

Tencent Cloud Practitioner Course

Bok, JongSoon

javaexpert@nate.com

<https://github.com/swacademy/yeonsung>

Contents

- Introduction to Cloud Computing
- Cloud Virtual Machine Basics
- Tencent Cloud Storage
- Tencent Cloud VPC
- Tencent Cloud CDN
- Tencent Cloud Databases
- Tencent Cloud Serverless Architecture
- Terms Relevant to Cloud Computing

Lab Environment

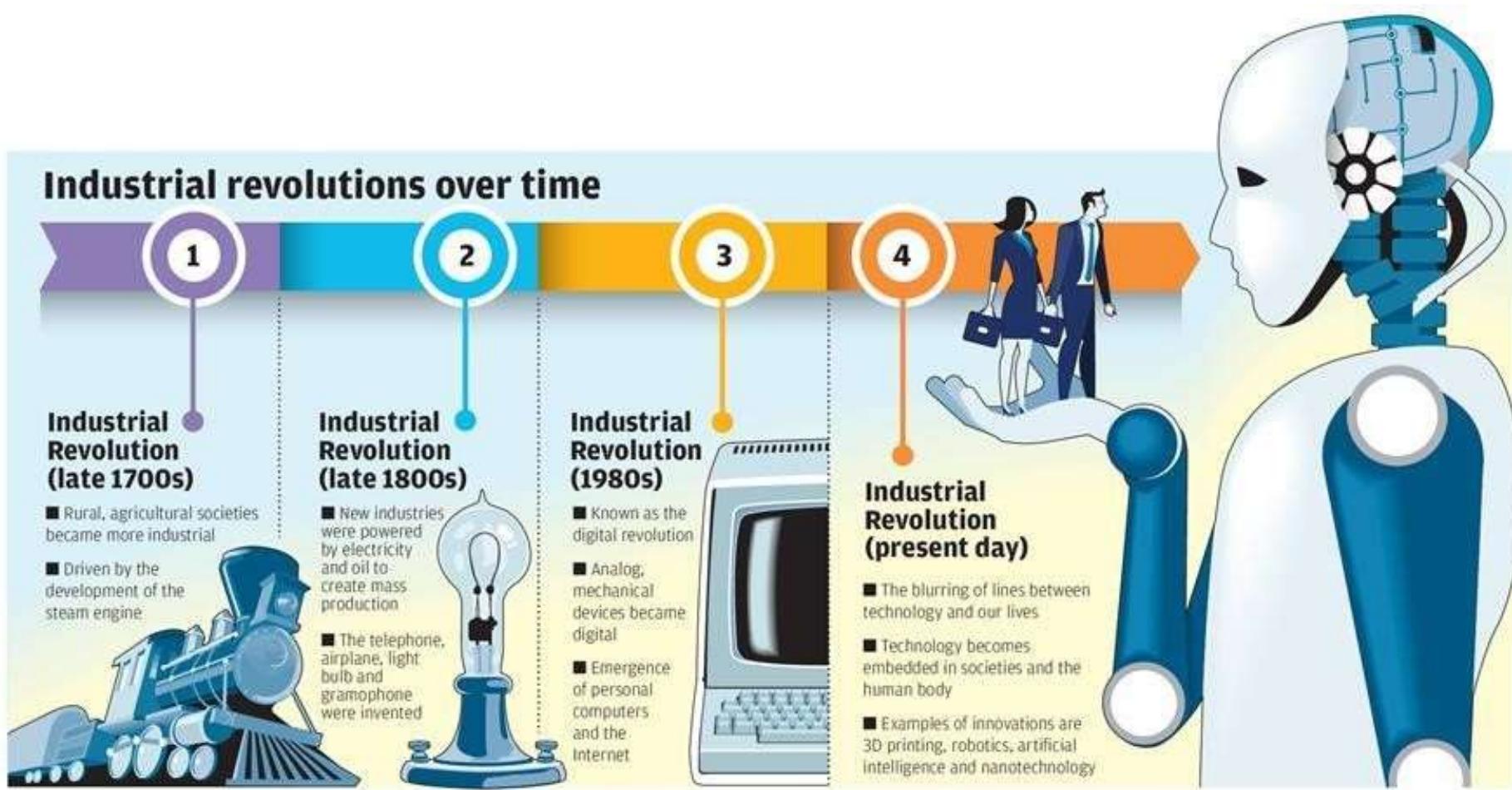
- Apple MacBook or Microsoft Windows 10+
- Google Chrome or Mozilla Firebox
- Adobe Acrobat PDF Reader or Foxit PDF Reader
- Microsoft Visual Studio Code for 64-bit
- SSH Client Tools : PuTTY, XSHELL, MobaXterm etc.



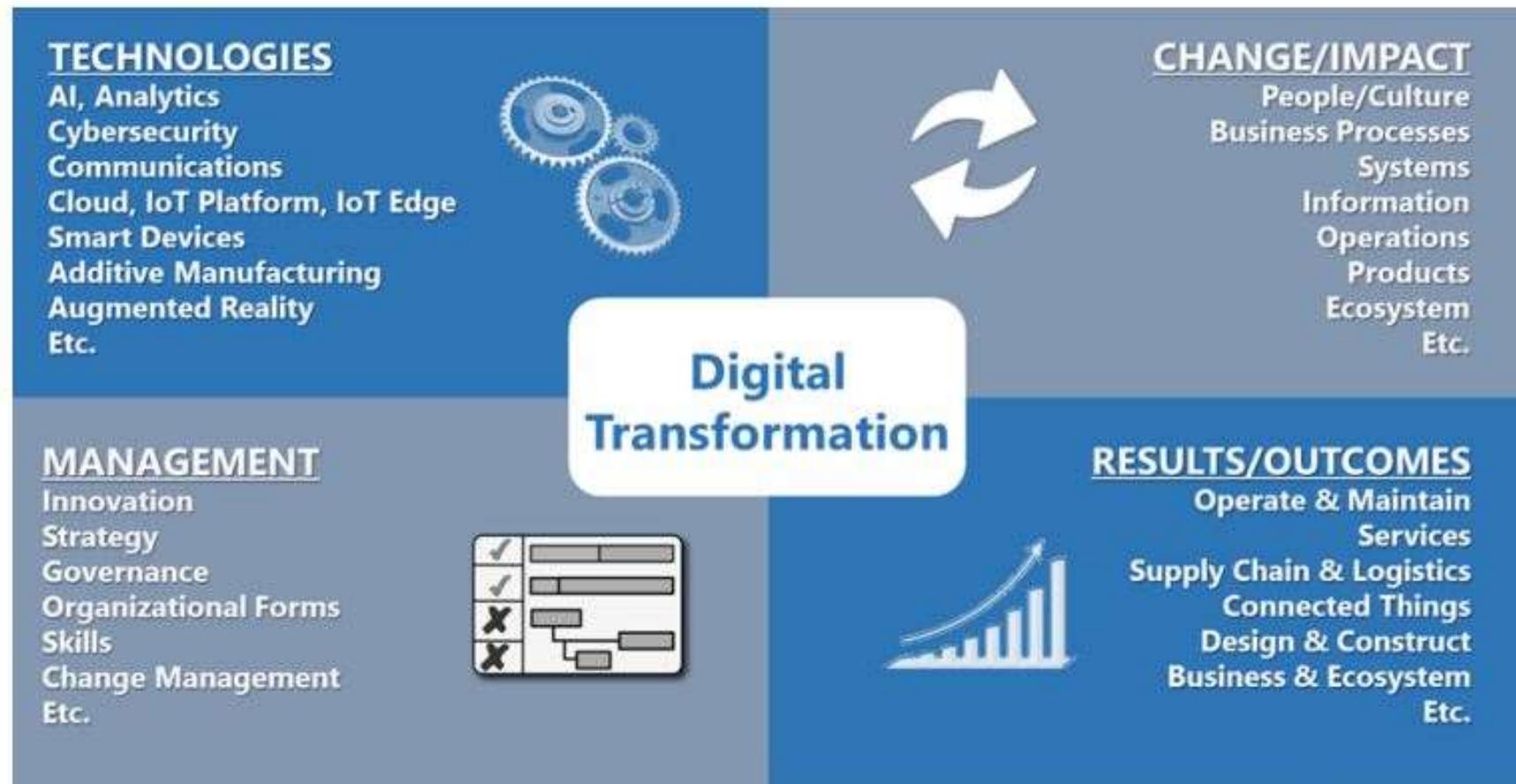
Introduction to Cloud Computing



4th Industrial Revolution



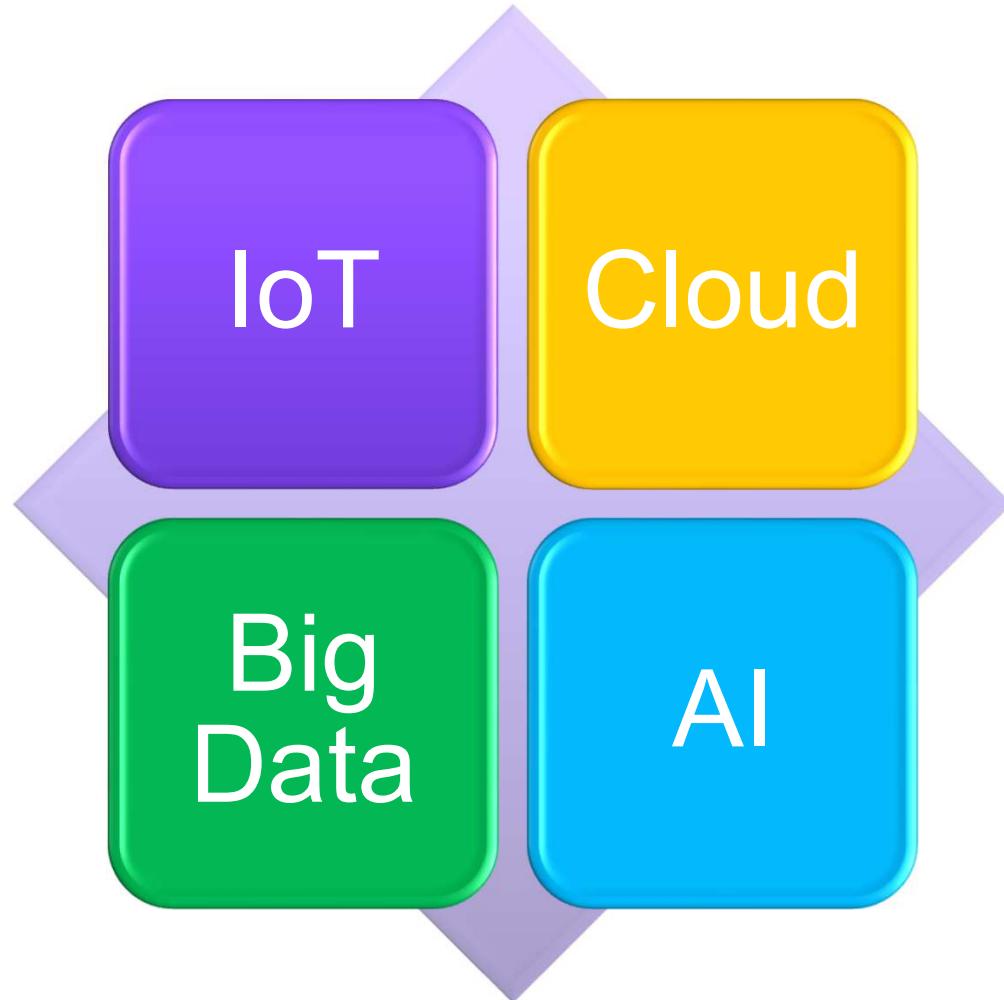
Digital Transformation



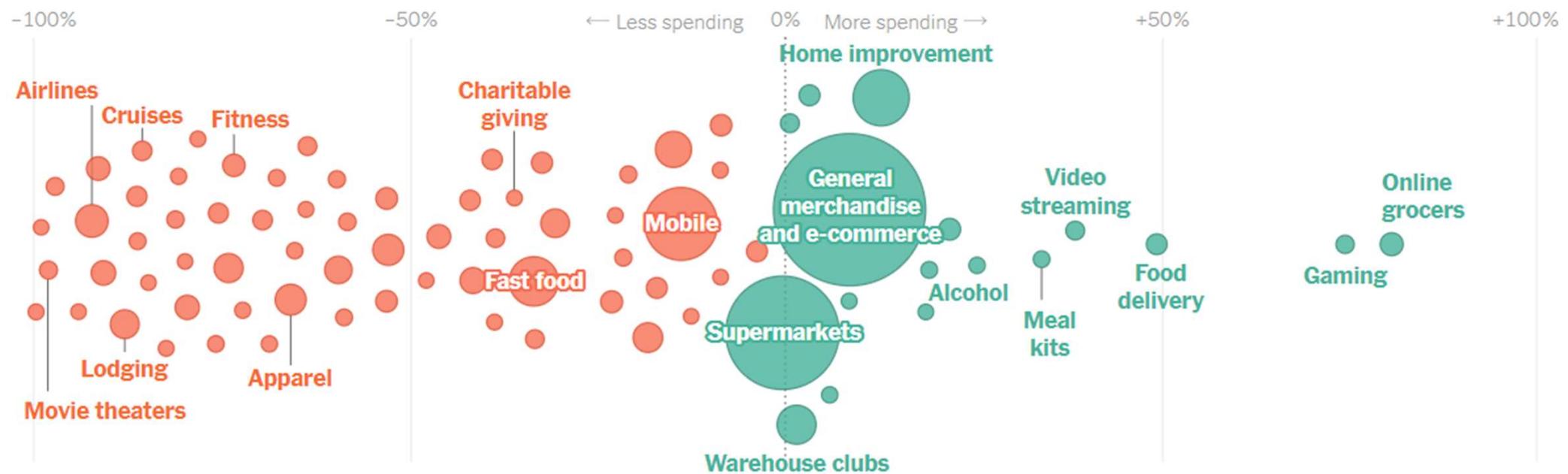
Four Dimensions to Consider When Developing a Digital Transformation Strategy

<https://www.arcweb.com/blog/industrial-digital-transformation-snapshot-strategies-success>

Digital Transformation (Cont.)

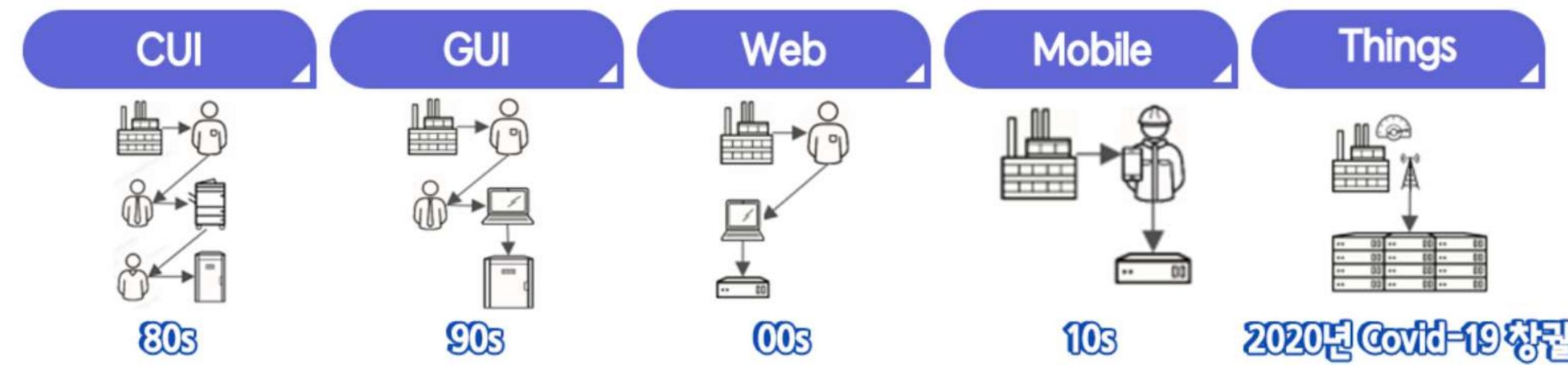


Post Pandemic(COVID-19) and Business Trend



<https://www.nytimes.com/interactive/2020/04/11/business/economy/coronavirus-us-economy-spending.html>

Post Pandemic(COVID-19) and Business Trend (Cont.)



e-koreatech, "CI/CD를 통한 DevOps 엔지니어링 이해", 2회차

Legacy Enterprise IT Architecture



The Evolution of Data Centers – Enterprise Data Centers(EDCs)

■ Challenges:

- Difficult to build, involves complex Ops management
- Hard to scale and make adjustments, involves long launch cycles

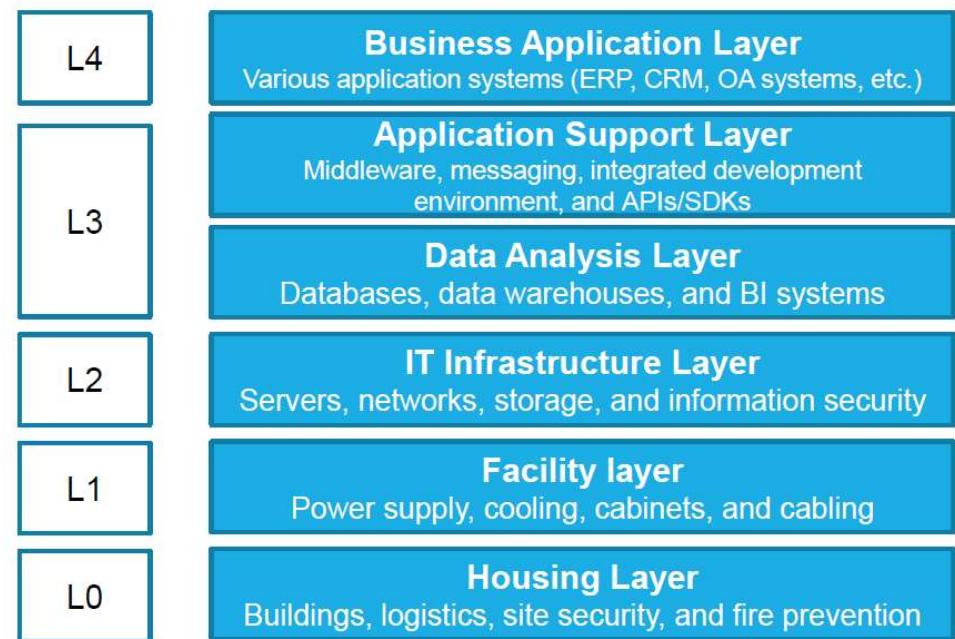
■ High TCO

- $\text{TCO} = \text{CapEx} + \text{OpEx} + \text{OppCost}$

■ Uncertain TVO

- $\text{TVO} = \text{Business value and benefits from IT}$

Data Center Layers: L0-L4



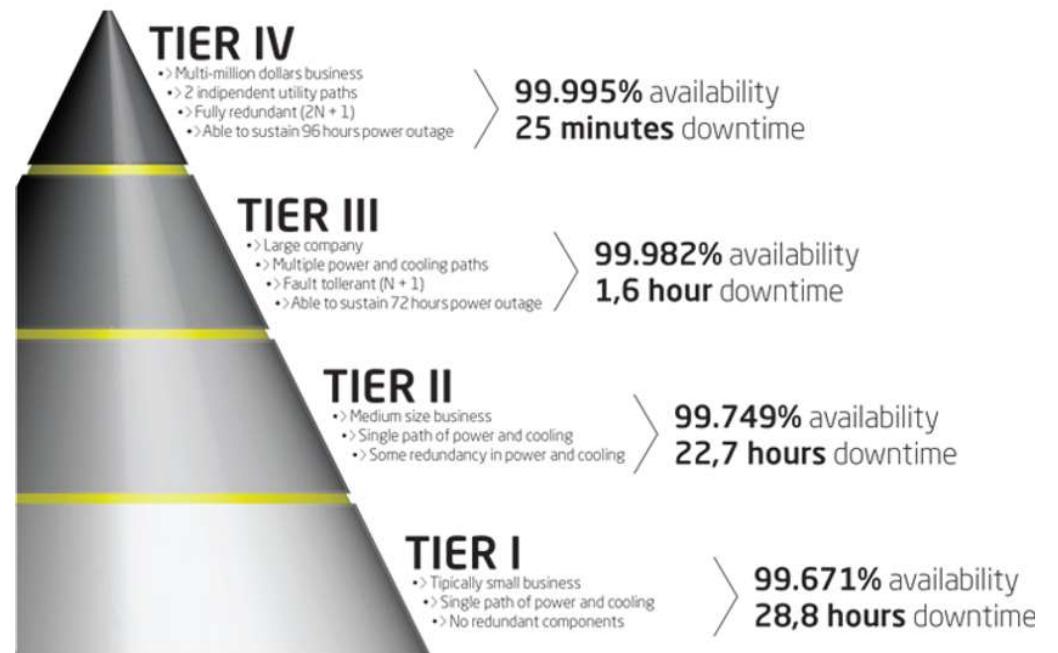
The Evolution of Data Centers – Enterprise Data Centers(EDCs)

■ IDC Tiers : T1 – T4

- Reliability and security
- Ops management capabilities
- Infrastructure availability

$$\text{Availability} = \frac{\text{Promised service time} - \text{downtime}}{\text{Promised service time}} \times 100\%$$

■ Tencent Cloud data centers must be above **T3**.



<https://www.netari.com/post/2014/02/04/what-to-look-for-in-a-data-center-understanding-tier-levels-industry-standards>

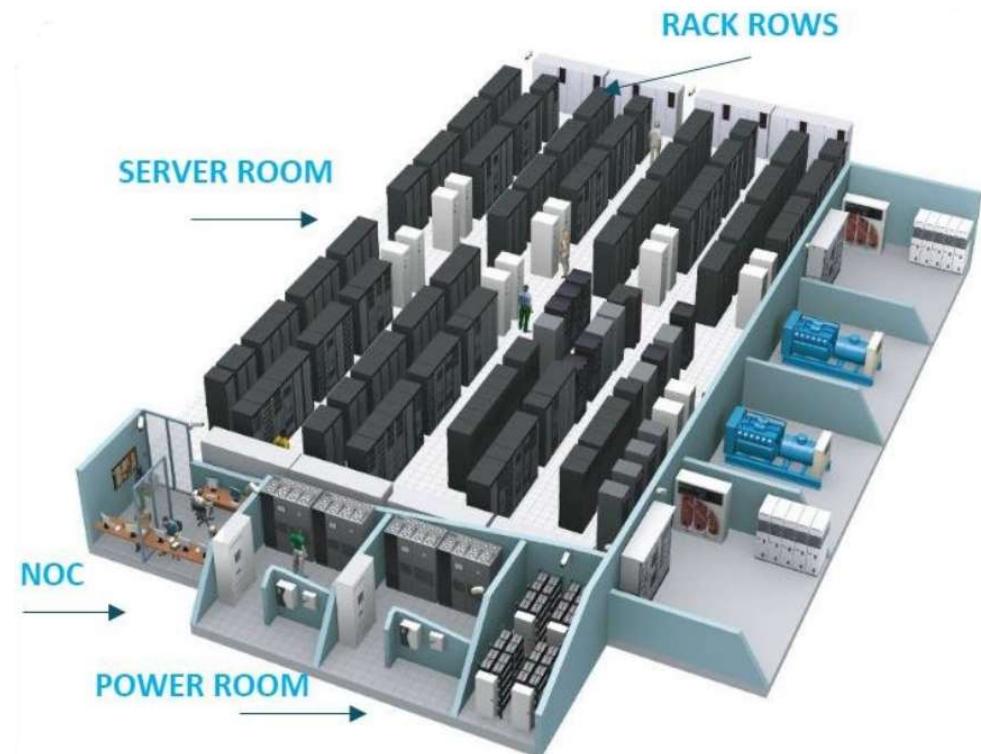
The Evolution of Data Centers – Self-built Internet Data Centers(IDC)

■ Advantages :

- Planning and construction : IDC design, civil engineering...
- Deployment: servers, storage...
- Ops: monitoring, alarming, security Ops...
- Business system deployment: security Ops, availability, and reliability

■ Disadvantage:

- High costs



https://www.researchgate.net/figure/Typical-layout-of-a-Data-center-arranged-by-three-main-areas-server-room-power-room_fig2_343722092

The Evolution of Data Centers – Hosted/Rented IDC

- Two types of leasing of IDC resources such as storage, servers, and bandwidth : hosting and renting
- Advantages of hosted/rented IDCs over self-built EDCs:
 - Lower costs
 - Faster IDC launch
 - Carrier-grade reliability
 - Standardization
 - Ops management

Responsible Entity	Hosted	Rented
The ISP provides:	Facilities, Bandwidth, Power	Facilities, Bandwidth, Power, Hardware, Management, Maintenance
The enterprise provides:	Hardware, Management, Maintenance, Business systems	Business systems

Cloud Computing

- Service on-Demand, *Pay-as-you-go*
- Origin : More and more, companies will fulfill their IT requirements simply by purchasing fee-based *Web services* from third parties – similar to the way they currently buy electric power or telecommunications services.
 - 『IT Doesn't Matter』, Nicholas Carr, 2003
- Proposal : in 2006, Google CEO *Eric Schmidt* proposed the concept of cloud computing. AWS was founded in 2006, marking the birth of cloud computing.



Cloud Computing

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Cloud Computing (Cont.)



인터넷 기술을 활용하여 다수의 고객들로부터 높은 수준의 확장성을 가진 자원들을 서비스로 제공받는 컴퓨팅의 한 형태



표준화된 IT 기반 기능들이 IP 네트워크를 통해 제공되며, 언제나 접근이 허용되고 수요의 변화에 따라 가변적이며 사용량이나 광고에 기반한 과금 모형을 제공하는 웹 또는 프로그램적인 인터페이스를 제공하는 컴퓨팅

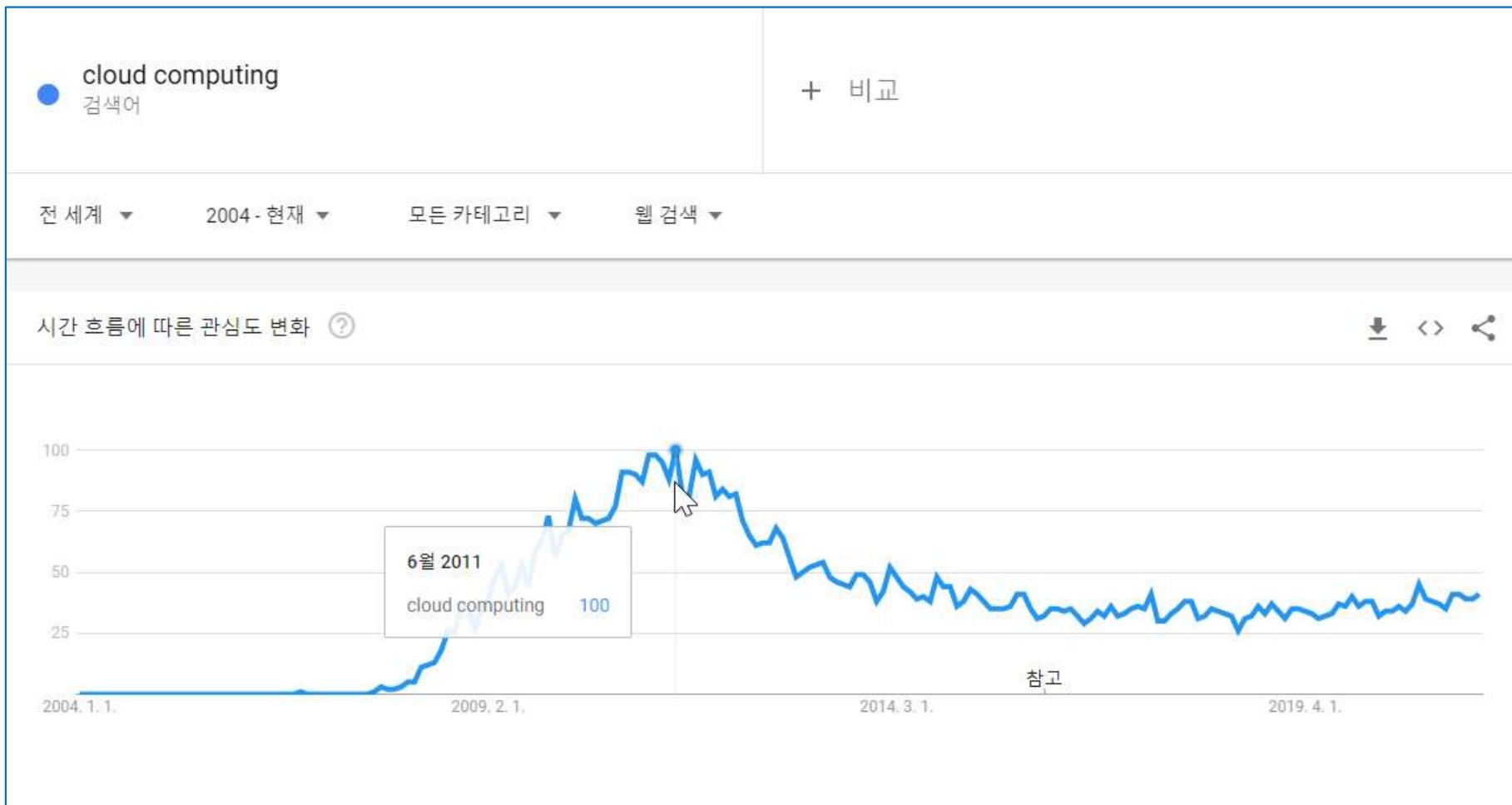


인터넷에 기반한 개발과 컴퓨터 기술의 활용을 뜻하는 것으로 인터넷을 통해서 동적으로 규모화 가능한 가상적 자원들이 제공되는 컴퓨팅



웹 기반 어플리케이션을 활용하여 대용량 데이터베이스를 인터넷 가상 공간에서 분산처리하고 이 데이터를 PC, 휴대 전화, 노트북 PC, PDA 등 다양한 단말기에서 불러오거나 가공할 수 있게 하는 환경

Cloud Computing (Cont.)



<https://trends.google.com/trends/explore?date=all&q=cloud%20computing>

Cloud Computing (Cont.)



Special Publication 800-145

2. The NIST Definition of Cloud Computing

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models.

**Recommendations of the National Institute
of Standards and Technology**

Peter Mell
Timothy Grance

Cloud Computing (Cont.)

Features	Description
Massive scale	A public cloud often has hundreds of thousands or even millions of servers; a private cloud can have hundreds to thousands of servers.
High reliability	Multi-replica fault tolerance provides high reliability.
Isolation of tenants	Multiple tenants share the underlying hardware resources, but are logically isolated at the upper layers.
Elastic scaling	Dynamic scaling helps clients cope with the growth of their applications and their user base.
Service on demand	Cloud provides a large pool of resources that clients can purchase on demand.
Monitorable and measurable resources	Cloud platforms provide features for monitoring and measuring resources.
Low costs	Users only pay only for the resources they use, not the entire infrastructure.

Cloud Computing (Cont.)

Electric Power Development

Factories build their own power generation facilities



Factories rent power generation plants/devices



Power is provided by utility company for on-demand usage

Independent and Self-built

Partially Rented

Use on Demand

Internet+

Utilities on the Cloud

IT Development

EDCs

Hosted/Rented IDCs

Cloud computing for on-demand usage

Cloud Computing (Cont.)

Item	EDCs	Traditional IDCs	Cloud Computing
Rental Scope	None	L0, L1, and part of L2	L0 – L4
Overall Costs	High	Moderate	Low
Launch Cycle	Long	Moderate	Very short
Ops Management	Complicated	Moderate	Simple
Scalability	Difficult	Moderate	Elastic scaling
Independence and Controllability	High	Moderate	Public cloud / private cloud

Cloud Computing (Cont.)

