

Serverless Computing Platform with OpenWhisk

DongKyoung Kim

Serverless Computing

Function as a Service

Index

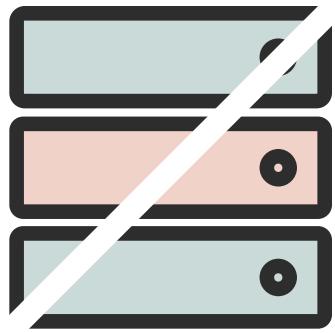
01 **Serverless Computing**

02 **OpenWhisk**

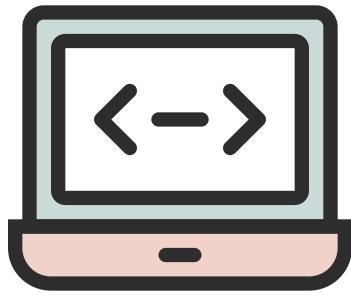
03 **도입시 고려사항**



What is Serverless?



No Server



Only Code



On-demand



Why Serverless?

01 02 03 04

**No Operation
Resource Utilization
Fine Granularity
Isolation**

01

No Operation

10

Provisioning

Servers

Vendors

Type

Specs

OS

Monitoring

24/7 운영

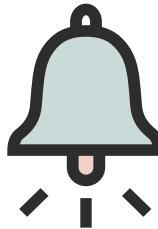


Server

CPU
Memory
Disk
Network
Latency

Application

Port
Process
Instrumentation



SMS

E-Mail



Application Log

System log (syslog)

Log 수집 시스템



Traffic Analytics

*

Total Visitors

319,136

Total Visitors

Response Codes by Continents



Unique Visitors

29,740

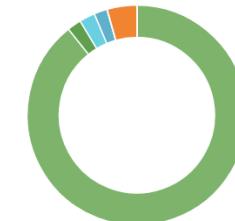
Unique Visitors

Download Volume

2GB

Download Volume

Response Codes



- 200
- 206
- 301
- 304
- 400
- 403
- 404
- 405
- 416

- United States
- France
- Germany
- China
- Netherlands
- United Kingdom
- Brazil
- India
- Canada
- Russian Federation

Top Visitors

Top Visitors	Count	Bytes	Error?
46.105.14.53	9,101	14.2MB	200
66.249.73.135	8,405	32.3MB	500
177.135.170.179	7,862	10.6MB	404
208.115.113.88	3,519	48.1MB	404
208.115.111.72	3,322	38.8MB	404
198.143.129.170	3,288	9.3MB	404
50.16.19.13	2,814	14.2MB	200
202.43.182.16	2,599	426.5KB	404
209.85.238.199	2,541	23.6MB	304
128.30.28.58	2,471	123.2MB	206

Geomap



New

Add

Save

Open

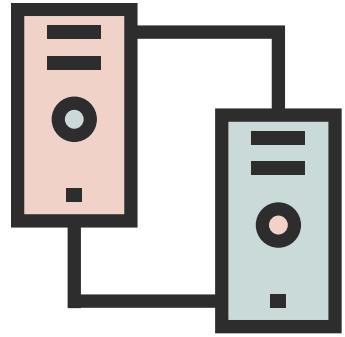
Share

Export PDF

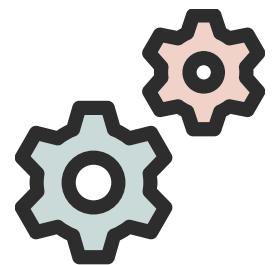
~ 2 years ago to ~ a year ago



Failover



HA



Recovery

LB

Active - Active

Active - Passive

Master - Slave

Server Clustering

Copy

Migration

2-Phase Commit



서버 1대 추가



운영에 대한 부담이 2배 늘어남

Scalability



서버 N대 추가



운영에 대한 부담이 N배 늘어남

Operation is not easy

▲ stickfigure 305 days ago [-]

By this definition, we've been running "serverless" on Google App Engine for most of a decade.

* We don't monitor how many instances are running and don't really care. Our "functions" are http endpoints.
the size of the bill at the end of the month.

* Async task processing is also just an http endpoint function. We even have a little bit of syntactic sugar so it

* We have no ops or devops staff. We just deploy code that implements functions (http endpoints).

* Persistence is also scaled by Google; there's no database server, just an API to read/write data that scales ir

It sounds to me like the article is trying to distinguish between "serverless" and PaaS by describing PaaS done
app. They've exposed a lot more of the underlying constructs since, but you can still ignore them unless you're

우리는 우리가 얼마나 많은 인스턴스를 사용하고 있는지 신경쓰지 않는다.

(그 달에 나온 청구서가 우리 서비스의 규모를 나타낸다.)

우리의 "Functions"이 곧, http endpoints 이다.

Async task도 단지 http endpoint function 이다.

우리 서비스에는 운영, Devops 인력이 없다.

우리는 DB 서버가 없고, Persistence는 GAE에 의해 자동으로 scaled 된다.

