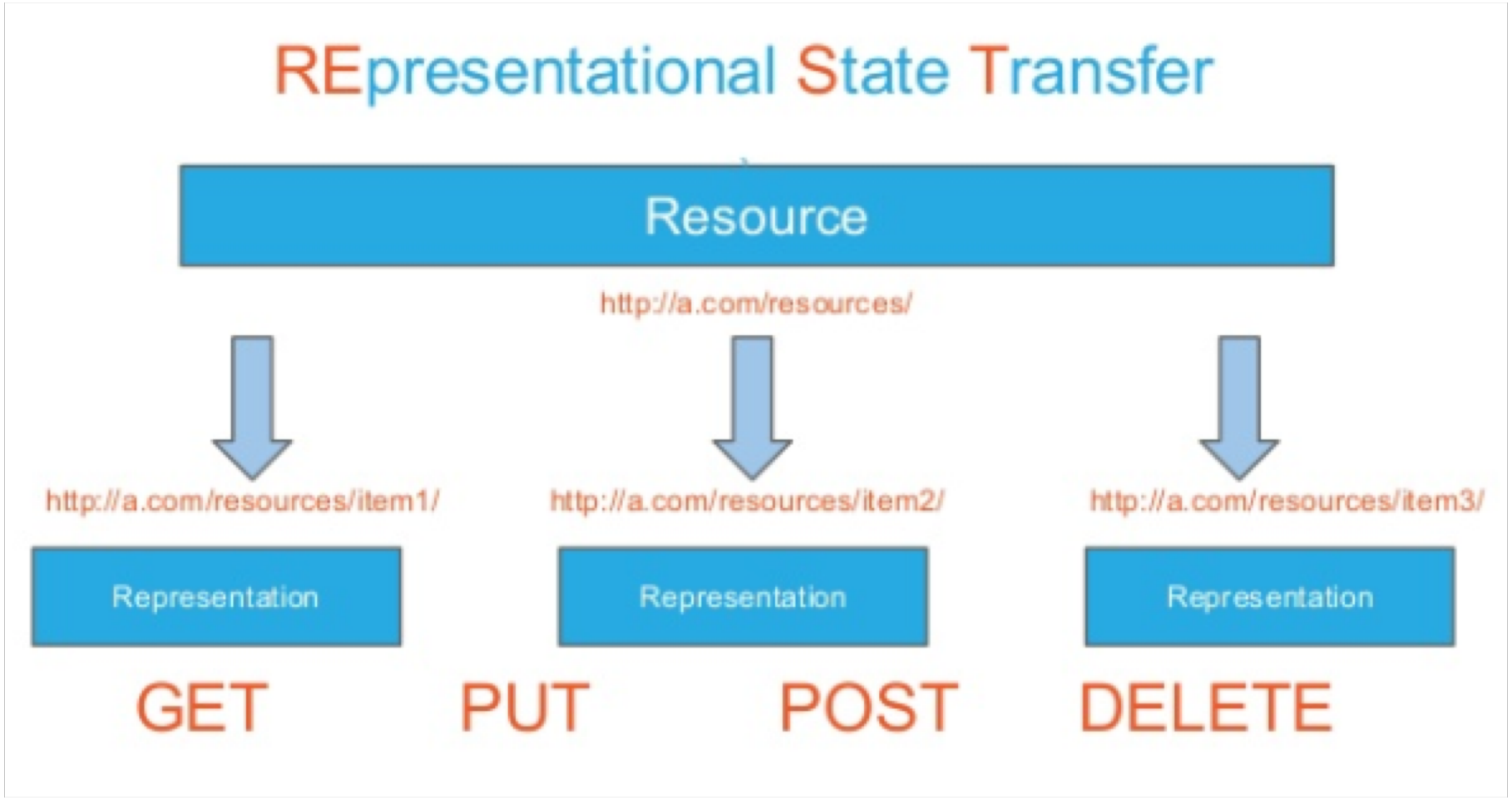
Service Oriented Architecture

- SOAP vs REST



Service Oriented Architecture

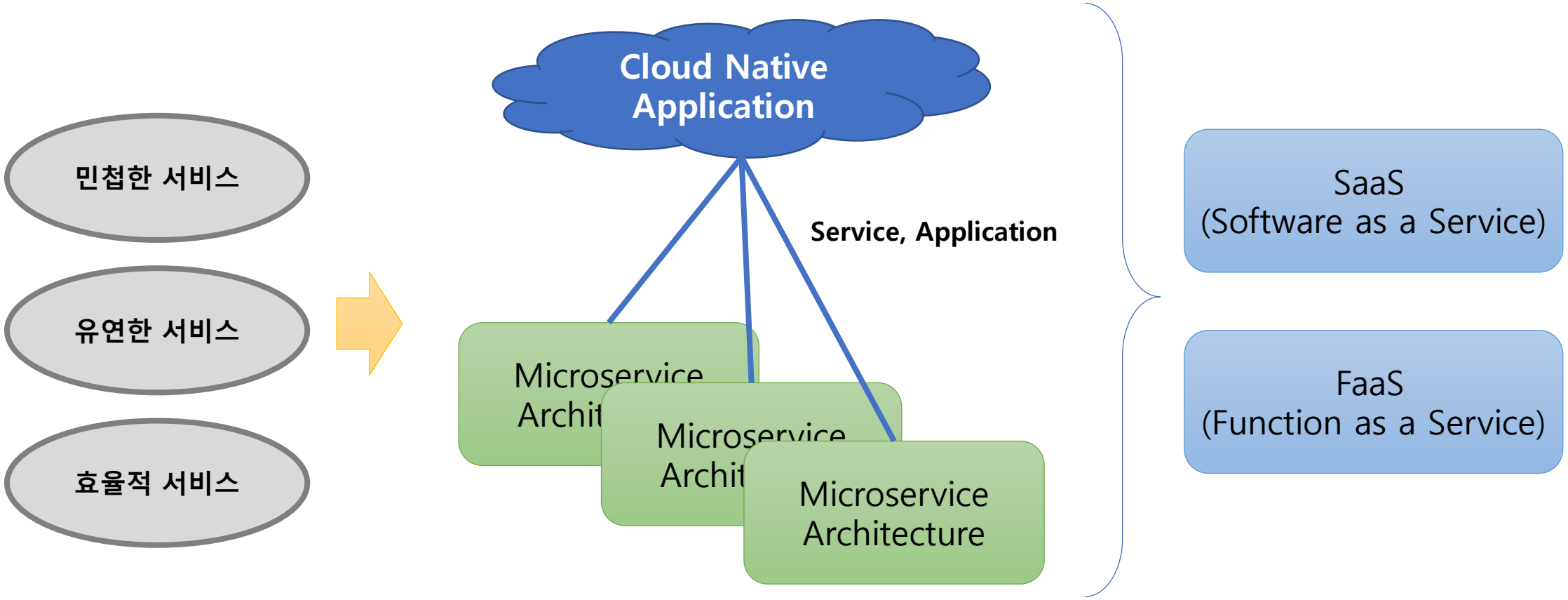
- SOAP vs REST



Cloud Native

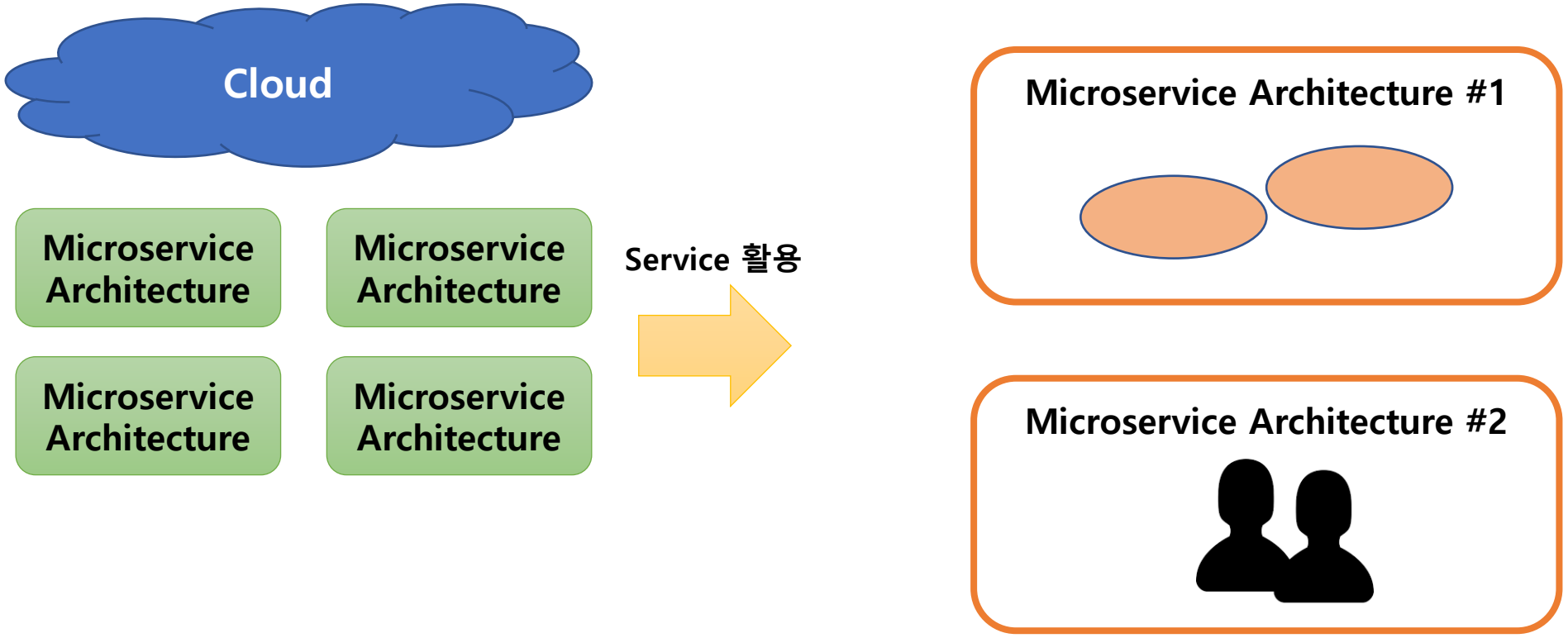
Cloud Native

- Cloud Native Application
  - 클라우드 네이티브 환경에서 SaaS난 FaaS 형태로 서비스되는 애플리케이션



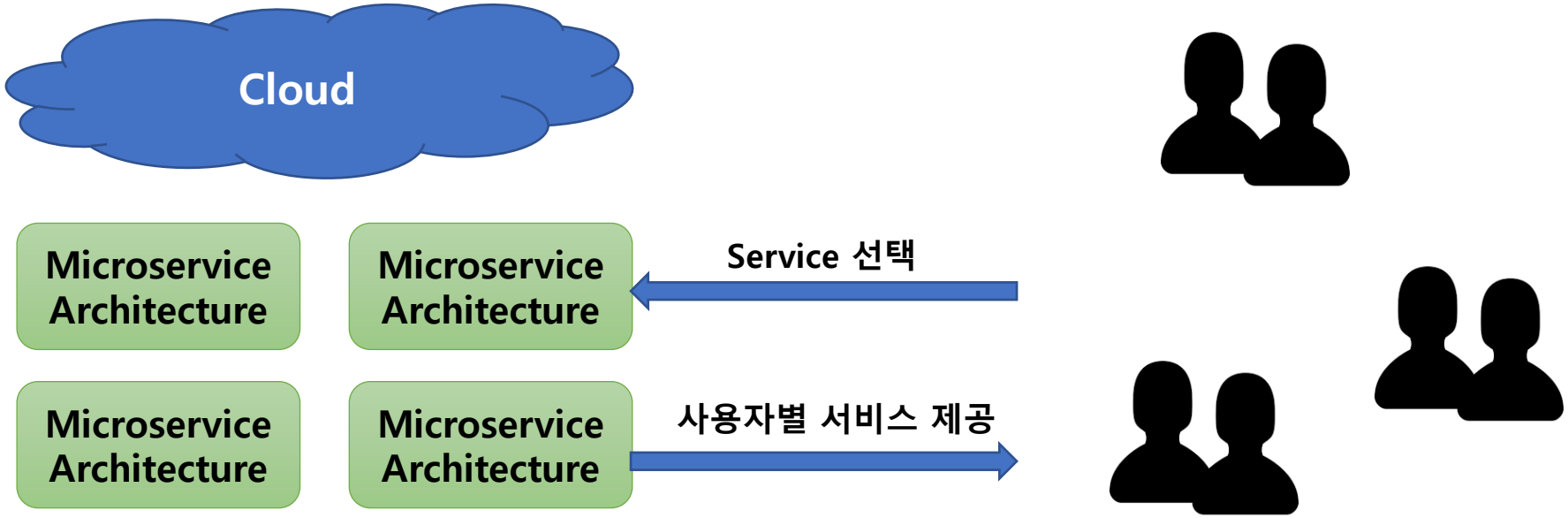
