Cloud Computing: Overview

Direct quotes from source: Simplilearn, 2018, URL: https://www.youtube.com/watch?v=RWgW-CgdIk0&feature=youtu.be,

Otherwise, as specified.

Prepared by: Celeste Ng, May 2023

Contents

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1. What is cloud computing?

Celeste: What is a "cloud" computing?

互連計算基礎設施和 IT 資源網絡的"虛擬化"

- A "virtualization" of a network of "interconnected" computing infrastructures & IT resources (such as servers, computers, storage, printers, scanners, IoT devices, IT systems, ….) that are
  - Available remotely,
  - Accessible over the Internet
  - (typically,) Hosted by a 3rd party service provider

- 遠程可用，
- 可通過互聯網訪問
- 通常）由第三方服務提供商託管

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Types of networks (accessibility perspective):

- Internet
- Extranet
- Intranet

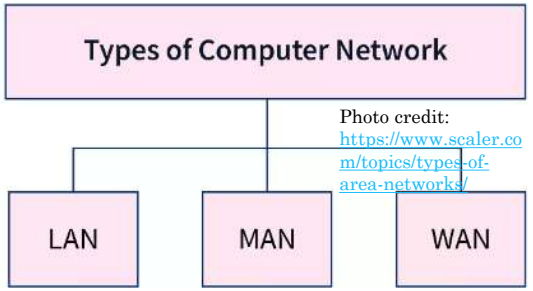

Photo credit: https://www.scaler.com/topics/types-of-area-networks/

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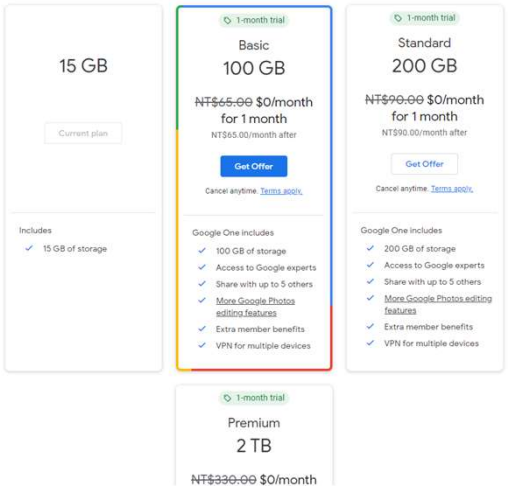
1. What is cloud computing?

按需計算服務

Cloud computing is the delivery of on-demand computing services over the internet on a pay-as-you-go basis



Google Drive Pricing

Plan	Cost	Cloud Storage Per User
Business Starter	**$6/user/month**	30 GB
Business Standard	$12/user/month	2 TB
Business Plus	$18/user/month	5 TB
Enterprise	Custome Quote	As Much as You Need

TrustRadius
https://www.trustradius.com › ... › Google Drive
Google Drive Pricing 2023 - TrustRadius