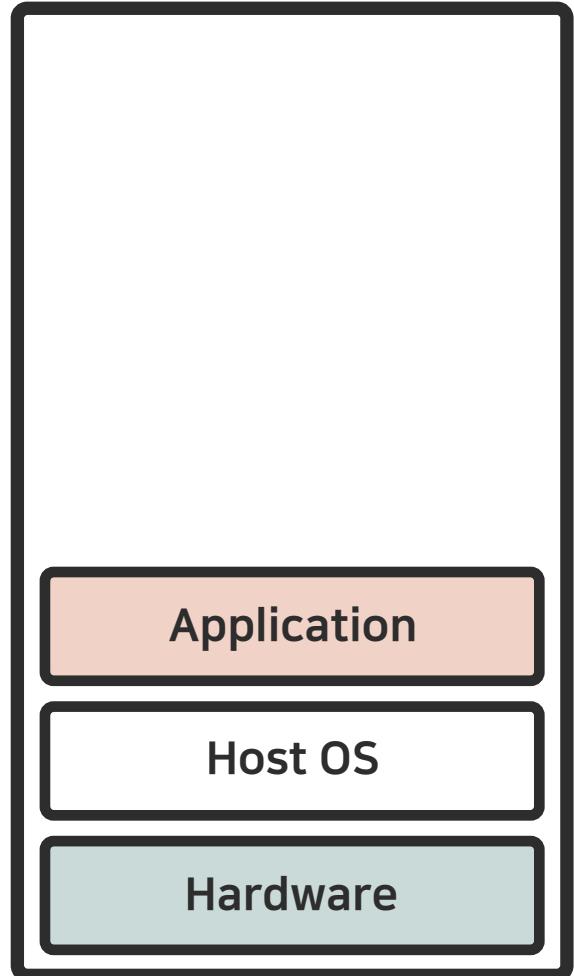
02

Resource Utilization

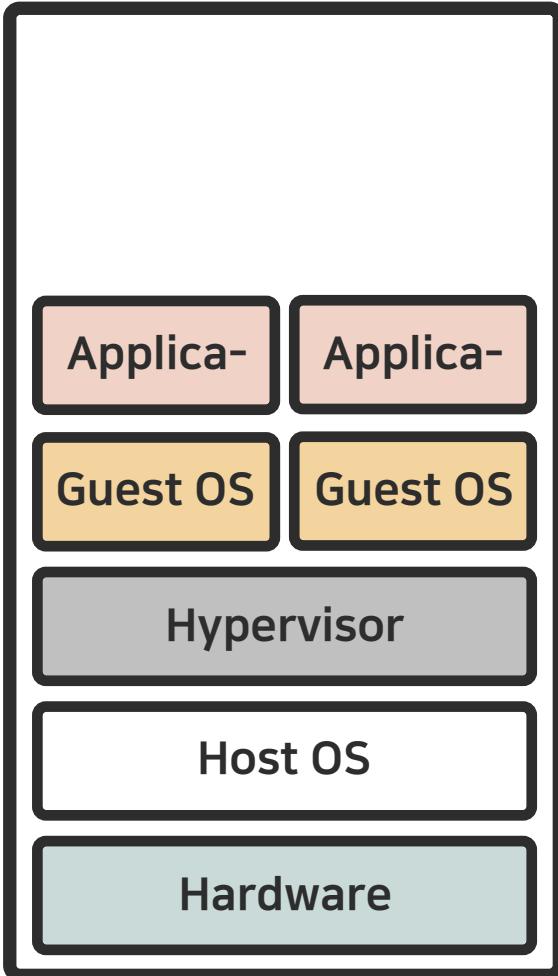
02

Evolution of computing

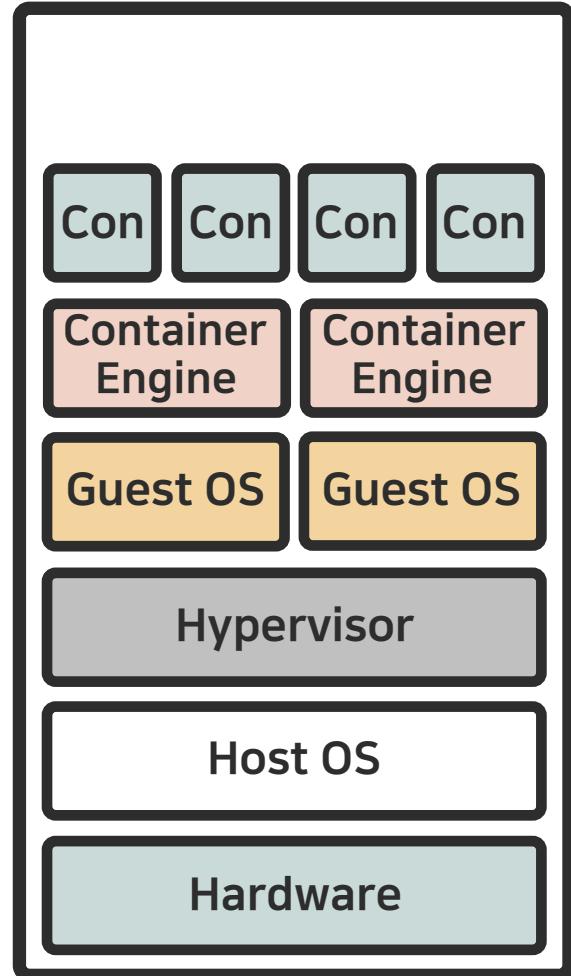
Physical Machine



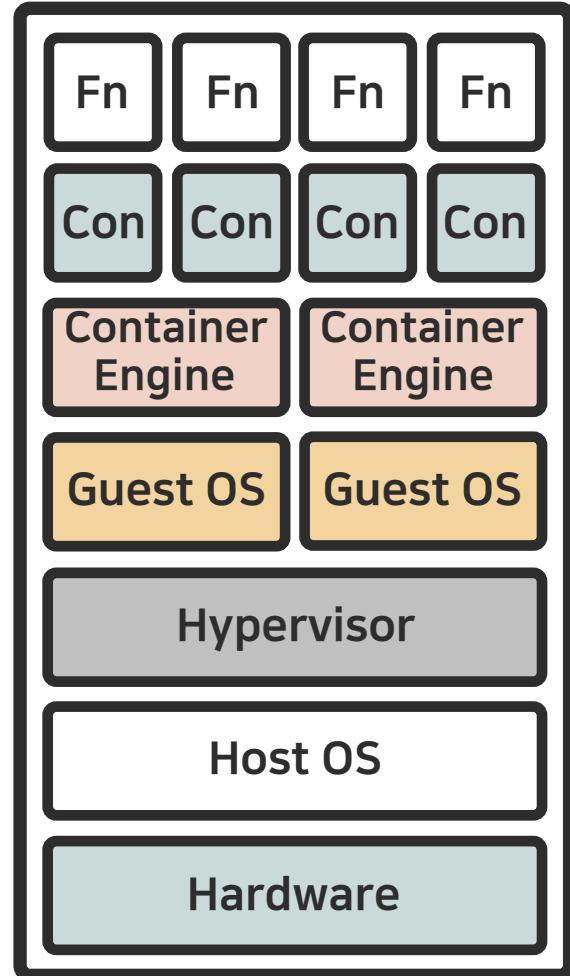
Virtual Machine



Container



Serverless



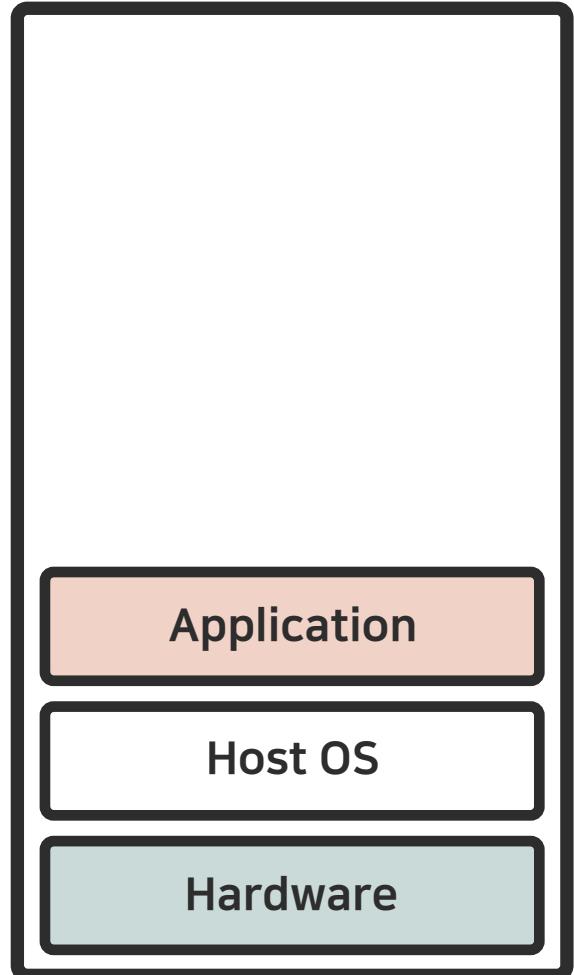
하드웨어 독점 사용

하드웨어 리소스 공유

VM 리소스 공유

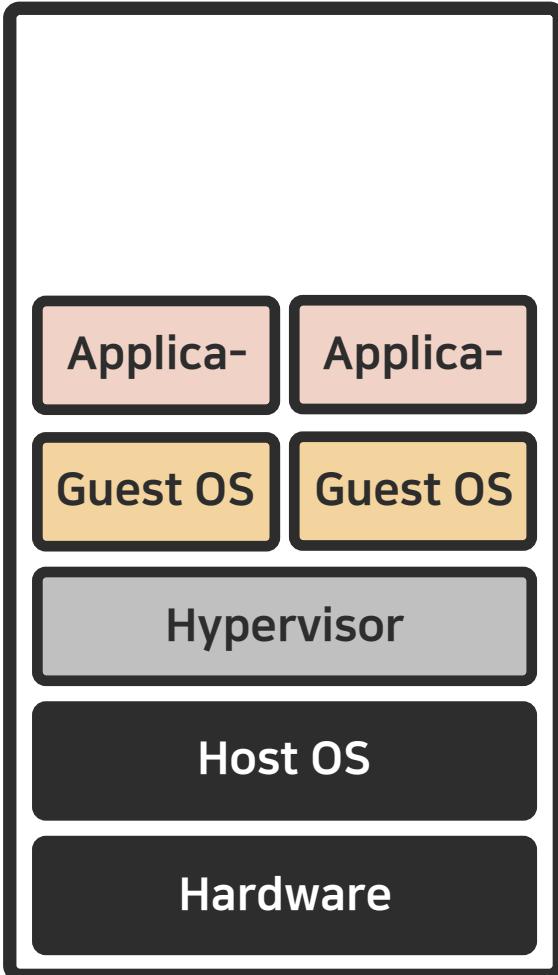
시간축으로 리소스 공유

Physical Machine



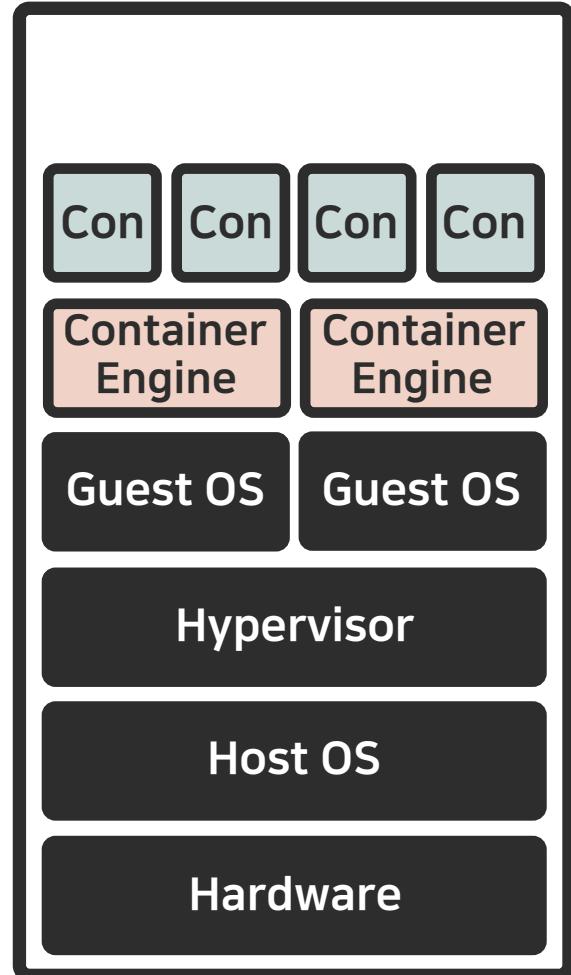
하드웨어 독점 사용

Virtual Machine



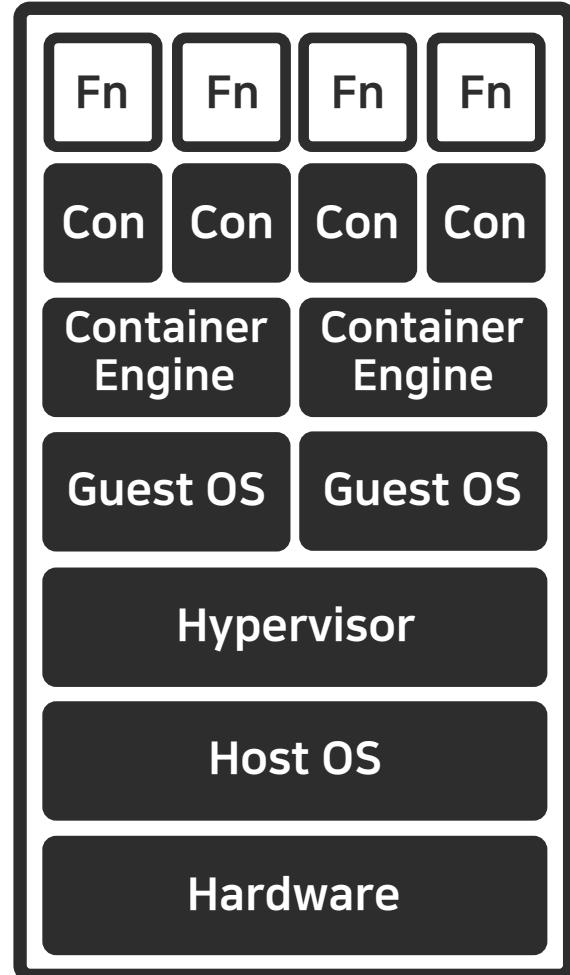
하드웨어 리소스 공유

Container



VM 리소스 공유

Serverless



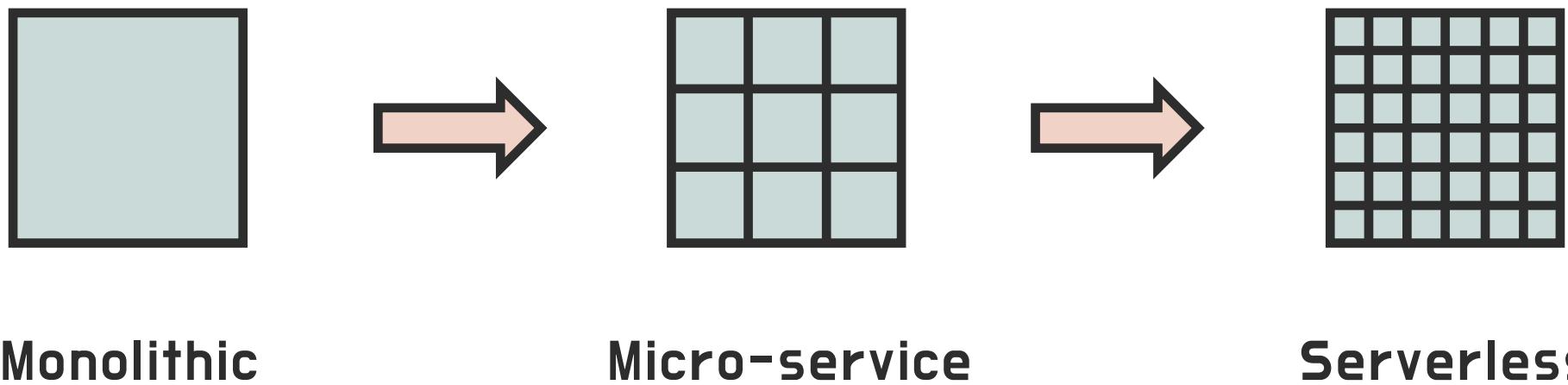
시간축으로 리소스 공유

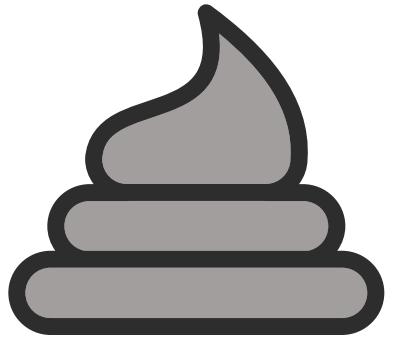
03

Fine Granularity

03

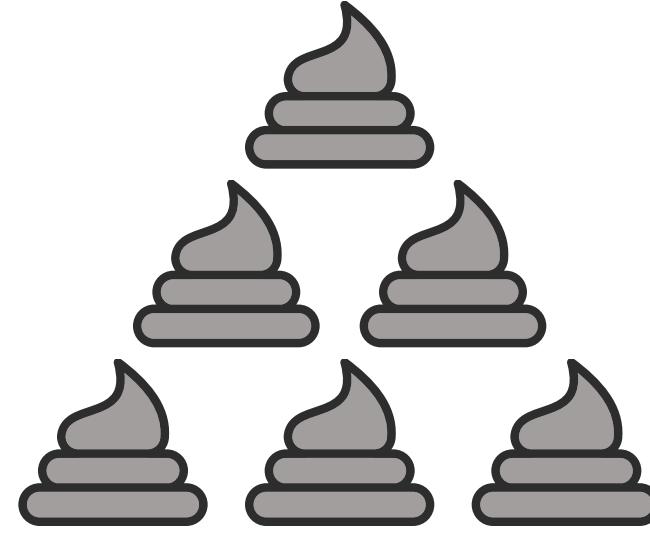
Function level granularity



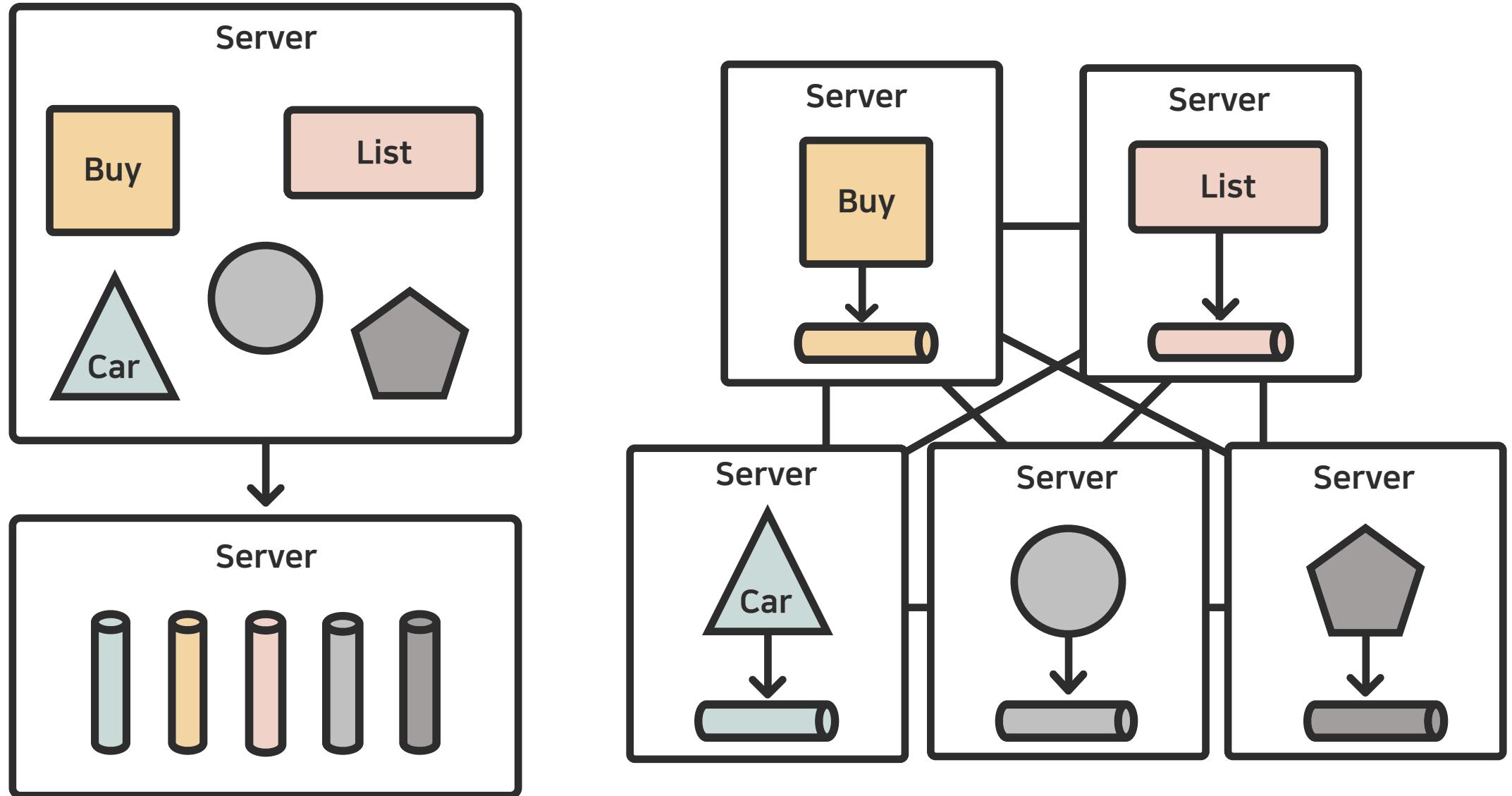


Monolithic

vs



Micro-service





NAVER



메일 카페 블로그 지식iN 쇼핑 Pay ▶TV 사전 뉴스 증권 부동산 지도 영화 뮤직 책 웹툰 더보기 ▾

5 광주날씨 ▾



연합뉴스 > 국민연금 "산은과 협의점 찾아"...최종합의엔 진통

네이버 뉴스 연예 스포츠 경제 대선

뉴스스탠드 > 전체 언론사 | MY뉴스



MBC

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한국경제TV

OhmyNews

스포츠조선

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연합인포맥스

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T Chosun

인천일보

경인일보



뮤직 영화 책·문화

함께N



여행+ 디자인 경제M JOB&

과학

자사교양

종

마음이 불편한
'두 친사'가 내려왔습니다
해피빈 공감편딩

낡은 비닐하우스에



여행가 아버지의



공연 티켓 가져가면



소중한 우리 한옥을

네이버를 보다 편리하고 안전하게 이용하세요.