Cloud Native

- Cloud Native Application
  - Microservice



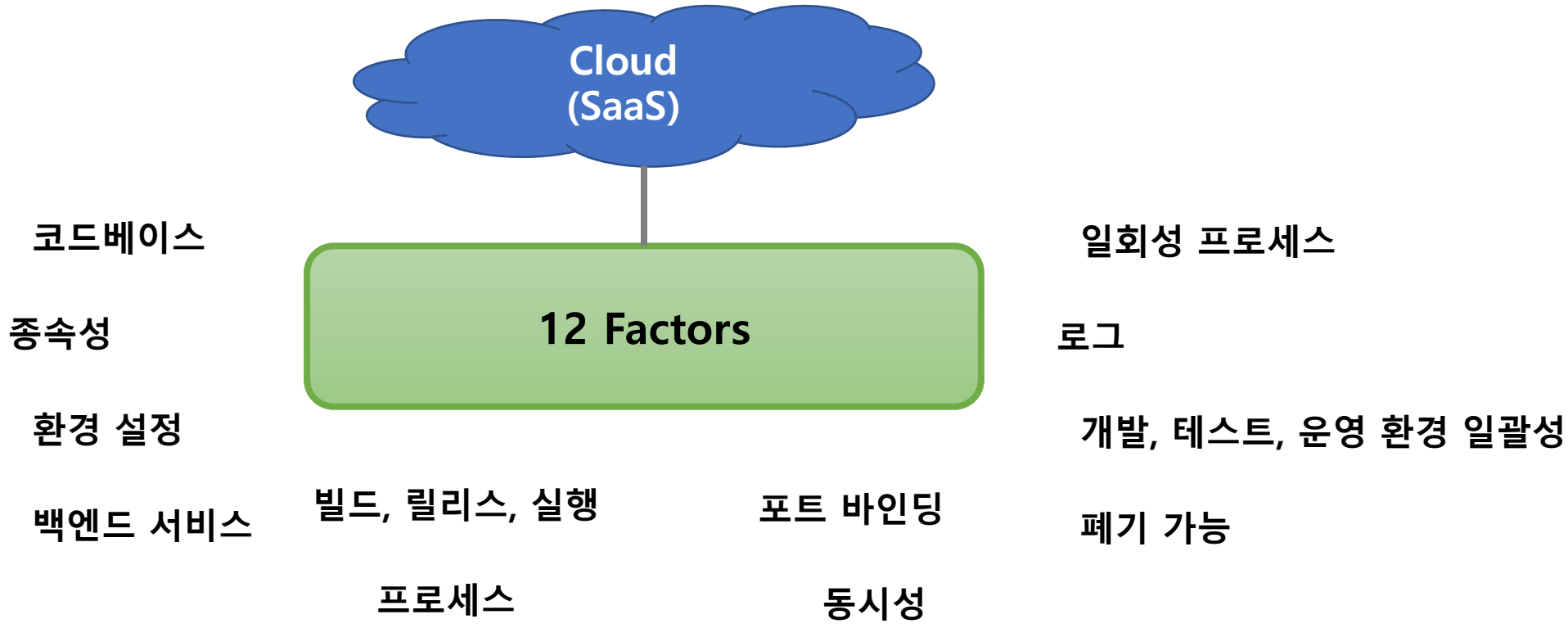
Cloud Native

- Cloud Native Application
  - SaaS



Cloud Native

- Cloud Native Application
  - 12 Factors

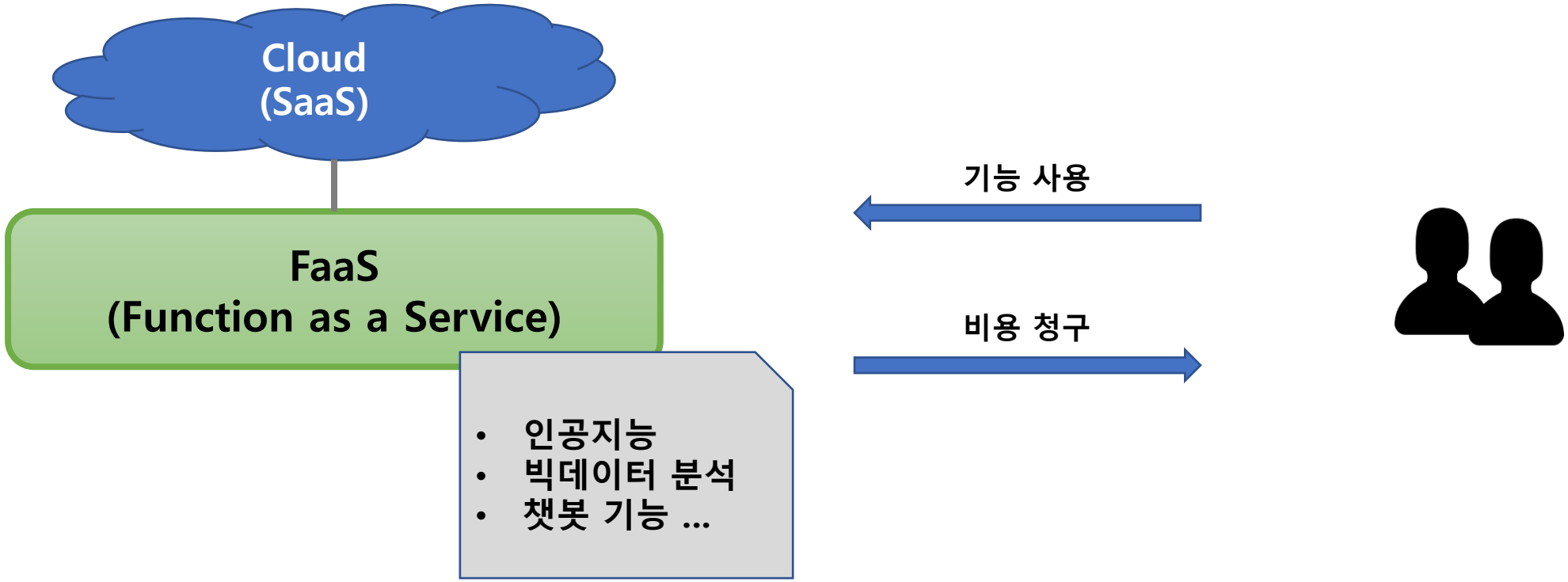


Cloud Native

- Cloud Native Application - 12 Factors

Cloud Native

- Cloud Native Application