simplilearn

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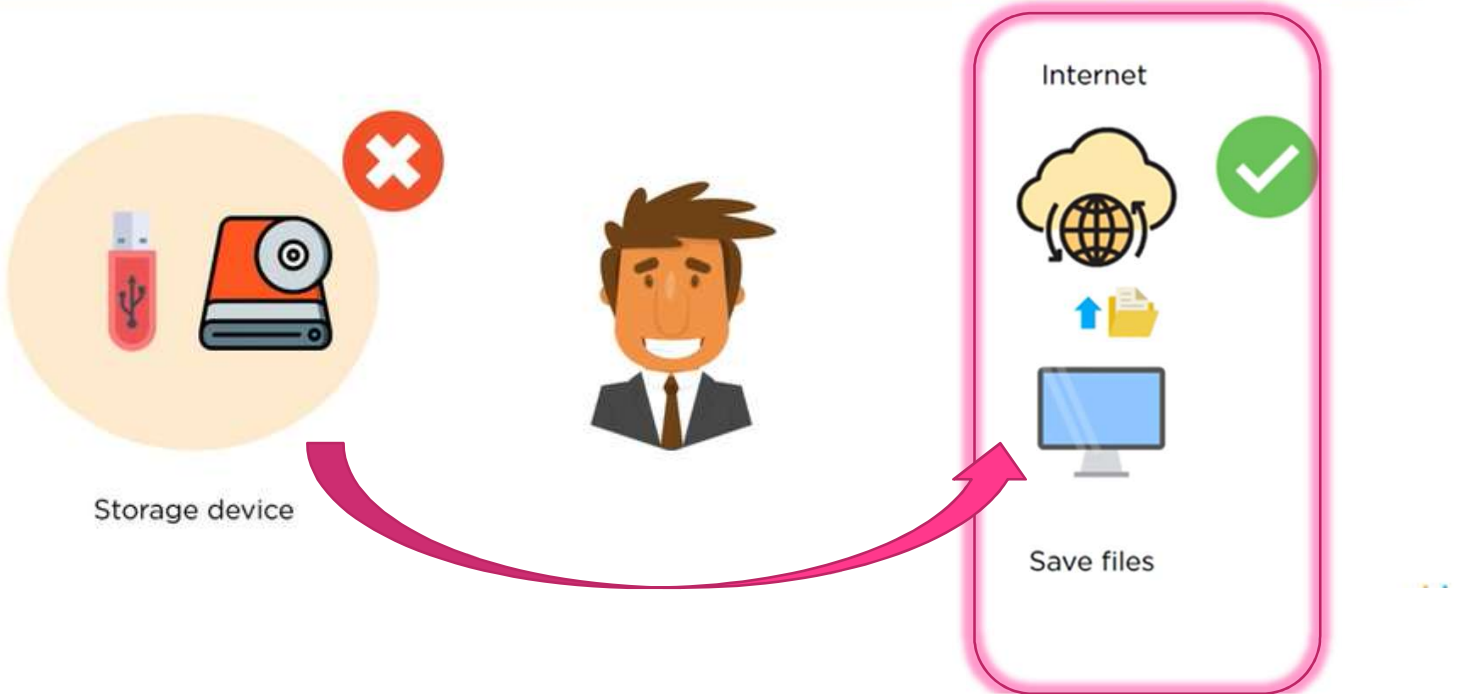
1. What is cloud computing? – example

Rather than managing files on a local storage device, cloud computing makes it possible to *save them over internet*