비대면 / Online

Mobile / Web

Credit Card

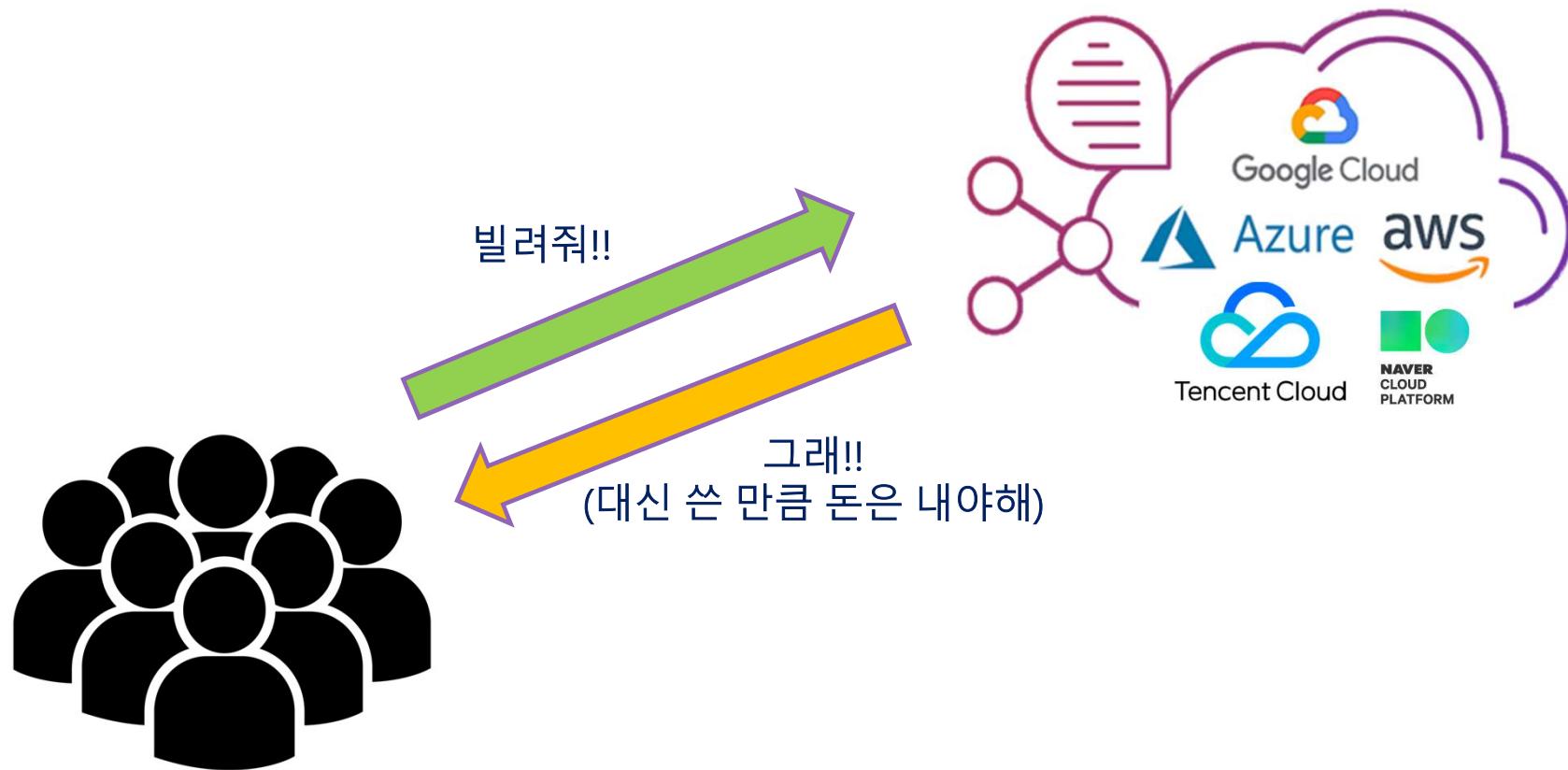
IT 공급 / 주문
Service

CRM / AI-
based Service

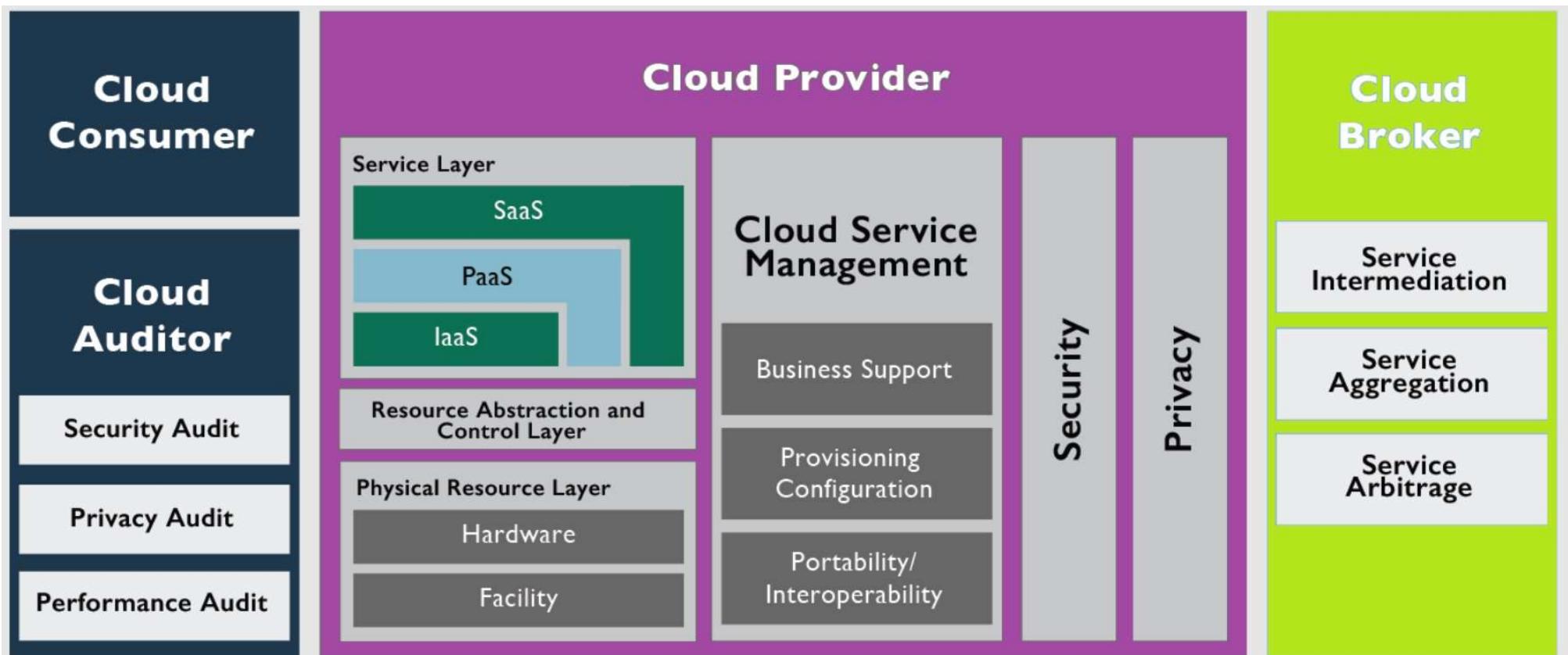
장바구니
System

신속 배송
System

Cloud Computing (Cont.)

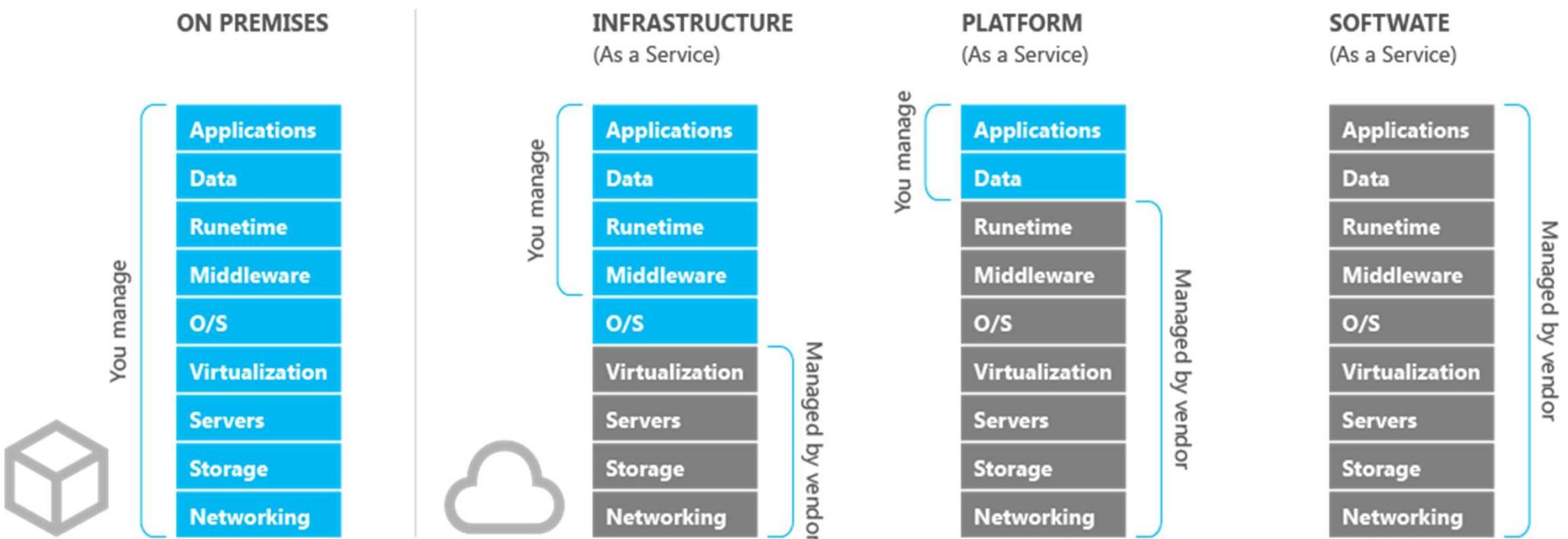


Cloud Computing – Reference Model



<https://cyberrisk-countermeasures.info/2021/12/08/nist-cloud-computing-reference-architecture-and-taxonomy%EF%BF%BC/>

Cloud Computing – Reference Model (Cont.)



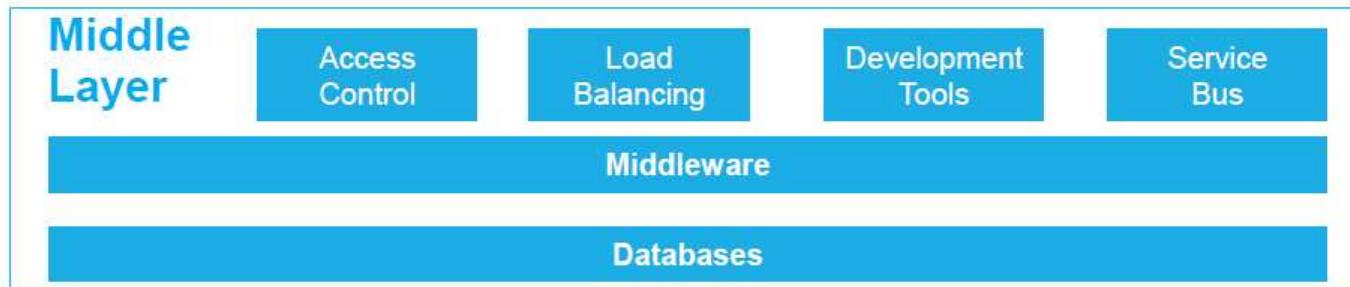
<https://velog.io/@aonee/%ED%81%B4%EB%9D%BC%EC%9A%B0%EB%93%9C%EB%9E%80-nzrij240>

Cloud Computing – Reference Model (Cont.)

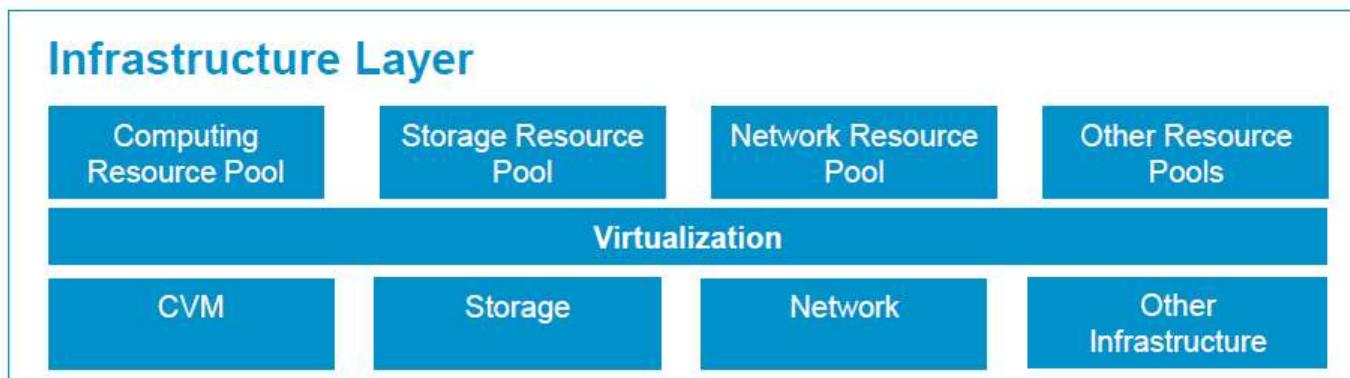
SaaS



PaaS



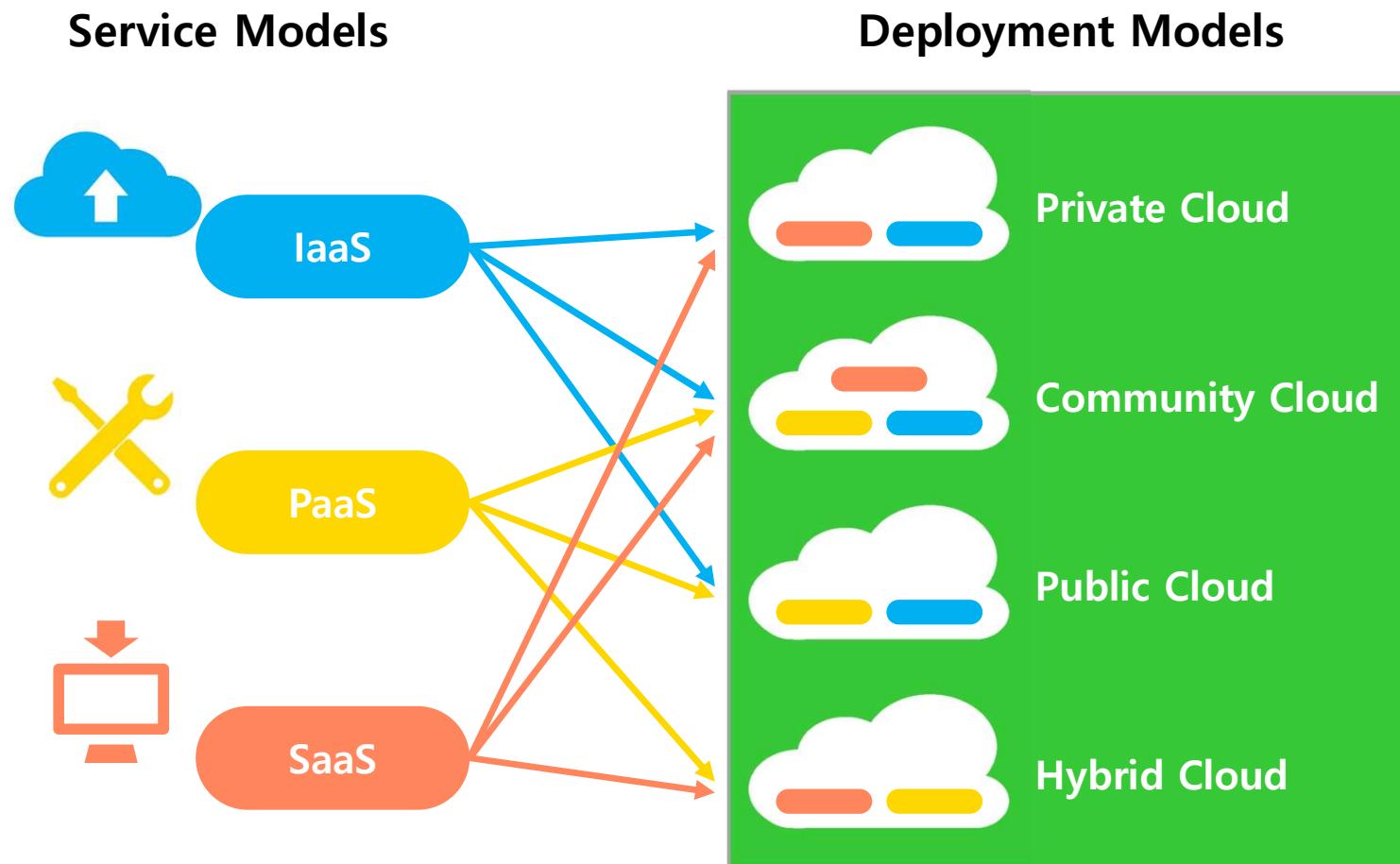
IaaS



Management Layer



Cloud Computing – Reference Model (Cont.)



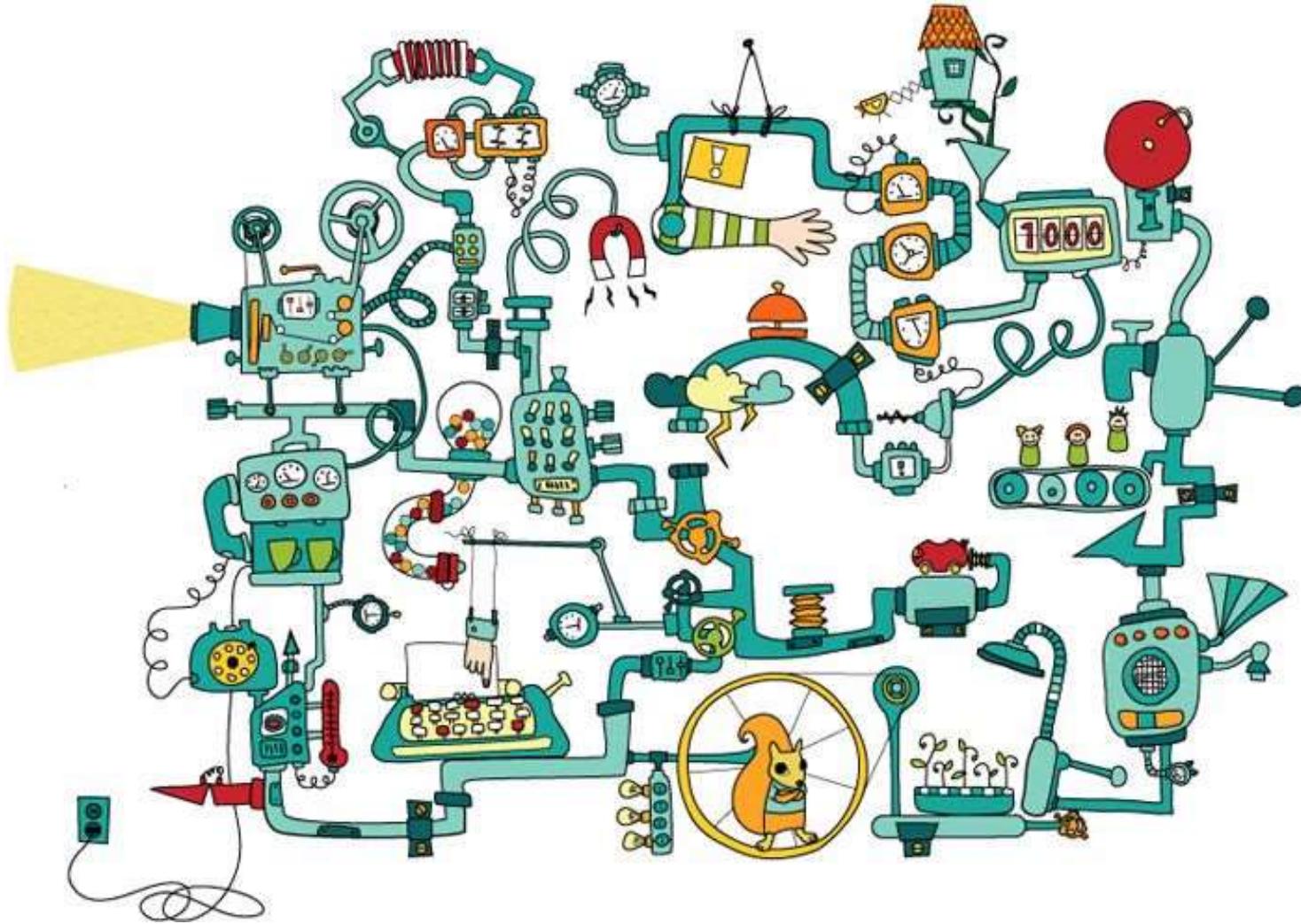
Cloud Computing – Reference Model (Cont.)

구분	장점	단점
퍼블릭 클라우드	<ul style="list-style-type: none">초기 투자비용 없음융통성 있는 사용량 조절	<ul style="list-style-type: none">서비스 제공자 기업의 의존도가 높음
프라이빗 클라우드	<ul style="list-style-type: none">기존 IT 자원을 활용 가능행위추적 용이	<ul style="list-style-type: none">초기 투자비용이 많이 소요
하이브리드 클라우드	<ul style="list-style-type: none">기존 IT 자원을 활용 가능서비스 구성변경 용이	<ul style="list-style-type: none">운용비와 도입비용 증가
커뮤니티 클라우드	<ul style="list-style-type: none">초기 투자비용 없음융통성 있는 사용량 조절	<ul style="list-style-type: none">서비스 제공자 기업의 의존도가 높음
공통정보보호 요구사항	외부에서 내부(클라우드) 시스템 접속이 이루어져 함에 따라 통신구간 암호화, 내부 시스템 보호를 위한 방화벽, 침입방지 시스템 구축 등 주요 보호조치 필요	

Legacy Enterprise IT Architecture

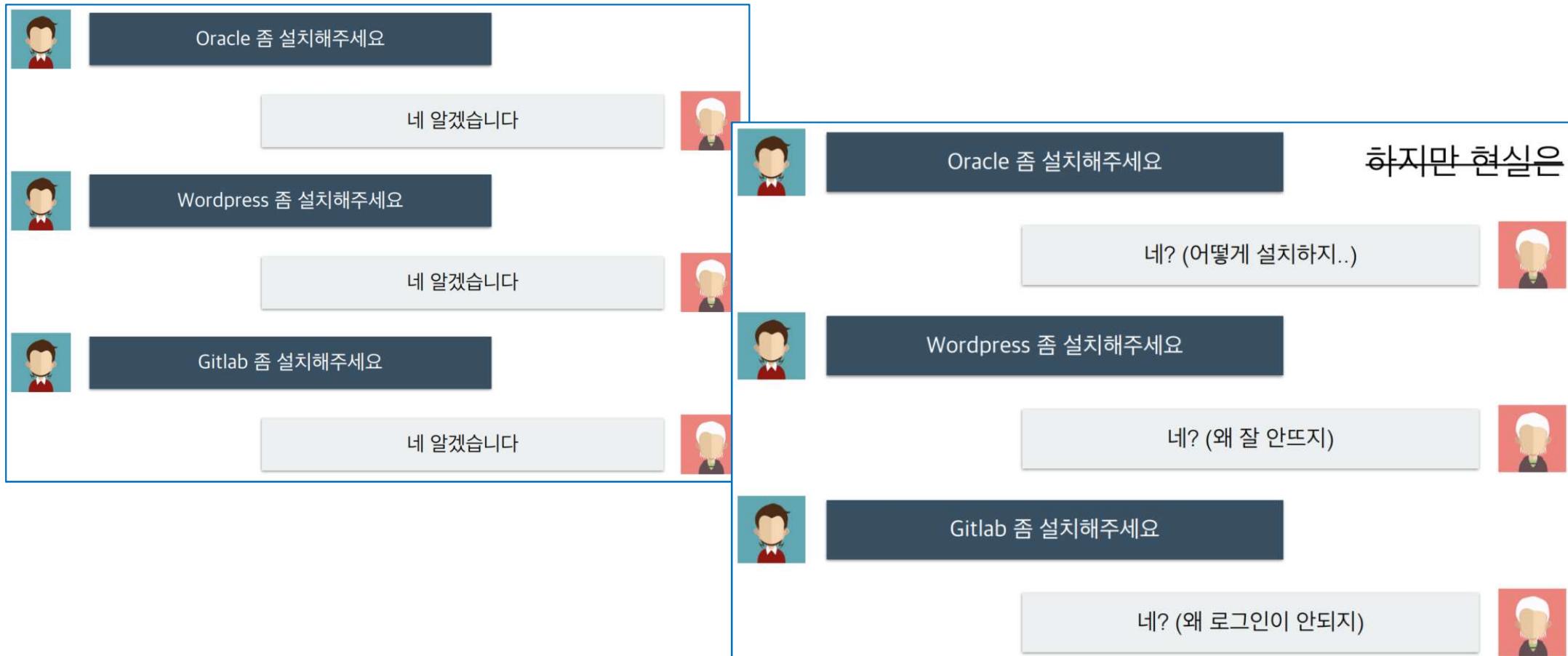
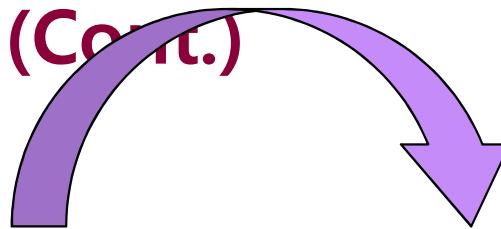


서버를 관리한다는 것은...



<https://subicura.com/2017/01/19/docker-guide-for-beginners-1.html>

서버를 관리한다는 것은...(Cont.)



서버를 관리한다는 것은...(Cont.)



이제 AWS를 쓰기로 했습니다!



이제 Azure를 쓰기로 했습니다!



이제 Google Cloud를 쓰기로 했습니다!

계속해서 바뀌는 **서버 환경** 😕



Node.js를 쓰기로 했습니다!



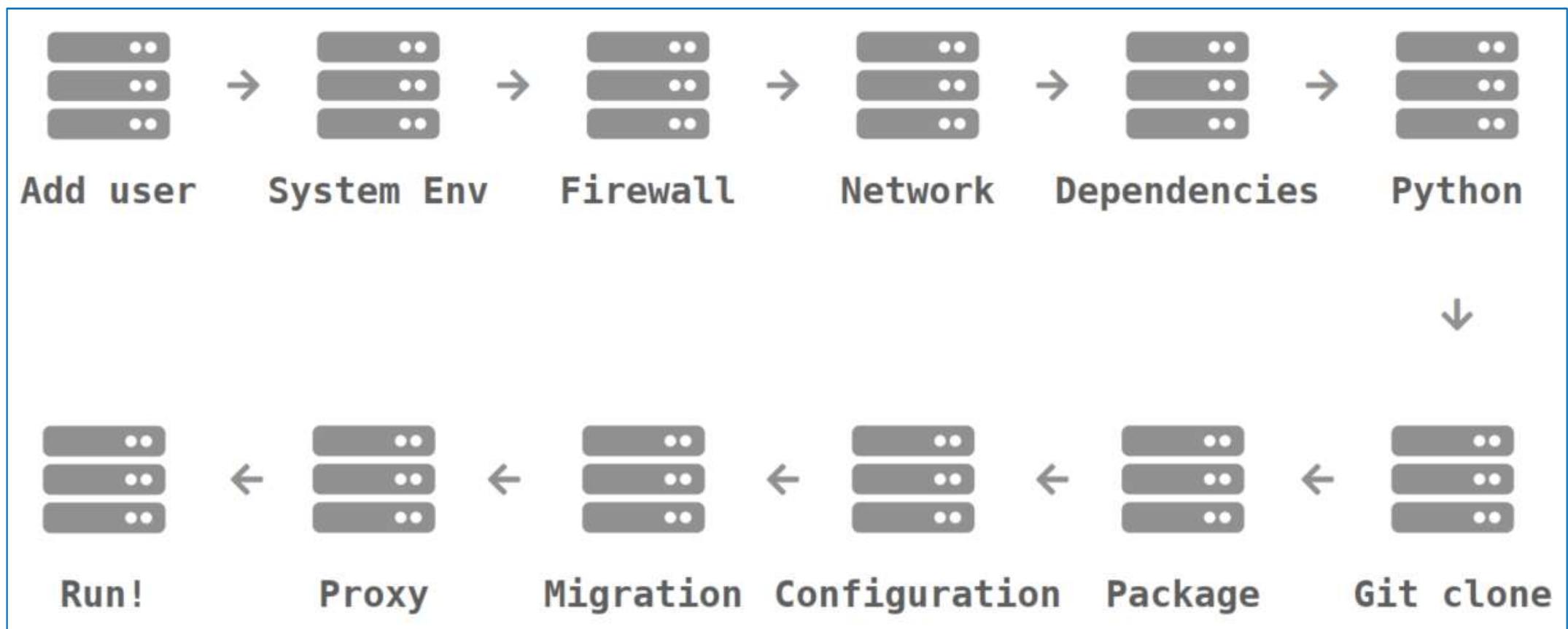
Python을 쓰기로 했습니다!



Ruby를 쓰기로 했습니다!

계속해서 바뀌는 **개발 환경** 😱

서버를 관리한다는 것은...(Cont.)



Virtualization

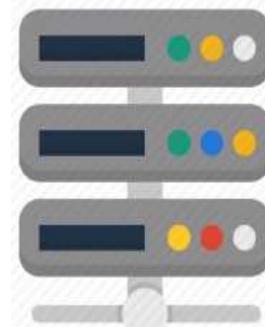


Virtualization (Cont.)

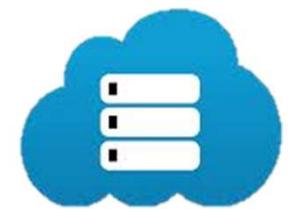
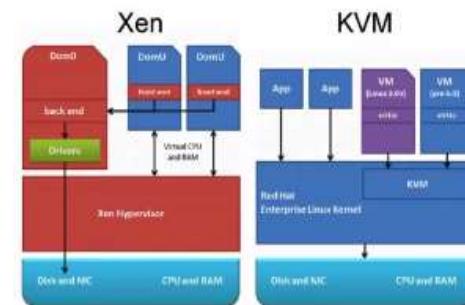
Data Centers



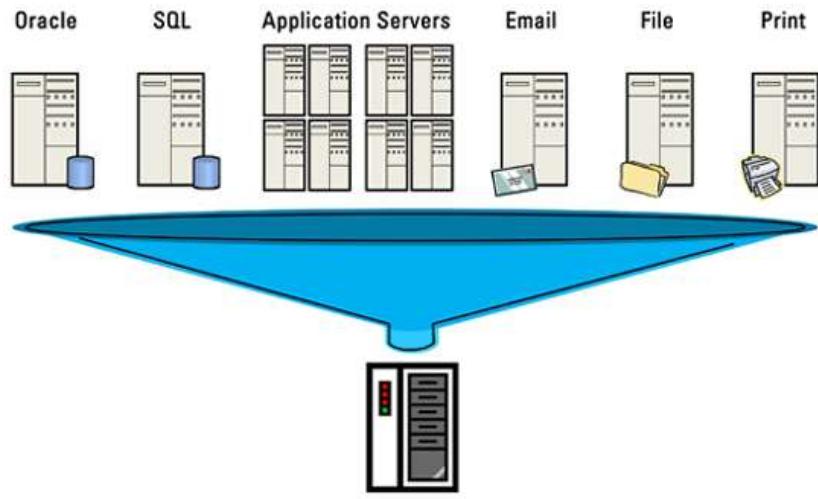
Server Racks



Virtualization



Virtualization (Cont.)