  - FaaS(Function as a Service)
    - *SW 수준보다 더 세분 된 기능 단위로 개발*
    - *필요할 때 즉시 사용*
    - *기능들의 조합을 통해서 새로운 서비스 생성*



Cloud Native

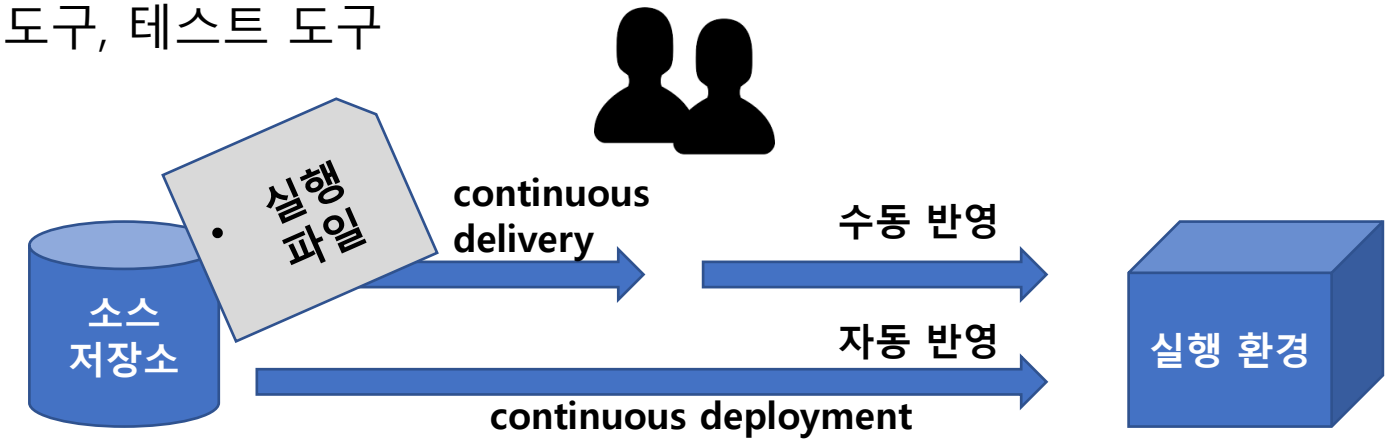
- Cloud Native Architecture
  - 확장 가능한 아키텍처
    - *시스템의 수평적 확정에 유연*
    - *확장된 서버로 시스템의 부하 분산, 가용성 보장*
    - *모니터링*
  - 탄력적 아키텍처
    - *서비스 생성 - 통합 - 배포, 비즈니스 환경 변화에 대응 시간 단축*