NAVER 로그인

아이디/비밀번호 찾기

회원가입

04.14. (금) 뉴스

2/6

생중계 **LIVE** 디지털경제협의회 초청포럼-문재인

뉴스 '세상을 따뜻하게' 오아시스 뉴스

부동산 긴급서 캔 강동구 전셋값 '들썩들썩'



쇼핑

상품

쇼핑몰 MEN

G마켓 옥션 11번가 위메프 티몬 이마트몰 GS샵
롯데몰 신세계몰 롯데닷컴 CJmall 현대나물 올리브영

1/19

봄·분위기여신
인기 폭주!예쁜거 알자니
브랜드컬리너리이번시즌 핫해
예쁜봄꽃느낌

NAVER

04

Isolation

04

Isolation

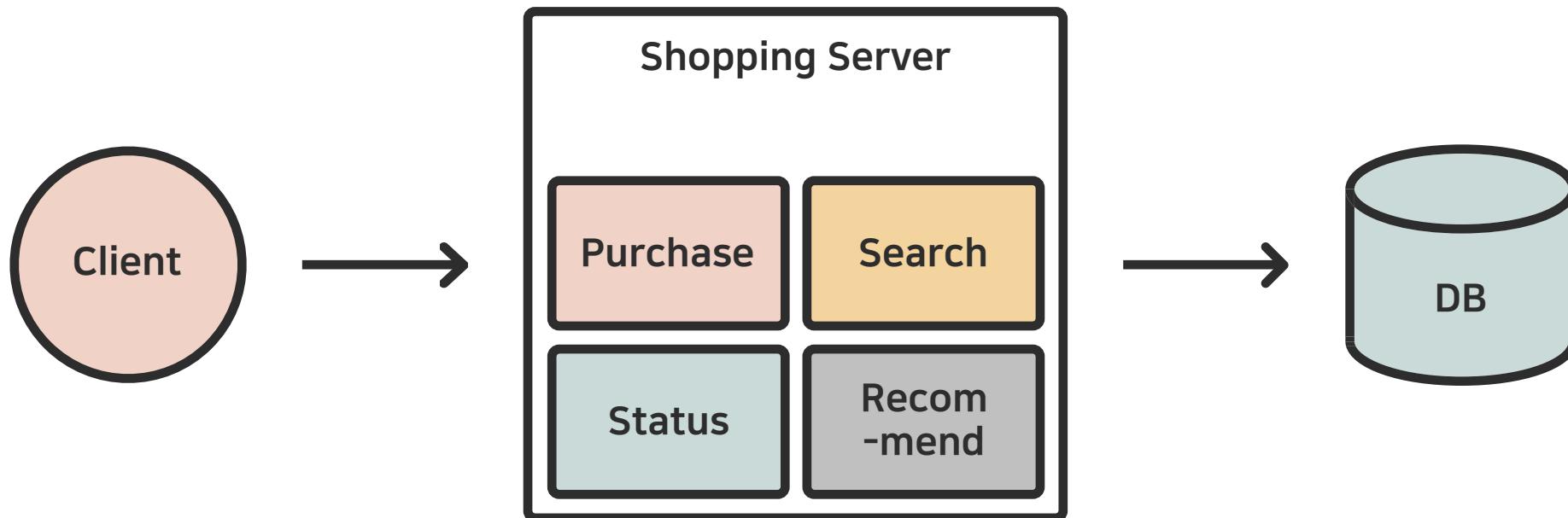
Sandbox 형태의 안전한 실행 보장

- Container