1. What is cloud computing? – Architecture

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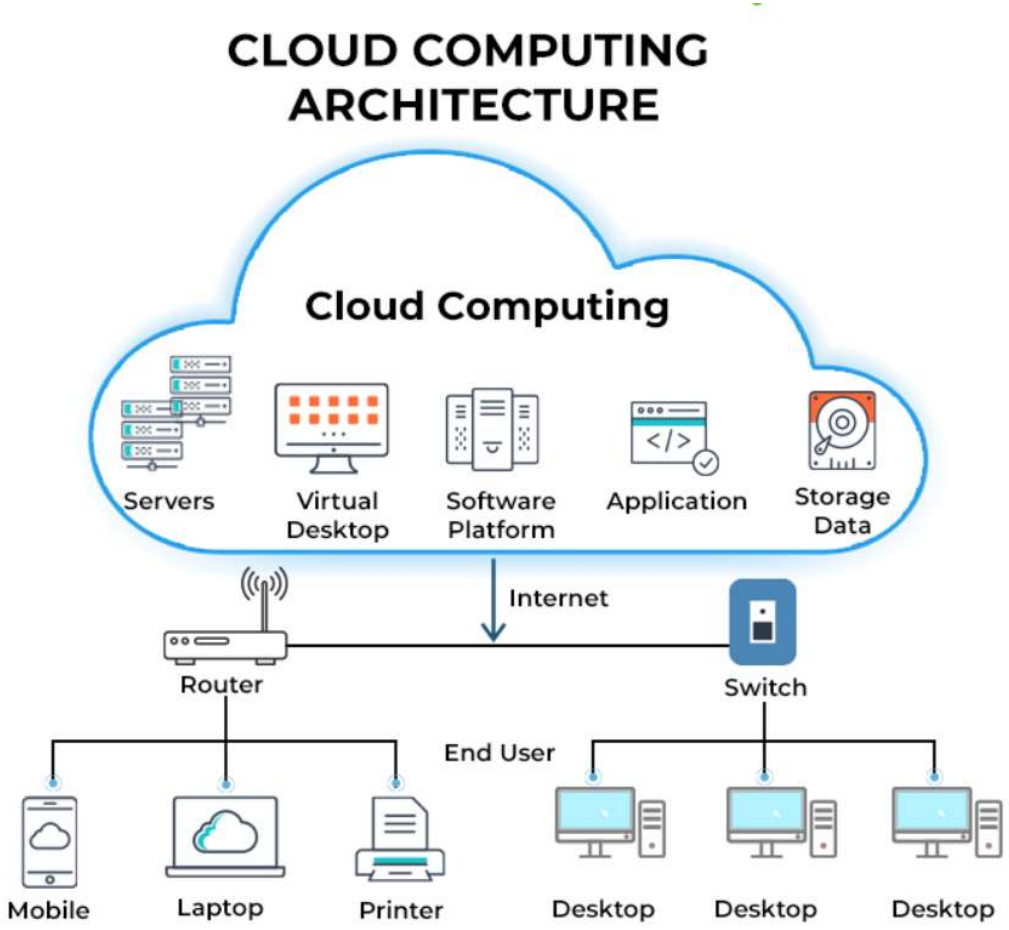

Source: https://www.spiceworks.com/tech/cloud/articles/what-is-cloud-computing/

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1. What is …

Celeste: What is "on-premise" computing?

- A "physicalization" of a network of "interconnected" computing infrastructures & IT resources (such as servers, computers, storage, printers, scanners, IoT devices, IT systems, ….) that are
  - Installed and available in-house,
  - Operated from the user or business owner's own data center

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The average enterprise data center costs between $10 million and $12 million per build, with costs typically front-loaded onto the first few megawatts of deploymer the typical edge data center costs between $8 million and $9 million.

Source: https://www.datacenterdynamics.com/en/marketwatch/cutting-data-center-construction-costs-use-supporting-infrastructure-ptss-peter-sacco/

Pricing. Palo Alto Networks offers a wide range of NGFW options. The company's most recently released appliances, the PA-220R (ruggedized), PA-3200 Series and PA-5280, range in price from $2,900 to $200,000, while the base PA-220 lists at $1,000.

eSecurity Planet
https://www.esecurityplanet.com › products › palo-alto-n...

Palo Alto Networks PA Series Review: NGFW Features & Cost

Visit

2. Why cloud computing?

本地(地端)數據中心

雲端數據中心

On-premise vs Cloud Computing

	On-premise	Cloud Computing
1	• Higher pay, less scalability 較少的可擴展性	• Pay for what you use Scale up= pay more Scale down= pay less
2	• Allot huge space for servers 為服務器分配巨大的空間	• No server space required
3	• Appoint a team for hardware and software maintenance任命一個團隊進行硬件和軟件維護	• No experts required for hardware and software maintenance
4	• Poor data security	• Better data security
5	• Less chance of data recovery 資料復原	• Disaster recovery