    - *분활 된 서비스 구조*
    - *무상태 통신 프로토콜*
  - 장애 격리 (Fault isolation)
    - *특정 서비스에 오류가 발생해도 다른 서비스에 영향 주지 않음*

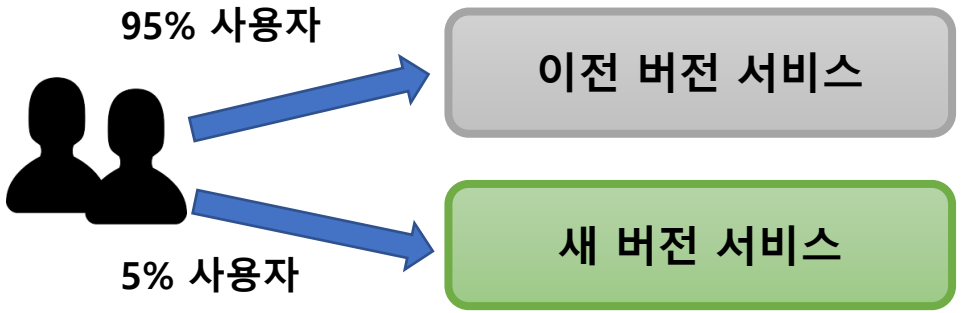
Cloud Native

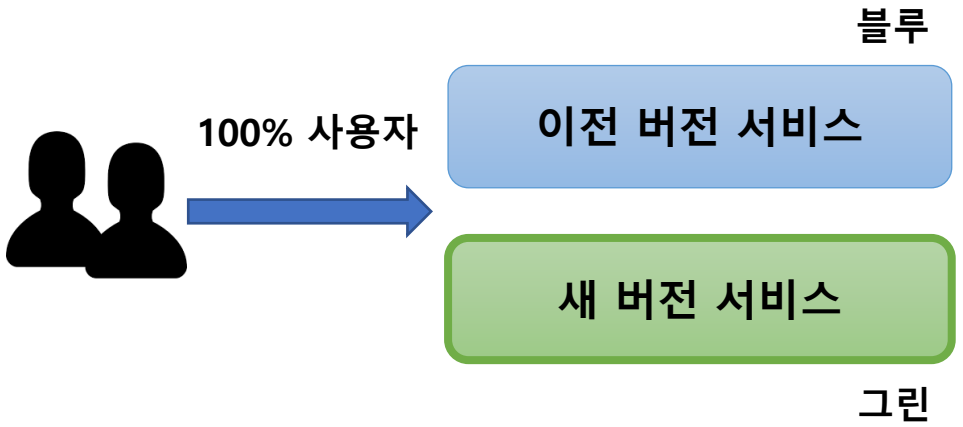
- Cloud Native Infra
  - 컨테이너 기반 패키지
    - *시스템 또는, 서비스 애플리케이션 단위의 패키지*
  - 동적 관리
    - *서비스의 추가와 삭제 자동으로 감지*
    - *변경된 서비스 요청을 라우팅*