- Secure Container
- HyperD

유저가 직접 기능을 정의하고 확장

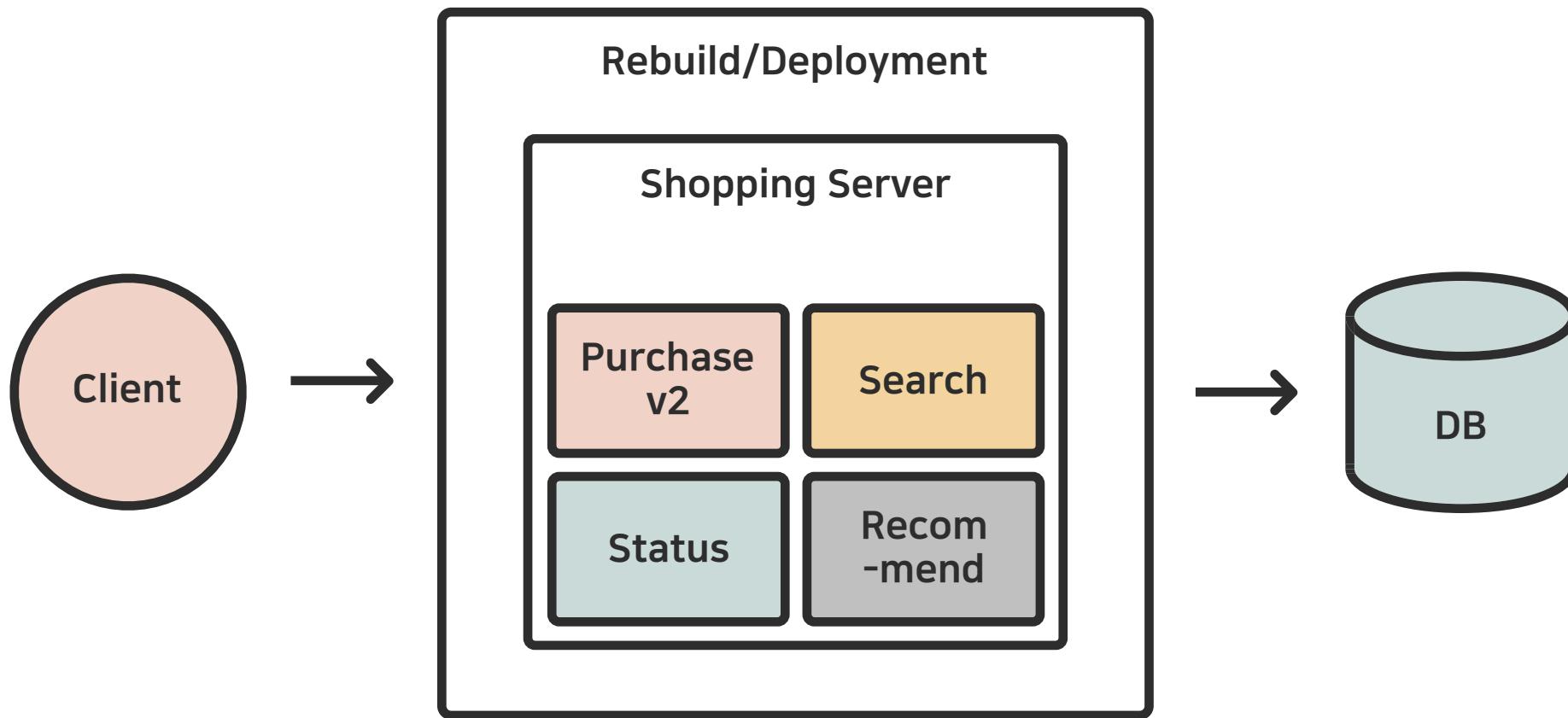
Third Party 연동

Server-Based

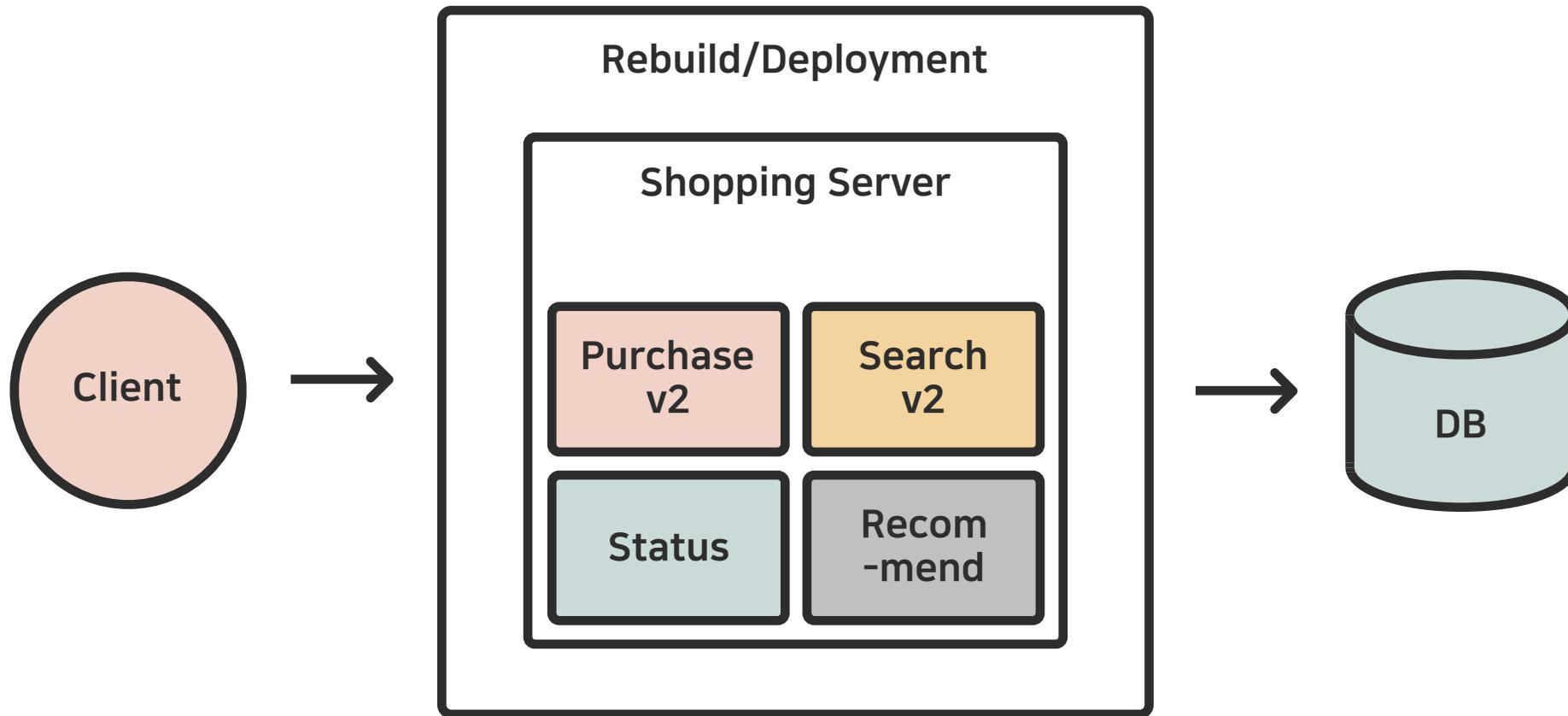


NAVER

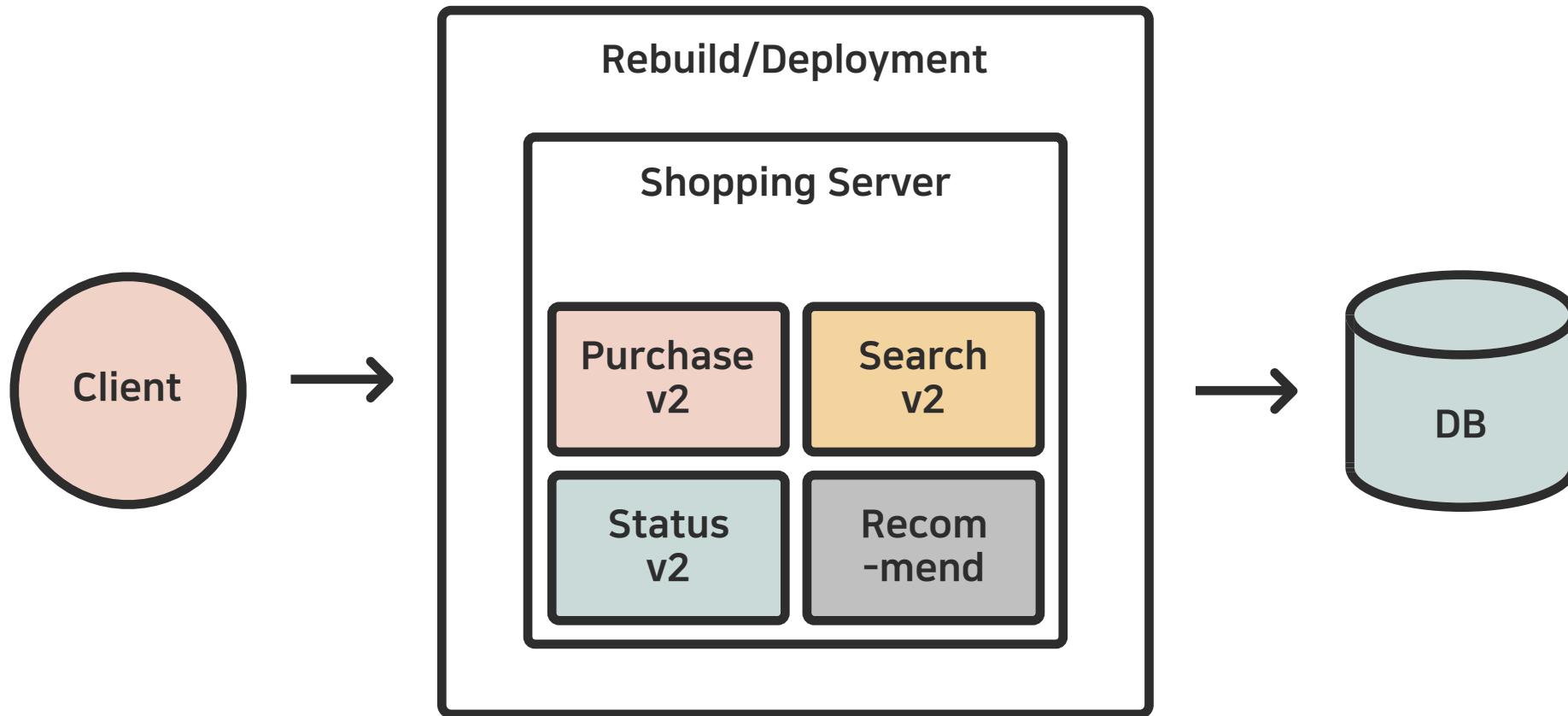
Server-Based



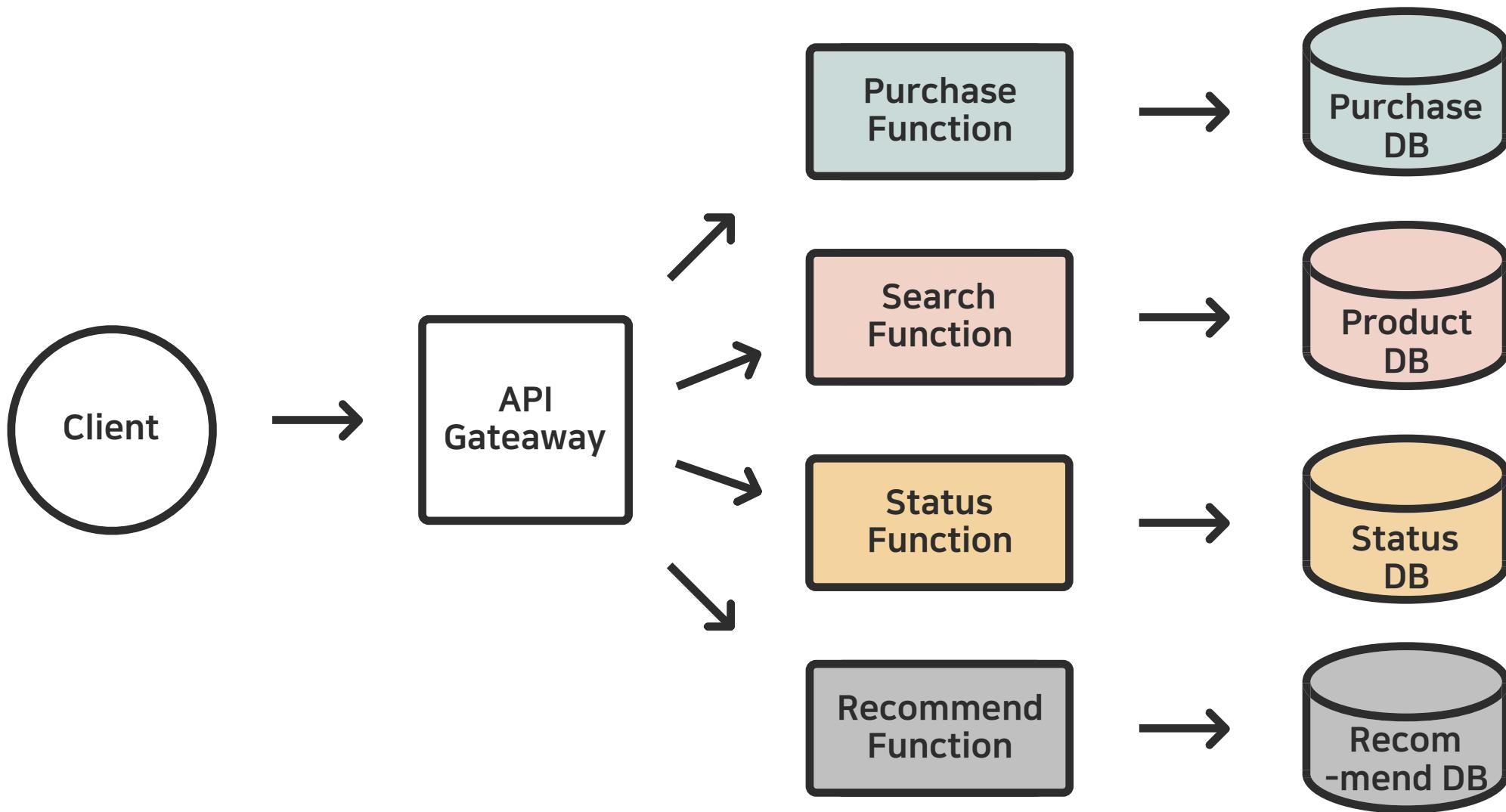
Server-Based



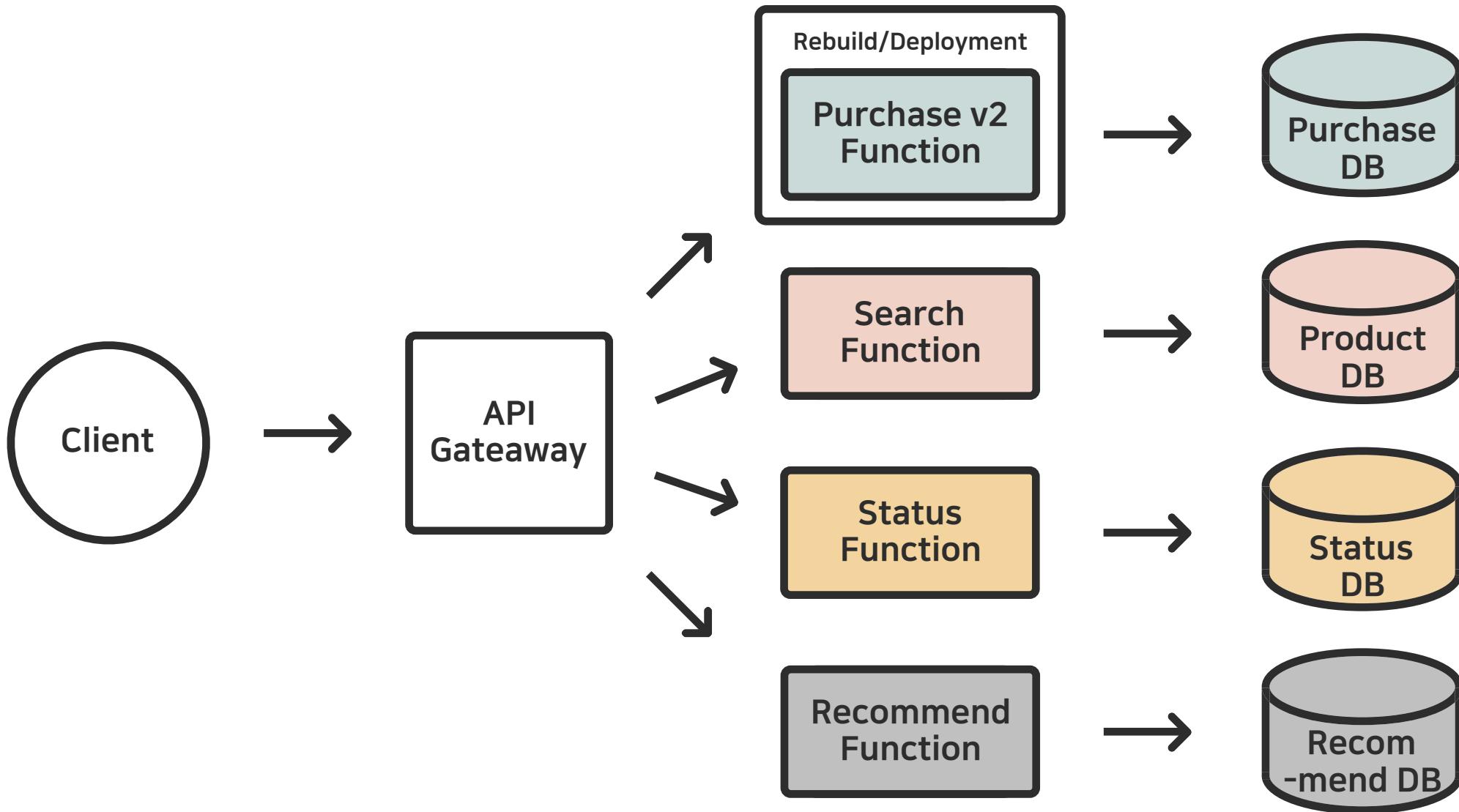
Server-Based



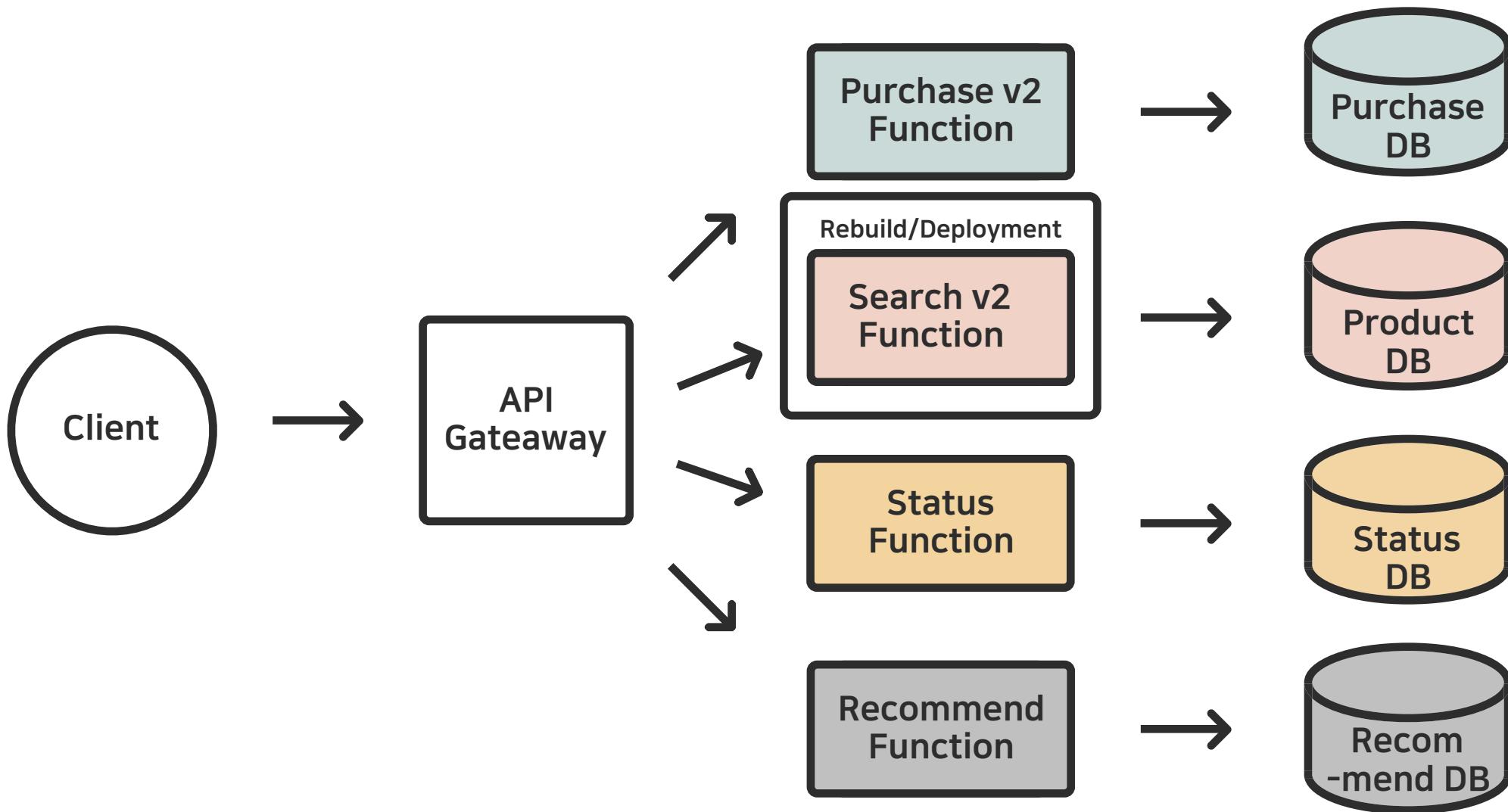