- V12n
- 물리적인 하드웨어 장치**를**
- 논리적인 객체**로**
- 추상화하는 기술
- Is the act of creating a virtual(rather than actual) version of something, including virtual computer hardware platforms, storage devices, and computer network resources.

Container



컨테이너

위키백과, 우리 모두의 백과사전.



다른 뜻에 대해서는 [컨테이너 \(동음이의\)](#) 문서를 참조하십시오.

컨테이너(영어: Container)는 철판으로 만들어져 재사용이 가능한 규격화된 통으로 화물을 옮길 때 쓴다.

1950년대 상용화 되고 그후 점차 널리 쓰게 되었으며, 짐 꾸리기에 편하고 운반이 쉬우며 보관에도 좋은 점 때문에 전 세계적으로 널리 퍼지게 되었다.^[1]

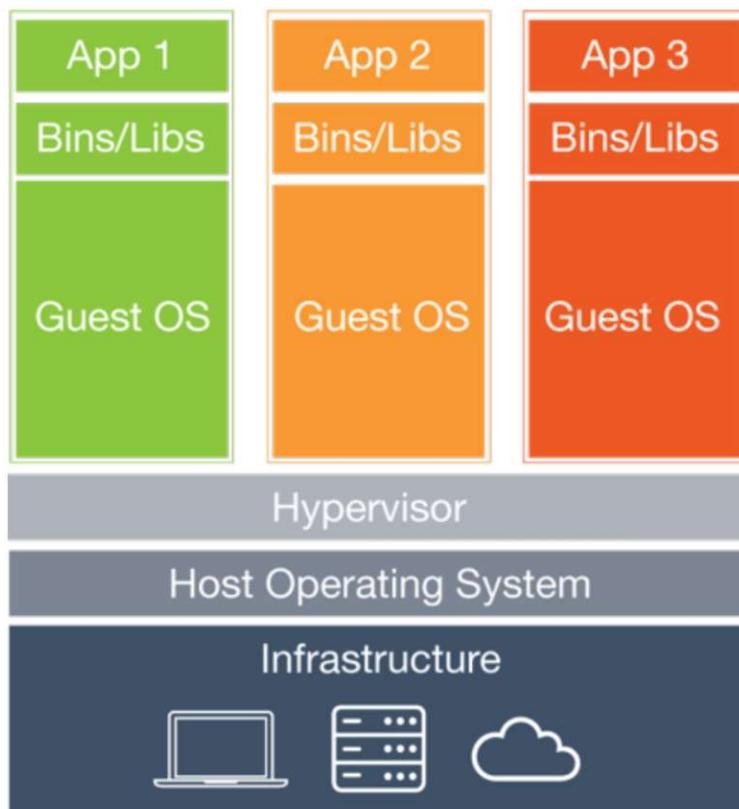
Container (Cont.)



WHY CONTAINERS?

<https://www.youtube.com/watch?v=n-JwAM6XF88>

Container (Cont.)



가상머신이 있는데, 왜 컨테이너인가?

→ 성능차이

CPU, RAM 할당하고, OS 넣고...

성능을 높이는 방법으로...

→ 가상 머신의 일을 줄이자...

가상 하드웨어를 또 생성?

→ 하이퍼바이저 빼자...

OS위에 또 OS?

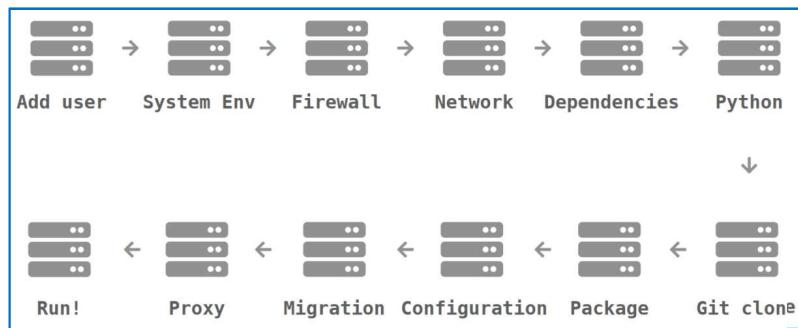
→ Guest OS 빼자...

자원 할당은 OS Kernel이 하자.

→ LXC가 하자.

다시 처음으로 돌아가서, 서버를 관리하는 것은...

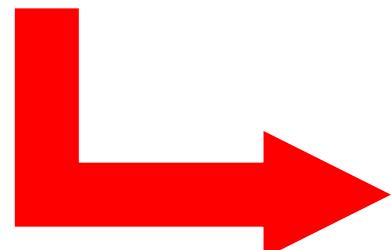
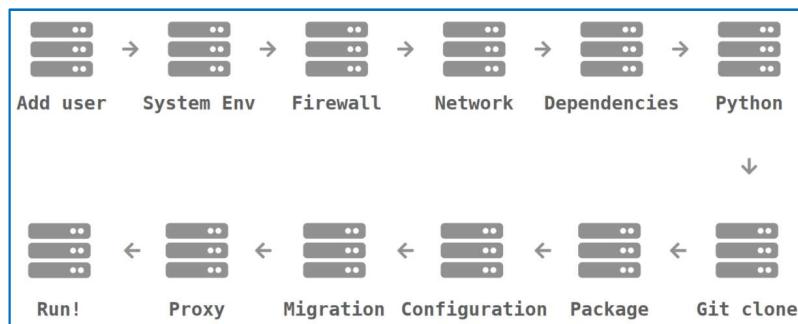
1번째 방법은...



**문서화를
잘하자.**

다시 처음으로 돌아가서, 서버를 관리한다는 것은...(Cont.)

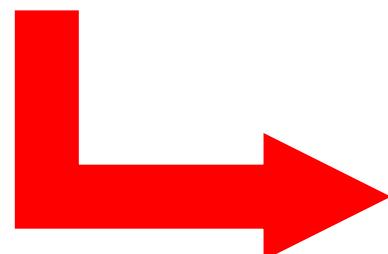
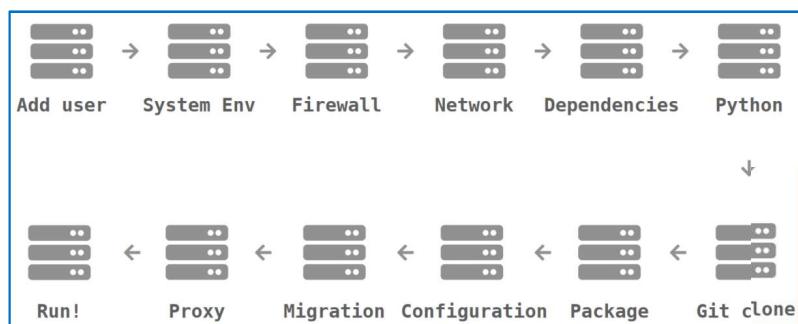
2번째 방법은...



툴을 잘
쓰자.

다시 처음으로 돌아가서, 서버를 관리하는 것은...(Cont.)

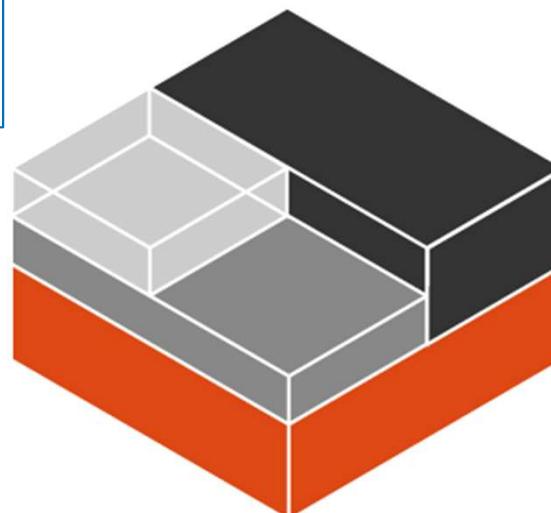
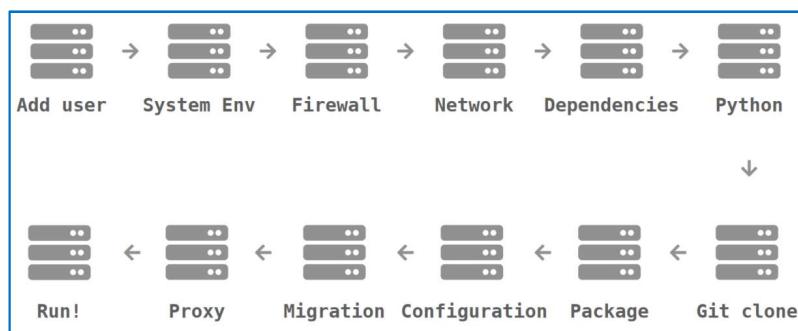
3번째 방법은...



가상화

다시 처음으로 돌아가서, 서버를 관리하는 것은...(Cont.)

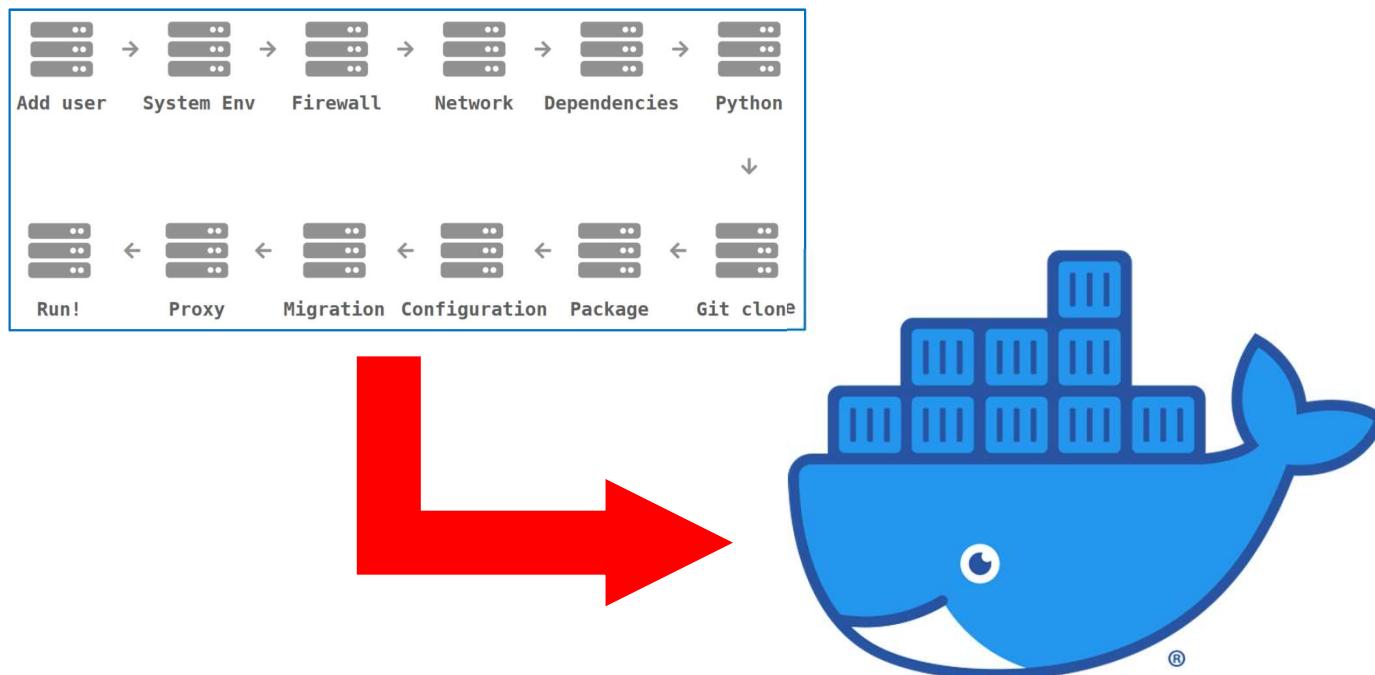
4번째 방법은...



**리눅스 기능을
이용한 빠르고
효율적인 서버
관리**

다시 처음으로 돌아가서, 서버를 관리하는 것은...(Cont.)

5번째 방법은...

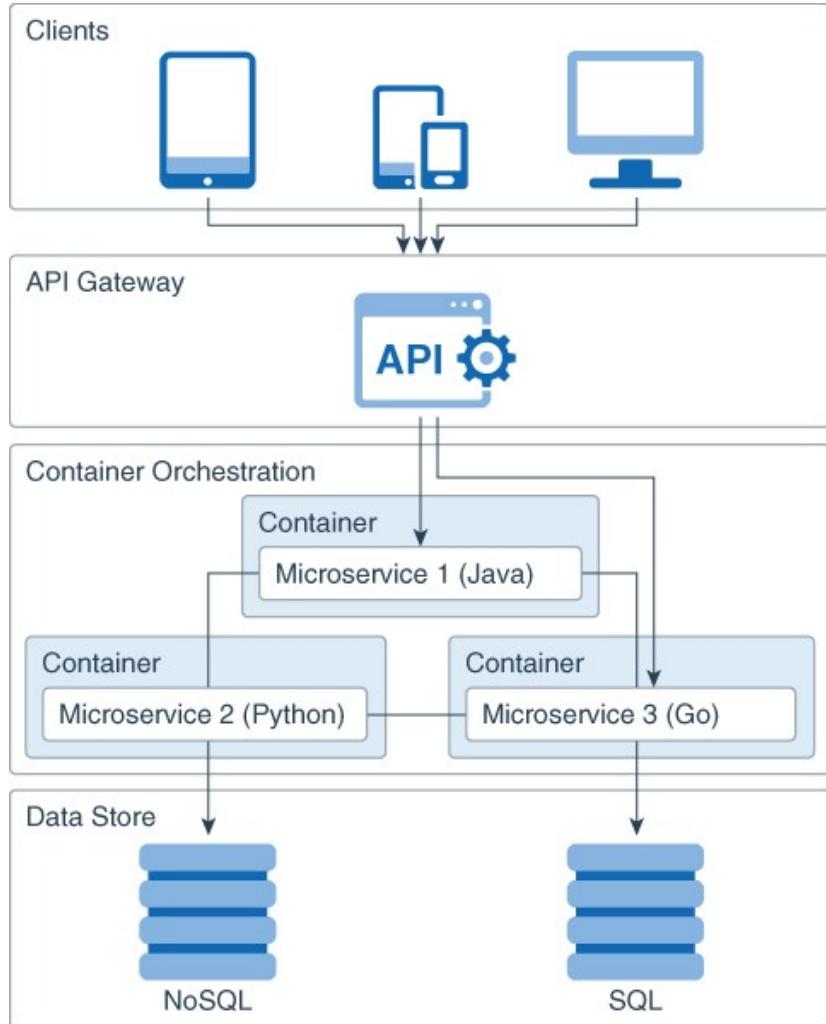


**어렵고 복잡한
기능을 사용하기
쉽게!!!**

Legacy Enterprise IT Architecture

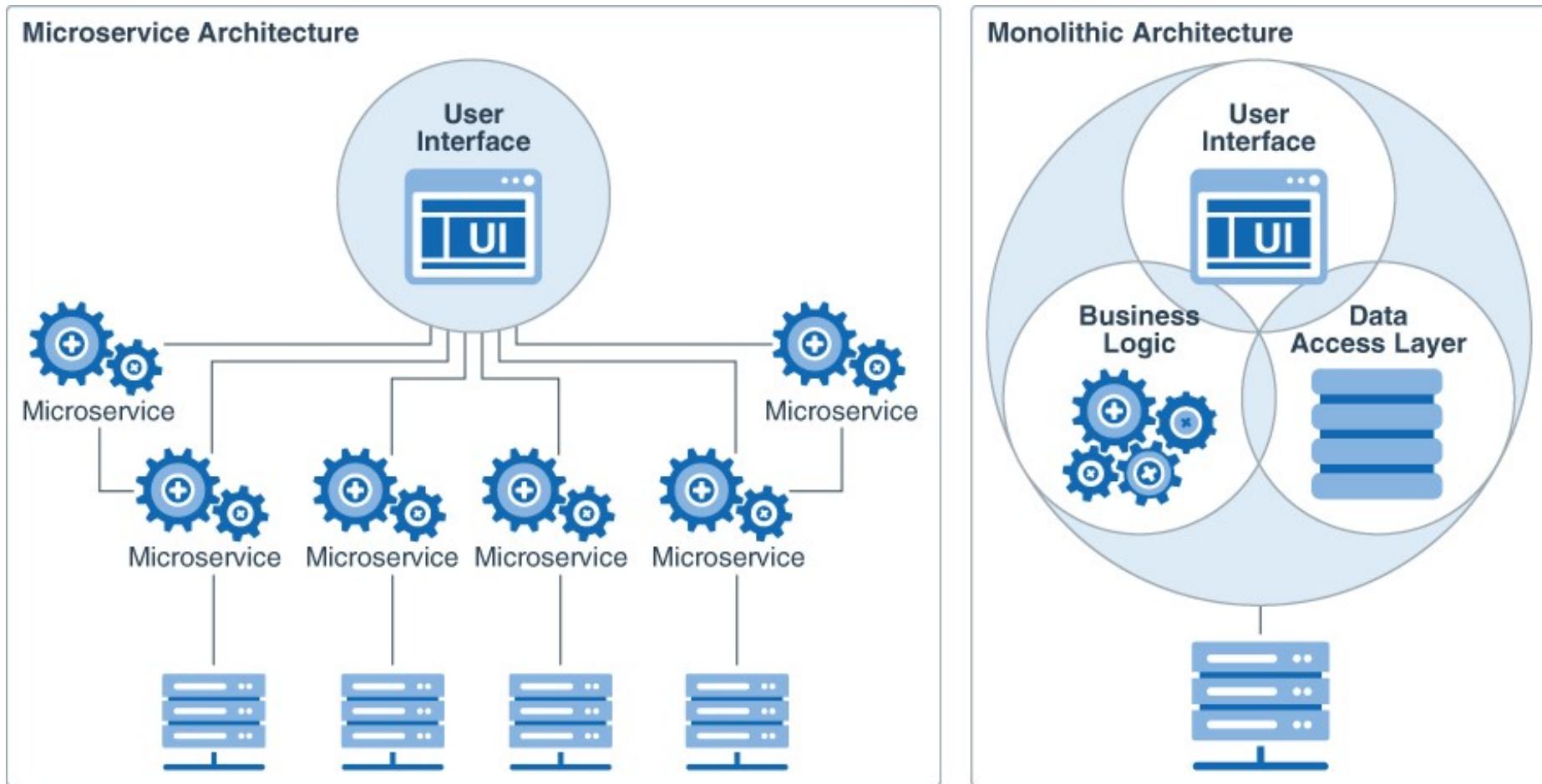


Microservices



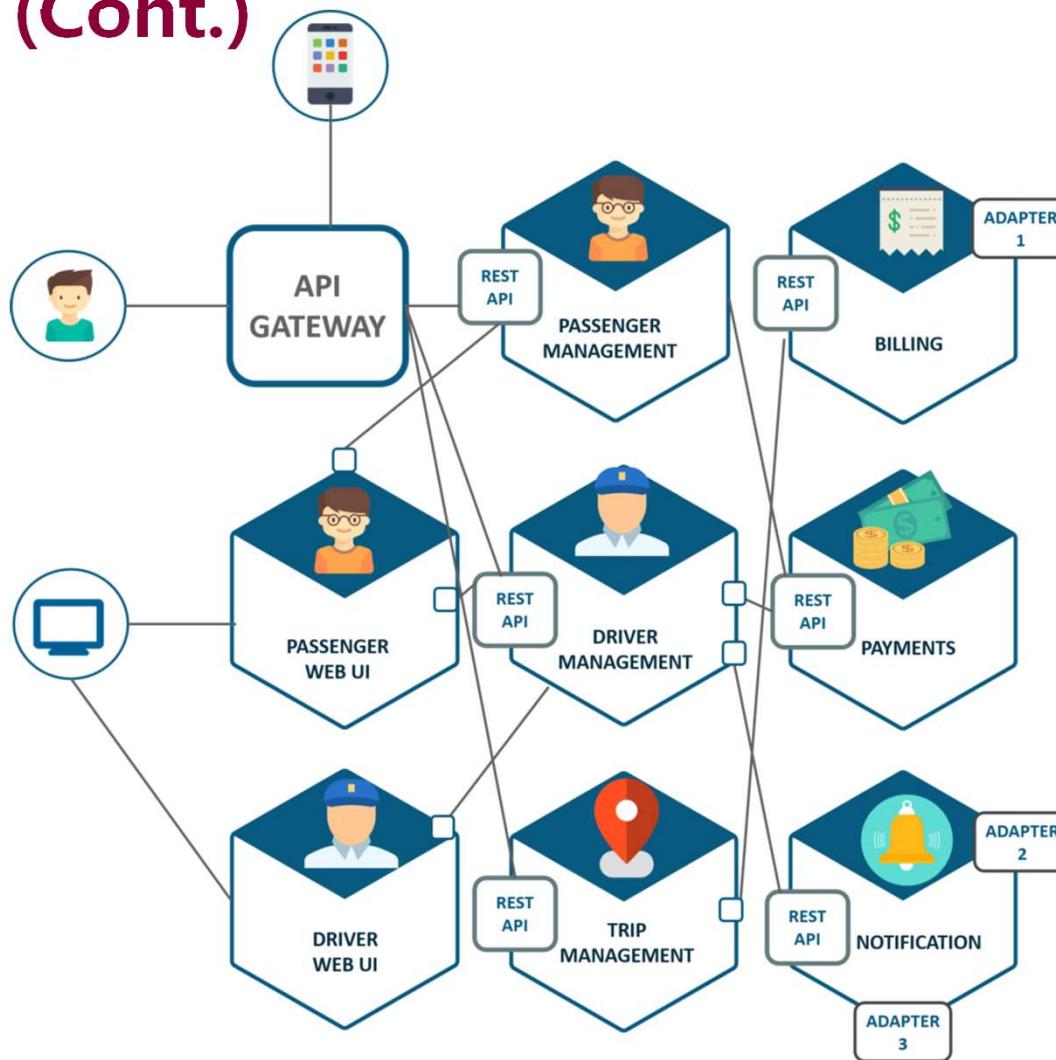
- Design an application :
 - Is multilanguage
 - Easily scalable
 - Easy to maintain and deploy
 - Highly available
 - Minimizes failures
- Each microservice owns :
 - A simple task
 - Communicates with the clients or with other microservices
 - Using lightweight communication mechanisms such as REST API requests.

Microservices (Cont.)



<https://docs.oracle.com/en/solutions/learn-architect-microservice/#GUID-1A9ECC2B-F7E6-430F-8EDA-911712467953>

Microservices (Cont.)

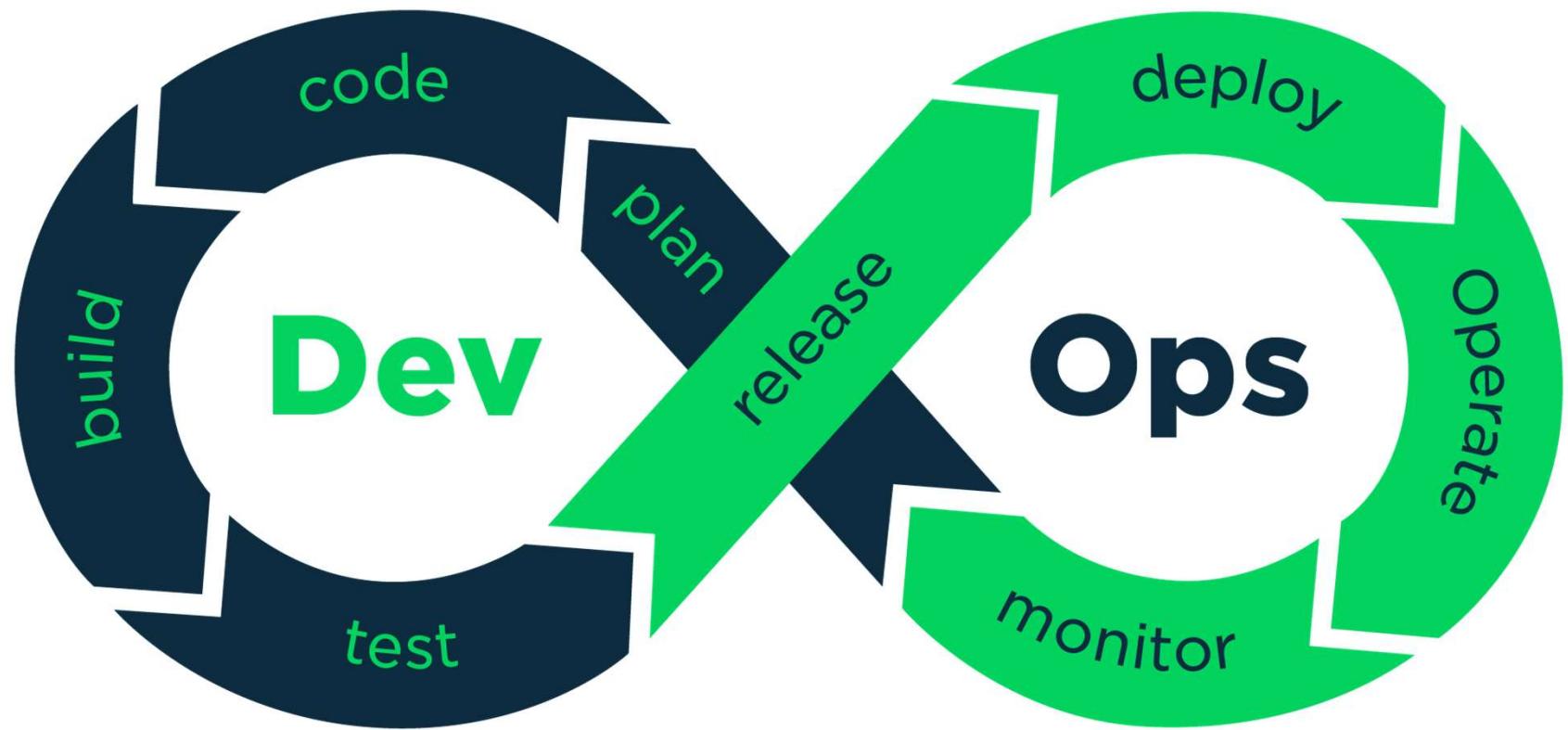


<https://aionys.com/how-to-benefit-from-microservices-architecture-implementation/>

Legacy Enterprise IT Architecture

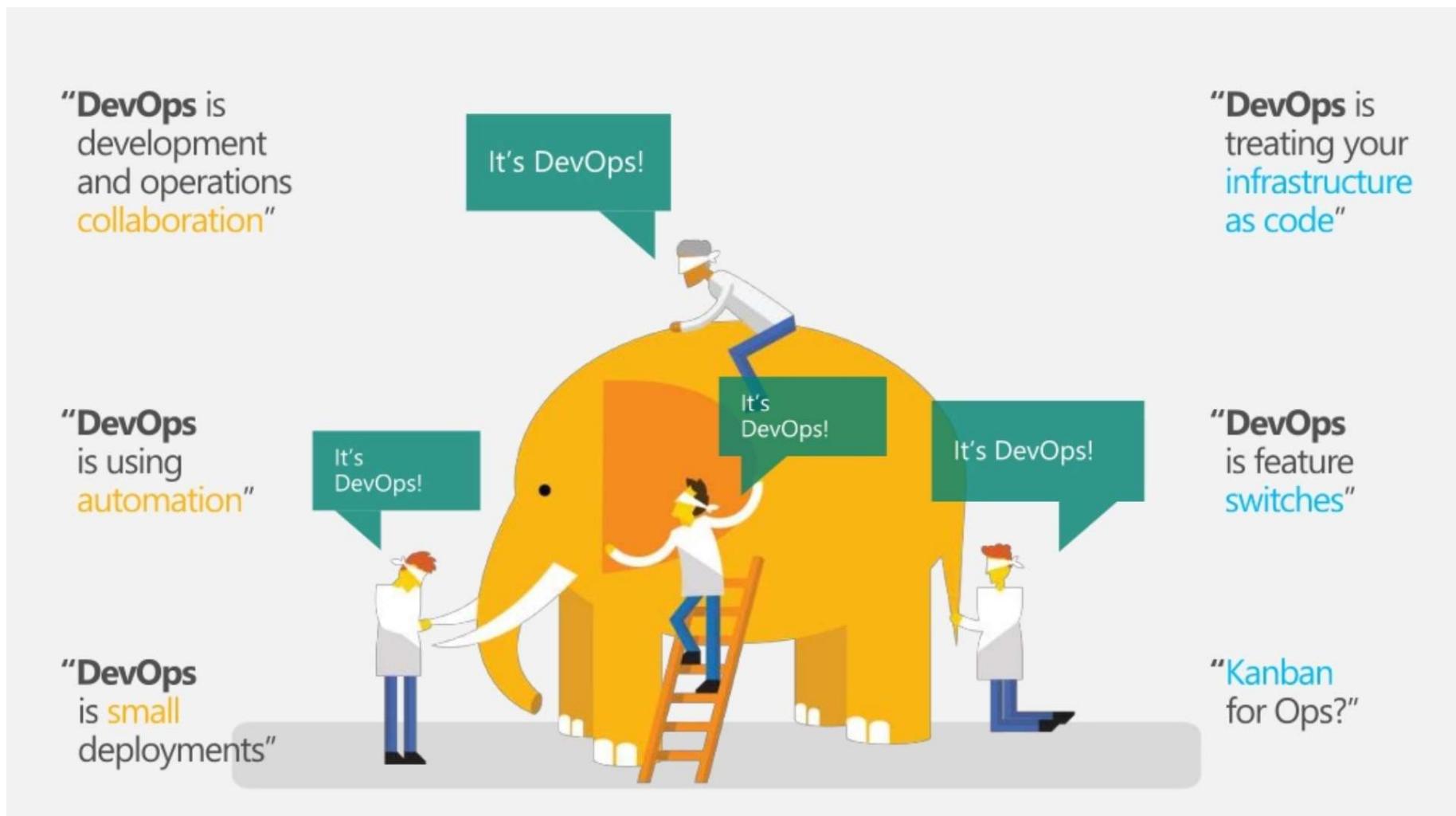


DevOps

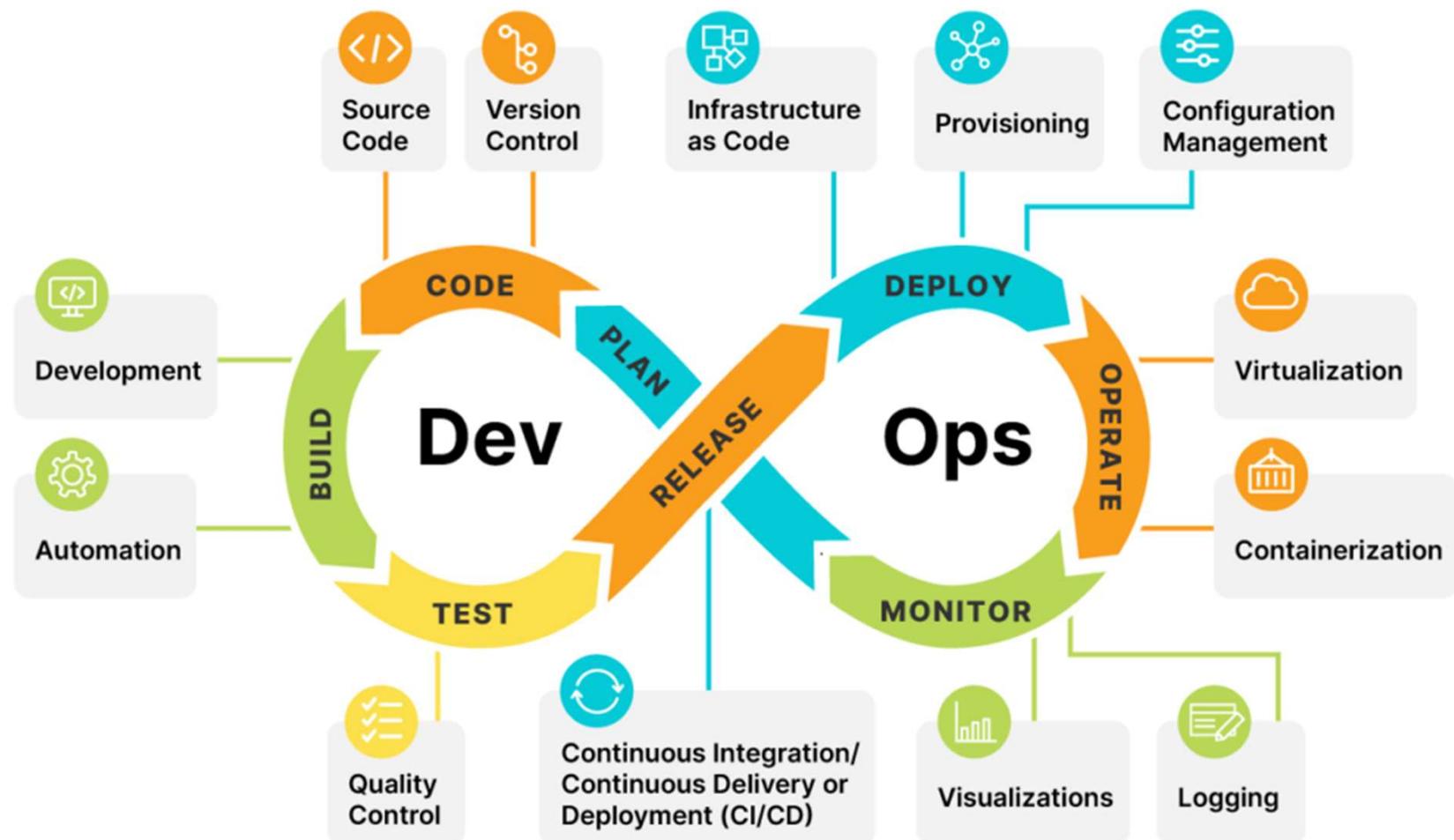


<https://devopedia.org/devops>

DevOps (Cont.)