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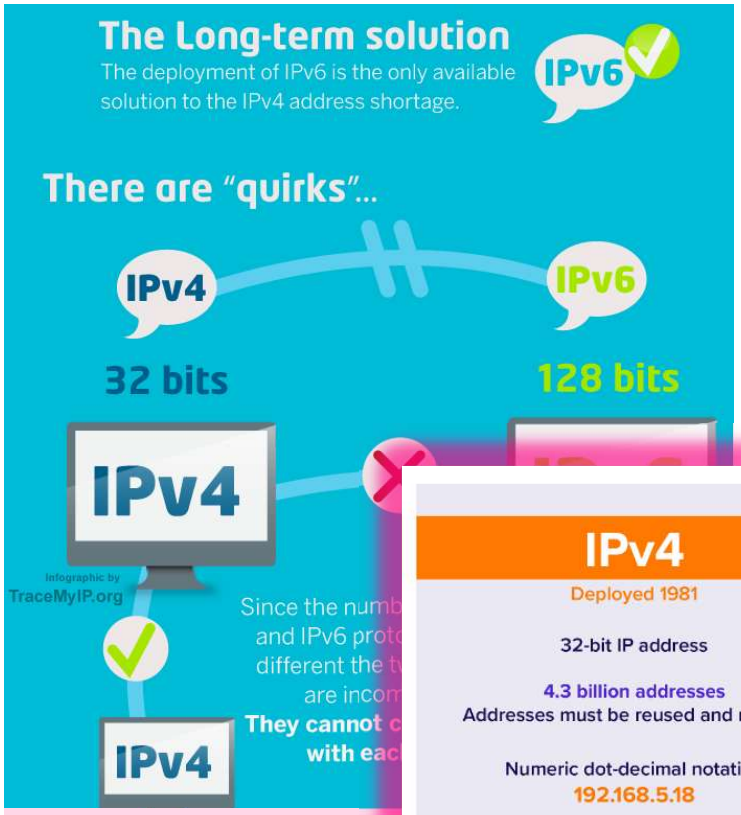
2. Why cloud computing?

本地(地端)數據中心

雲端數據中心

	本地(地端)數據中心	雲端數據中心
6	• Lack of flexibility	• High Flexibility
7	• No automatic updates	• Automatic software updates
8	• Less collaboration 較少的跨團隊&地點協作	• Teams can collaborate from widespread locations
9	• Data cannot be accessed remotely 無法遠程訪問數據	• Data can be accessed and shared anywhere over the internet
10	• Takes longer implementation time 更長的實施時間	• Rapid implementation

2. Why cloud computing? – Flexibility in IT infrastructure



Source: https://www.trace
ipv4-ipv6-address.htm

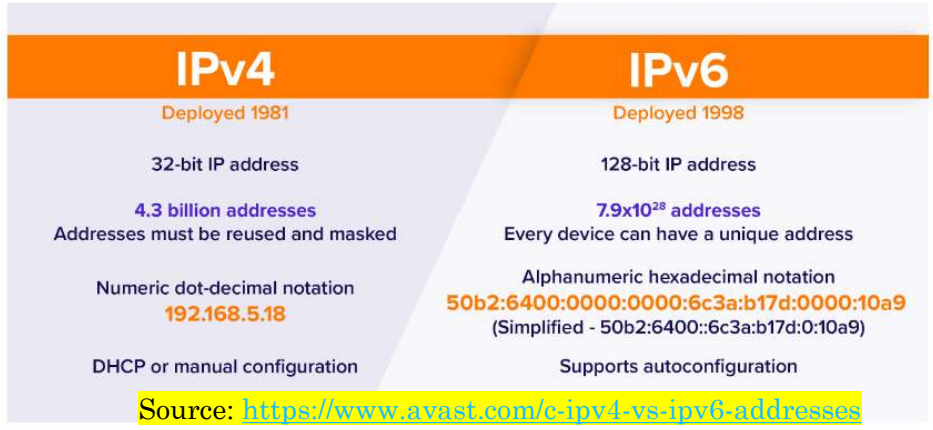
IPv6

Internet protocol 互聯網協議

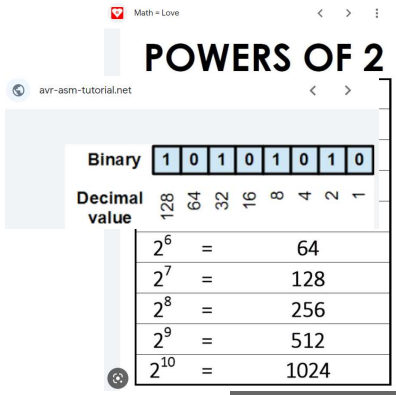
Internet Protocol version 6 is the most recent version of the Internet Protocol, the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. Wikipedia