Serverless



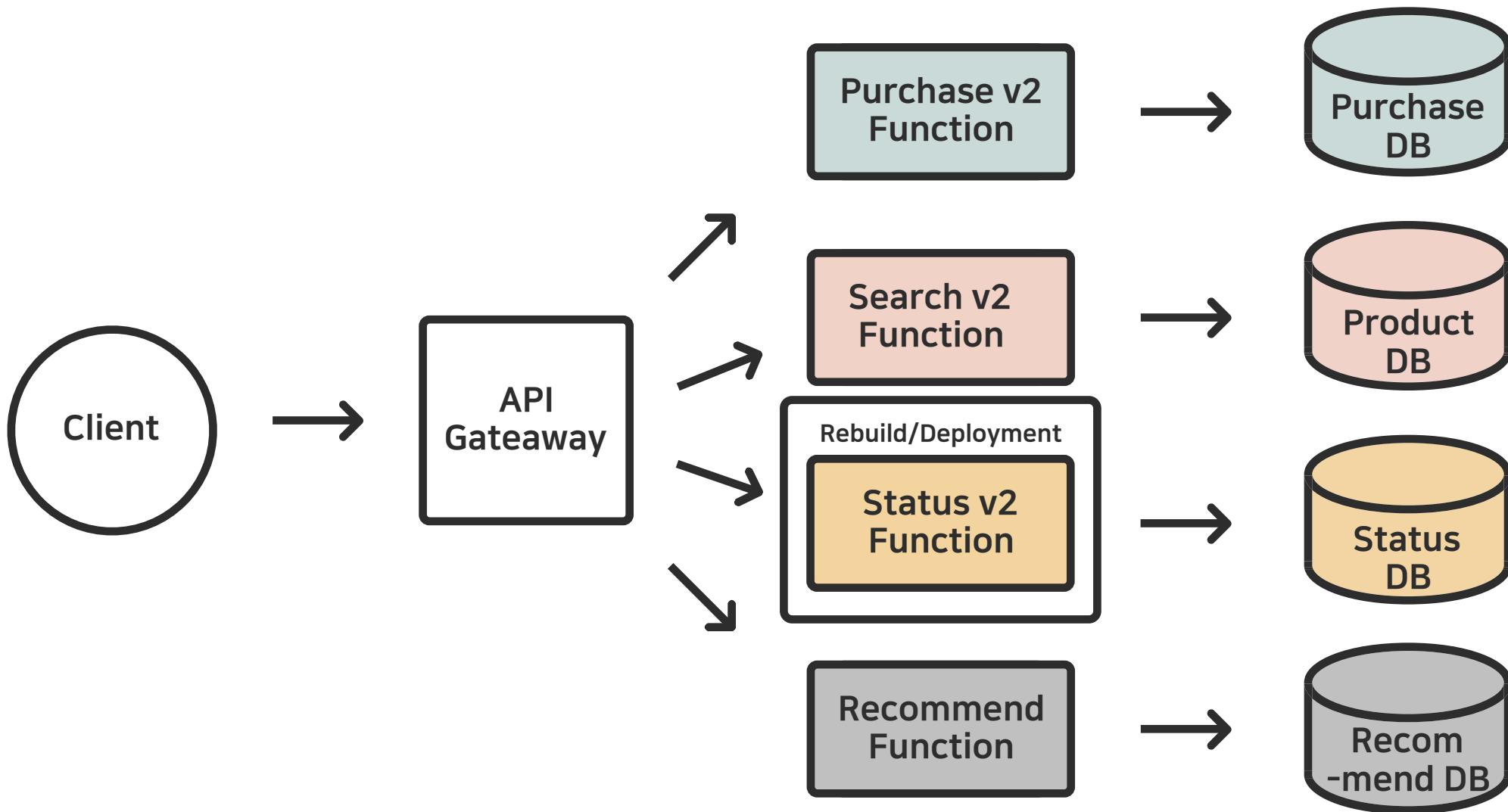
Serverless



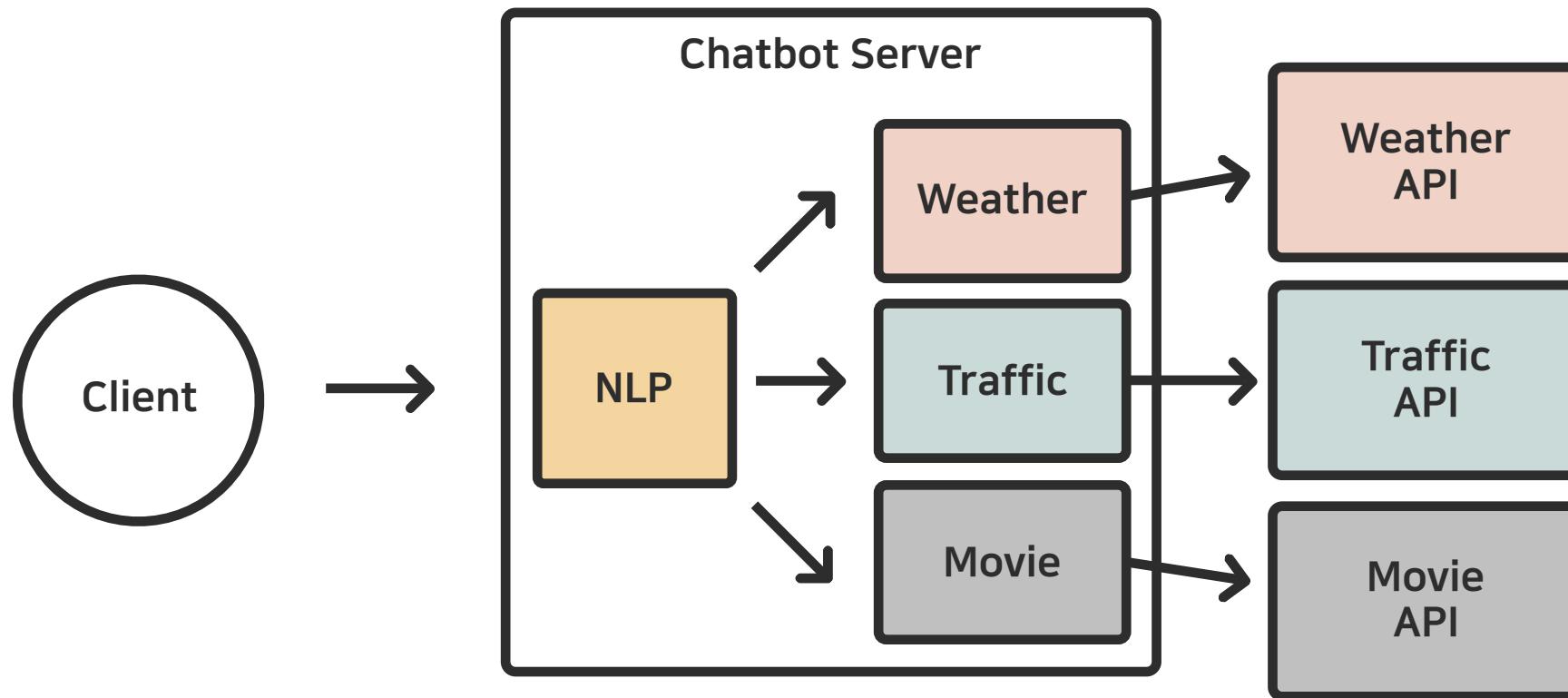
Serverless



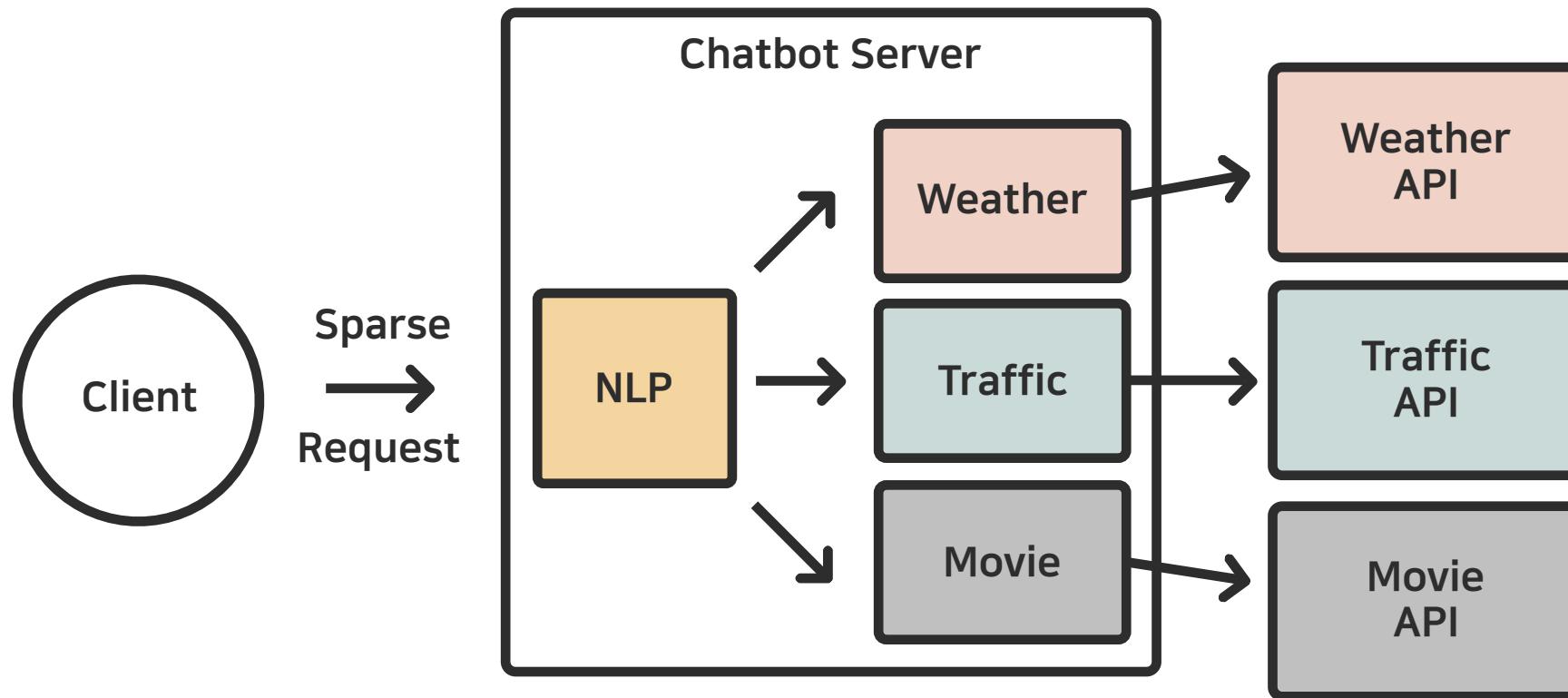
Serverless



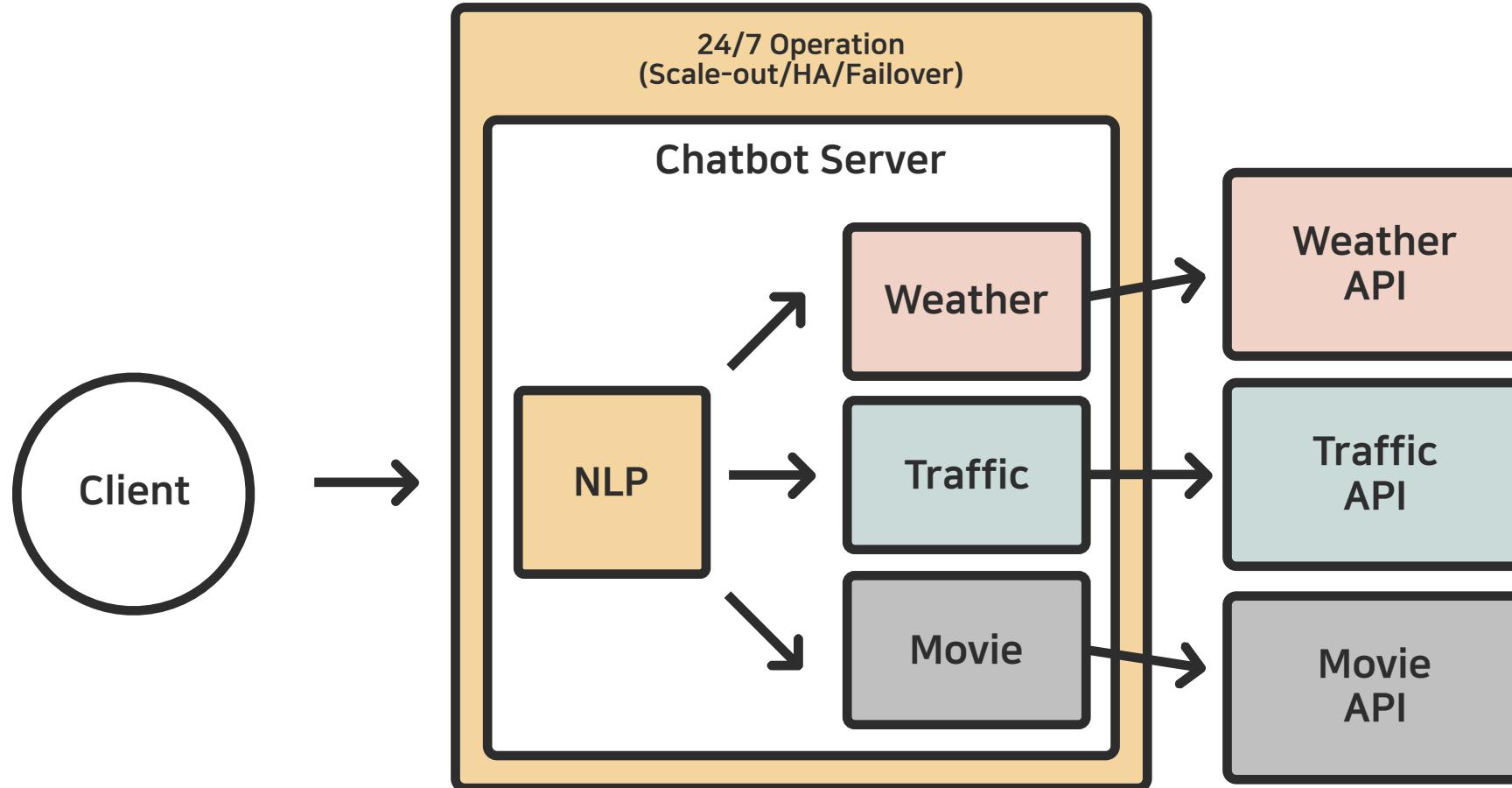
Server-Based



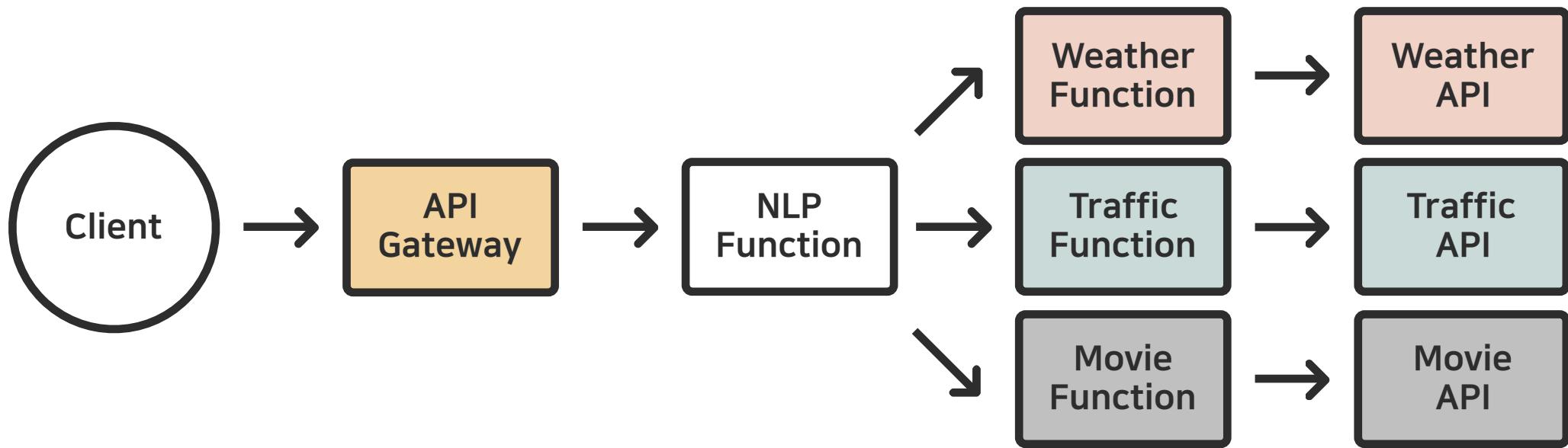
Server-Based



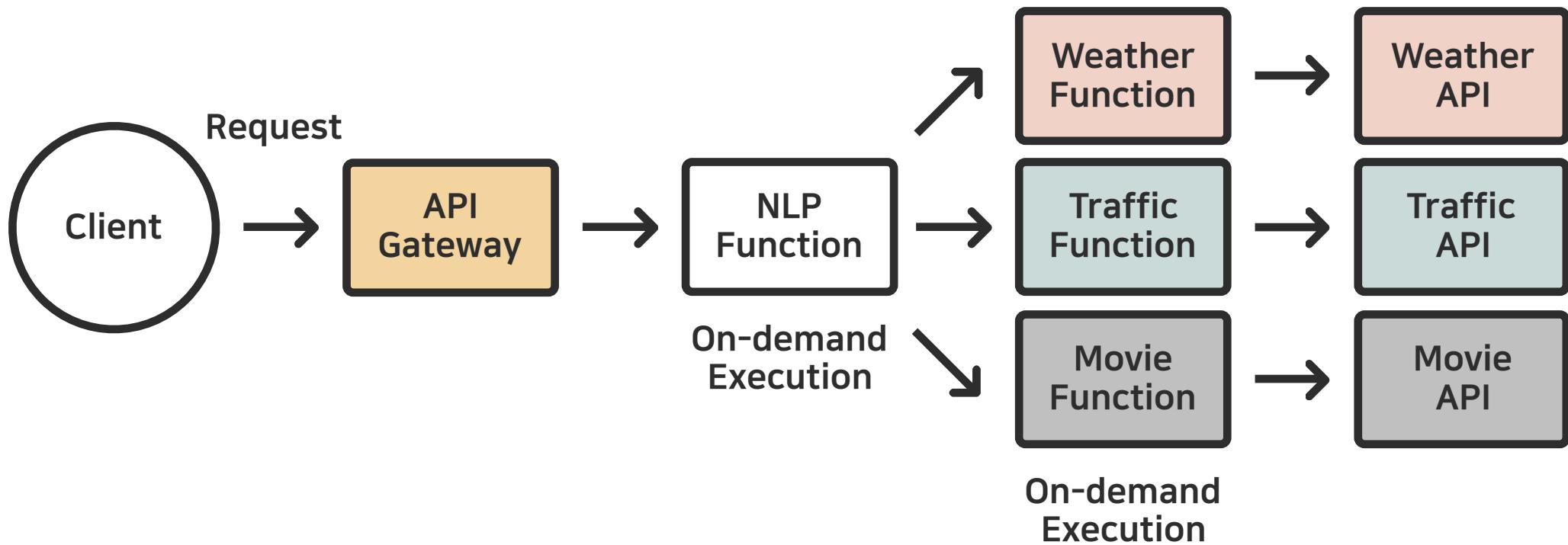
Server-Based