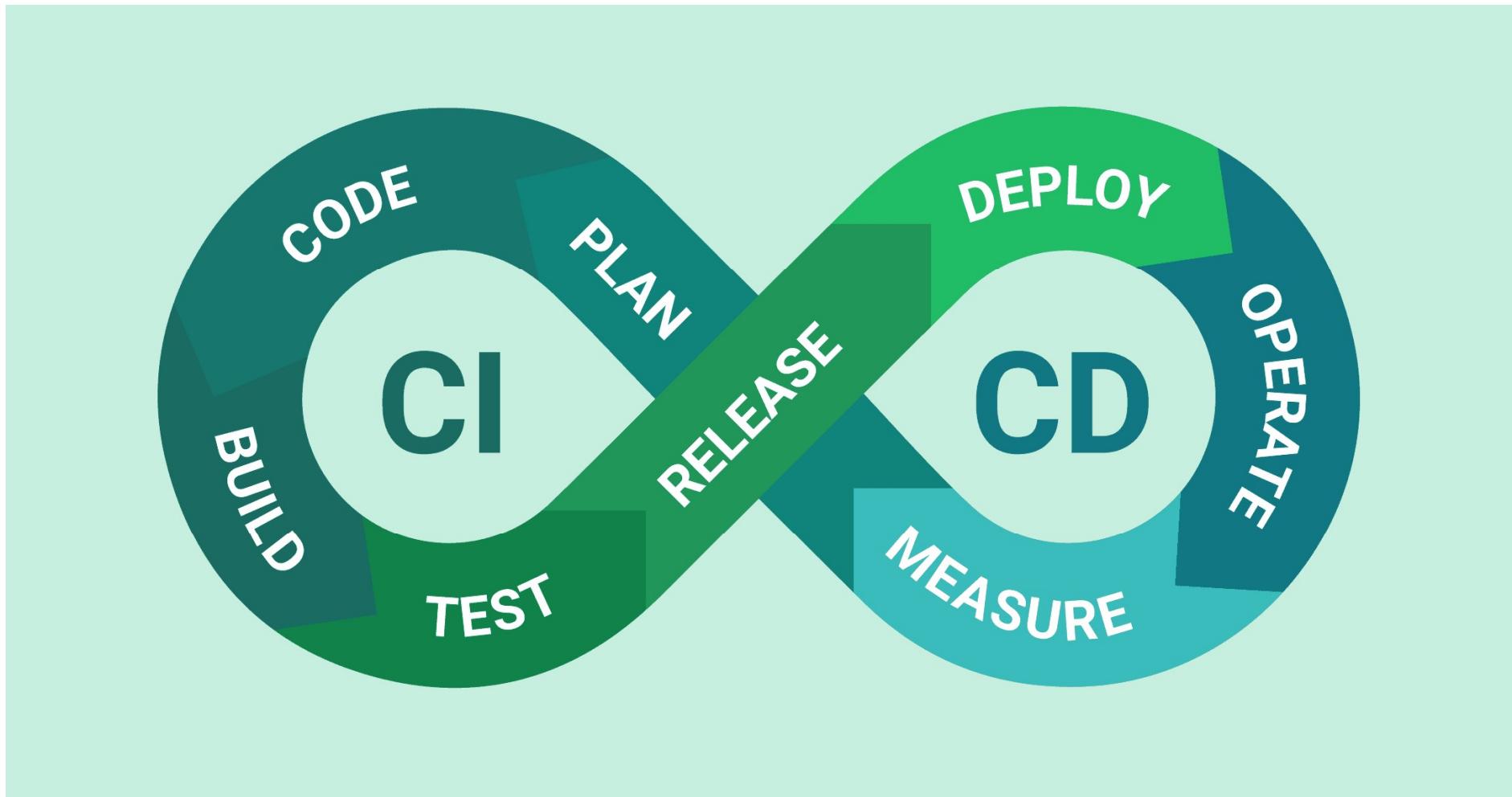


DevOps (Cont.)



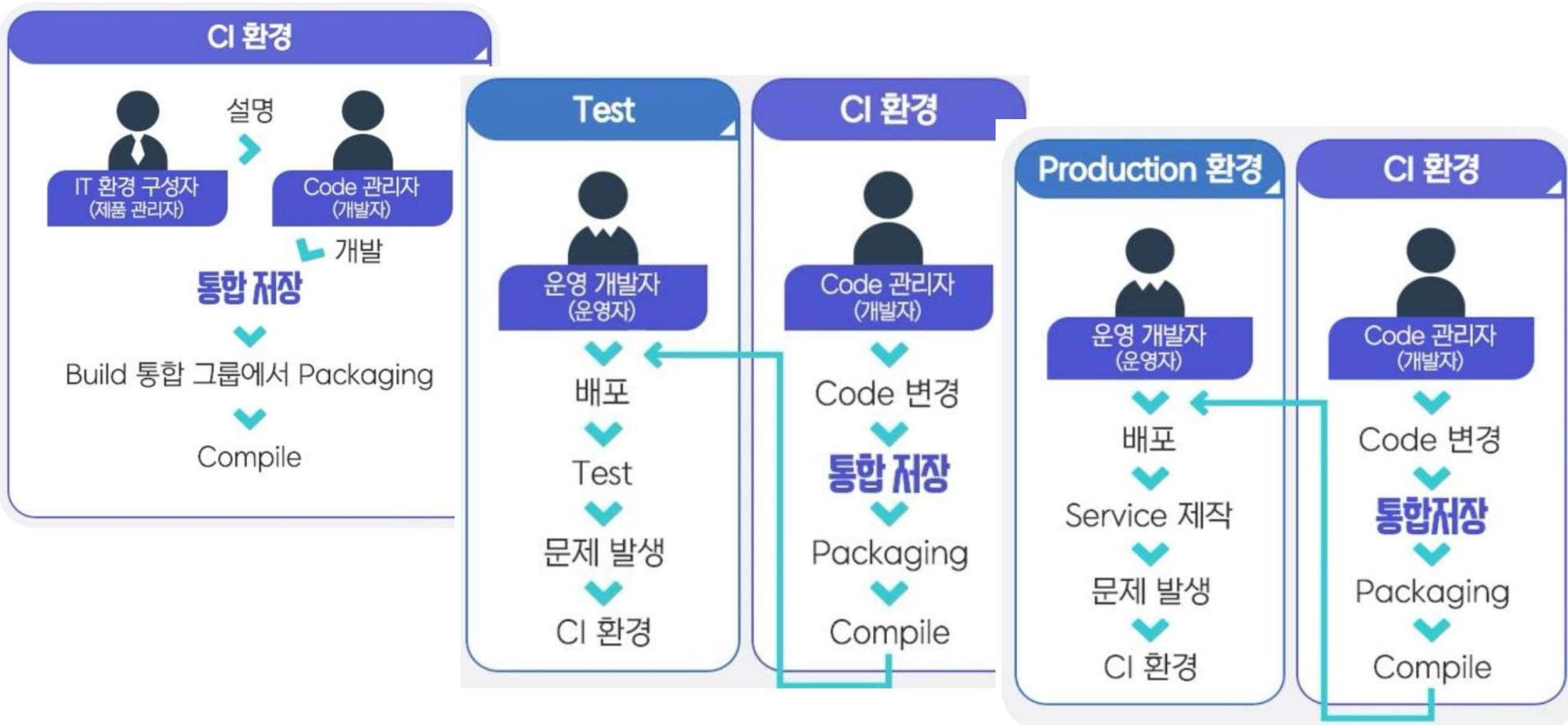
<https://orangematter.solarwinds.com/2022/03/21/what-is-devops/>

CI/CD

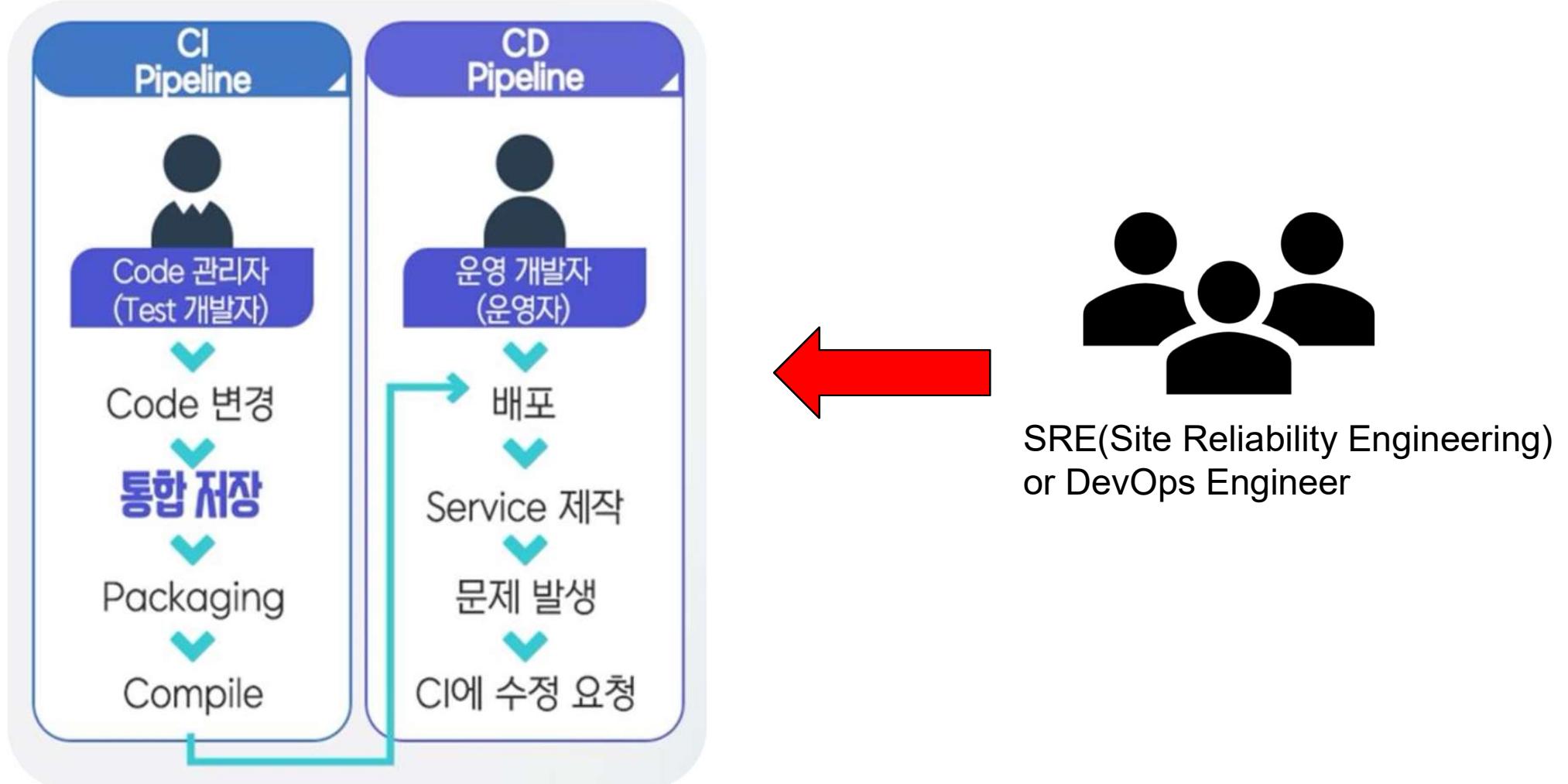


<https://velog.io/@cham/CICD-CICD%EB%9E%80>

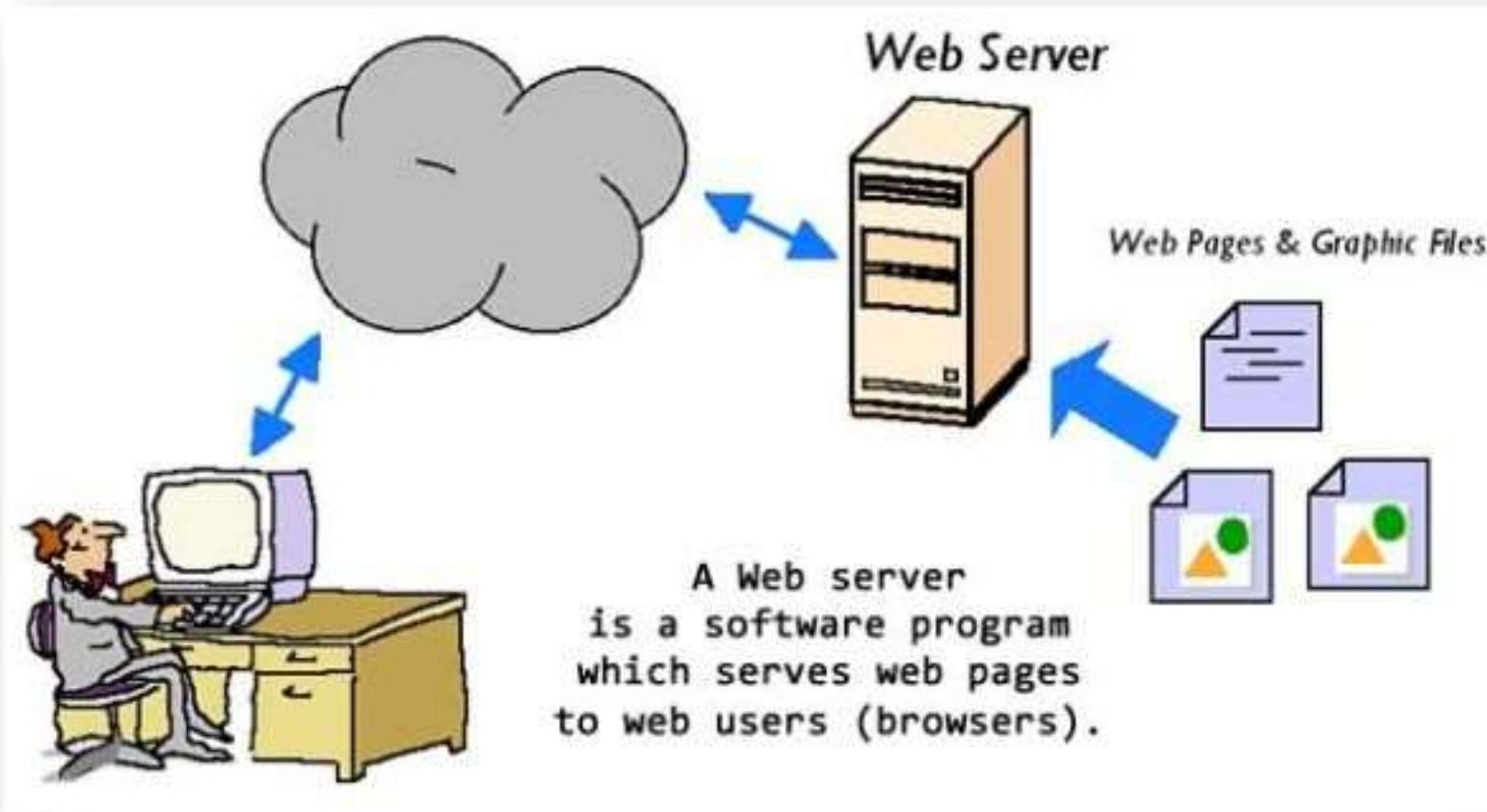
CI/CD (Cont.)



CI/CD (Cont.)

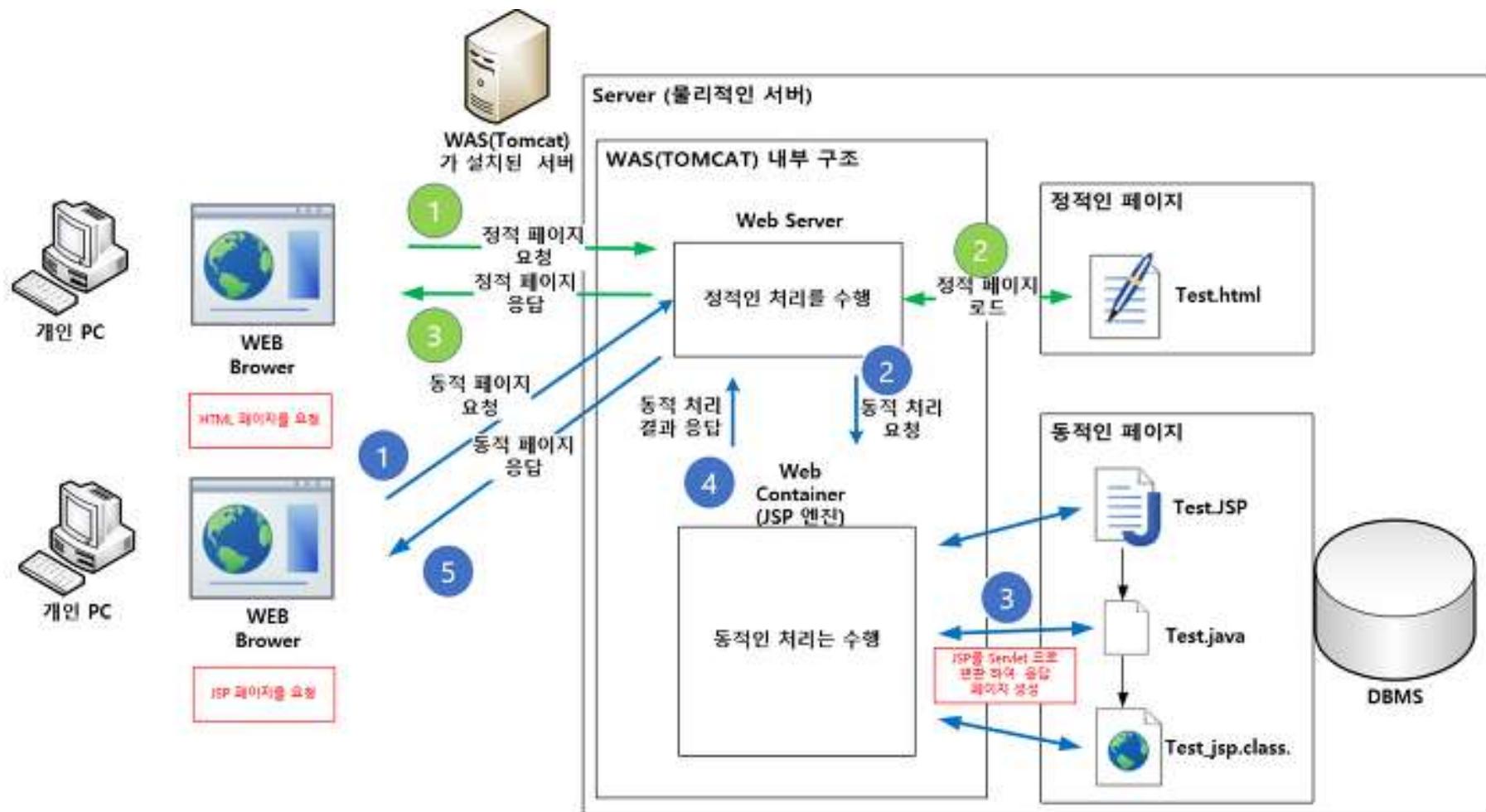


Server-Less vs Server-Oriented



<https://dyncs.data.blog/2020/08/17/what-is-a-web-server/>

Server-Less vs Server-Oriented (Cont.)

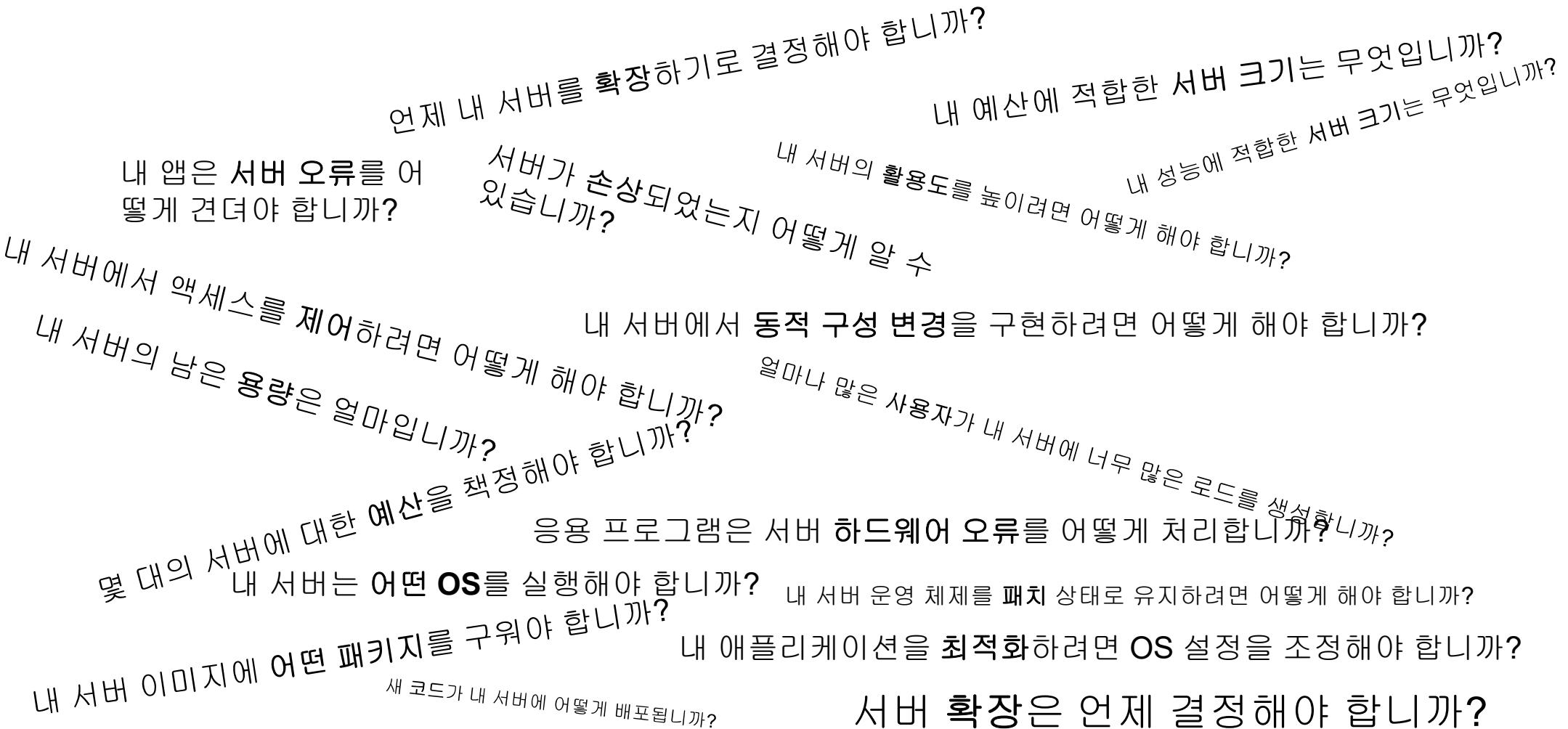


Server-Less vs Server-Oriented (Cont.)



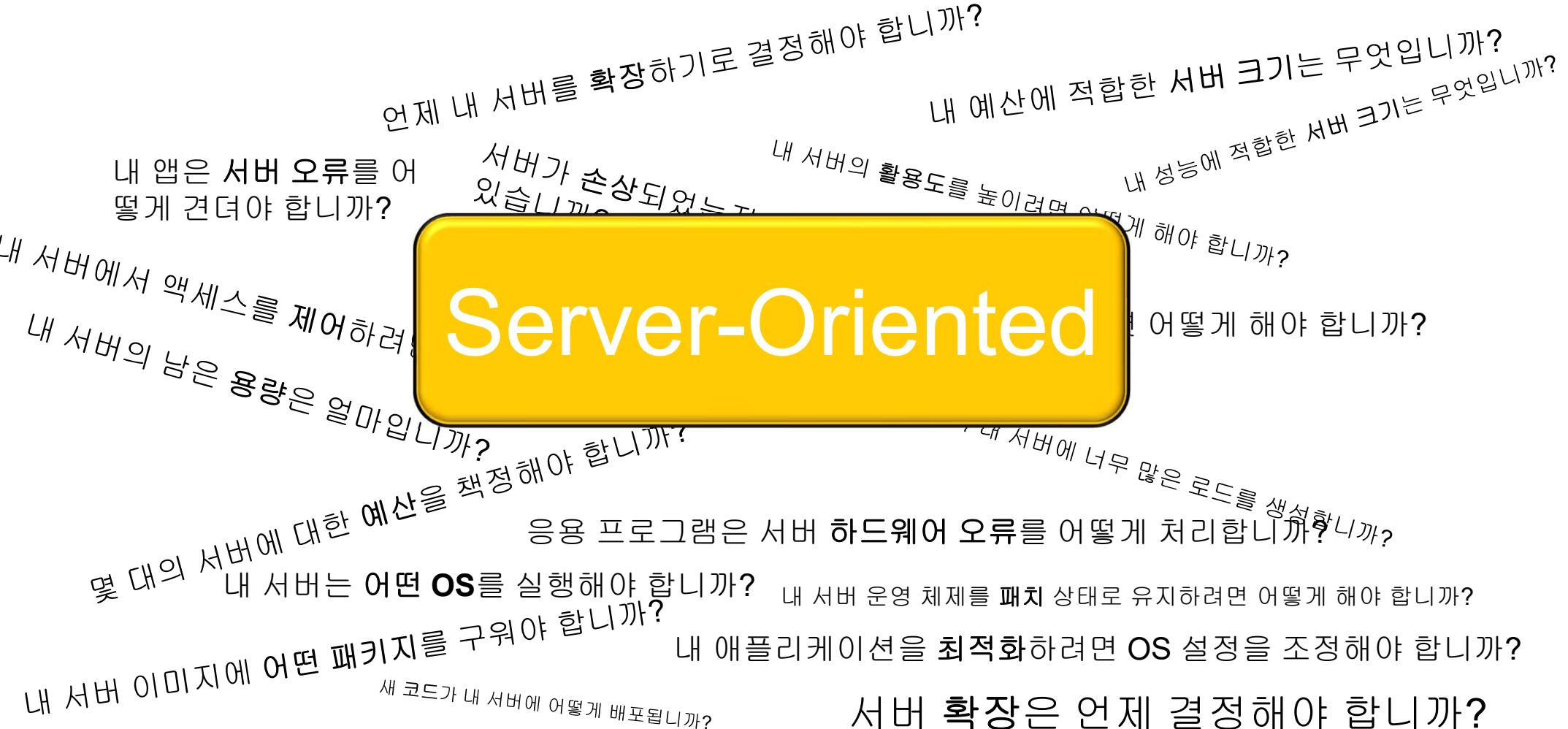
<https://www.crn.com/news/data-center/google-unveils-new-750m-data-center-as-part-of-9-5b-goal>

Server-Less vs Server-Oriented (Cont.)



Server-Less vs Server-Oriented (Cont.)

Server-Oriented



Server-Less vs Server-Oriented (Cont.)



<https://stackify.com/function-as-a-service-serverless-architecture/>

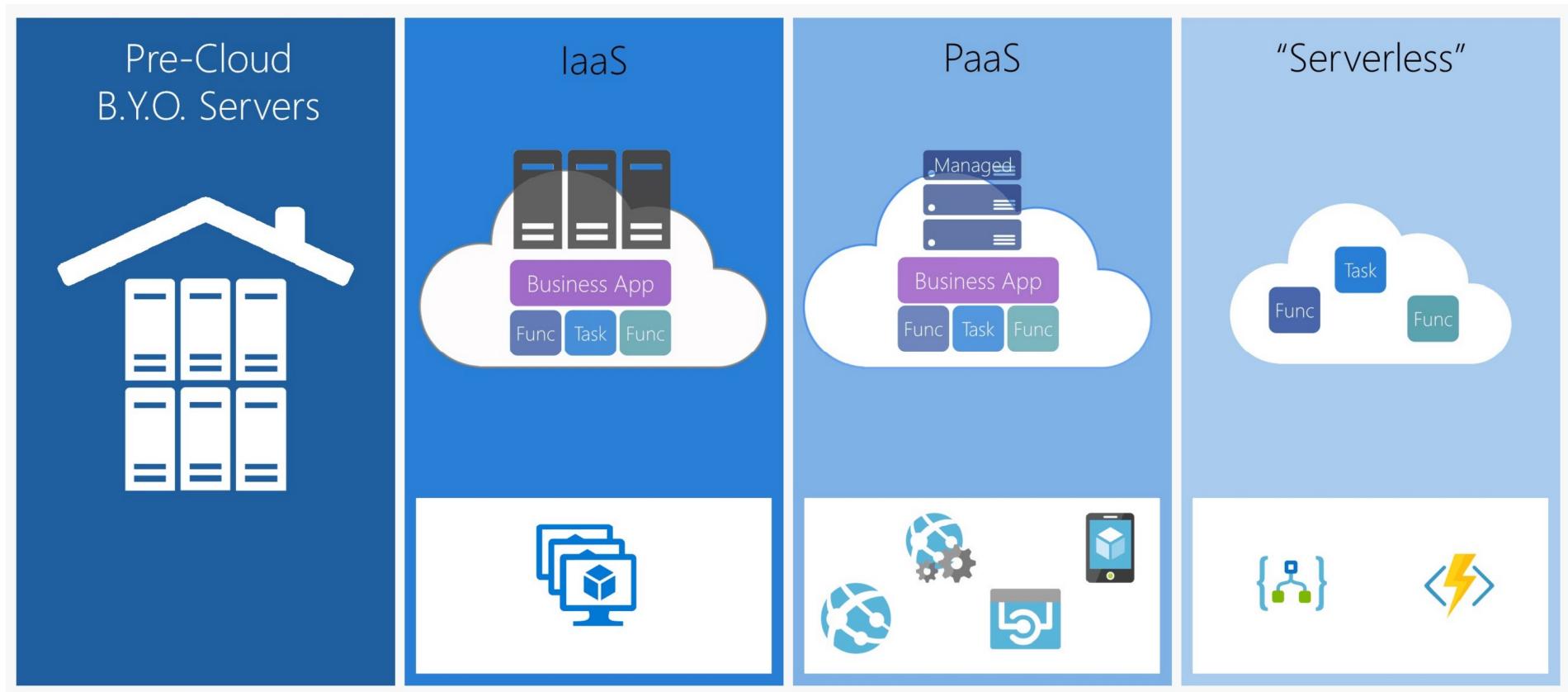
Serverless

“**Serverless**” is a **misnomer** in the sense that servers are **still** used by cloud service providers to execute code for developers. However, developers of serverless applications are **not concerned with** capacity planning, configuration, management, maintenance, fault tolerance, or scaling of containers, VMs, or physical servers.