Cloud Native

- 지속적 통합과 배포
  - CI(Continuous Integration)
    - 통합 서버, 소스 관리 (SCM), 빌드 도구, 테스트 도구
    - ex) Jenkins
  - 지속적 배포
    - Continuous Delivery
    - Continuous Deployment
    - Pipe line
  - 카나리 배포와 블루그린 배포

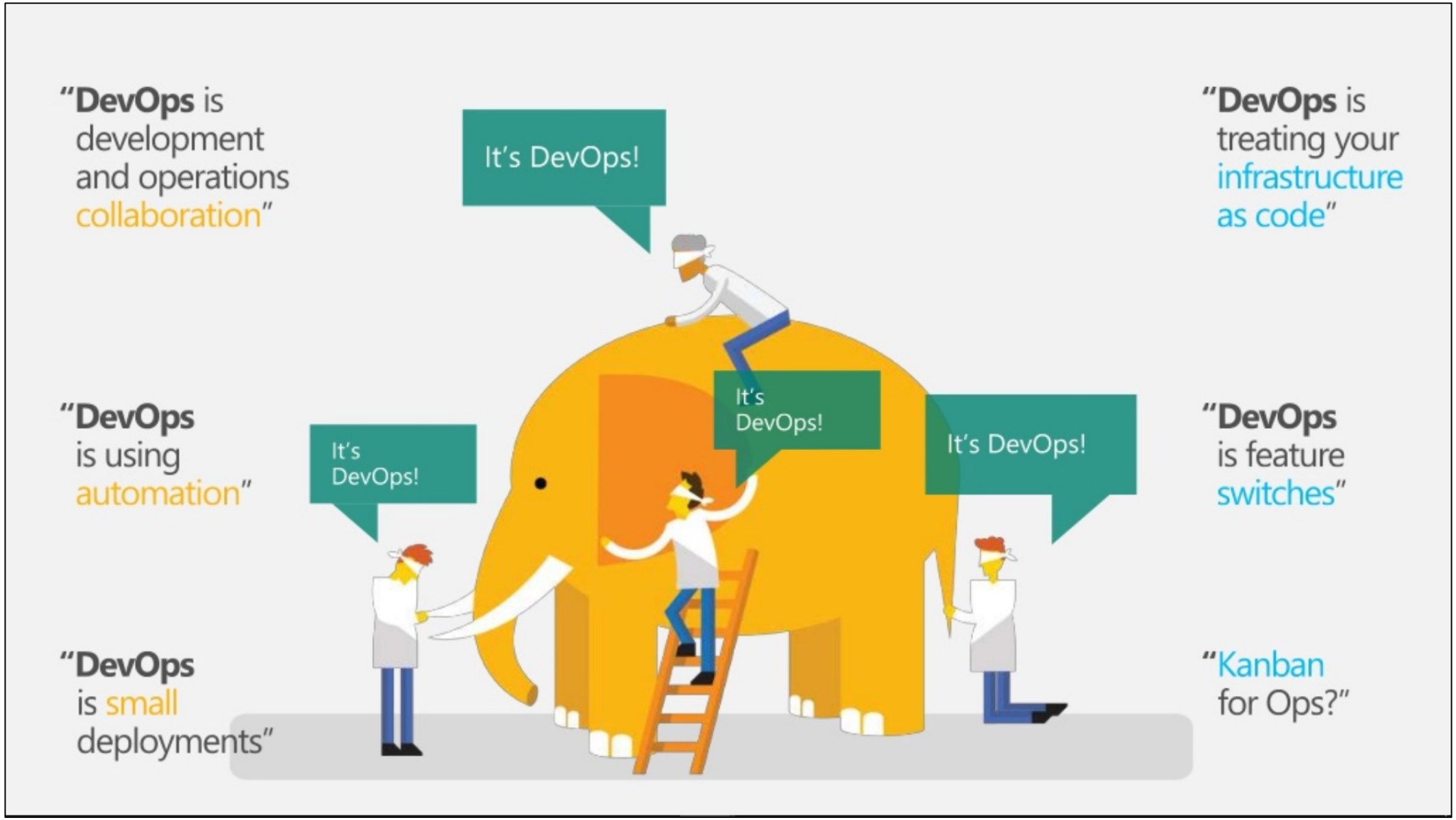






Cloud Native

- DevOps

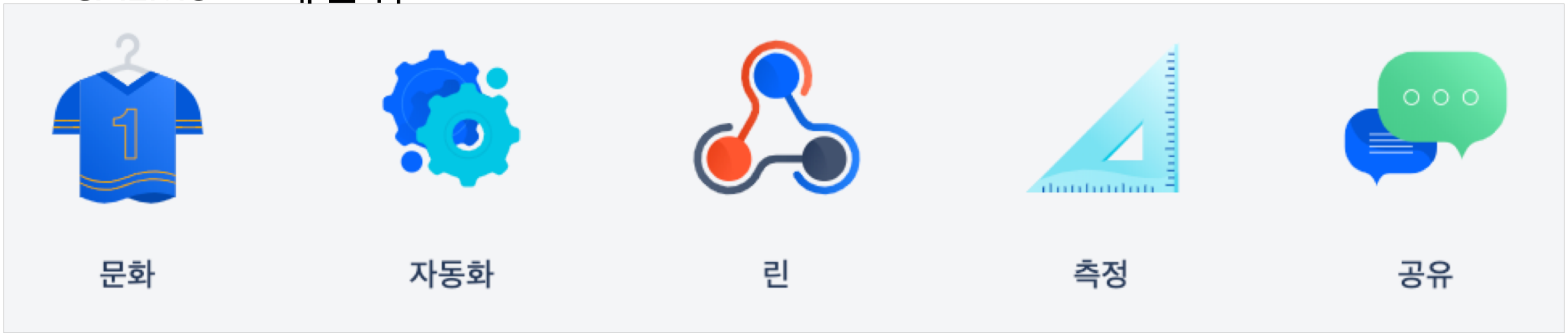


Cloud Native

- DevOps
  - 2007~2008년 → IT 운영 및 SW 개발에 문제점 대두
    - 개발과 배포가 다른 조직에서 관리 (다른 목표를 가짐)
  - 협업 및 신뢰
  - 더 빠른 릴리스, 더 스마트한 업무 진행
  - 문제 해결 시간 단축
  - 계획되지 않은 업무 쉽게 관리