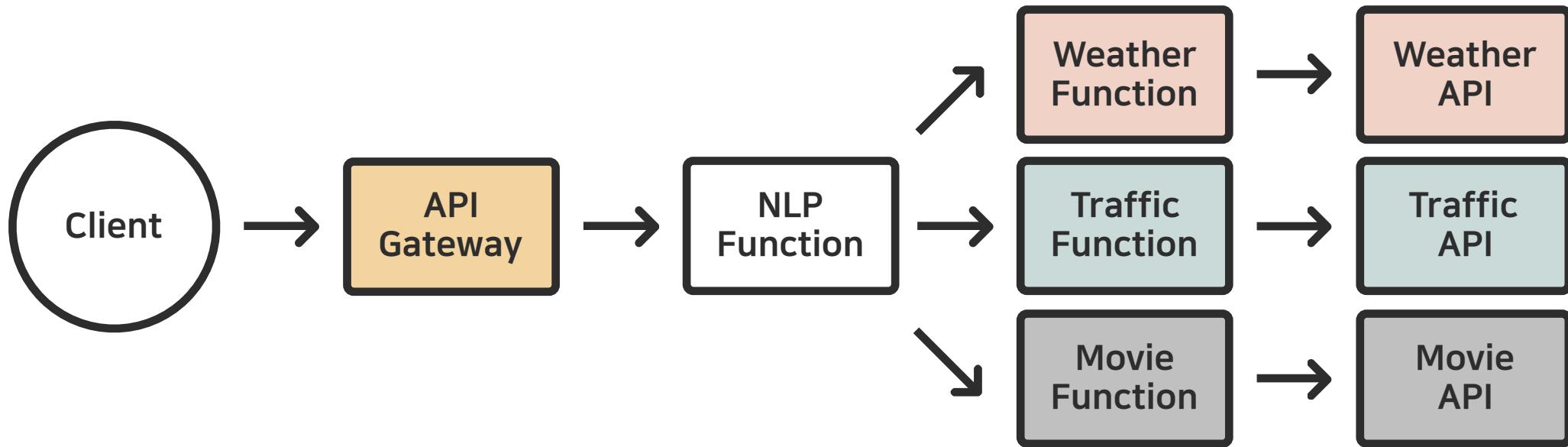
Serverless



Serverless



Serverless

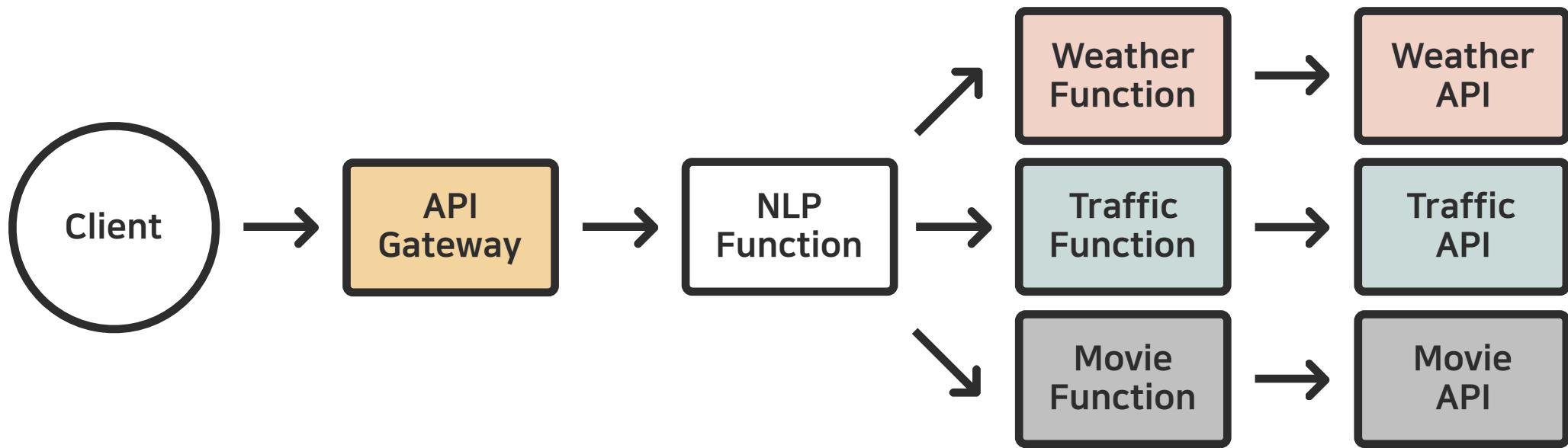


No operation

No Failover

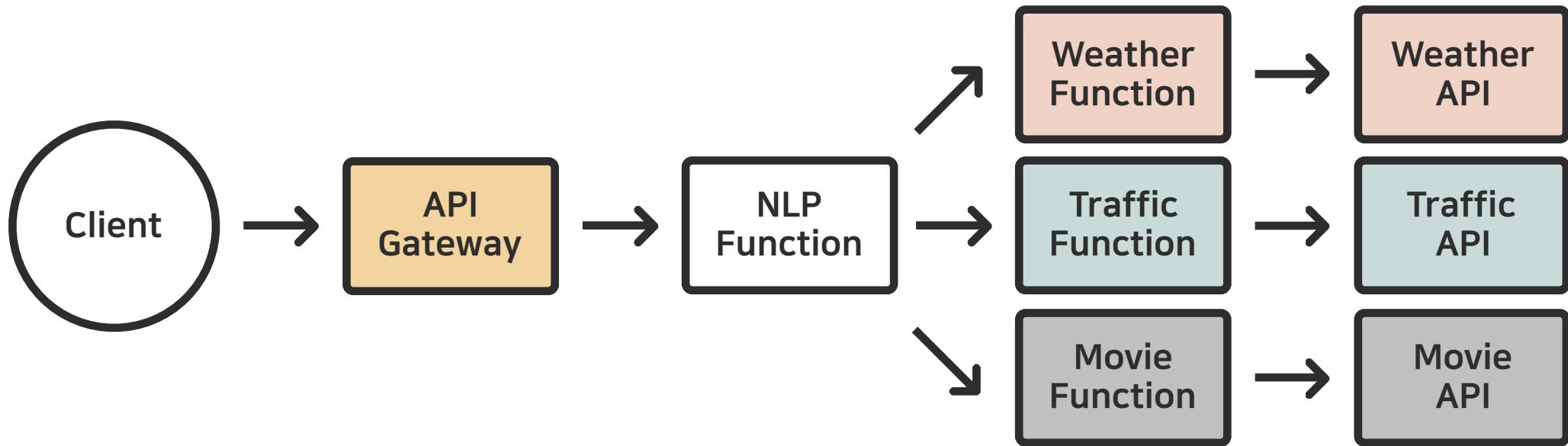
No HA

Serverless



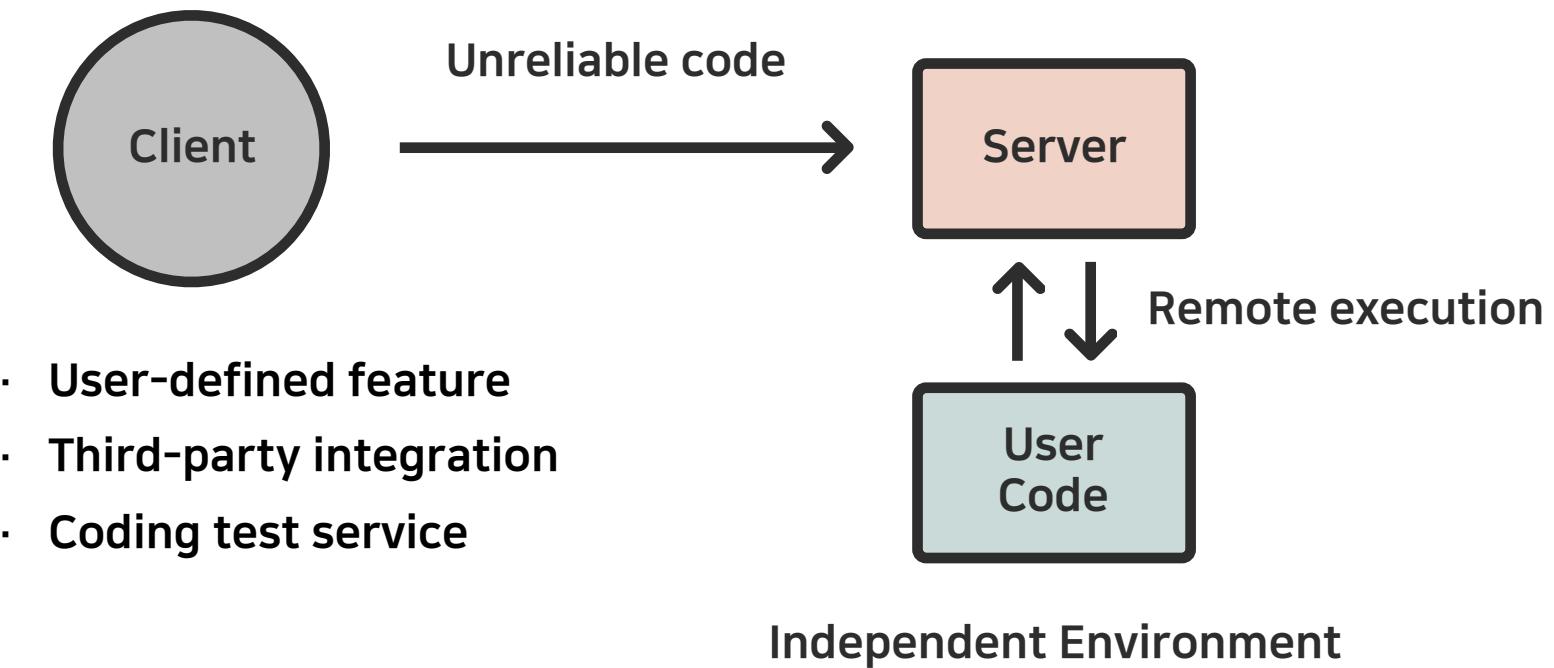
of Request = # of Execution

Serverless



Inherent scalability

Secure Isolation





Is Serverless a magic-bullet?