Serverless computing **does not hold resources** in volatile memory; computing is rather done in short bursts with the results persisted to storage. When an app is **not in use**, there are **no computing resources** allocated to the app. Pricing is based on the **actual amount of resources** consumed by an application. It can be a form of utility computing.

Serverless computing can simplify the process of **deploying code** into production. Serverless code can be used in conjunction with code deployed in traditional styles, such as microservices or monoliths. Alternatively, applications can be written to be purely serverless and use **no provisioned servers** at all. This should not be confused with computing or networking models that do not require an actual server to function, such as peer-to-peer (P2P).

Serverless (Cont.)



<https://stackify.com/function-as-a-service-serverless-architecture/>

Serverless (Cont.)

Base64 Encoded HTML5 content in the URL as a query param

The Cloud Fn. Decodes the base64 string and renders the html

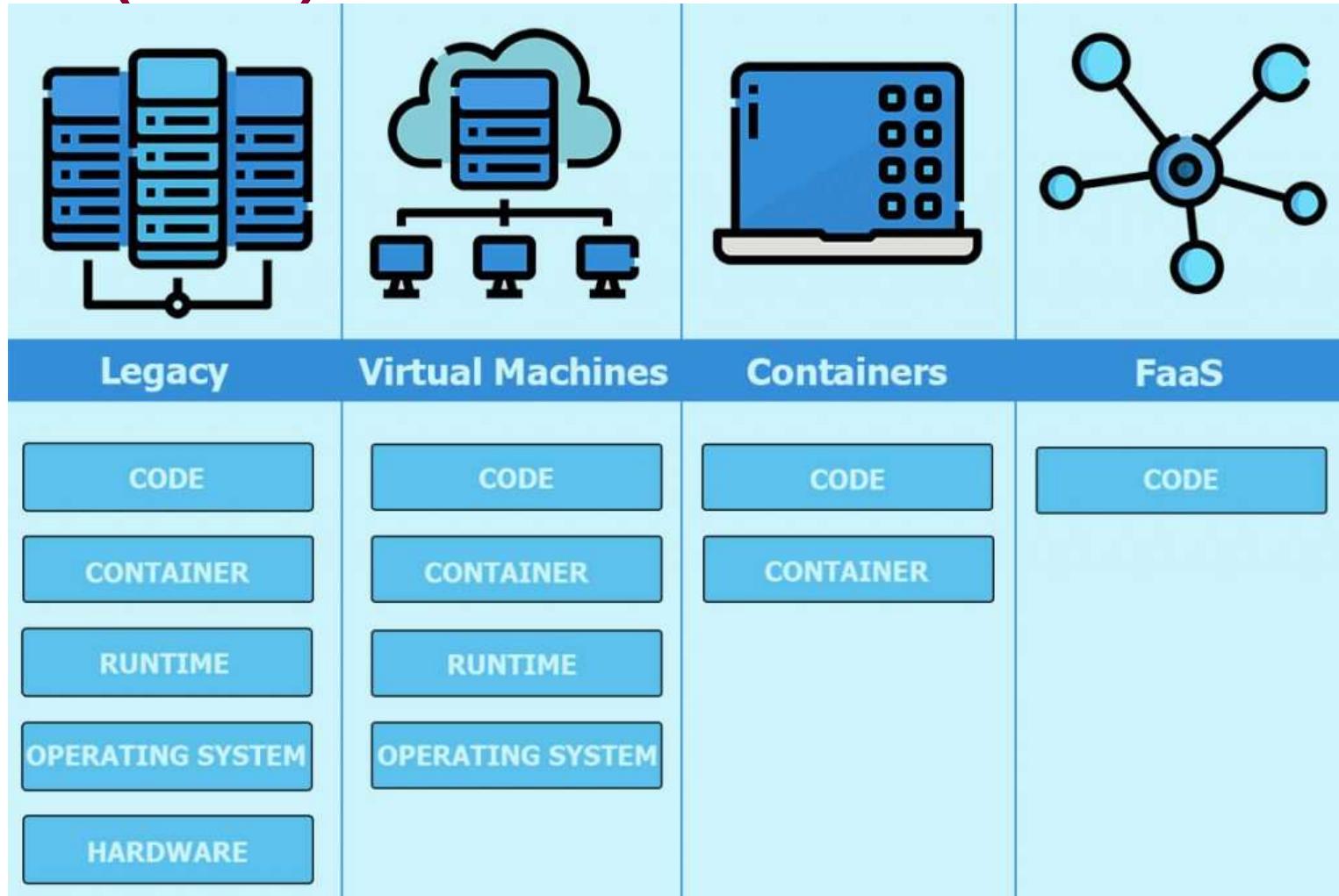


`https://<faas_http_trigger_url>/<function_name>/?q=<base64_encoded_html5_content>`

Ex. <https://a46b334a-6c53-4e7d-944f-e8758537b4c5.ingress.live.faas-live.shoot.live.k8s-hana.ondemand.com/f1/?q=PGg2Pg0KTG10dGx1IFBvdGF0bw0KPC9oNj4NCjxoMT4NCkJpZyBQb3RhdG8NCjwvaDE+>

<https://www.validatek.com/technologies/function-service-faas>

Serverless (Cont.)



<https://www.webapper.com/case-for-functions-as-a-service/>

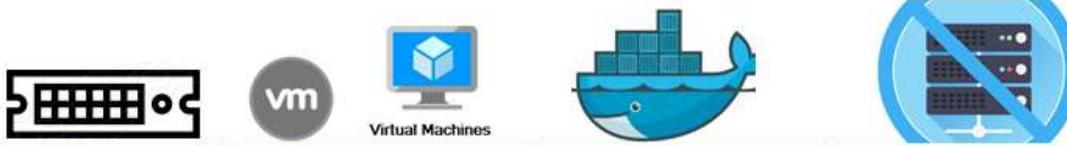
Serverless (Cont.)

- Serverless architecture
- Event-based architecture design

*Serverless computing, also known as **function as a service (FaaS)**, is a cloud computing and code execution model in which the cloud provider fully manages starting and stopping of a function's container **platform as a service (PaaS)**.*

Serverless (Cont.)

Advantages of Serverless Computing



	Bare Metal	VM	Container	Serverless
Boot Time	~20 mins	~2 mins	2 secs	~0.0003 secs
App deployment lifecycle	Deploy in Weeks Live for years	Deploy in minutes Live for weeks	Deploy in Seconds Live for minutes/hours	Deploy in milliseconds Live for seconds
Development Complexity	Need to know: 1. Hardware 2. OS 3. Runtime Environment 4. Application code	Need to know: 1. OS 2. Runtime Environment 3. Application code	Need to know: 1. Runtime Environment 2. Application code	Need to know: 1. Application code
Investment	Buy/rent dedicated server	Rent a dedicated VM, on a shared server	Rent Containers, pay for the actual runtime	Pay for compute resources used during runtime
Scaling	Takes months Should be approved by a panel of experts	Takes hours Should be approved by administrators	Takes seconds Policy driven scaling	Takes milliseconds Scaling is event driven

https://3.bp.blogspot.com/-WfMUSEeaR84/WfFBaEVKdjl/AAAAAAAAMyM/_FIHqv5TaOlli4fzlna90jHCqpO6CJB9ACLcBGAs/s320/Advantages%2Bof%2BServerless%2BComputing.png

Serverless (Cont.)

- 가격
 - 실제 사용량에 대해서만 비용 청구
- 애플리케이션의 품질에 집중
 - 서버에 집중할 필요없이 애플리케이션 품질 향상에 좀 더 집중 가능
- 높은 가용성과 유연한 확장
 - 요청이 들어올 때만 실행되고
 - 동적으로 자원이 할당
 - 스케일링에 대한 고민 불필요.

- **Cold Start**

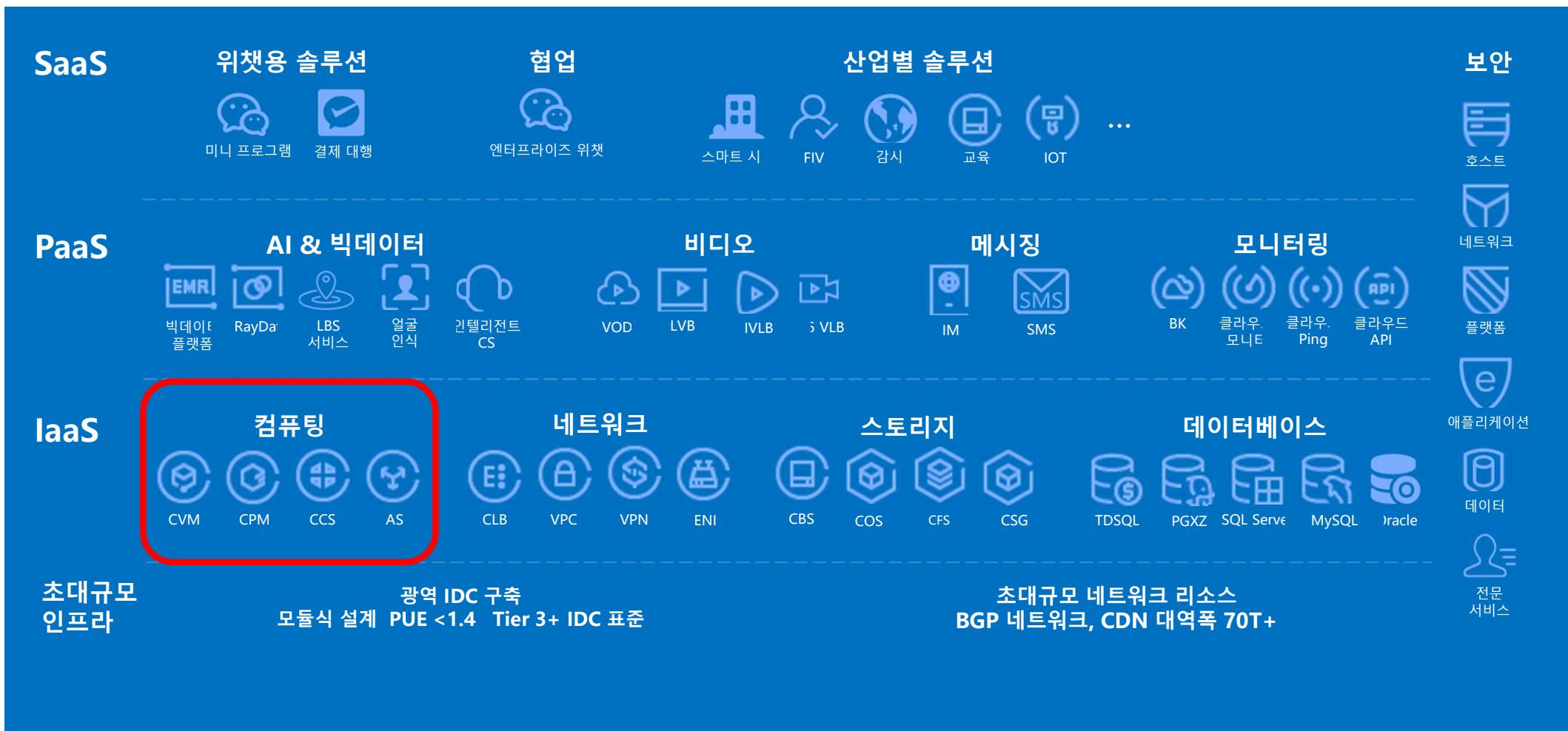
- 상시 대기가 아닌 요청이 들어올 때 시작
- 클라우드 제공 플랫폼에 더욱 종속적
 - 타 플랫폼 이전이 힘듦
- 긴 시간이 필요한 작업에 불리
 - 동영상 업로드, 데이터 백업 등.



Cloud Virtual Machine Basics



Tencent Cloud Product Portfolio



Tencent Cloud Product Portfolio - Computing

애플리케이션 및 웹
사이트에 적용

딥러닝, 과학 컴퓨
팅 등

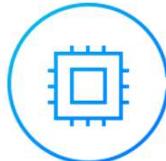
전용 서버, 사용자의
비즈니스 전용 사설
네트워크

확장성이 뛰어난
클러스터 컨테이너
관리 서비스

더 높은 수준의 애플
리케이션 내고장성
구현



CVM



GPU



FPGA



CDH



CPM



CCS



AS



CLB

What is CVM?

- Is an elastically scalable computing service.



Elastic Computing
Scaling in minutes



Flexible Configuration
CPU, memory, and bandwidth



Stability and reliability
99.95% availability
and three replicas



Simple management
APIs, CLI, or console

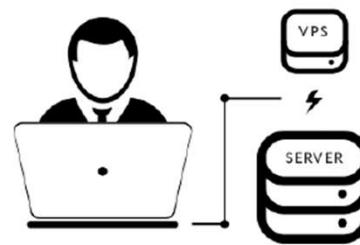


Secure network
VPC, ACL, security groups



Comprehensive protection
Trojan and vulnerability detection and
protection against brute force attacks

What is CVM? (Cont.)



Virtual Server

A portion of the server disk space is partitioned for the user.



Dedicated Server

The customer rents a dedicated server to host a website.



VPS

A physical server hosts several virtual servers.



CVM

Virtual servers are hosted on clusters.

Regions and Availability Zones

■ Regions:

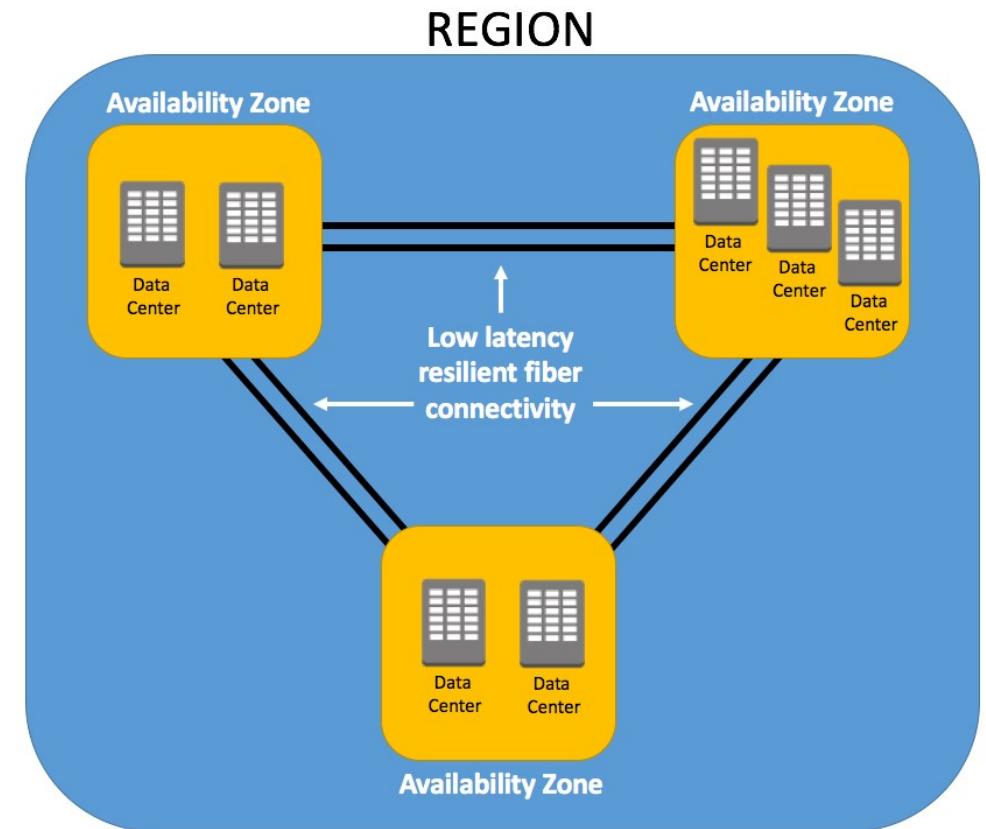
Are independent geographical areas.

Naming convention: [*coverage area + name of the city where the data center is located*].

■ Availability zones:

These are physical data centers with independent electrical and network systems in the same region. **Naming convention:** [*city + zone number*].

■ Tencent Cloud currently has over **27** regions and over **60** availability zones worldwide.



<https://cloudacademy.com/blog/aws-global-infrastructure/>

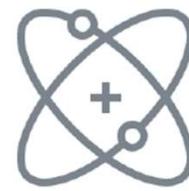
Regions and Availability Zones (Cont.)



Nearby
access



Fault
Isolation



Load
Balancing



High
availability

Regions and Availability Zones (Cont.)

Region	China	Asia Pacific	Europe and America			
	Seoul	Tokyo	Singapore	Bangkok	Jakarta	Mumbai

Tencent Cloud products in different regions cannot communicate via a private network. **The region cannot be changed after the creation.** Please select the region closest to your customers to reduce access latency.

Availability zone	Random	Seoul Zone 1	Seoul Zone 2
			New

Tencent Cloud products in different AZs in the same region can communicate via a private network.

CVM Instances

■ Instances

- A CVM instance includes components such as CPU, memory, disk, network, and operation system.

■ Naming convention

- *Series.Model* (Specification, Number of vCPUs, Memory Size)

S4.SMALL2(Standard S4, 1-core, 2 GB)

■ Management

- Instances are managed by the console or APIs.
- Can adjust the instance configuration online and restart the instance to apply the changes.

■ Security

- CVMS support security policies, security groups, and login control

CVM Instance Models

- Instances of different models have different hardware and configurations (CPU, memory, bandwidth, and maximum configurations).

	Standard S1	Standard S2	Standard S3	Standard S4
CPU	Intel Xeon CPU	Xeon Broadwell (v4)	Skylake 6133	Skylake 6148
Memory	DDR3	DDR4	Latest DDR4	Latest DDR4
Private network bandwidth	10 Gbps	10 Gbps	10 Gbps	25 Gbps
Maximum configuration	48-core, 96 GB	56-core, 224 GB	80-core, 320 GB	72-core, 228 GB

CVM Instance Families and Types

- An instance family is a collection of instance types with similar purposes and configurations. An instance type is a collection of instance configuration options. These options include the model, specifications, number of vCPUs, memory size, CPU model, private network bandwidth, throughput, and supported availability zones.

The screenshot shows two views of AWS CloudWatch Metrics. On the left is a search interface for 'Instance configurations' with filters for 'All CPU cores' and 'All MEMs'. It lists 'Instance family' categories: Standard, High IO, MEM-optimized, Compute, FPGA-based, Big Data, and Cloud Physical Machine 2.0. Under 'Model', it lists Standard S6, Standard SA2, Standard S5 (selected), Standard SR1, Standard SA3, Standard SA1, Standard S2, and Standard S1. A message at the bottom says 'Selected model: S5.MEDIUM2 (Standard S5, 2C2G)'. On the right is a detailed table of 'Standard S5' instance types, showing 20 items per page. The columns are: Instance, Specifications, vCPU, MEM, Processor, and Reference fee. The first item is selected with a blue outline.

Instance	Specifications	vCPU	MEM	Processor	Reference fee
Standard S5	S5.MEDIUM2	2Core	2GB	Intel Xeon Cascade Lake	0.03USD/hour
Standard S5	S5.MEDIUM4	2Core	4GB	Intel Xeon Cascade Lake	0.06USD/hour
Standard S5	S5.MEDIUM8	2Core	8GB	Intel Xeon Cascade Lake	0.12USD/hour
Standard S5	S5.LARGE4	4Core	4GB	Intel Xeon Cascade Lake	0.12USD/hour
Standard S5	S5.LARGE8	4Core	8GB	Intel Xeon Cascade Lake	0.16USD/hour
Standard S5	S5.LARGE16	4Core	16GB	Intel Xeon Cascade Lake	0.23USD/hour
Standard S5	S5.2XLARGE16	8Core	16GB	Intel Xeon Cascade Lake	0.31USD/hour

Features and Use Cases of Different Instance Types

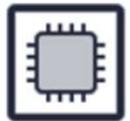
Type	Features	Use Cases
Standard	Balanced computing power, memory, and network capabilities	Small-and medium-sized web applications and databases, and official company websites.
Memory	Large memory size	Memory-intensive operations, such as searching, computing, and distributed in-memory caching.
High I/O	High I/O, high throughput, and low latency	NoSQL databases, clustered databases, and OLTP systems.
Computational	CPU with a high clock speed and a max price/performance ratio	High-traffic web servers, MMO game servers, and HPC.

How to Choose a Suitable CVM



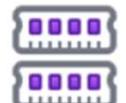
Standard

Small-and medium-sized web applications and databases



Computational

Large game servers, ad service engines, and high-performance computing



Memory

Memory-intensive operations, such as searching and computing



High I/O

Low-latency and I/O-intensive applications

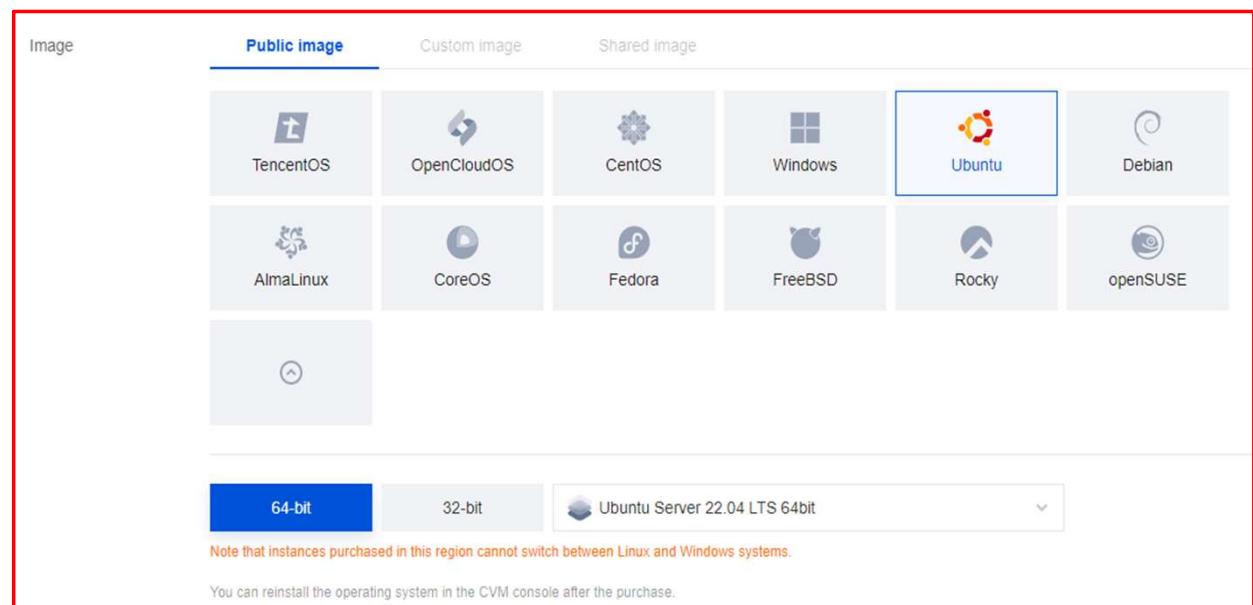
CVM Images

■ Definition

- Images are *templates* (installation disks) for creating CVMs.
- They contain operating systems and relevant configuration information

■ Functions

- Batch deployment
- Specific software deployment
- Runtime environment backup

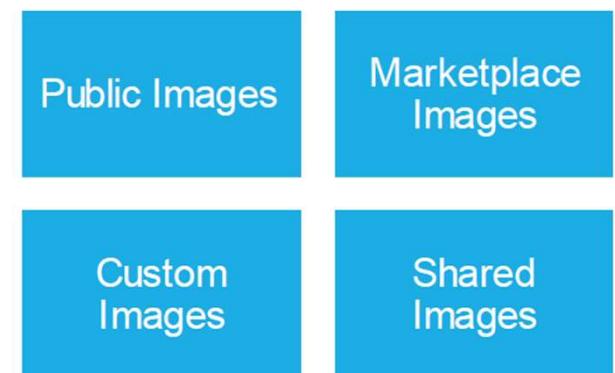


CVM Images (Cont.)

■ Image deployment vs. Manual installation

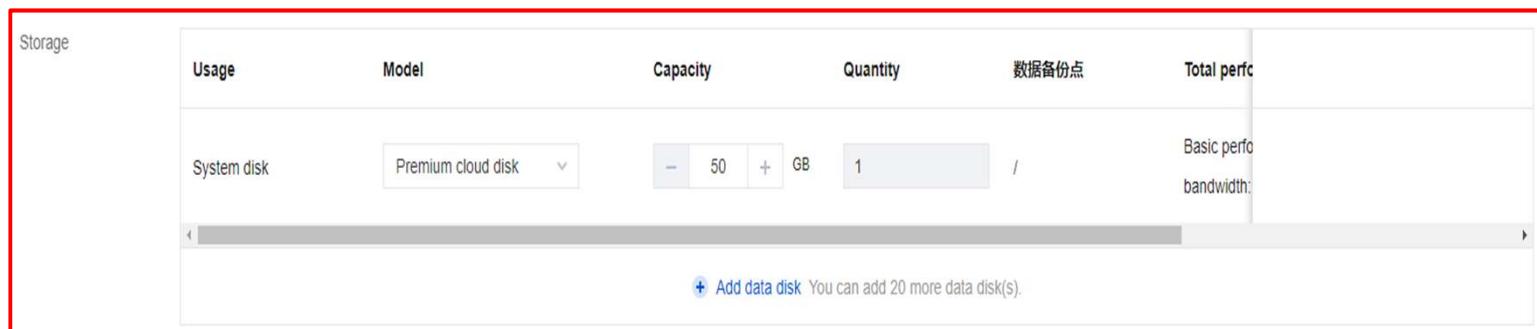
- Types of CVM images:

	Image Deployment	Manual Installation
Deployment time	3 ~ 5 minutes	1 ~ 2 days
Deployment process	Select an image and deploy it with one click	Manually select and install the software and perform debugging
Security	Tested and approved by Tencent Cloud	Relies on the expertise of development and deployment staff
Source	Public images, marketplace images, custom images, and shared images	Manual deployment from scratch



CVM Storage

- By storage media
 - Premium Cloud Storage, SSD Cloud Storage, and Enhanced SSD
- By partition type
 - System disk and data disk
- By architecture
 - Local disk, Cloud Block Storage (CBS), and Cloud Object Storage (COS)



CVM Pricing

CVM Total Price = Configuration Fee^{*} + Bandwidth Fee^{**}

Fee	Configuration Fee	Bandwidth Fee
	0.05USD /hr	0.08USD /GB

^{*}Configuration Fee = CVM Model Fee + Cloud Disk Fee

^{**}The bandwidth fee is billed by traffic and depends only on outbound traffic per unit.

CVM Billing Mode

■ Pay-as-you-go

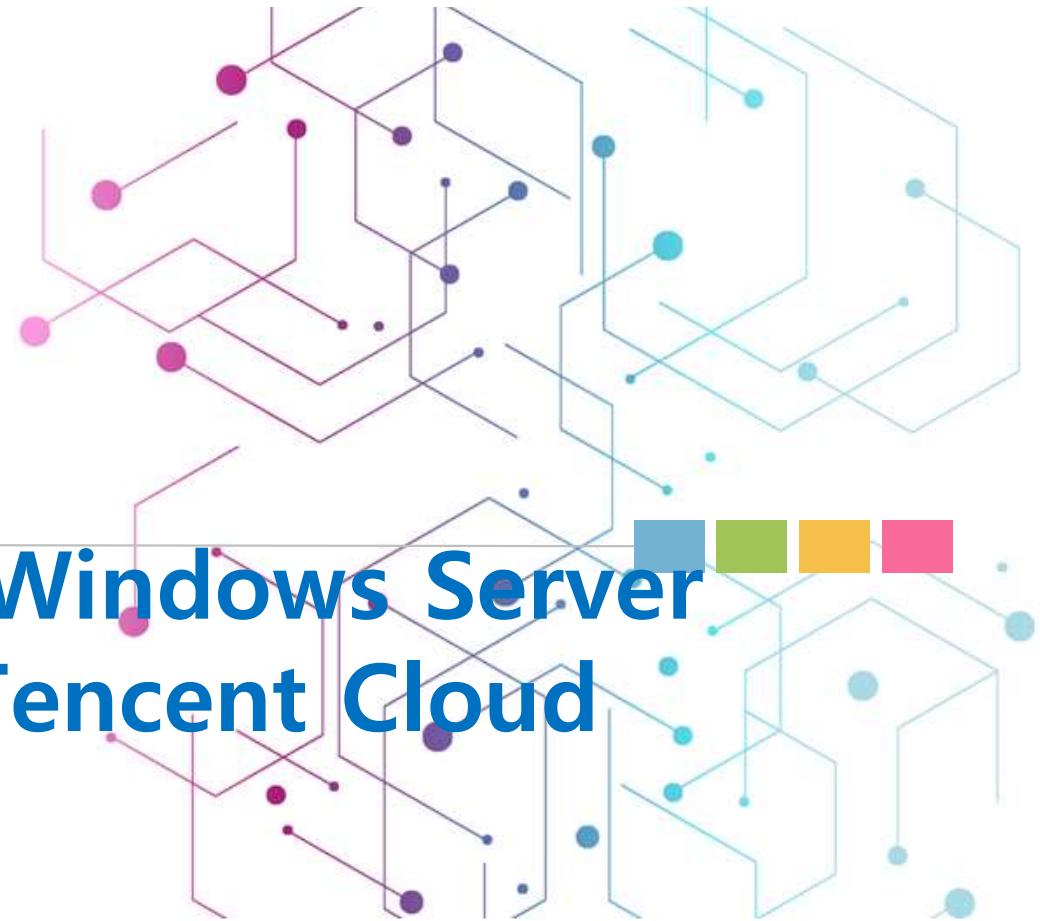
- Tencent Cloud CVM is *pay-as-you-go*.
- You only pay for what you use.
- This flexible billing method is designed to meet your demands in multiple business scenarios.
- You can activate or terminate CVMs at any time and be billed only for the actual usage, with billable time being accurate to the second.
- Pay-as-you-go is best suited for big online sales promotions or other scenarios with highly fluctuating demands.



Billing starts after successful creation of CVM instance and ends when termination is initiated.