Cloud Native

- DevOps
  - CALMS 프레임워크

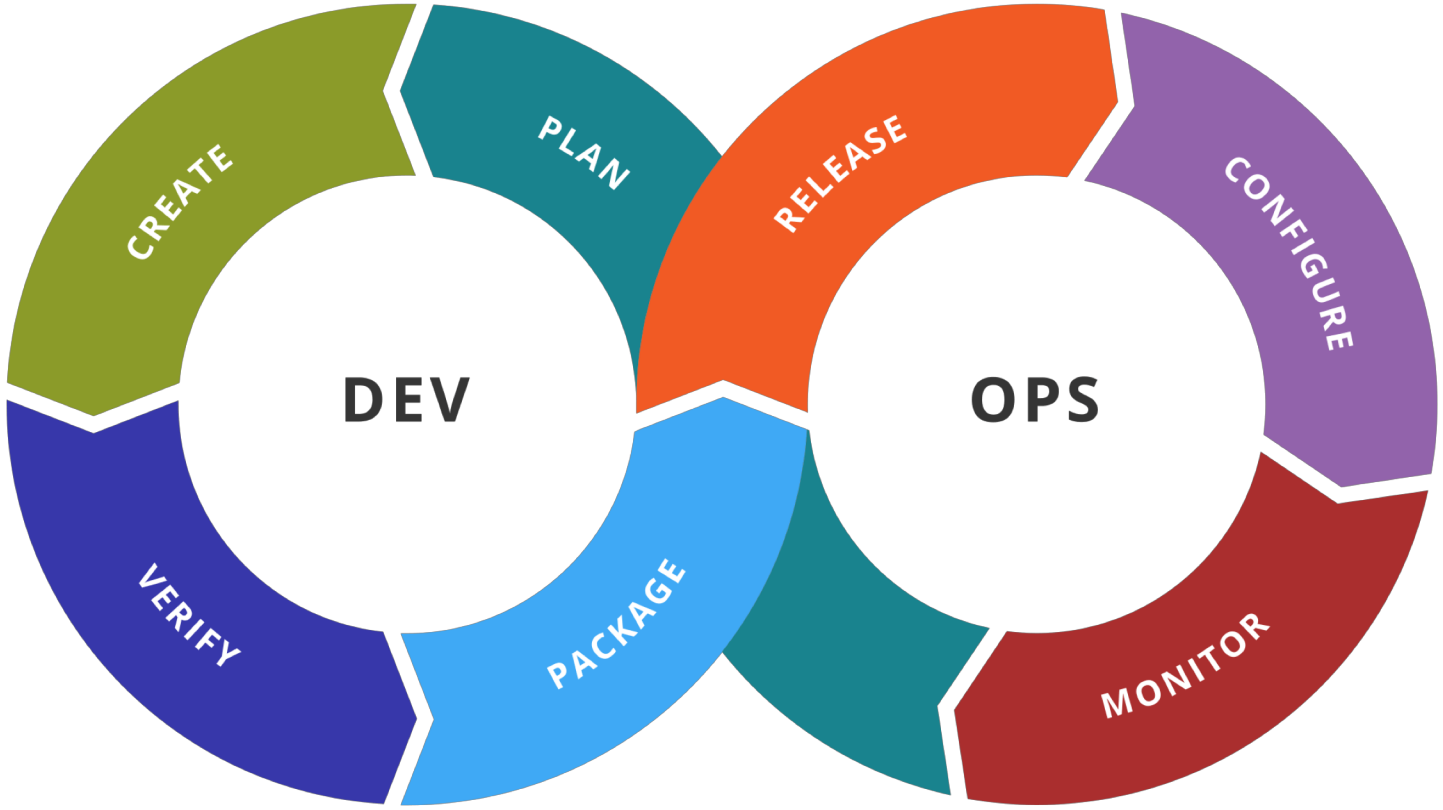


“DevOps를 활용하는 팀은 30배 더 자주 배포할 수 있고, 실패는 60배 줄일 수 있으며, 160배 빠르게 복구할 수 있습니다.”

Puppet Labs 2016 DevOps 상태 보고서

Cloud Native

- DevOps
  - 팀의 구성
    - 애플리케이션과 서비스의 개발에서 배포 운영까지 빠르게 제공하기 위한 조직의 협업 문화
    - 하나의 파이프라인으로 소스 코드의 배포가 필요할 때 즉시 반영
    - ***서비스의 기획, 설계, 개발, 배포 및 운영 → 한 팀에서 수행***