Disadvantages of Serverless

Performance

Stateless

Complexity

Serverless

: New paradigm

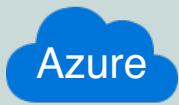
OpenWhisk

Function as a Service

Hosted service



AWS Lambda



Azure Functions



Google Cloud Function



IBM OpenWhisk



Iron Worker

Open source

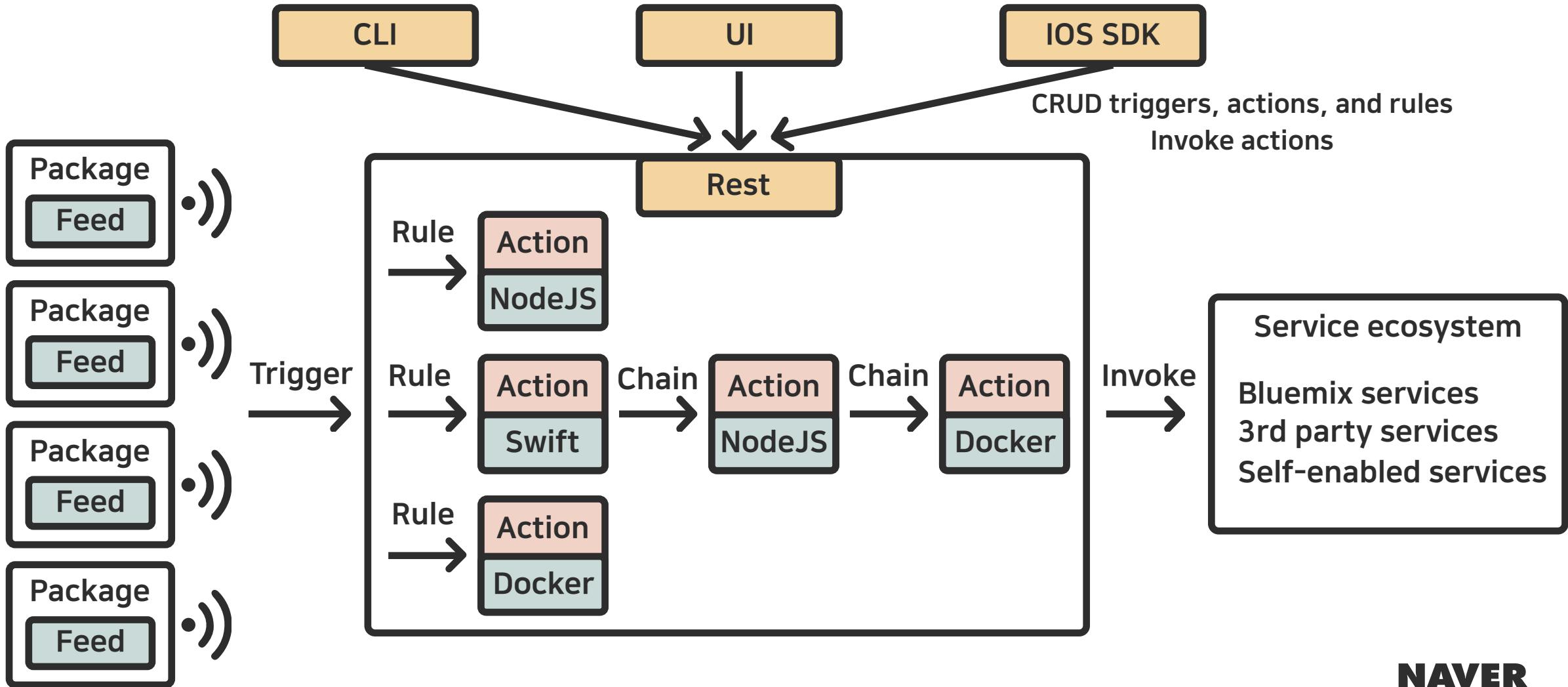
Apache OpenWhisk

Fission

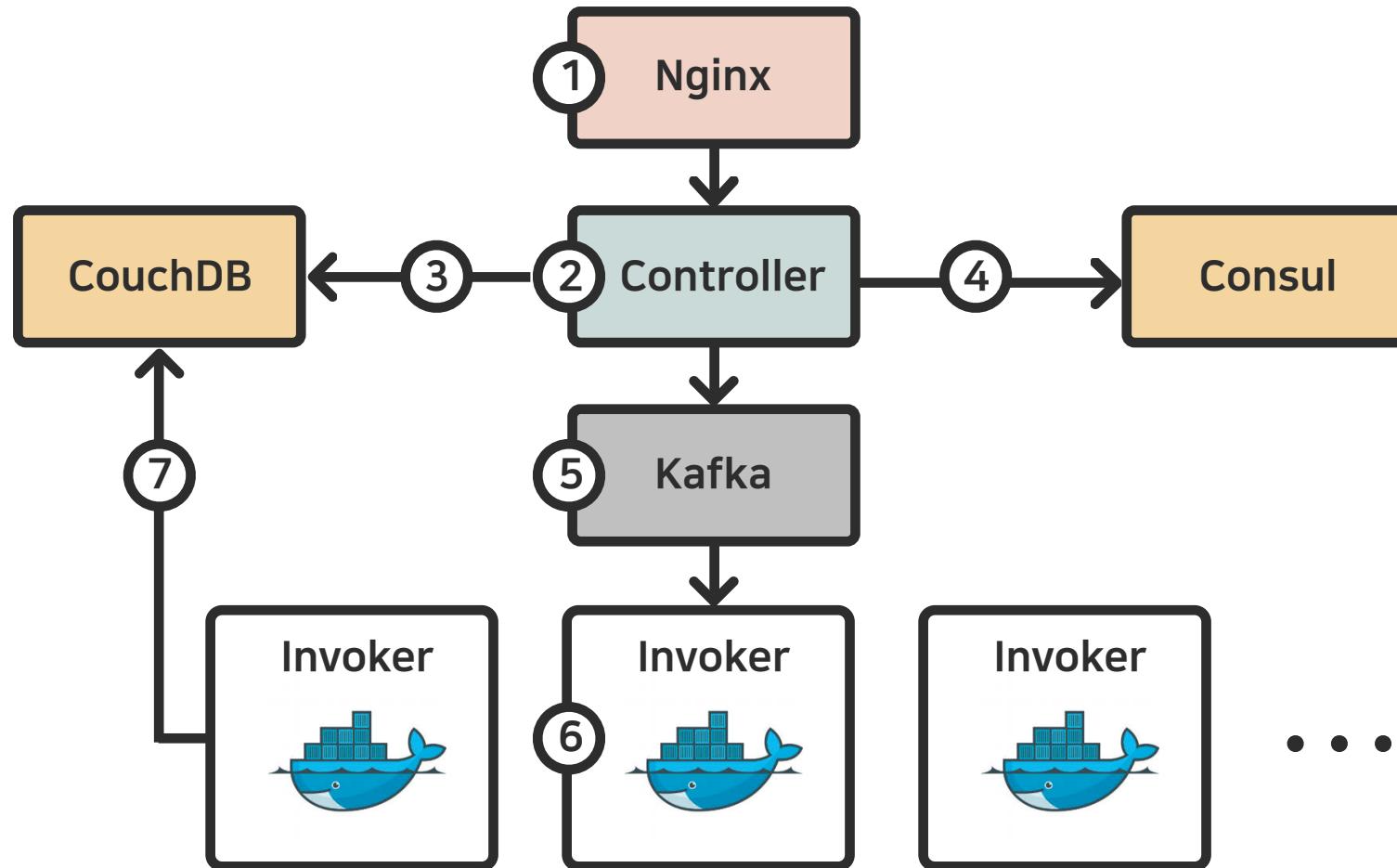
Iron Function

Serverless

What is OpenWhisk?



How to work?



데모

Web UI

기본 기능

Sample App

- 자동 이미지 인식/분류

고려사항

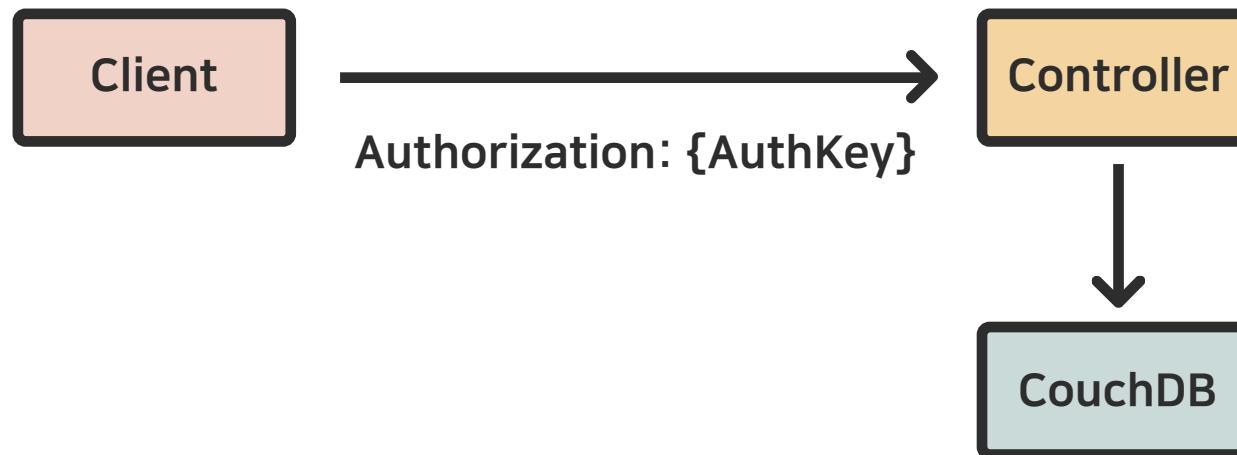
인증 통합

Subject:Auth Key 1:1 매팅

{789c46b1-71f6-4ed5-8c54-816aa4f8c502:abczO3xZCLrMN6v2...9lyGVCGuMDGIwP}

UUID

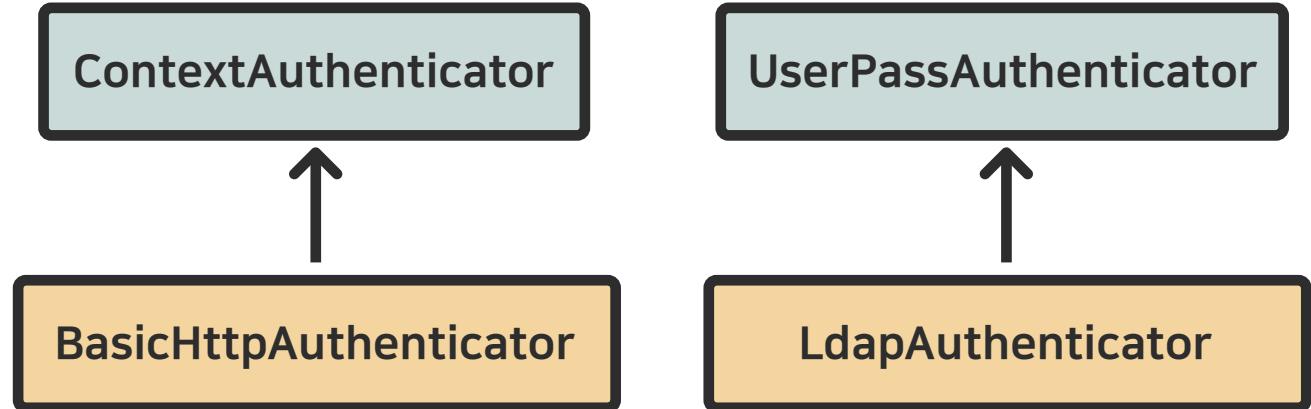
64 Digits Random String



인증 통합

Spray Framework

- Authenticator 상속



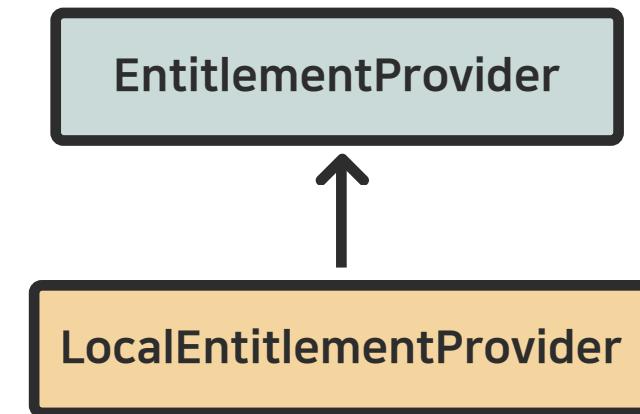
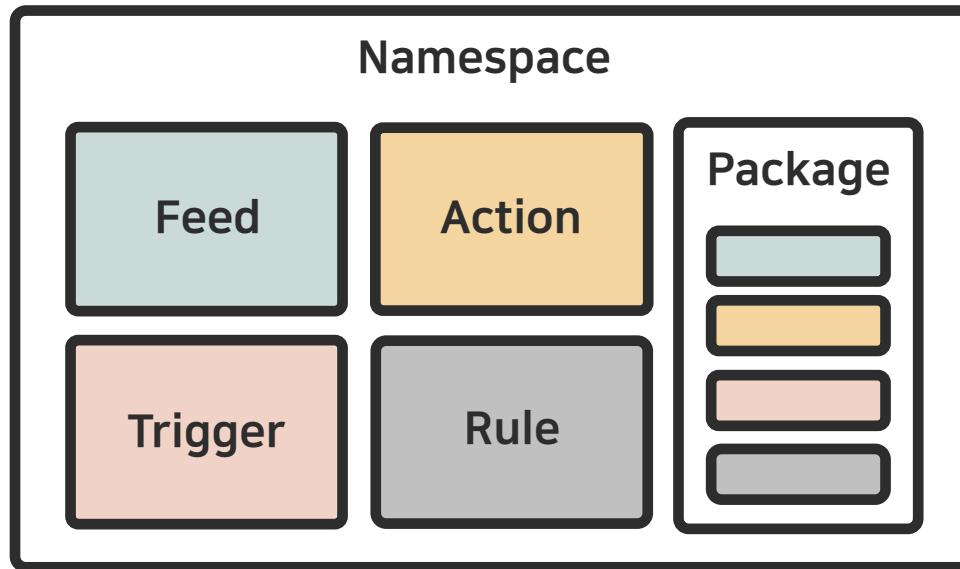
Client Certificate Authentication