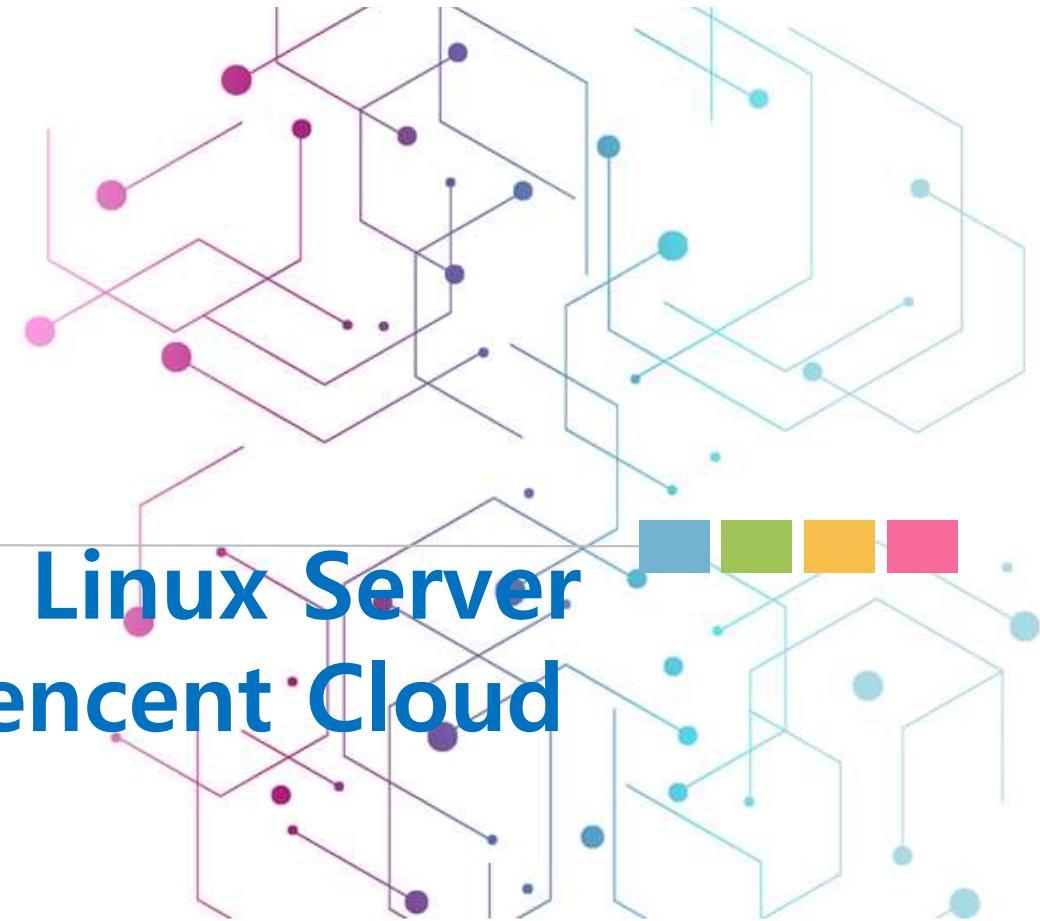


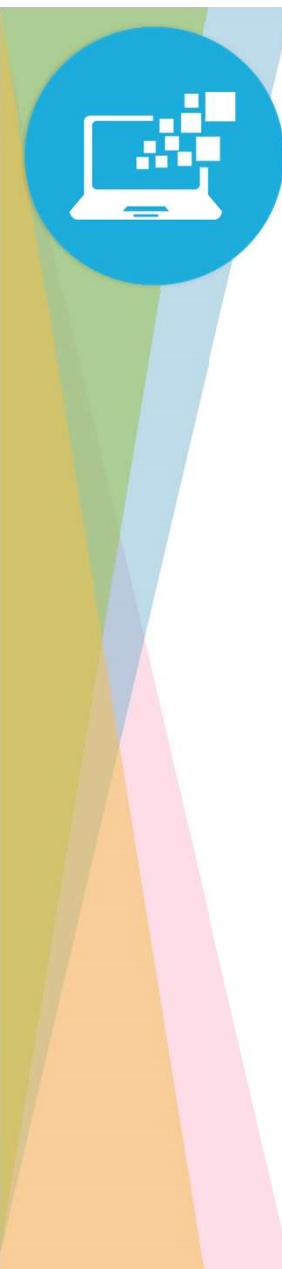
Lab1. Creating Windows Server Instance on Tencent Cloud





Lab2. Creating Linux Server Instance on Tencent Cloud





Lab3. Implementing Web Service with Cloud Virtual Machine





Tencent Cloud Storage



Tencent Cloud Product Portfolio



Storage Media

Media	Hard Disk Drive	Solid State Disk
How it works	The disc rotates and the head reads and writes data	The master reads and writes concurrently using logical block addressing (LBA)
Performance	Read: 200 MB/s; Write: 100 MB/s	Read: 500 MB/s; Write: 200 MB/s
Maximum capacity	16 TB	4 TB
Number of writes	Unlimited	SLC master 100,000; MLC master 10,000
Power consumption and noise	Driven by a high-power motor, HDDs have high power consumption and generate noise and heat	SSDs feature low power consumption, a standby feature, low noise, and no heat
Shock resistance	The high-speed running head is susceptible to shocks	SSD chip storage is highly resistant to shocks
Data recovery	Data can be recovered by software after deletion	Data cannot be recovered after deletion
Price	Low	High



HDD



SSD

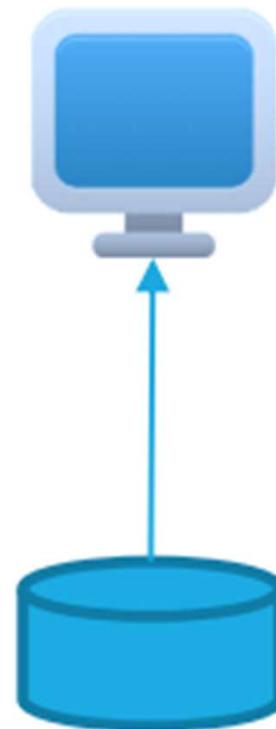
Storage Types – Block Storage

■ Advantages

- Low costs
- Parallel write and SAN networking, which improve transmission speed and Read/Write efficiency.

■ Disadvantages

- Hardware investment
- Data sharing
- Cross-system sharing



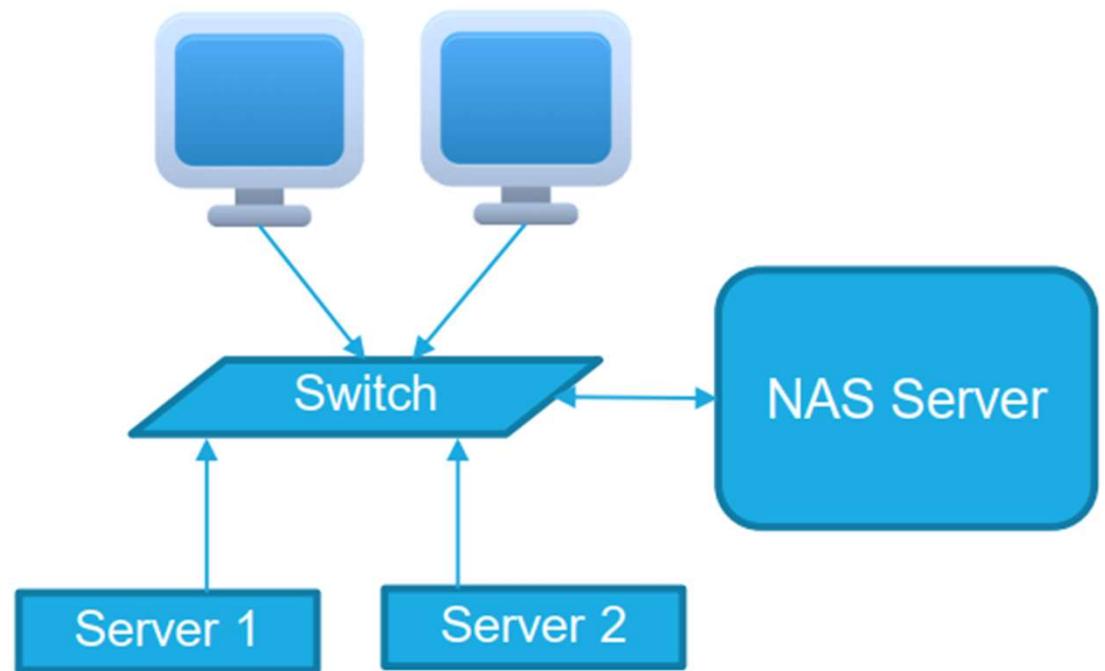
Storage Types – File Storage

■ Advantages

- Low costs
- Convenient file sharing

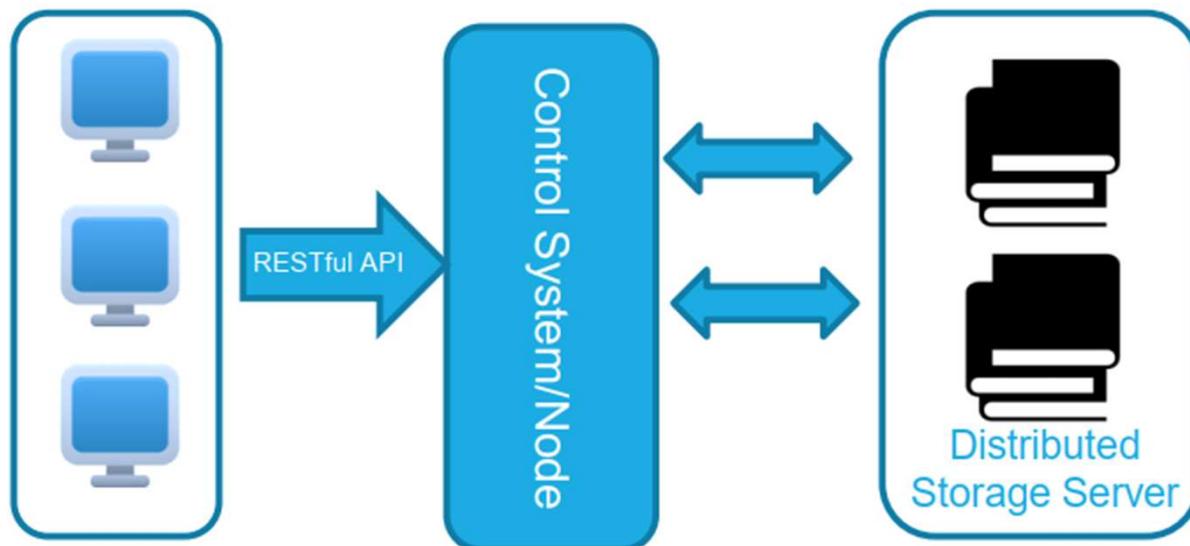
■ Disadvantages

- Low Read and Write speed
- Slow transmission speed



Storage Types – Object Storage

- Combines the high-speed direct access to disks of SAN and the distributed sharing of NAS.



Cloud Object Storage (COS)

- Is used to store unstructured data, such as video, audio, images, and files.
- Use cases: uploading user-generated content from multiple locations, cloud storage with frequent I/O, massive data archiving and backup, hot resource distribution and downloading, etc.

Block Storage

- High I/O performance
- No file sharing
- Directly attach to host

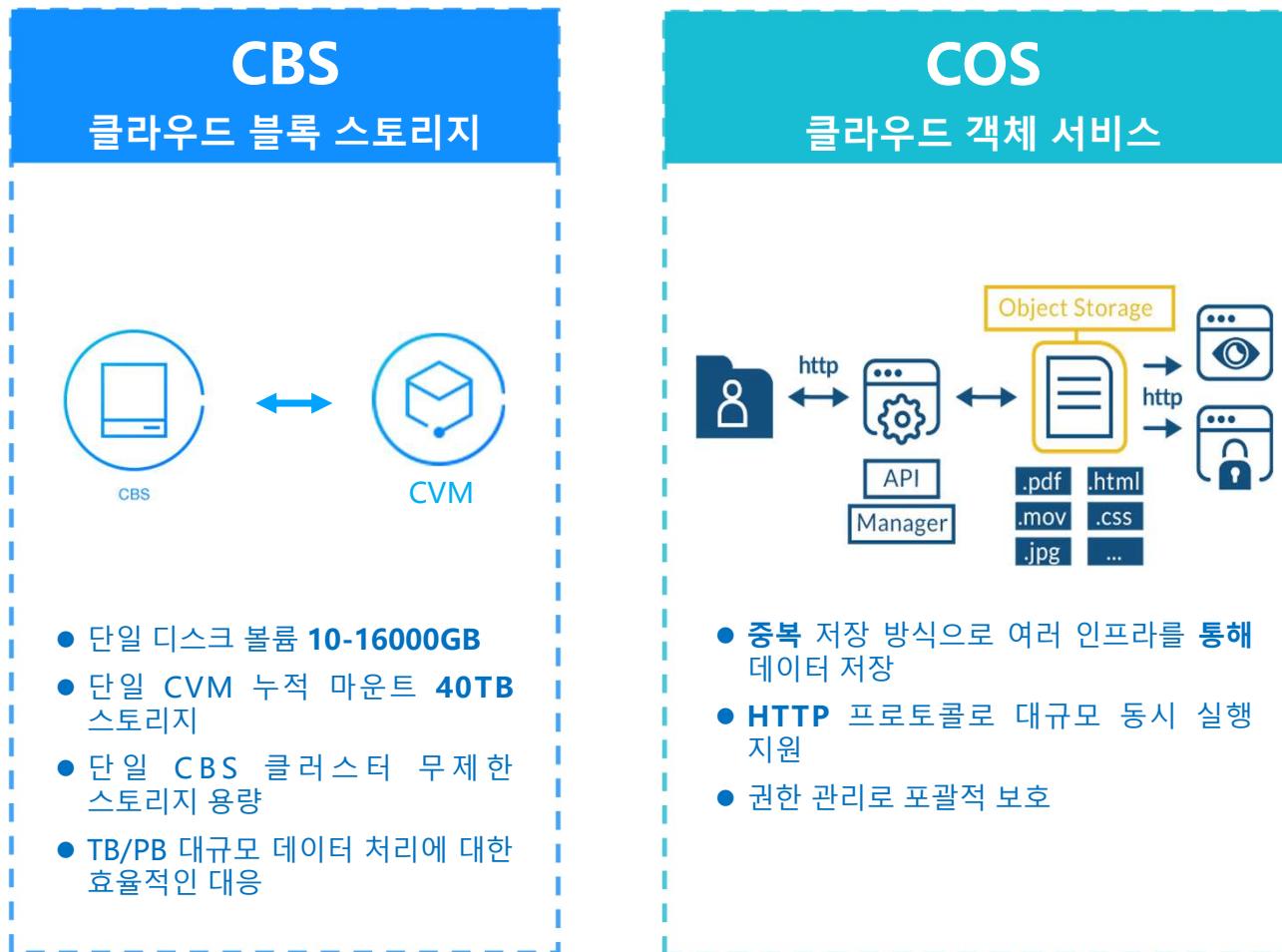
File Storage

- File sharing
- Limited performance
- Not suitable for large data volumes
- Sharing via NFS/CIFS

Object Storage

- Combines performance and sharing capabilities
- Distributed and large-scale
- Suitable for big data applications
- Accessible via HTTP and other interfaces

Cloud Object Storage (COS) (Cont.)



COS Access Control

- Objects in COS can be accessed and downloaded via an object link:

<https://dmcos01-12xxxxxx69.cos.ap-guangzhou.myqcloud.com/%E5%9B%BE%E7%89%8701.jpeg>

User-defined bucket name + The domain name assigned by the system based on the region / Encoded object name

- Access control

- **Public permissions:** Private Read and Write, public Read and private Write, public Read and Write

- **User permissions:** Full control, data read, permission read, permission write

The screenshot shows the details of an object named 'CloudIntl_NewAccount_Creation_20180123.xlsx'. It includes basic info like Object Name, Size, Last Modified, ETag, and two types of links: Object Link and Temporary Link. The temporary link is highlighted with a red box. Below this, the Object ACL section is shown, which lists the Root account with 'Full control' permissions. The entire screenshot is framed by a red border.

User Type	Account ID	Permissions	Actions
Root account	100000750436	Full control	--



Lab4. Using Cloud Object Storage





Tencent Cloud VPC

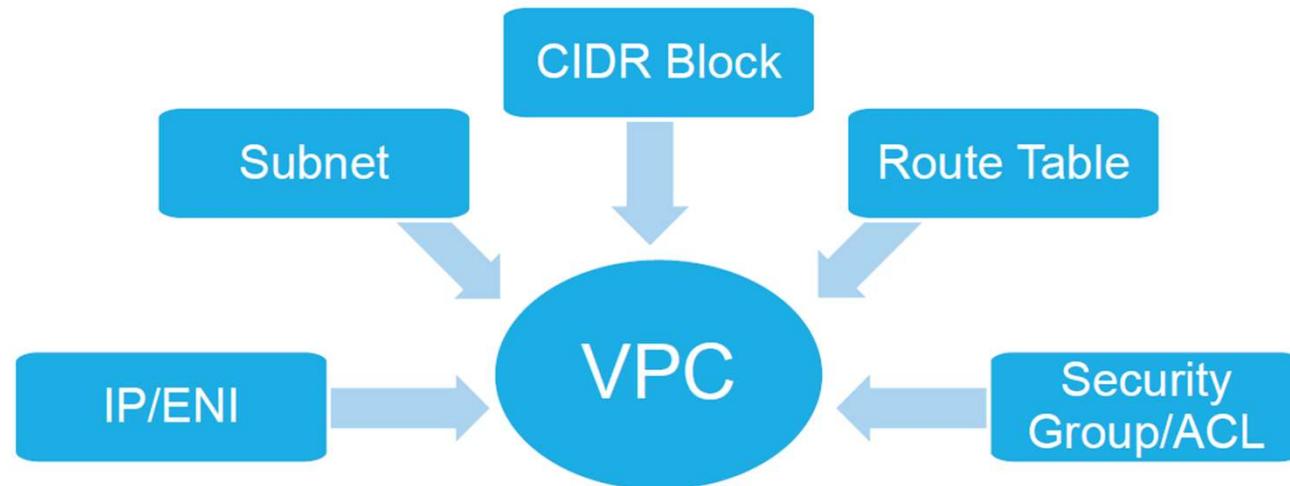


Tencent Cloud Product Portfolio



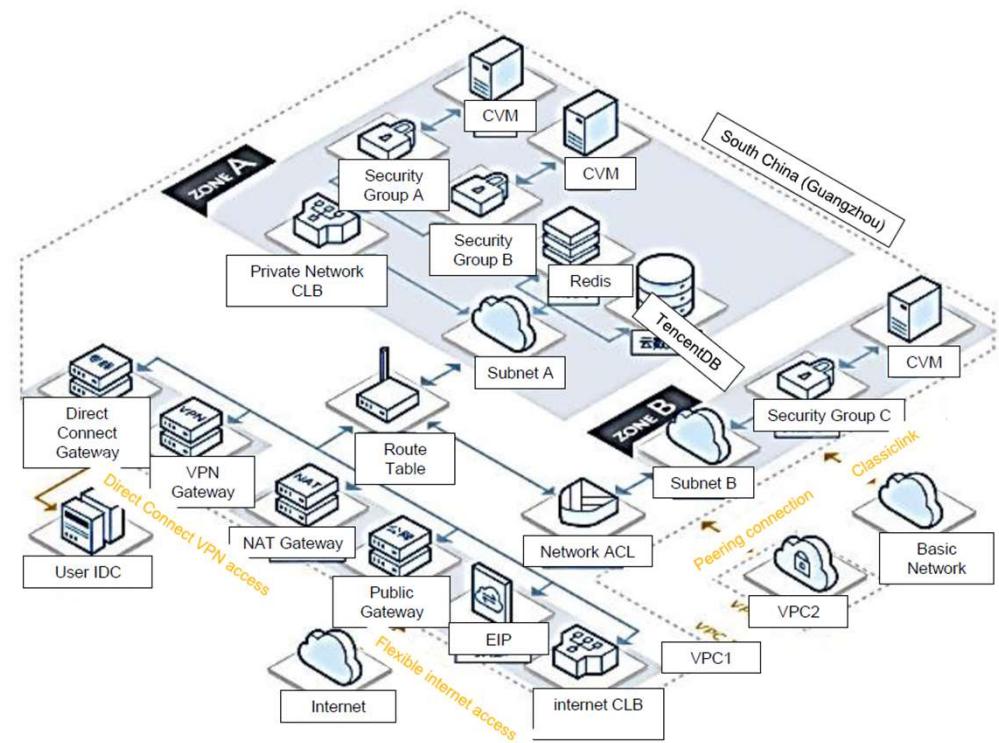
What is a VPC?

- Virtual Private Cloud
- Refers to a user-defined, logically isolated, and dedicated cloud-based network space.



What is a VPC? (Cont.)

- 고객 맞춤형 계층적 네트워크 인프라
- 유연한 고성능 인터넷 액세스
- 안정적이고 신뢰할 수 있는 IDC 연결
- Tencent Cloud에서 다각적 상호 연결
- 다차원적 네트워크 보안



What is a VPC? (Cont.)



VPC CIDR Blocks

CIDR blocks

- 10.0.0.0 ~ 10.255.255.255 (subnet mask 16 ~ 28)
- 172.16.0.0 ~ 172.31.255.255 (subnet mask 16 ~ 28)
- 192.168.0.0 ~ 192.168.255.255 (subnet mask 16 ~ 28)

Subnet

- Cloud resources (e.g., CVM and CDB) need to be deployed on subnets.
- Private IPs obtained through DHCP are not routable on the public network.
- The number of available IPs per subnet is $2^n - 3$ (n is the subnet mask).

Create VPC

VPC information

Region: Northeast Asia(Seoul)

Name:

IPv4 CIDR Block: 10 . 0 . 0 . 0 / 16 (Cannot be modified after creation)

For better usage of VPC, it's recommended to have a proper [network structure](#).

[Advanced options](#)

Subnet information

Subnet name:

IPv4 CIDR Block: 10.0.0.0 / 24

Remaining IPs: 253

Availability zone:

Associated route table: Default

[Advanced options](#)

VPC CIDR Blocks - Subnetting

■ Subnetting

- IP address composition (binary): xxxx xxxx . xxxx xxxx . xxxx xxxx . xxxx xxxx
Subnet location (mask 24) host bit

- The number of subnet mask bits determines the number of available subnets and the number of host IP addresses.
 - For example, if the subnet mask is n , the number of subnets will be 2^n , and the number of IPs will be $2^{(32-n)} - 3$.

■ Example: 10.3.5.7/24

- Binary: 00001010 00000011 00000101 **00000111**
 - Number of subnets: 2^{24} ; number of hosts: $2^{(32-24)} - 3$.
 - Network address: 10.3.5.0; broadcasting address: 10.3.5.255; gateway address (as configured)

VPC Route Tables

- IP addresses in the same VPC network can communicate by default, but those in different VPC networks cannot communicate unless VPC peering is established and a route table is configurated to facilitate traffic among VPCs and between VPCs and public networks.
- Type of route table
 - Default route table
 - Customized route table
- Routing policies
 - Destination
 - Next hop type
 - Next hop

Create route table

Name 60 more characters allowed

Network

Advanced options ▾

Routing rules

Routing policies control the traffic flow in the subnet. For details, please see [Configuring Routing Policies](#).

Destination	Next hop type	Next hop	Notes	Operation
Local	LOCAL	Local	Delivered by default, indicates that C...	-
<input type="text" value="such as 10.0.0.0/16"/>	<input type="text" value="Public IP of CVM"/>	<input type="text" value="Public IP of CVM"/>	<input type="text"/>	

+ New line

Create **Close**

VPC Access Control

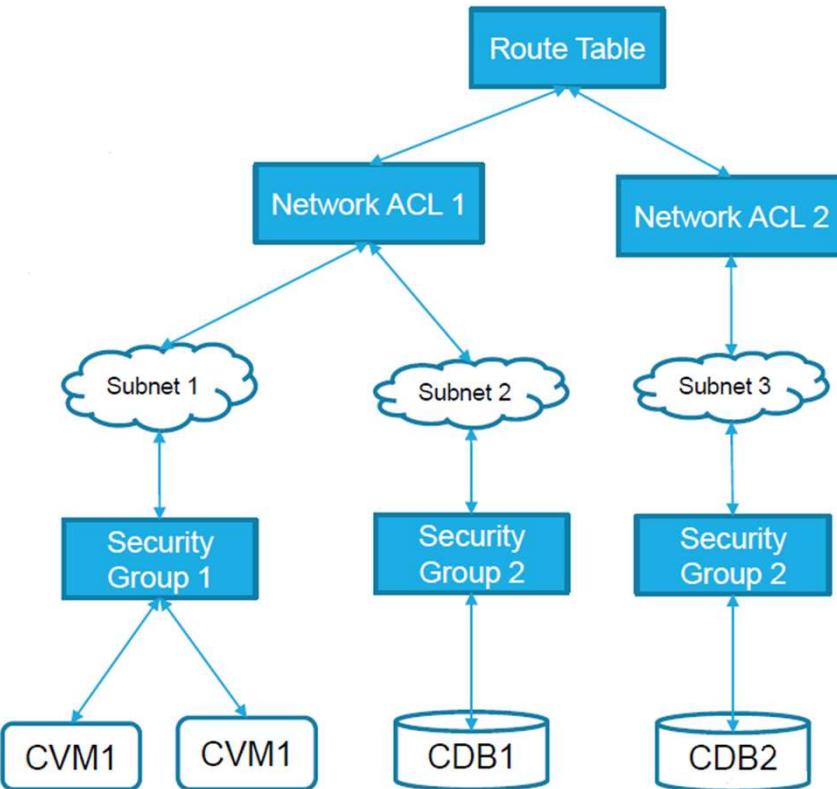
■ Network ACL

- Controls the inbound and outbound traffic of a subnet.

■ Security group

- Decides whether a port / protocol accepts traffic.

Inbound rules				Outbound rules
Add rule	Import rule	Sort	Delete	Open all common ports
<input type="checkbox"/> Source <small>(i)</small>	Protocol+port <small>(i)</small>	Policy	Notes	
<input type="checkbox"/> 0.0.0.0/0	TCP:80	Allow	Web service HTTP(80) open.	
<input type="checkbox"/> ::/0	TCP:80	Allow	Web service HTTP(80) open.	
<input type="checkbox"/> 0.0.0.0/0	ICMP	Allow	Allow ping command	
<input type="checkbox"/> ::/0	ICMPv6	Allow	Allow ping command	
<input type="checkbox"/> 0.0.0.0/0	TCP:22	Allow	Allow Linux SSH login	
<input type="checkbox"/> ::/0	TCP:22	Allow	Allow Linux SSH login	

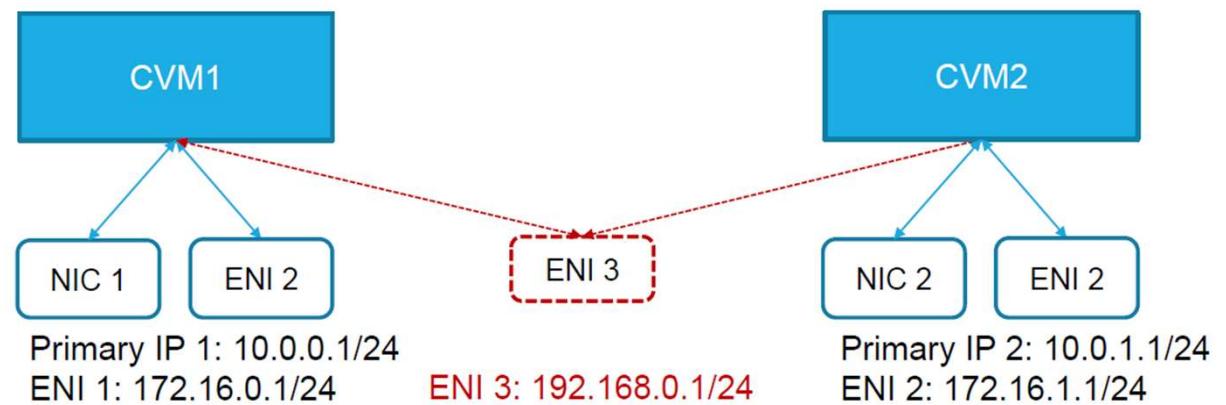


VPC Access Control (Cont.)

Security Group	Network ACL
CVM instance-level traffic control (the second layer of defense)	Subnet-level traffic control (the first layer of defense)
Supports Allow and Deny rules	Supports Allow and Deny rules
<i>Stateful</i> : The returned data stream is automatically allowed and is not affected by any rules.	<i>Stateless</i> : The returned data stream must be explicitly allowed by rules.
Rules only apply to an instance if they are associated with the security group.	Rules automatically apply to all CVM instances in the associated subnet. This can act as a backup defense if the instance is already associated with a security group.

ENIs

- Elastic Network Interface
- An elastic network interface is assigned to a CVM instance in a VPC network and can freely migrate between CVM instances.
- Advantages of ENIs
 - Multiple ENIs / IP addresses
 - Network isolation
 - Flexible migration

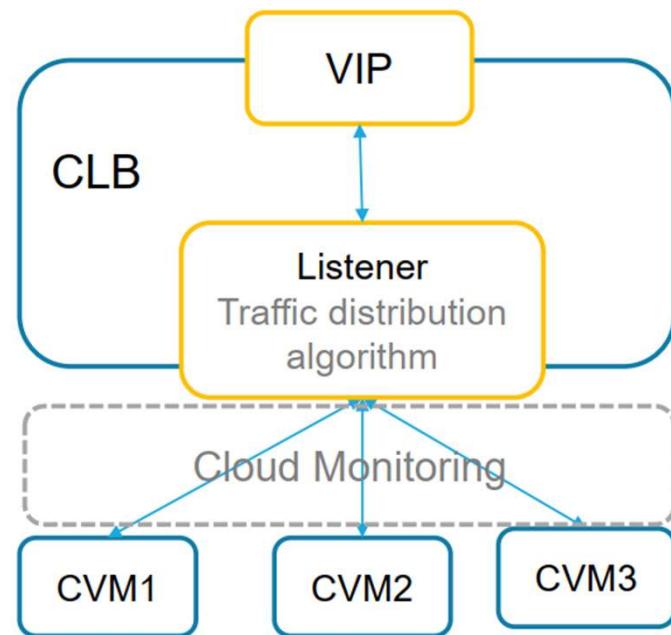


Public Network Access: EIP

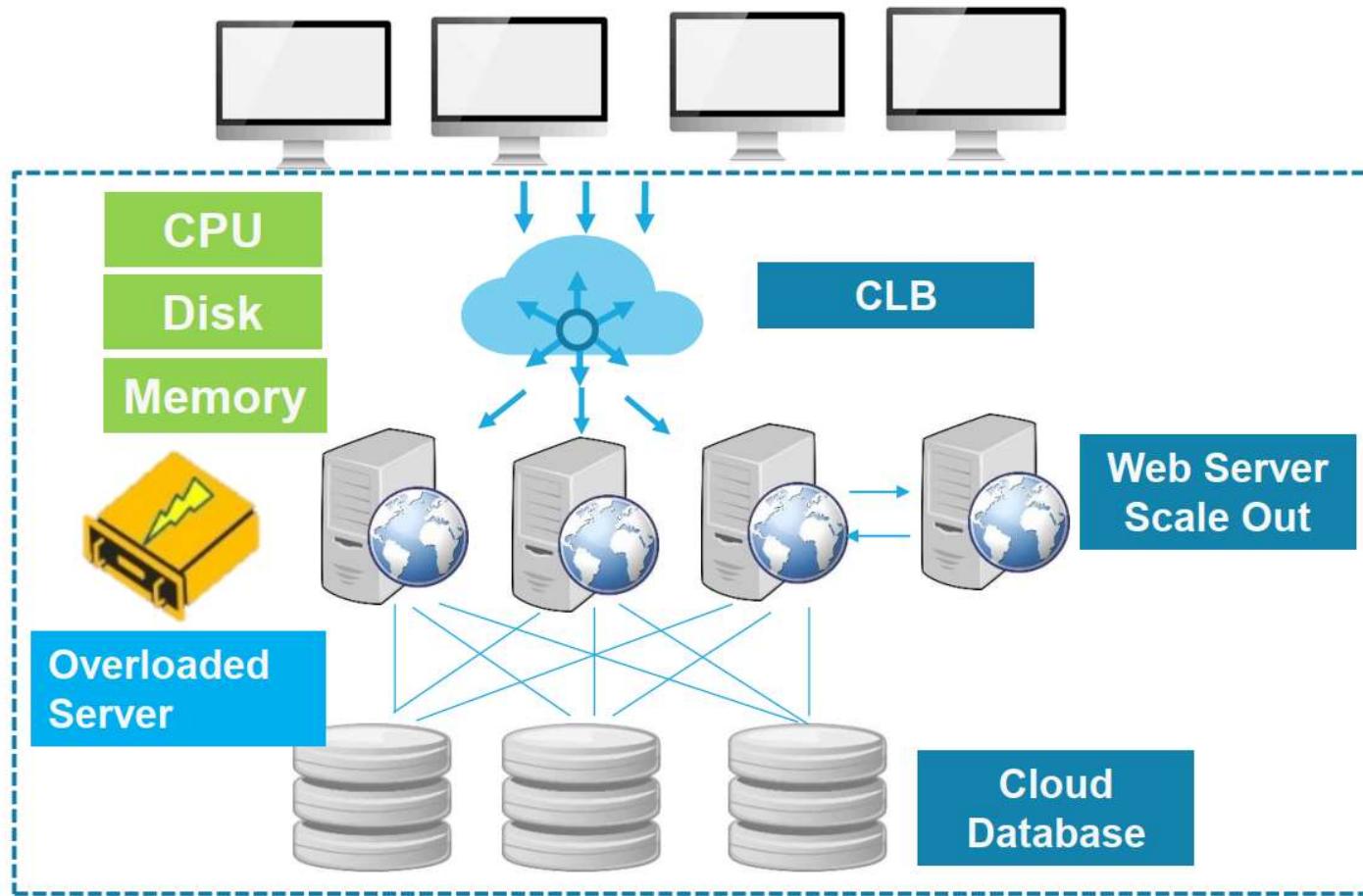
- A VPC network has private IP address in a range of your choice, For internet traffic, a public IP address must be assigned to the network.
- **Classic public network IP**
 - This type of IP address is bound to a CVM instance and is not associated with an account.
 - It is released immediately after unbinding and cannot be recovered.
- **Elastic Public Network IP**
 - An EIP is bound to the CVM or NAT Gateway.
 - It is associated with an account and therefore can be recovered and re-bound after unbinding.
 - It can be released via API/console or automatically released if the account becomes delinquent.