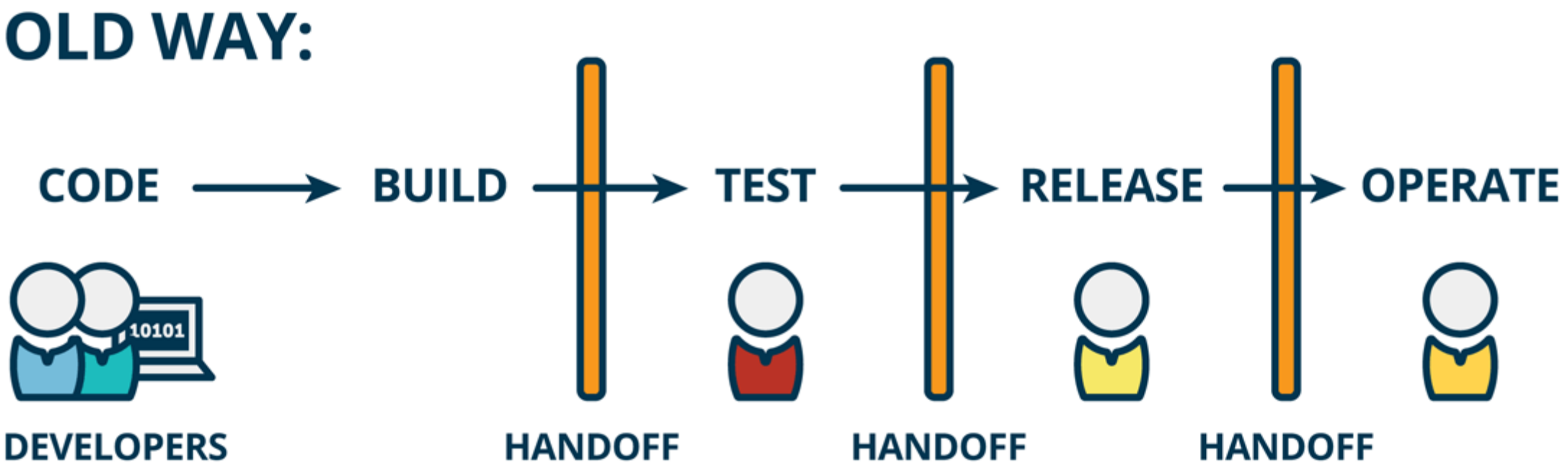


Cloud Native

- DevOps
  - Microservice Team Structure
    - Two Pizza team
    - Teams communicating through API contracts
    - Develop, test and deploy each service independently
    - Consumer Driven Contract