권한 통합

Namespace

Entitlement Provider



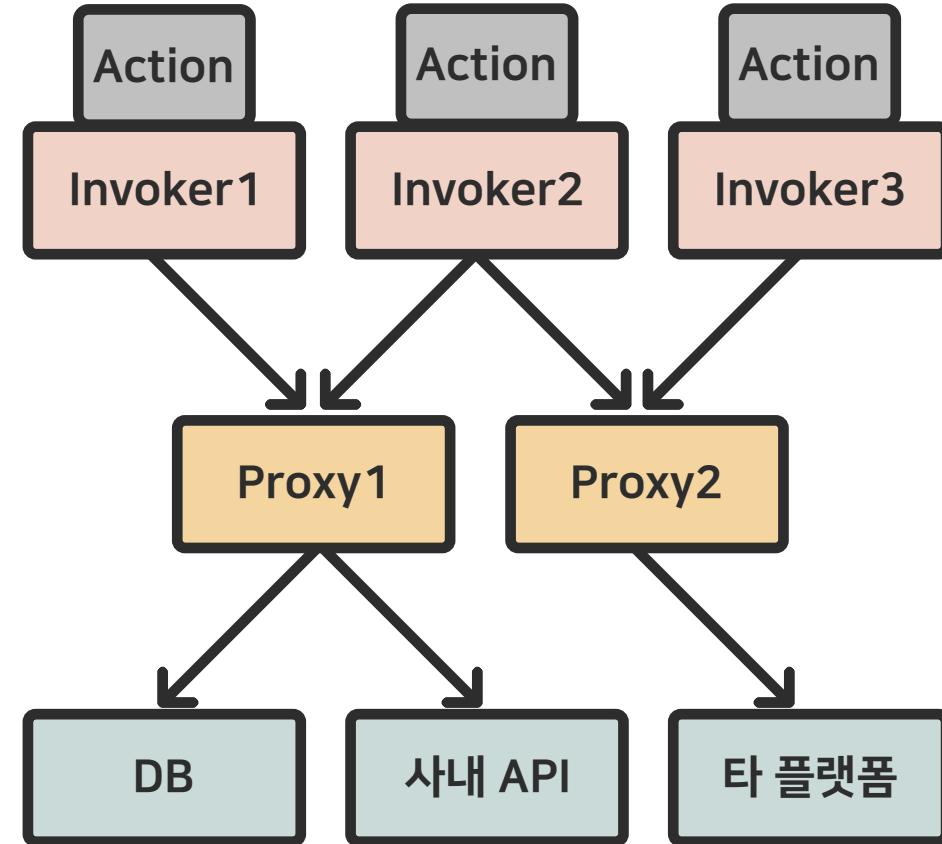
ACL

IP 기반 ACL만 지원하는 Legacy

- Action의 IP 제한 불가

Proxy as a Service

- 사용자가 self-service로 proxy 생성
- 생성된 proxy에 대해 ACL 신청



개발 환경

코드 작성 및 실행

- Local IDE 연동
- Web IDE

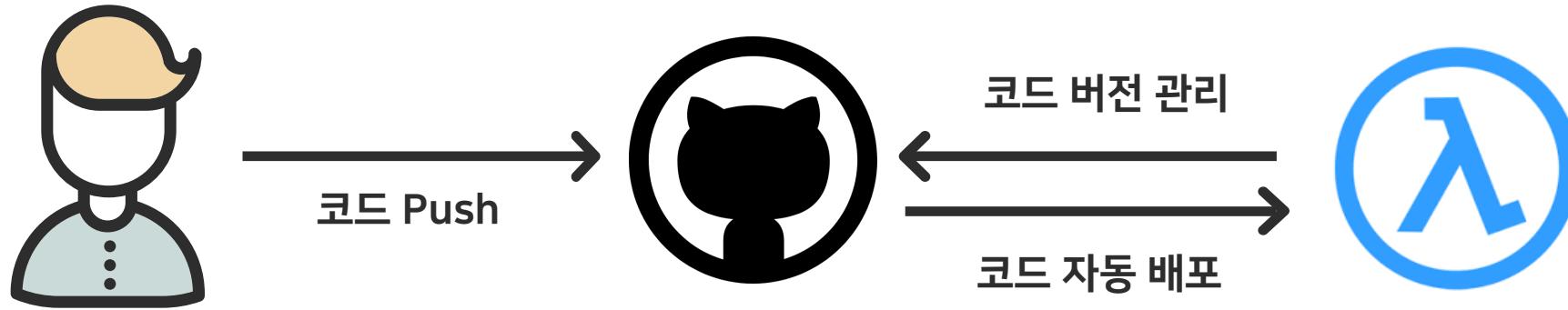
Debugging

- [OpenWhisk Debugger](https://github.com/apache/incubator-openwhisk-debugger): <https://github.com/apache/incubator-openwhisk-debugger>

Code Versioning

Github 연동

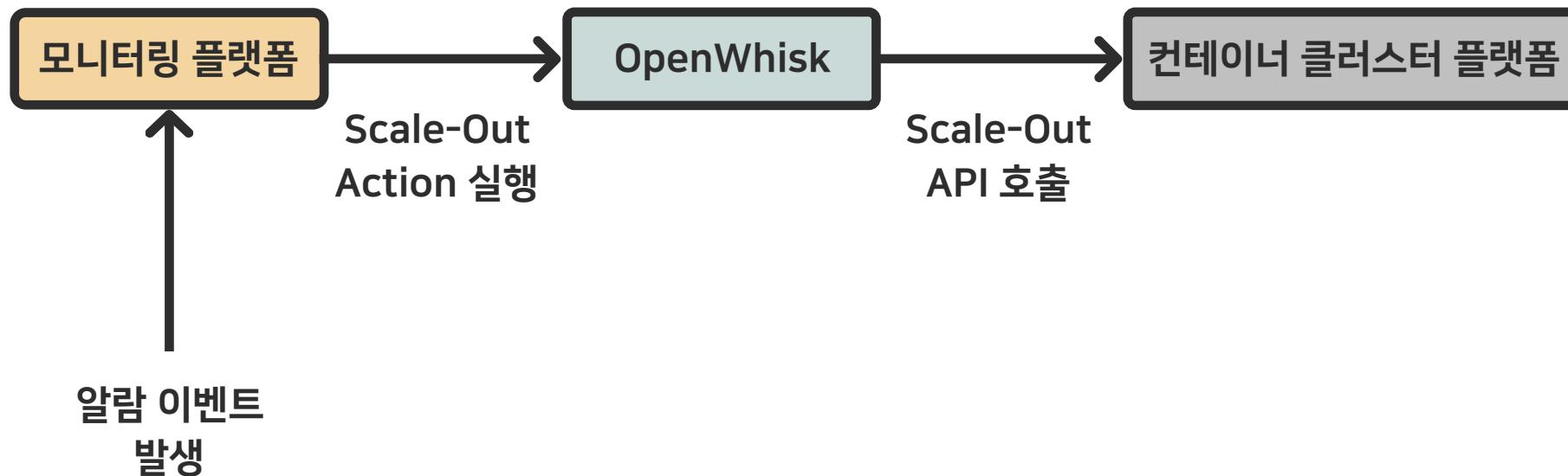
- Github Push시, 코드 배포



활용안

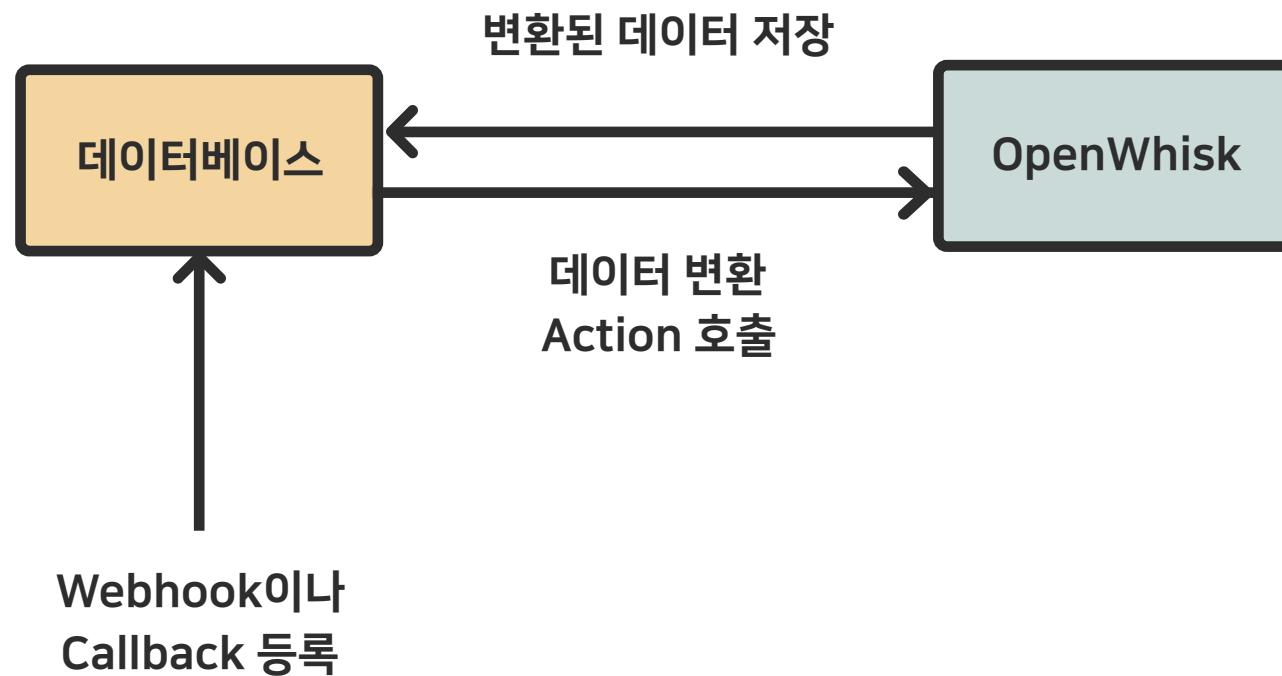
Common Interface

이종 인터페이스를 위한 공통 인터페이스



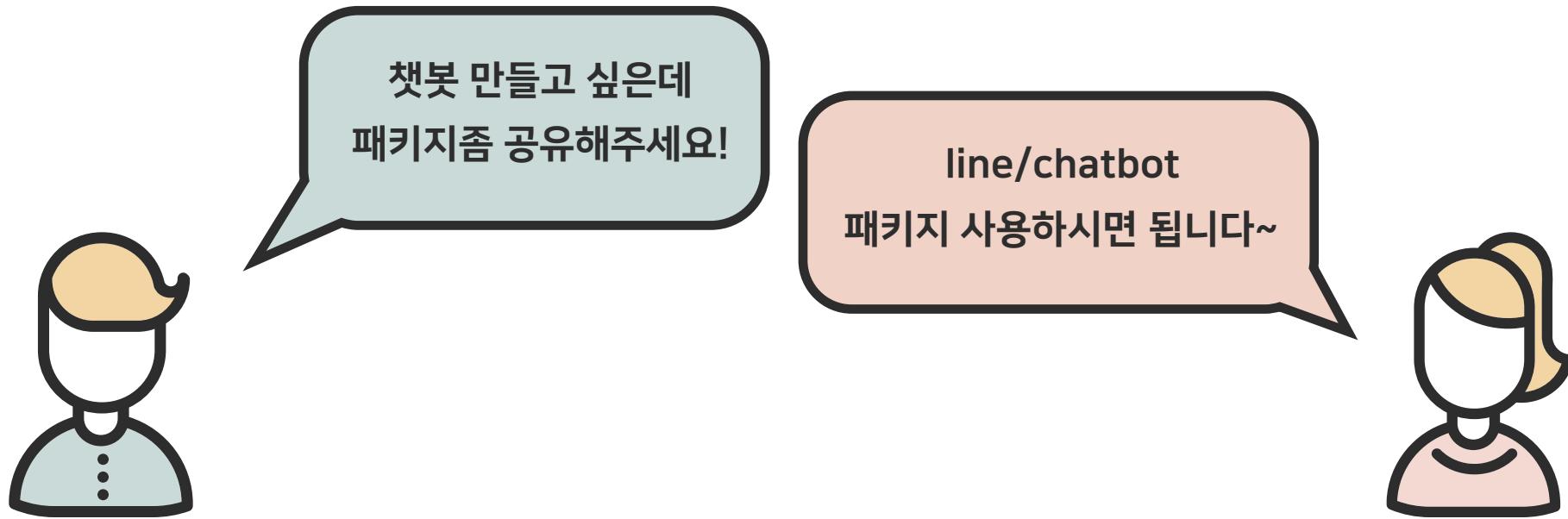
User-defined Features

사용자가 플랫폼 기능 확장



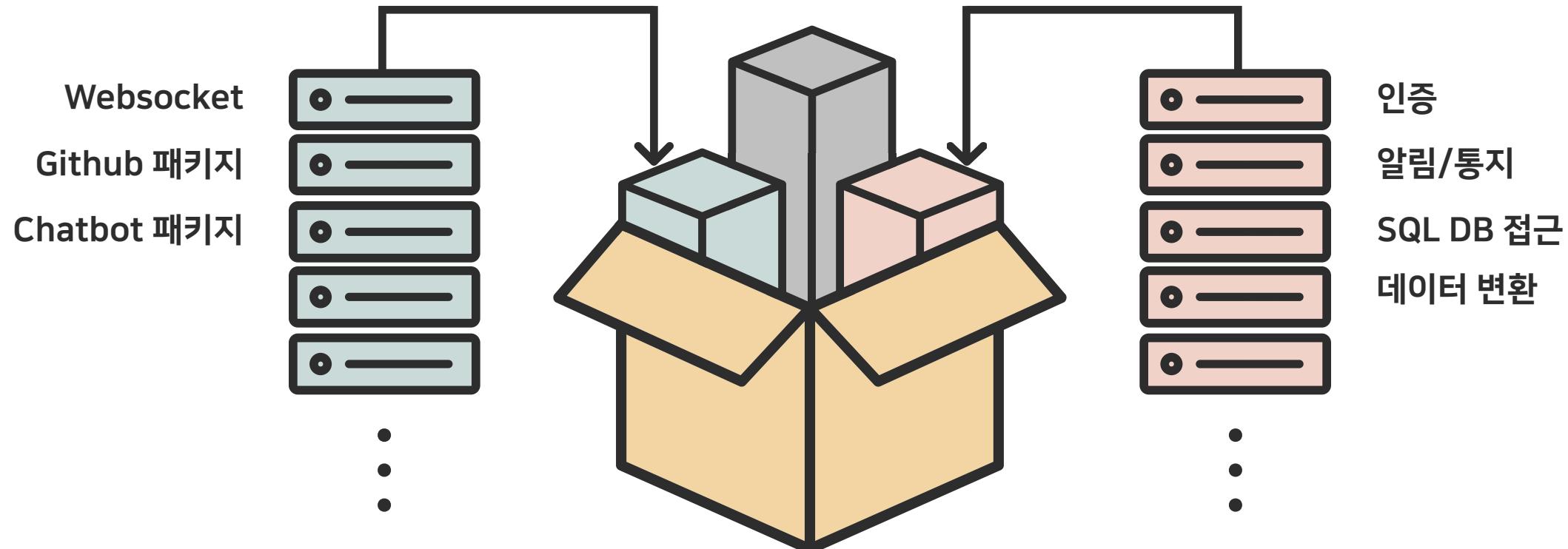
Public Package

- 사용자는 자신의 패키지를 다른 사용자와 공유
- 코드 공유/활용을 위한 UI 제공



Modular Programming

- 기능에 따라 Function들을 조합하여 Application 구성



THANK YOU

Speaker DongKyoung Kim

Designer Seulgaeng

Q&A



김동경 / DongKyoung Kim



dominic.kim@navercorp.com