Cloud Load Balancer (CLB)

- Provides a secure and fast traffic distribution service.
- How it works
 - **VIP**: A single IP address that handle requests
 - **CLB instances**: Monitor requests and distribute traffic through a listener.
 - **Backend CVMs**: Process requests and return results.
 - **Cloud Monitoring**: Monitors CVMs and synchronizes data to the listener.



Cloud Load Balancer (CLB) (Cont.)



Cloud Load Balancer (CLB) (Cont.)

Tencent Cloud Cloud Load Balancer

High Performance

- 하나의 CLB 클러스터 최대 1 억 2 천만 개의 동시 연결 지원
- 최대 40Gbps의 트래픽 대역폭을 처리하거나 초당 6 백만 개의 패킷을 처리 가능

High Availability

- 하나의 CLB 클러스터는 4 개의 물리적 서버로 구성되어 최대 99.95 %의 가용성 제공
- 결함 발생 인스턴스를 제거하고 정상적인 인스턴스를 유지하여 백엔드 서버가 계속 올바르게 작동하도록 함

Elastic Scalability

- CLB 클러스터는 부하에 따라 애플리케이션 시스템의 서비스 기능을 탄력적으로 확장하고 Auto Scaling의 동적 확장 그룹을 통해 CVM 인스턴스를 자동으로 생성하고 해제

Security and Stability

- BGP Anti-DDoS 시스템의 도움으로 CLB는 대부분의 네트워크 공격 방어
- CLB의 내장된 synproxy 공격 방지 메커니즘은 BGP 시스템이 적용되기 전에 백엔드로 공격 되는 것을 방지하여 데이터 보안과 안정성을 보장

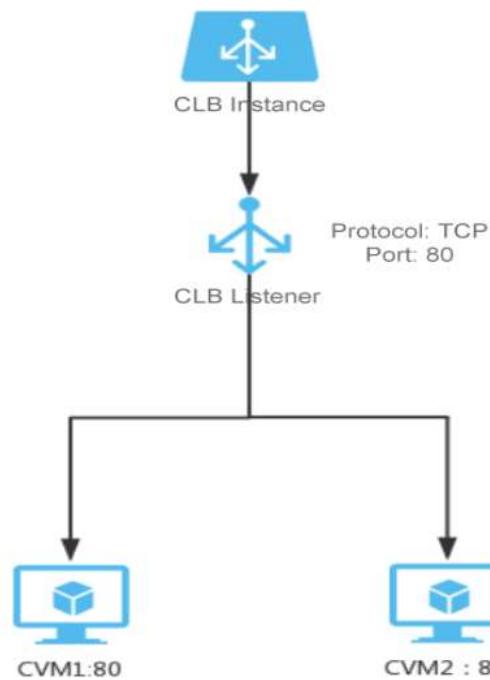
Low Costs

- CLB를 사용하면 추가로드 밸런싱 하드웨어에 투자 할 필요가 없음
- CLB는 종량제 방식으로 청구되어 사용한 만큼만 비용을 지불하고 비즈니스 요구에 따라 언제든지 CLB 인스턴스를 생성하고 종료 가능

Cloud Load Balancer (CLB) – Multi-protocol Forwarding

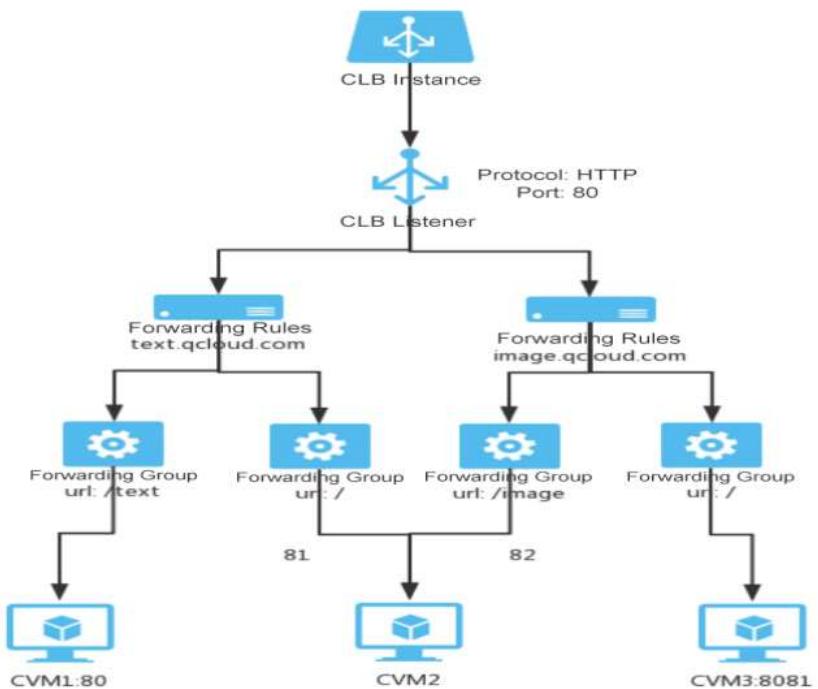
Layer-4 Cloud Load Balancer

Monitors TCP and UDP traffic, forwarding is based on port and VIP



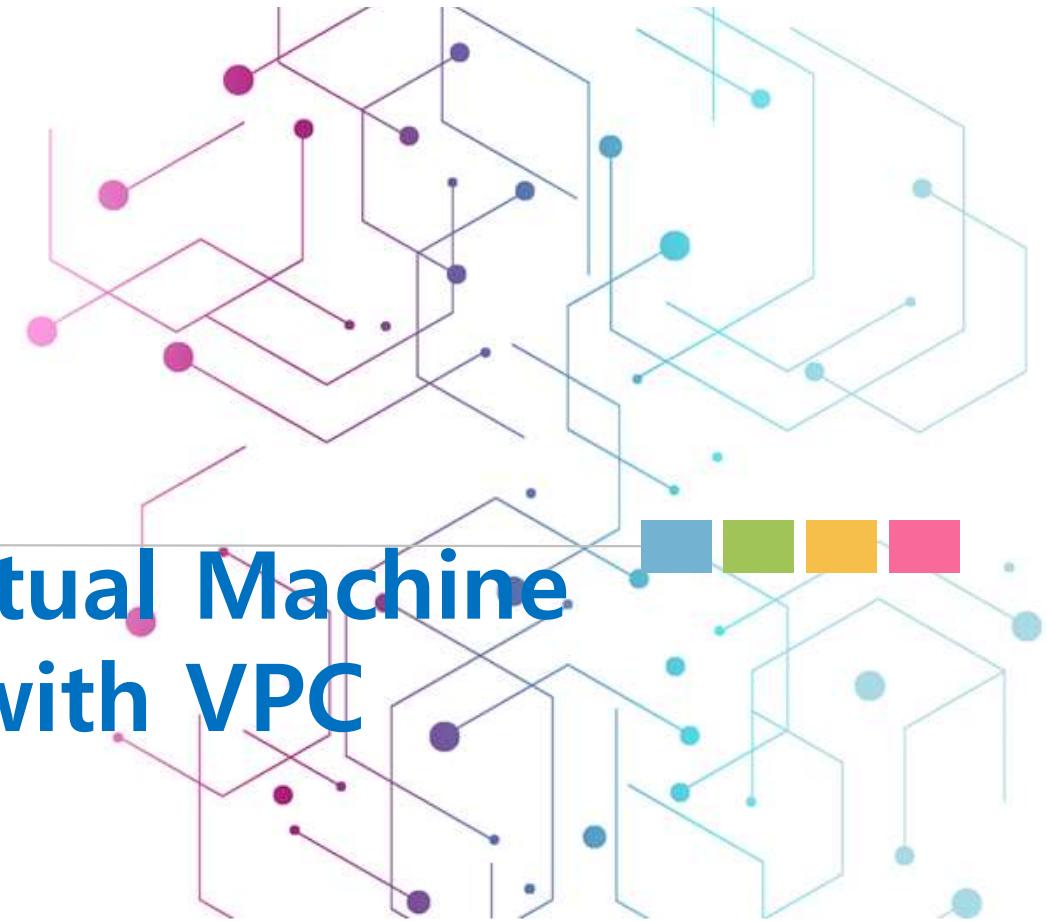
Layer-7 Cloud Load Balancer

Monitors HTTP and HTTPS requests, distribution is based on content (domain name/URL)





Lab5. Cloud Virtual Machine Fundamentals with VPC





Lab6. Implementing CLB & Auto Scaling



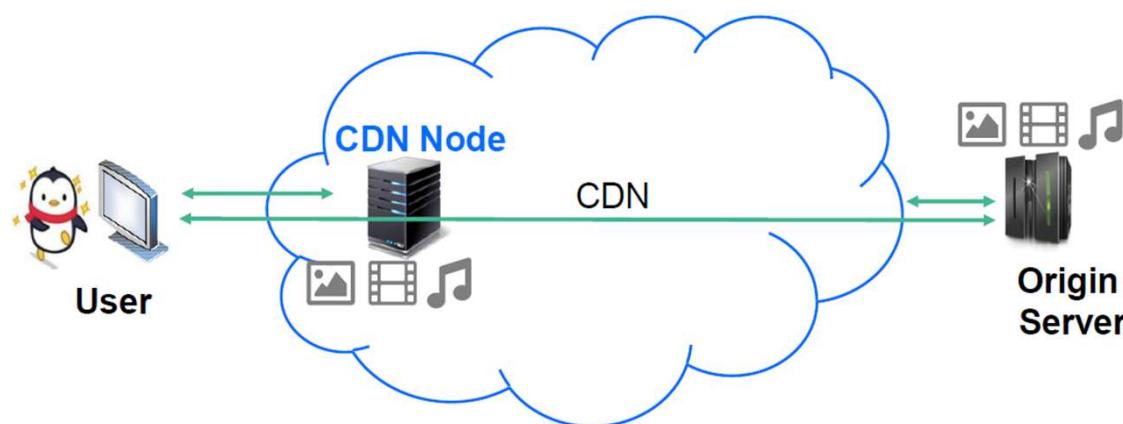


Tencent Cloud CDN

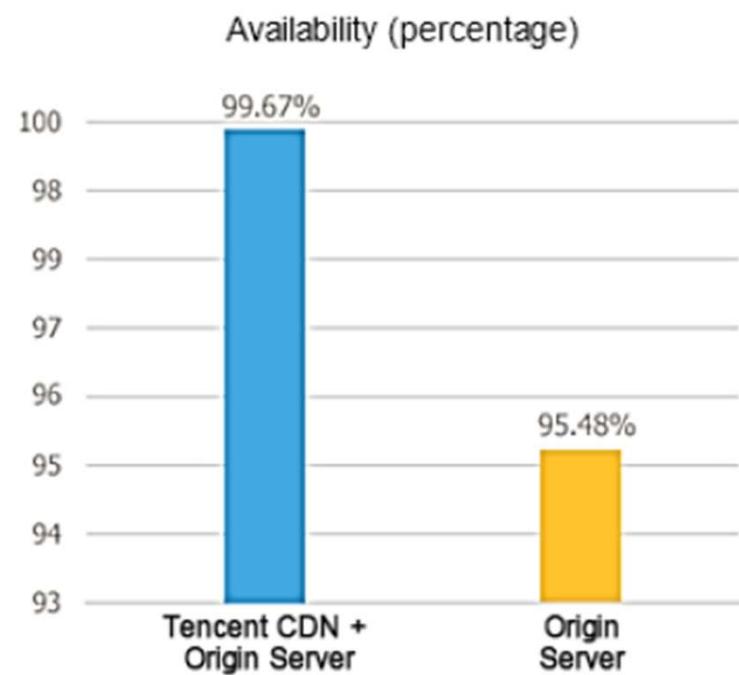
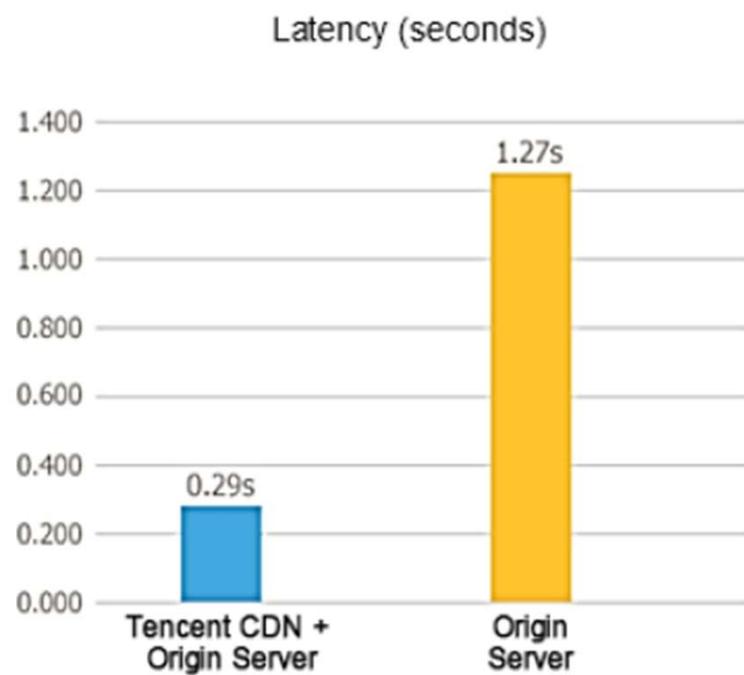


What is a CDN?

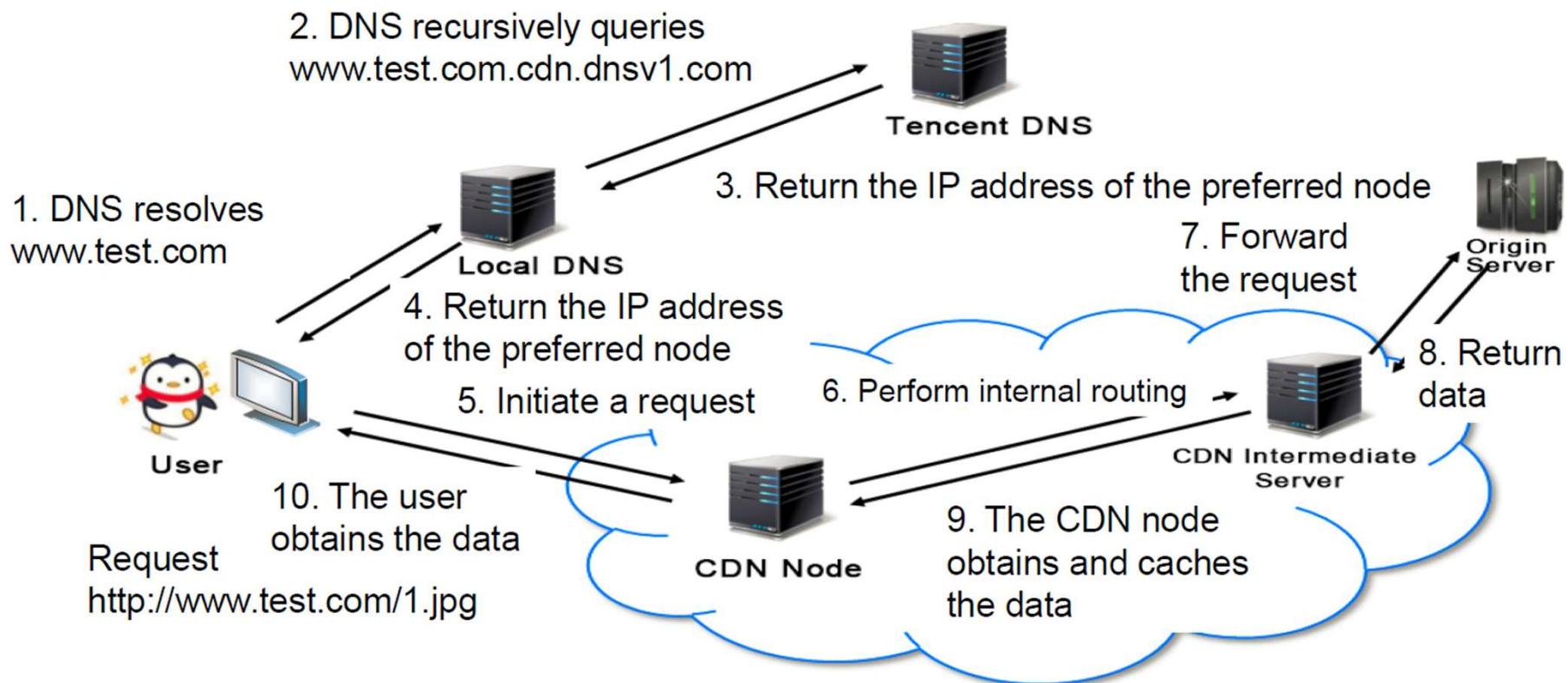
- Content Delivery Network
- Is a cluster of distributed servers that accelerate the delivery of content to users in different locations.
- Consists of nodes in different geographic locations and delivers content to users based on their locations, the origin of the desired content, and the node that hosts the content.



Why use a CDN?



Implements of CDN



Content Delivery Network (CDN) (Cont.)

■ Tencent Global CDN Infrastructure

▶ 1300+ CDN 노드 ▶ 100Tbps+ bandwidth ▶ 50+ 국가 및 도시

리전	국가 또는 도시
아시아 태평양 I	홍콩, 싱가폴, 마카오
아시아 태평양 II	베트남, 태국
아시아 태평양 III	한국, 일본, 필리핀, 인도네시아, 말레이시아
남아시아	인도
중동/ 아프리카	남아프리카, UAE, 터키, 남아프리카공화국
북아메리카	미국, 캐나다
유럽	영국, 독일, 프랑스, 러시아, 이탈리아, 스페인, 네덜란드
남아메리카	브라질
호주	호주



Content Delivery Network (CDN) (Cont.) - Benefits

Massive Acceleration

- Tencent Cloud CDN 리소스는 전 세계 50개 이상의 국가 및 지역에 분산되어 있고 120Tbps+에 달하는 전체 네트워크 대역폭 보유



Intelligent Scheduling

- Tencent에서 자체 개발한 **GSLB** 스케줄링 시스템은 전체 네트워크 감지 시스템을 사용하여 네트워크 링크의 실제 품질을 체크하고 스케줄링 정책을 실시간으로 조정함으로써 사용자에게 가장 최적의 노드를 할당하여 액세스 퀄리티 보장



Global Acceleration

- Tencent Cloud의 글로벌 가속 네트워크는 엣지 노드와 리전 센터의 2단계 구성을 사용하여 노드 간의 스마트 라우팅 및 특수 경로 최적화를 통해 가속 효과를 더욱 향상. 이로써 국가 간 Origin-pull 링크의 낮은 품질이나 느린 Origin-pull 속도 등의 문제를 효과적으로 해결하여 국가 간의 액세스 품질 개선.



Monitoring and Alarming

- 서비스를 전반적으로 실시간 모니터링. 분 단위의 액세스-Origin-pull 트래픽, 대역폭, 요청 수, 히트율 및 각각의 상태 코드 데이터를 모니터링함으로써 CDN의 서비스 상태를 실시간으로 파악할 수 있으며, 유지보수 인력의 원본 서버 상태 모니터링 업무에 도움을 줄 수 있음.

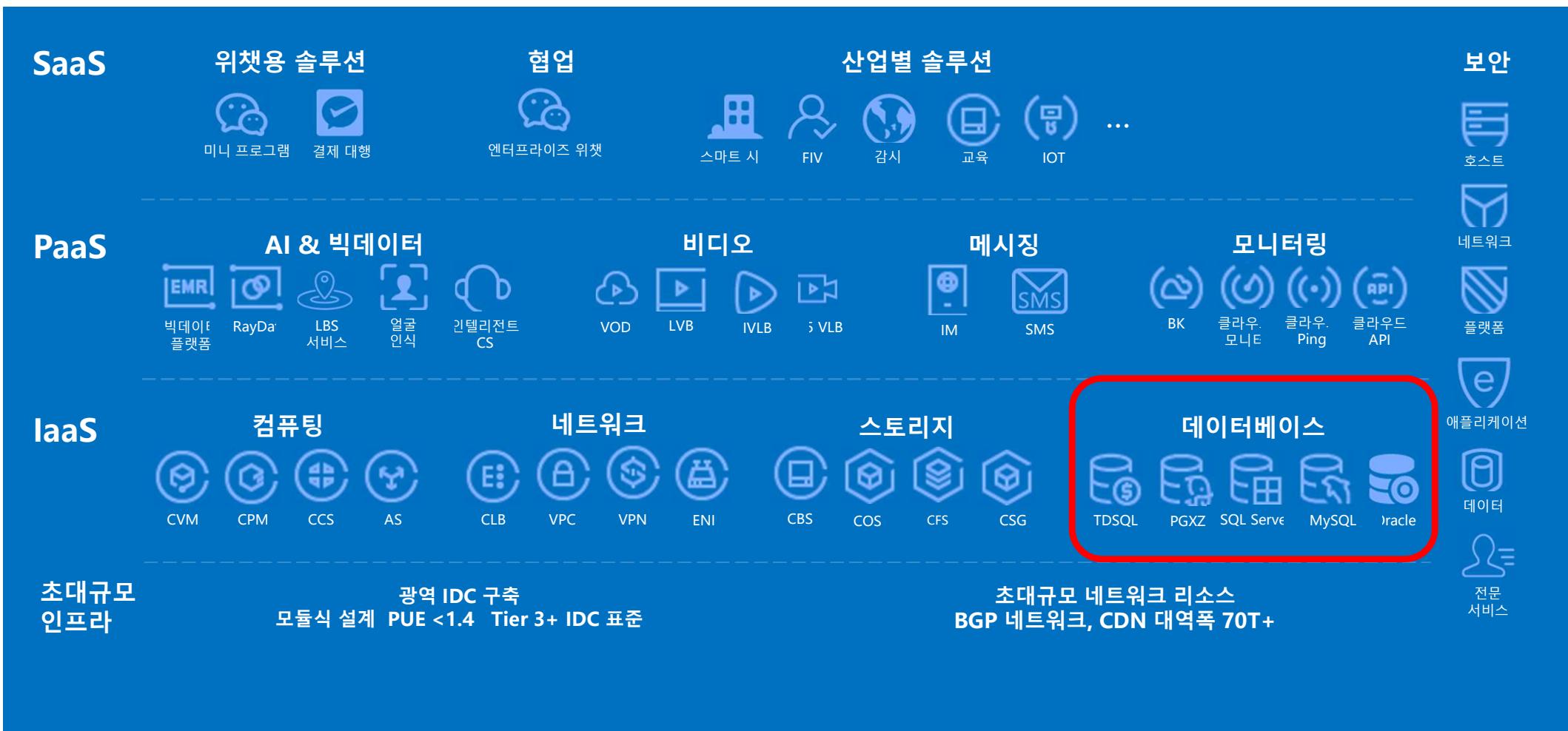




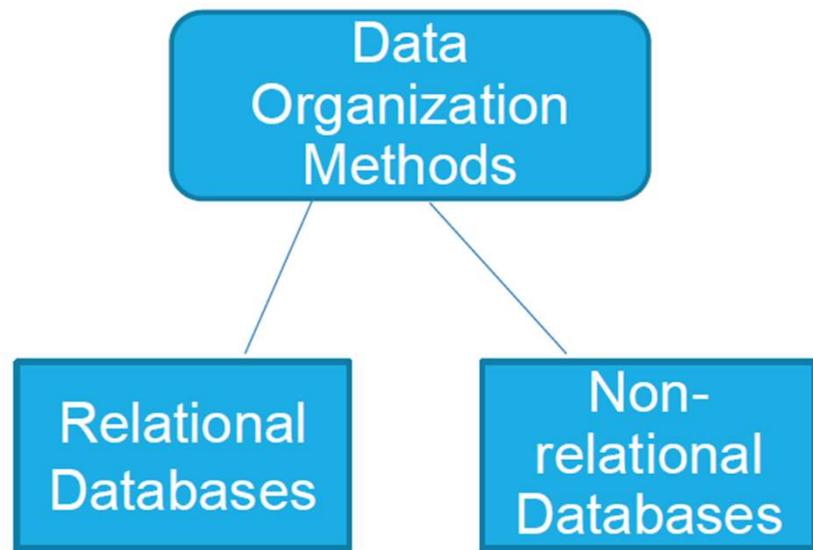
Tencent Cloud Databases



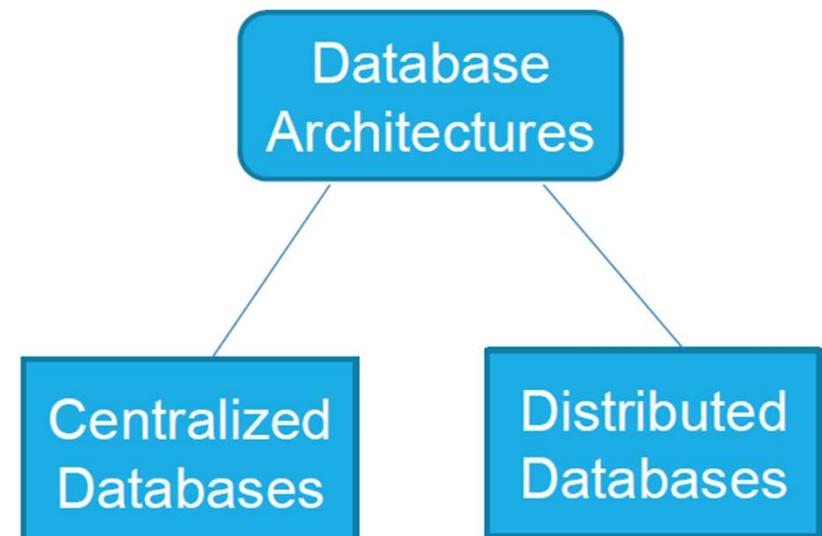
Tencent Cloud Product Portfolio



Database Types



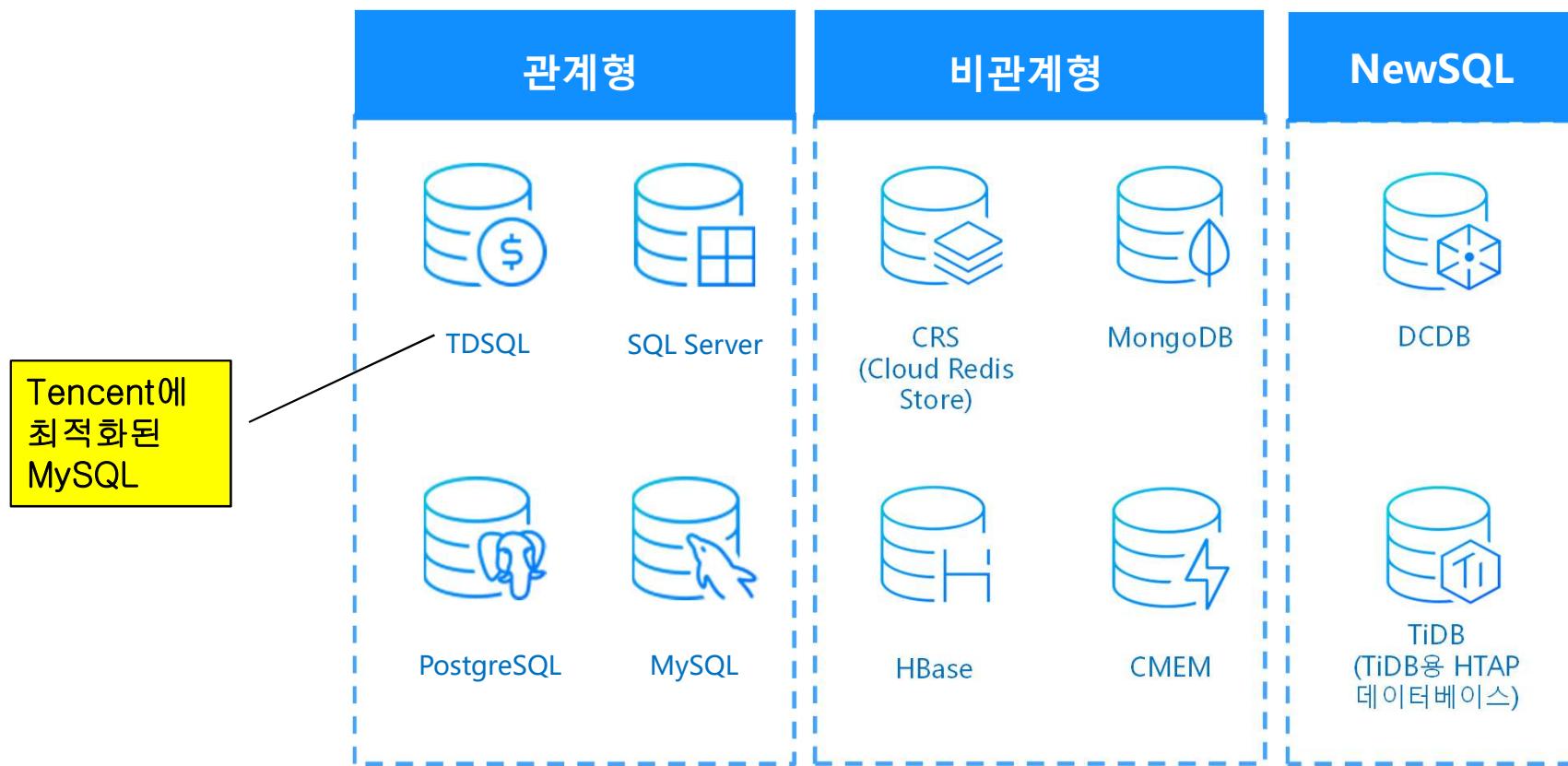
By data organization method



By architecture

Tencent Cloud Product Portfolio

■ 다양한 유형의 DB 지원



Relational vs. Non-relational Databases

Item	Relational SQL	Non-relational NoSQL
Data storage	Relational tables	Data sets (key values / JSON docs / hash tables / other)
Schema	Structured and predefined tables	Dynamically adjusted and non-structured schema
Scalability	Scaling up is supported, and higher processing capabilities are provided.	Scaling out is supported, and more distributed nodes can be added.
Data query	Standard query language (SQL)	Non-standard unstructured query language (UnQL)
Key features	ACID	CAP and BASE
Pros	Structured, transactional, and easy to maintain	High scalability, flexible adjustment, and big data analytics
Cons	Low scalability, poor performance in high concurrency scenarios, and no support for big data analytics	Weak support for transaction processing and lack of standardization