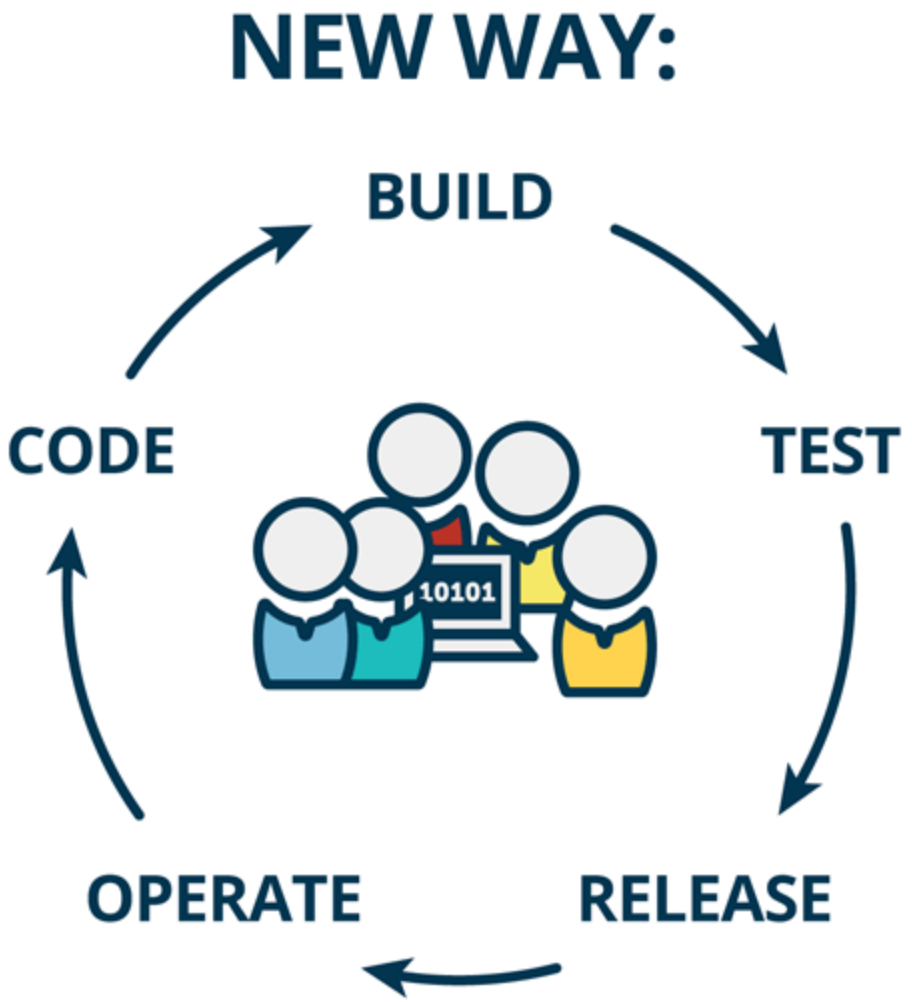
Cloud Native

- DevOps



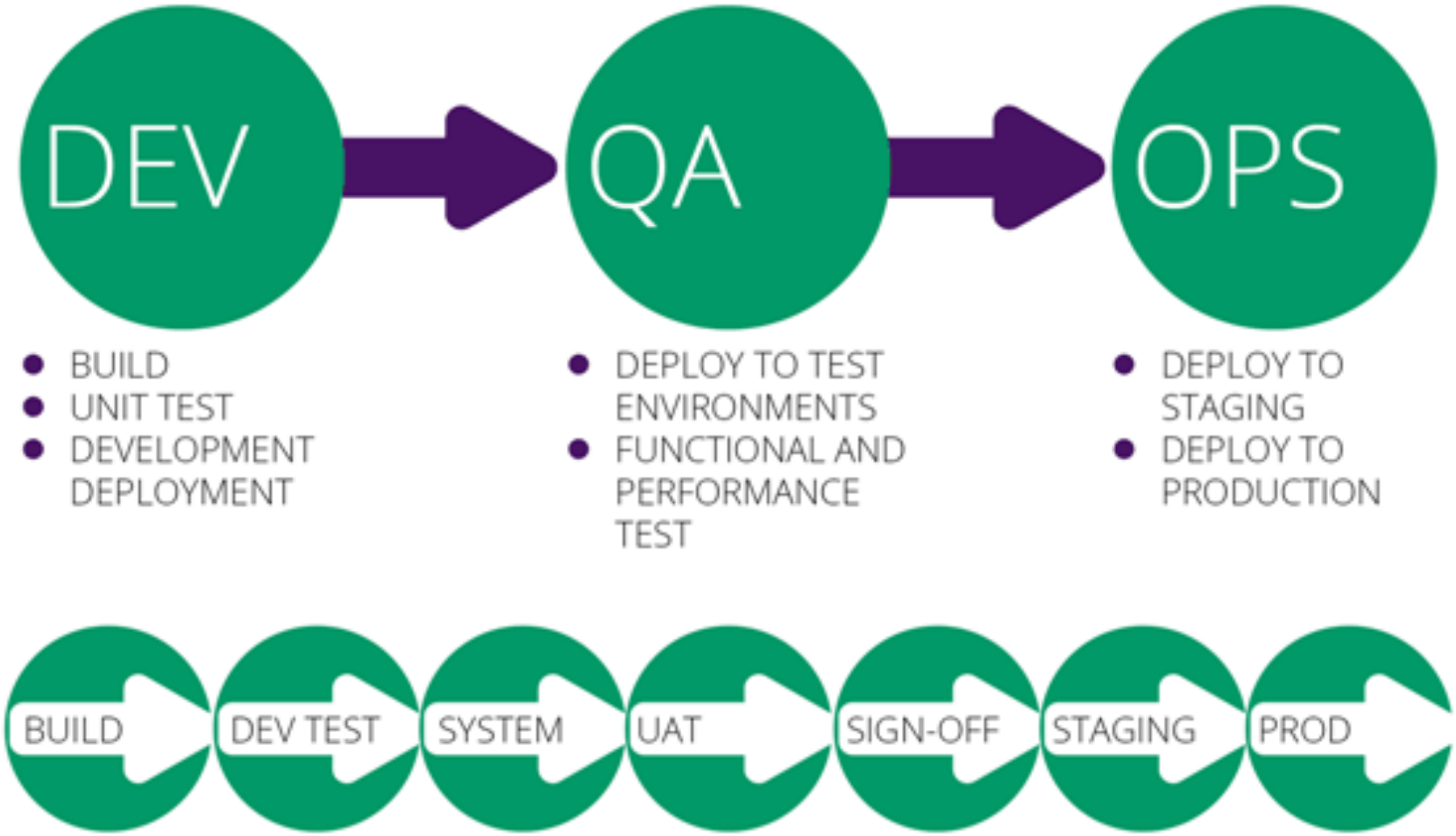
Cloud Native

- DevOps



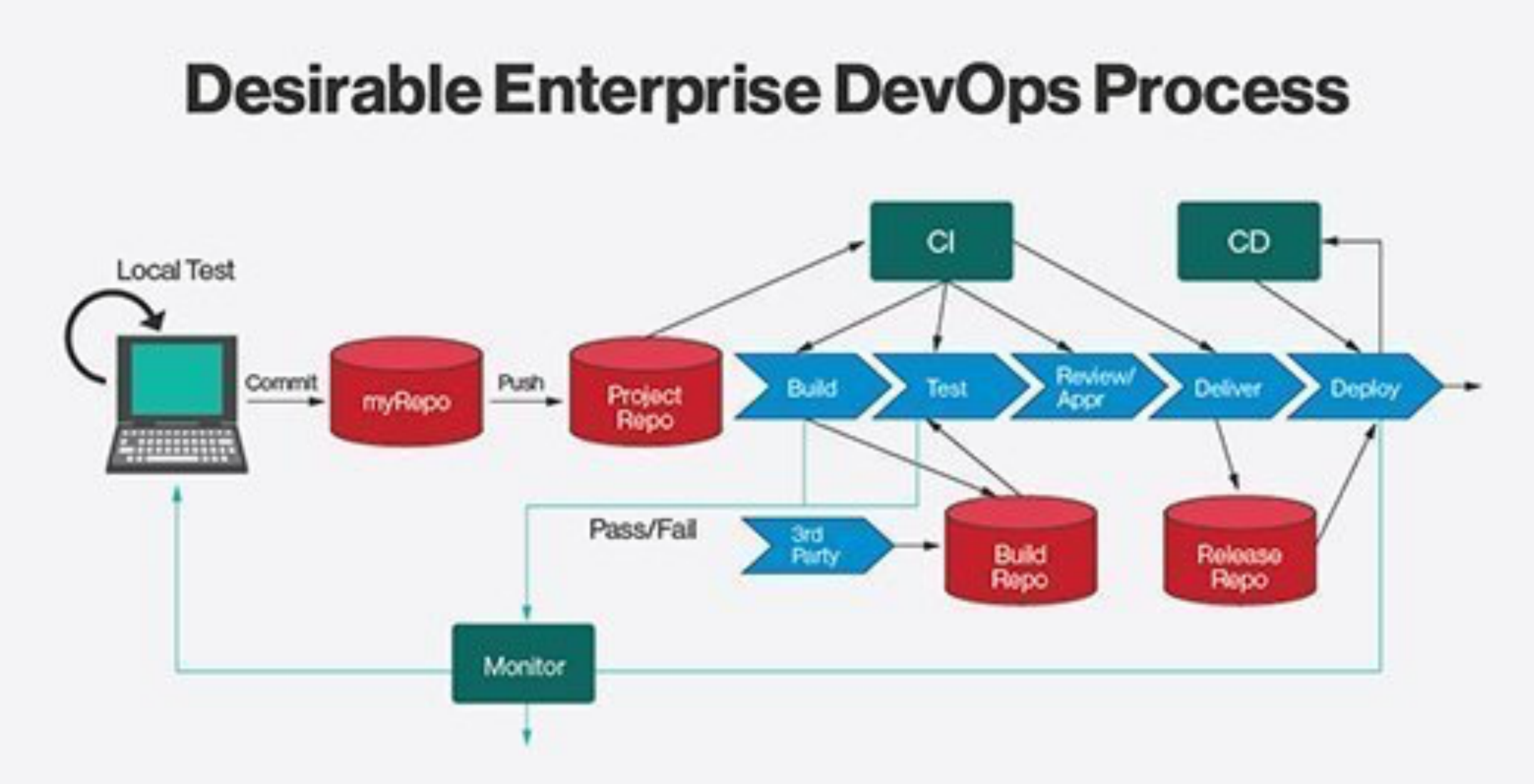
Cloud Native

- DevOps



Cloud Native

- DevOps
  - 자동화와 시각화



Cloud Native

- Monitoring
  - ***Health check API*** - expose an endpoint that returns the health of the service
  - ***Log aggregation*** - log service activity and write logs into a centralized logging server, which provides searching and alerting
  - ***Distributed tracing*** - assign each external request a unique id and trace requests as they flow between services
  - ***Exception tracking*** - report exceptions to an exception tracking service, which deduplicates exceptions, alerts developers, and tracks the resolution of each exception
  - ***Application metrics*** - service maintain metrics, such as counters and gauges, and expose them to a metrics server
  - ***Audit logging*** - log user actions