Lab7. Implementing TencentDB for MySQL



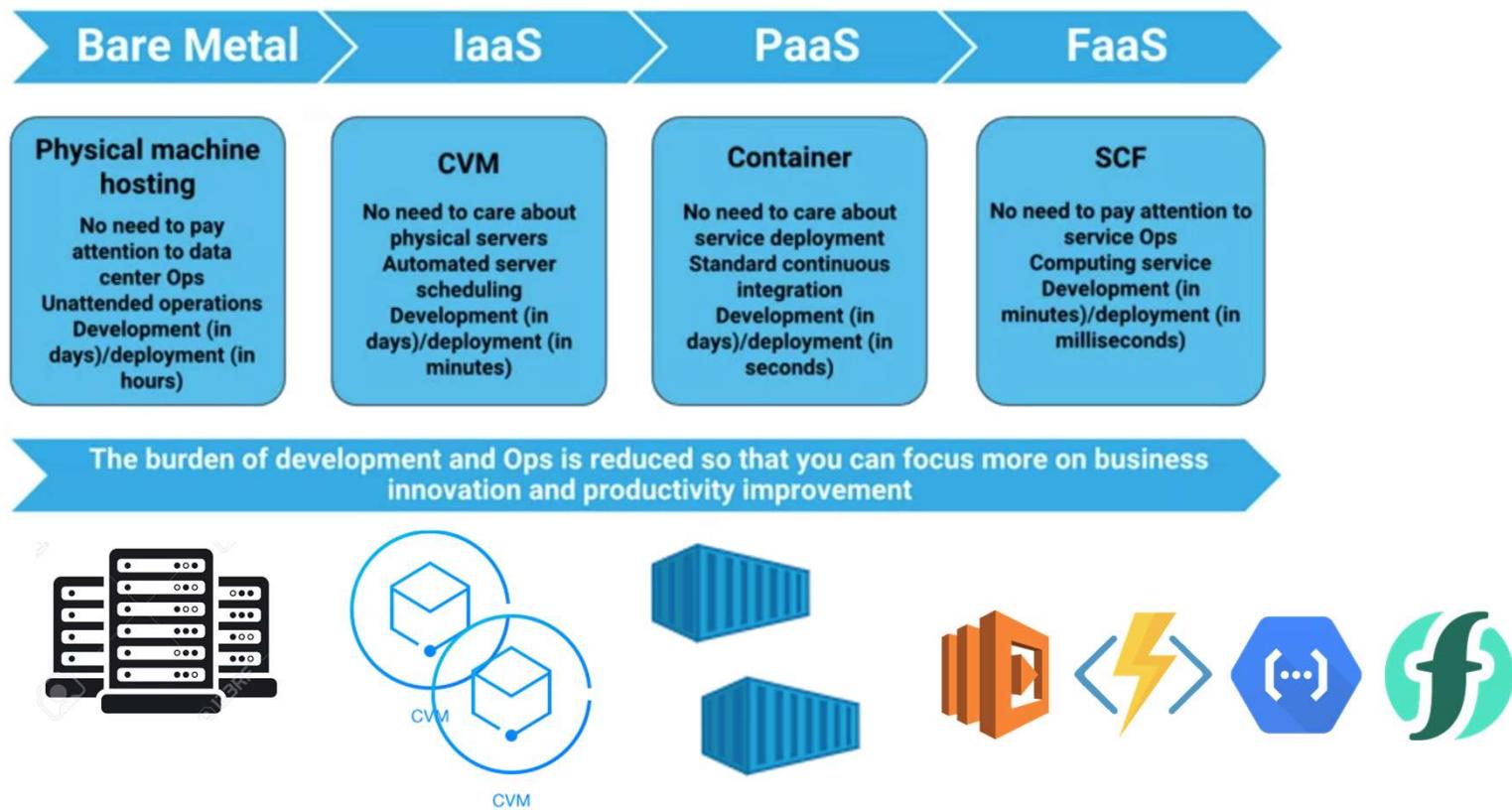


Tencent Cloud Serverless Architecture



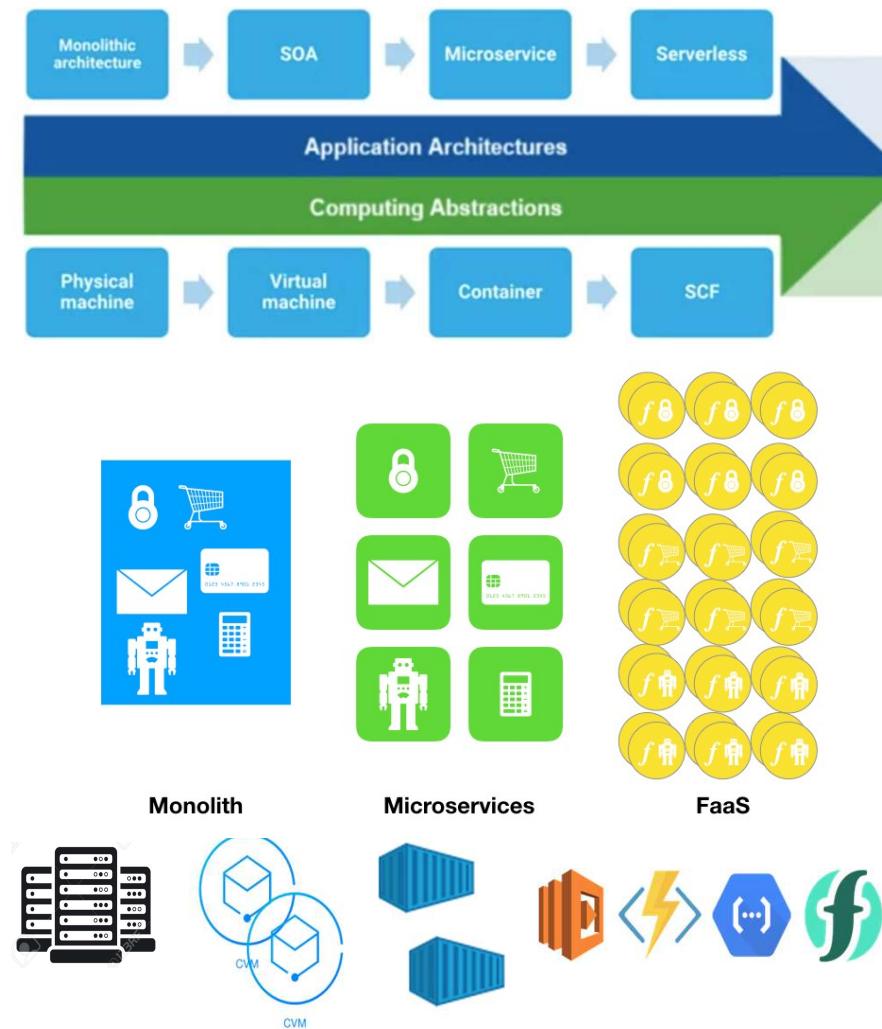
Overview of Serverless Architecture - Background

- Serverless transformation of computing resources.



Overview of Serverless Architecture – Background (Cont.)

- Architecture evolution



Overview of Serverless Architecture - Overview

*Serverless is an architecture concept whose core idea is **abstract the infrastructure** that provides service resources into various services and provide them for users to call in the form of **APIs**. It truly implements **on-demand scaling** and **pay-as-you-go billing**.*

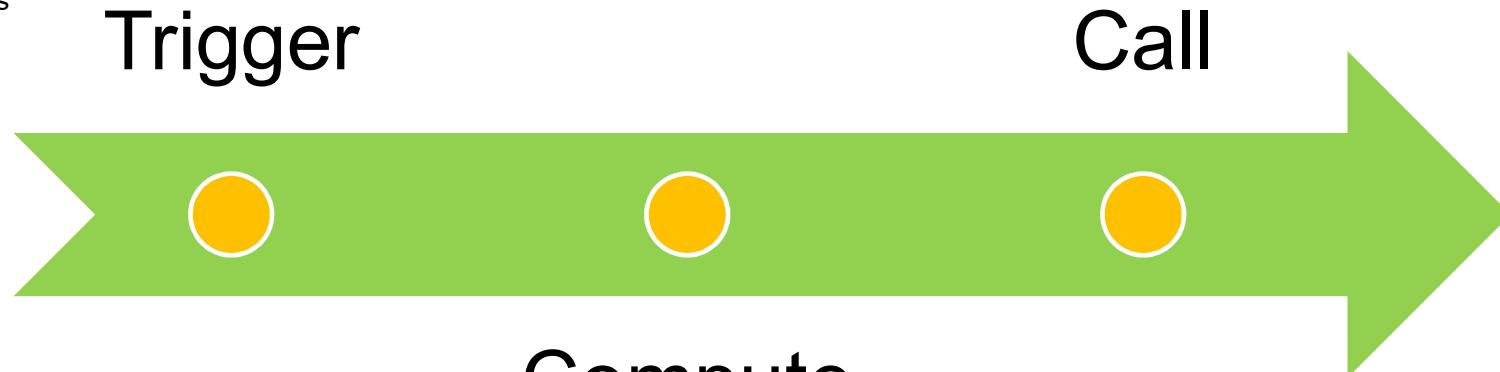
Overview of Serverless Architecture (Cont.)

Serverless = FaaS + BaaS

You entrust business code to the platform and configure the event triggering method. According to the trigger events, the platform completes the preparation, scheduling, triggering, execution, and expansion of the code runtime.

Various trigger conditions

TencentCloud API, timer, COS, CMQ, API Gateway, Kafka, and monitoring and alarm events



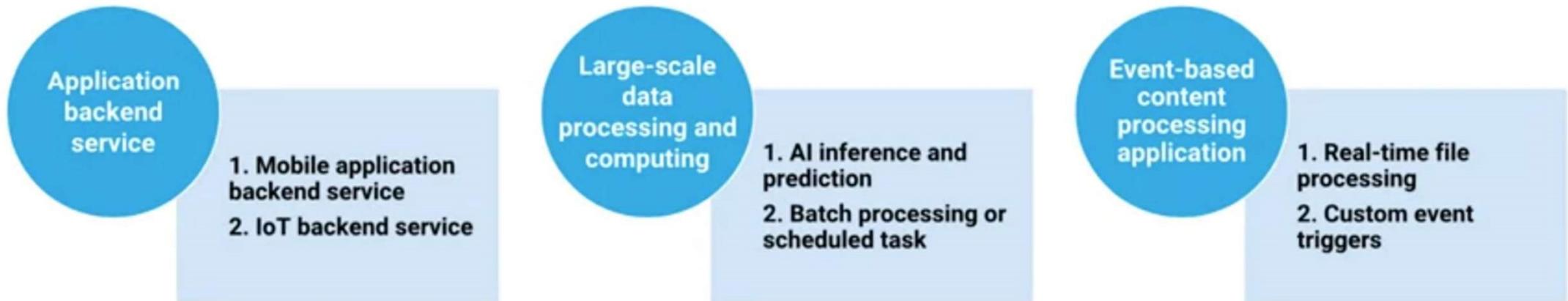
Backend as a service

COS, TencentDB for MySQL, CMQ, API Gateway, and CDN

Compute Managed computing

You can use computing services just like storage services without having to worry about capacity, security, Ops, and more.

Overview of Serverless Architecture (Cont.) – Use Cases



Overview of Serverless Cloud Function (SCF) - Overview

- Provides a serverless execution environment, enabling companies and developers to execute code without the need to purchase and manage servers.

Characteristics of SCF



Ease of use



Efficiency



High stability
and reliability



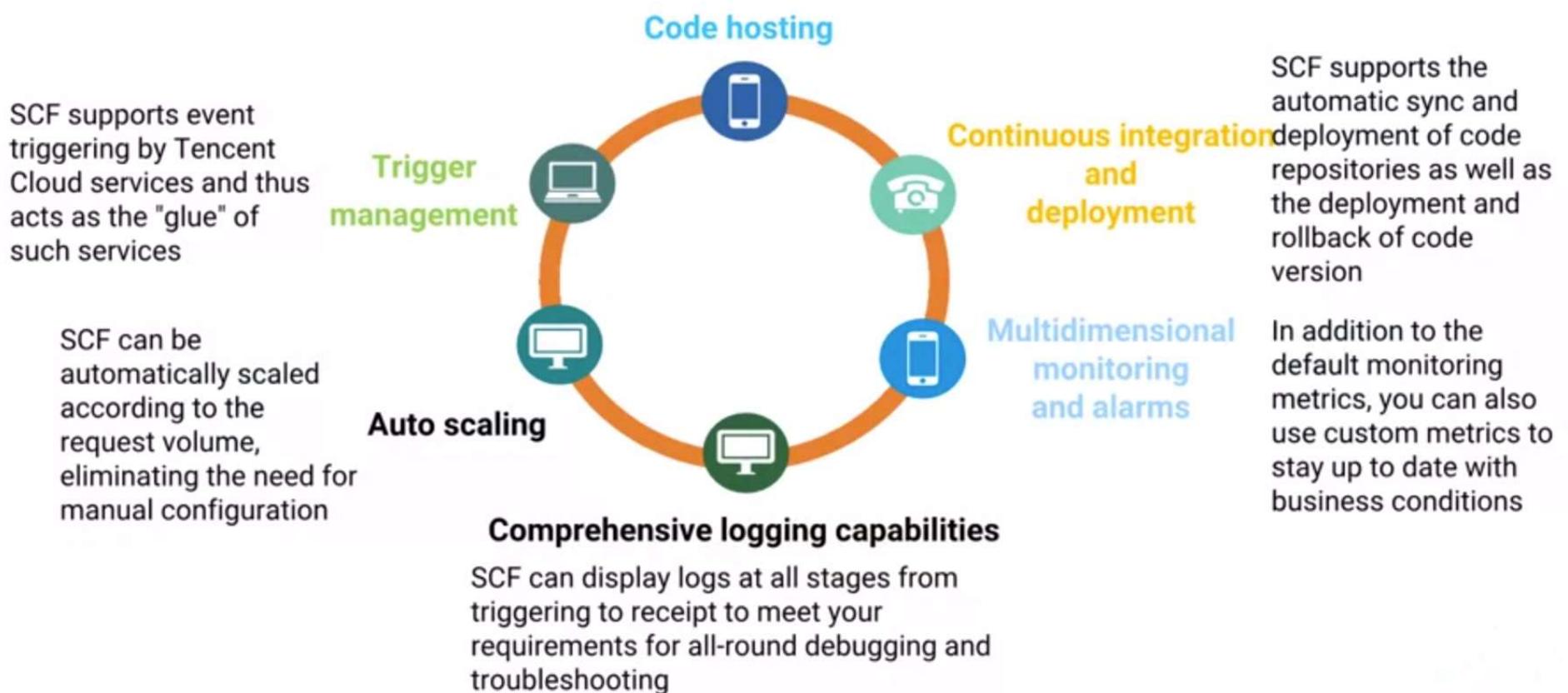
Simplified
management



Reduced
overhead costs

Overview of Serverless Cloud Function (SCF) - Features

- The code is securely hosted on the SCF platform to block intrusions.



Overview of Serverless Cloud Function (SCF) – Billing Mode

- The billing mode of SCF is depicted below :



Overview of Serverless Cloud Function (SCF) – Advantages

	Traditional development mode	SCF development mode	Pros/cons
Architecture design	Architecture layering, feature division, module communication, concurrency, disaster recovery, security, cost design, etc.	Function feature division, function invocation process/combination, event trigger relationship definition, etc.	The workload of the architecture design is significantly reduced
Code development	Network service development, business logic development, and development of non-functional requirements such as disaster recovery, concurrency, and scaling	The development of event processing functions	The workload of code development is significantly reduced
Code debugging	You can log in to the server and use familiar tools for local debugging	Debugging mainly relies on logs	The code debugging experience is not as good as that of traditional development mode
Release deployment	Software is distributed in the traditional mode or by using standardized container deployment, where multi-version management and hot upgrade are difficult to implement	Software can be quickly deployed through APIs or webpages, where multiple function versions can be released, production versions can be selected through aliases, and hot upgrade is supported	The release and deployment efficiency is greatly improved, and the impact of the release and deployment on the business is reduced
Service Ops	The server Ops burden is heavy, and business scaling and troubleshooting are costly and time-consuming	Scaling is performed automatically based on the load with failover capabilities	The needs for server Ops, scaling, and troubleshooting are eliminated, which reduces the impact on the business
Service costs	Fees are charged by the use duration, and at least one server should be retained	Fees are charged by the actual usage, and there is no need to retain any servers	Completely pay-as-you-go billing is achieved with no costs of idle resources incurred

Overview of Serverless Cloud Function (SCF) – Advantages of Developing with SCF

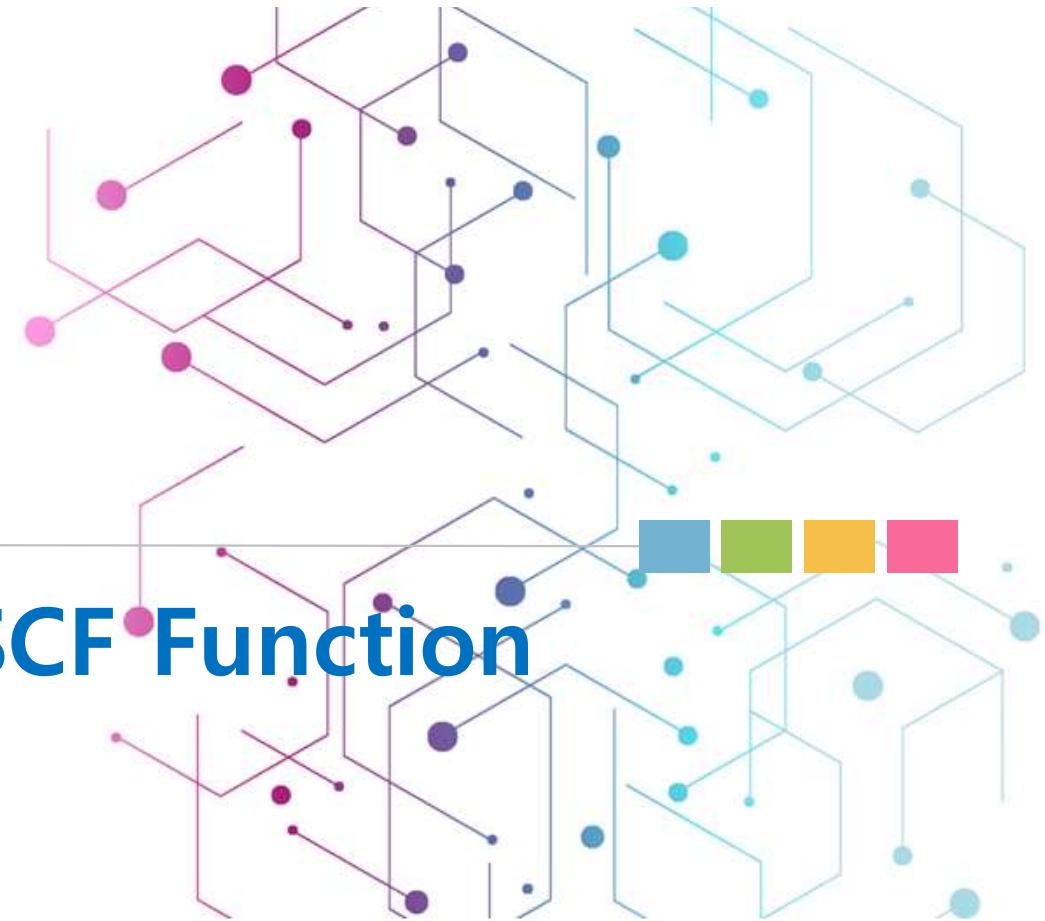


Overview of Serverless Cloud Function (SCF) – Use Cases

- Real-time file processing
- Data ETL
- Mobile and web application backend
- AI inference and prediction
- WeChat Mini Program CloudBase



Lab8. Using SCF Function





Terms relevant to Cloud Computing



IT Resources



물리적서버



가상서버



소프트웨어



서비스

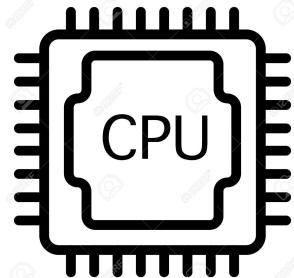


저장 장치



네트워크 장치

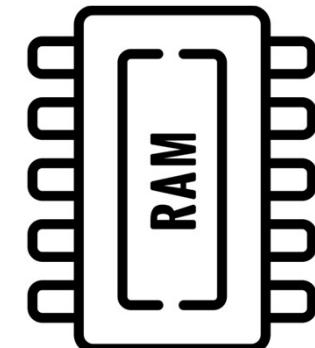
IT Resources (Cont.)



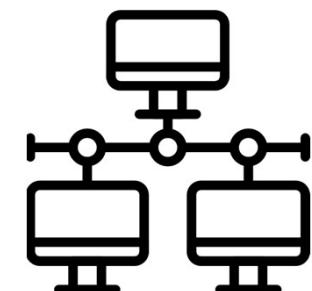
컴퓨팅 자원



네트워크 자원

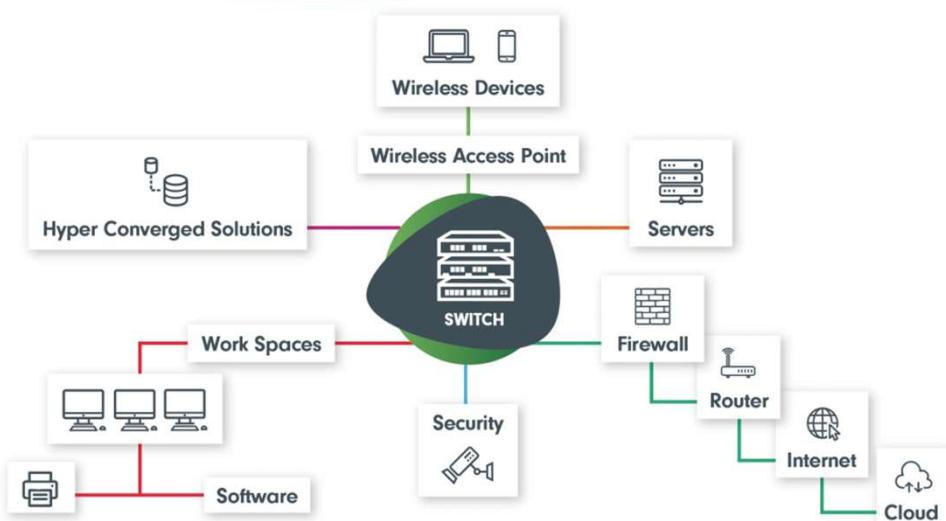


보안 자원



Infrastructure

IT Infrastructure



- 인프라
- 기반 시설
- IT 서비스의 기반이 되는
- 시스템 구조
 - 하드웨어와 네트워크 장비
 - 장비를 제어하기 위한 시스템 소프트웨어도 포함

<https://www.stonegroup.co.uk/insights/what-makes-up-an-it-infrastructure/>

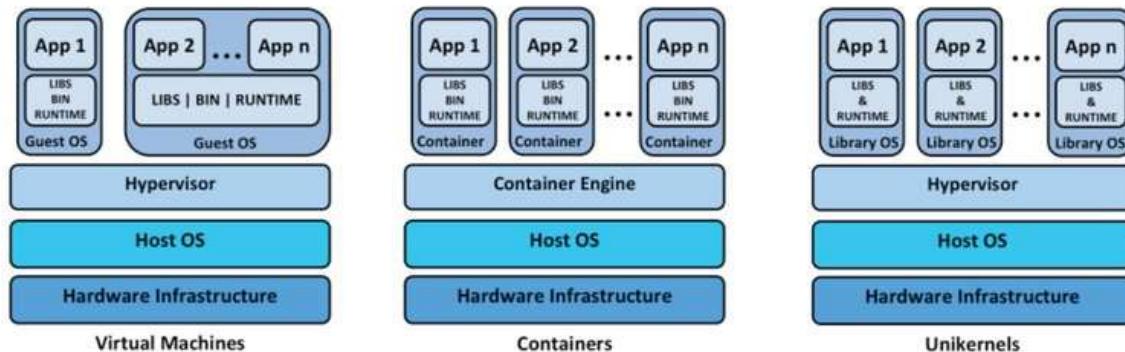
Platform



<https://medium.com/swlh/the-platform-edge-dbc541320fa7>

- 플랫폼
- 기차 플랫폼 또는 무대 강단
- 상생 생태계
- 판매자와 구매자 양쪽을
- 하나의 場으로 끌어들여
- 새로운 가치를 창출하도록 만드는 모델

Virtual Machines & Virtualization



<https://www.sdxcentral.com/edge/definitions/mec-virtualization/>

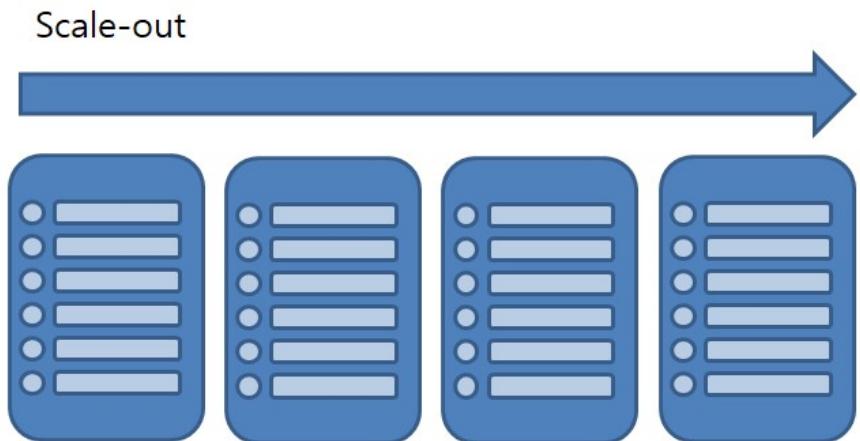
• 가상 머신

- 하나의 물리적 서버 상에
- 하이퍼바이저(Hypervisor)라는 소프트웨어가 여러 개의 가상 머신을 생성하여 제공

• 가상화

- 하나의 물리적 서버 상에
- 하나 이상의 가상 머신을 생성하여
- 복수 개의 논리적 서버를 운영하는 기술

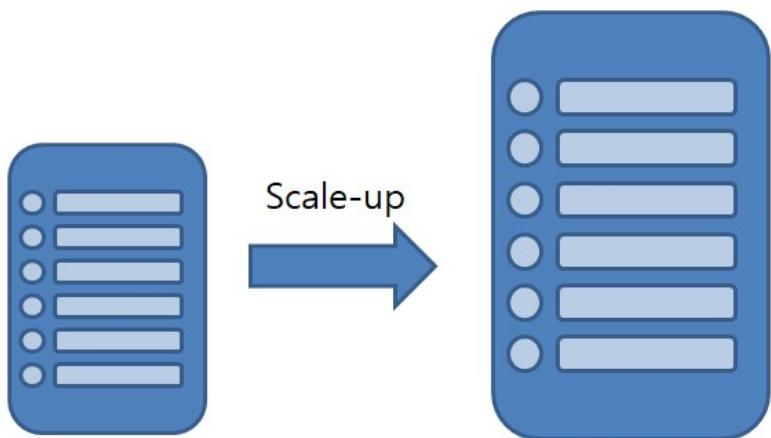
수평 확장



<https://toma0912.tistory.com/87>

- Horizontal Scaling
- 동일한 유형의 IT자원의 할당과 반납을 통한 확장과 축소
 - Scale Out : 자원의 수평적 할당
 - Scale In : 자원의 수평적 반납

수직 확장



<https://toma0912.tistory.com/87>

- Vertical Scaling
- IT 자원의 수요 증가/감소를 처리할 수 있는 능력
 - Scale Up : 기존 IT 자원을 고사양 용량의 다른 자원으로 대체한 경우
 - Scale Down : 저사양 용량의 IT자원을 다른 자원으로 대체한 경우

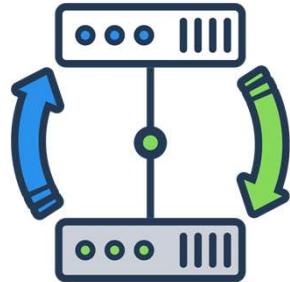
Data Center



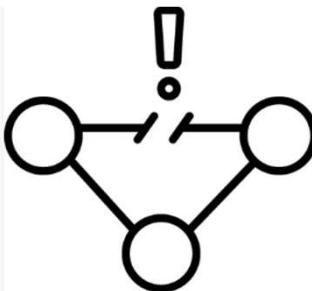
<https://www.ciokorea.com/news/39204>

- 서버 컴퓨터와 네트워크 회선 등을 제공하는 건물이나 시설
- 서버 호텔
- Application의 Server를 Hosting하는 실제 시설
- 운영에 필요한 Infra
 - Computing System을 위한 Hardware
 - Networking 장비
 - 전원공급장치
 - 전기 시스템
 - 백업 발전기
 - 환경 제어장치(에어컨, 냉각장치, 팬 등...)
 - 운영 인력
 - 기타 인프라

High Availability vs. Fault Tolerance

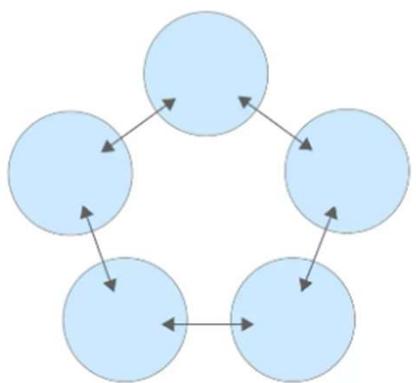


- 고가용성(High Availability)
 - 장애 상황을 해결하고 서비스를 지속할 수 있는 능력
 - 장애 상황의 준비가 되어 있는 Architecture 필요

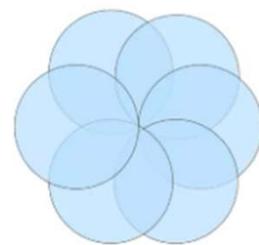


- 장애 내구성 or 내결함성(Fault Tolerance)
 - 장애 상황에도 서비스를 지속할 수 있는 능력
 - 장애 상황에 영향을 받지 않는 Architecture 필요

Tight Coupling vs. Loose Coupling



Loose Coupling



Tight Coupling

- Tight Coupling

- 다른 주체에 대해 단단하게 얹힌 상태
- 주체끼리 높은 의존성을 가지고 있어서 변경이 쉽지 않음.

- Loose Coupling

- 다른 요소에 대해 얹히지 않고 연결되어 있는 상태
- 주체끼리 낮은 의존성을 가지고 있어서 쉽게 변경할 수 있고 유연함.