Abbreviation: IPv6

Based on: IPv4



Source: https://www.avast.com/c-ipv4-vs-ipv6-addresses



8 binary digits

IPv4

- Comprise 4 sets of numbers, each ranging from 0 to 255 …
- E.g.: **104.103.88.45**
- Has a theoretical limit of 4.3 billion addresses
- Replacing old IPv4 equipment would be prohibitively expensive and disruptive, and so IPv6 is being slowly rolled out

IPv6

- Introduced in the late 1990s as a replacement for IPv4.
- Uses 128-bit addresses formatted as 8 groups of 4 hexadecimal numbers separated by colons [Hex numbers are represented by: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E and F.]
- IPv6 allows for a theoretical 340,282,366,920,938,463,463,374,607,431,768,211,456, or 340 undecillion addresses.
- This means that every device on the internet can have a unique IPv6 address.
- E.g.: IPv6 address looks like this — **2002:0de6:0001:0042:0100:8c2e:0370:7234**

Source: https://www.avast.com/c-ipv4-vs-ipv6-addresses

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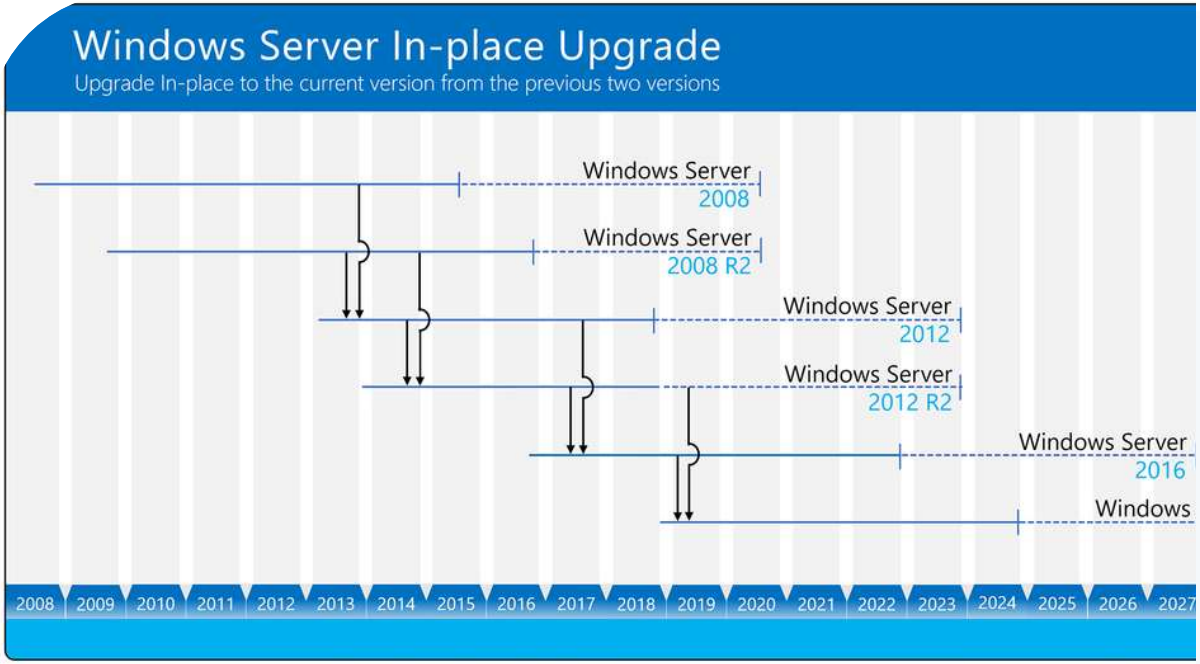
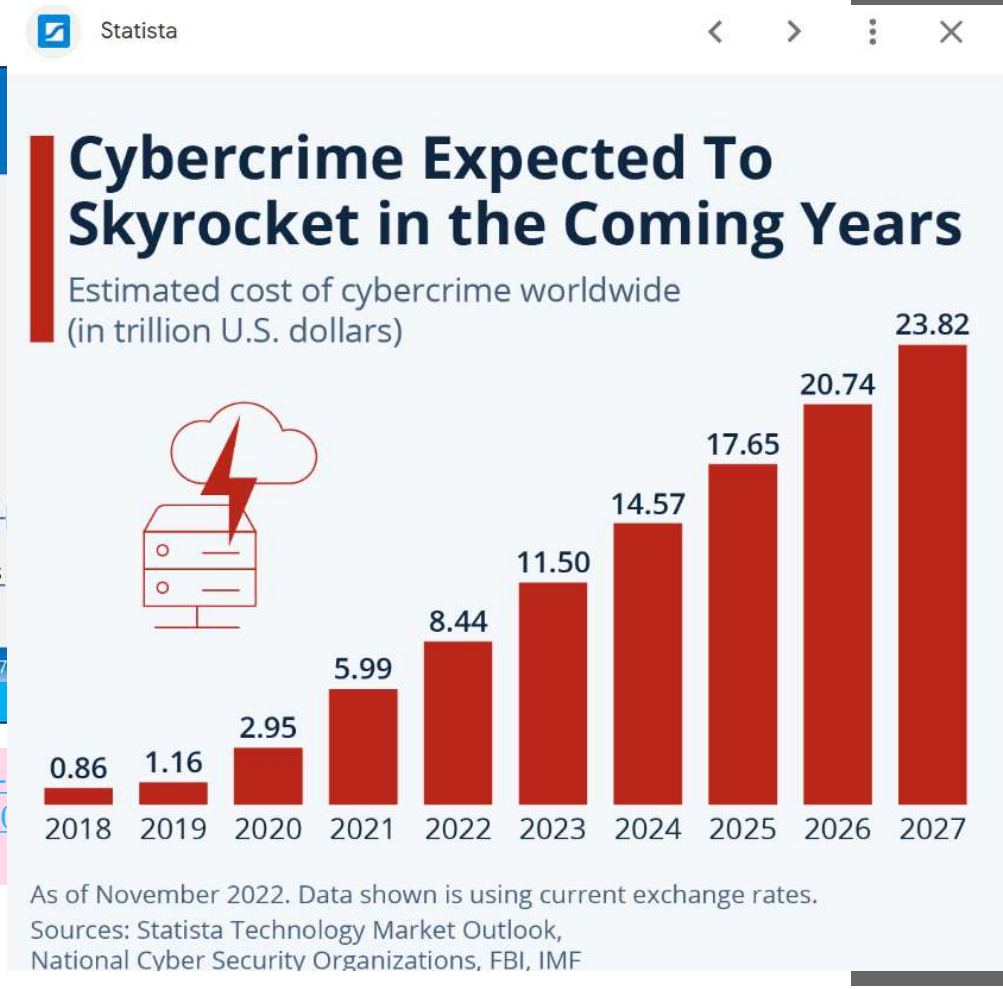
2. Why cloud computing? – Flexibility in IT infrastructure



Windows Server Upgrade Paths Diagram

Source: https://techcommunity.microsoft.com/t5/itops-talk-blog/how-to-in-place-upgrade-windows-server-200 r2-to-windows-server/ba-p/752330



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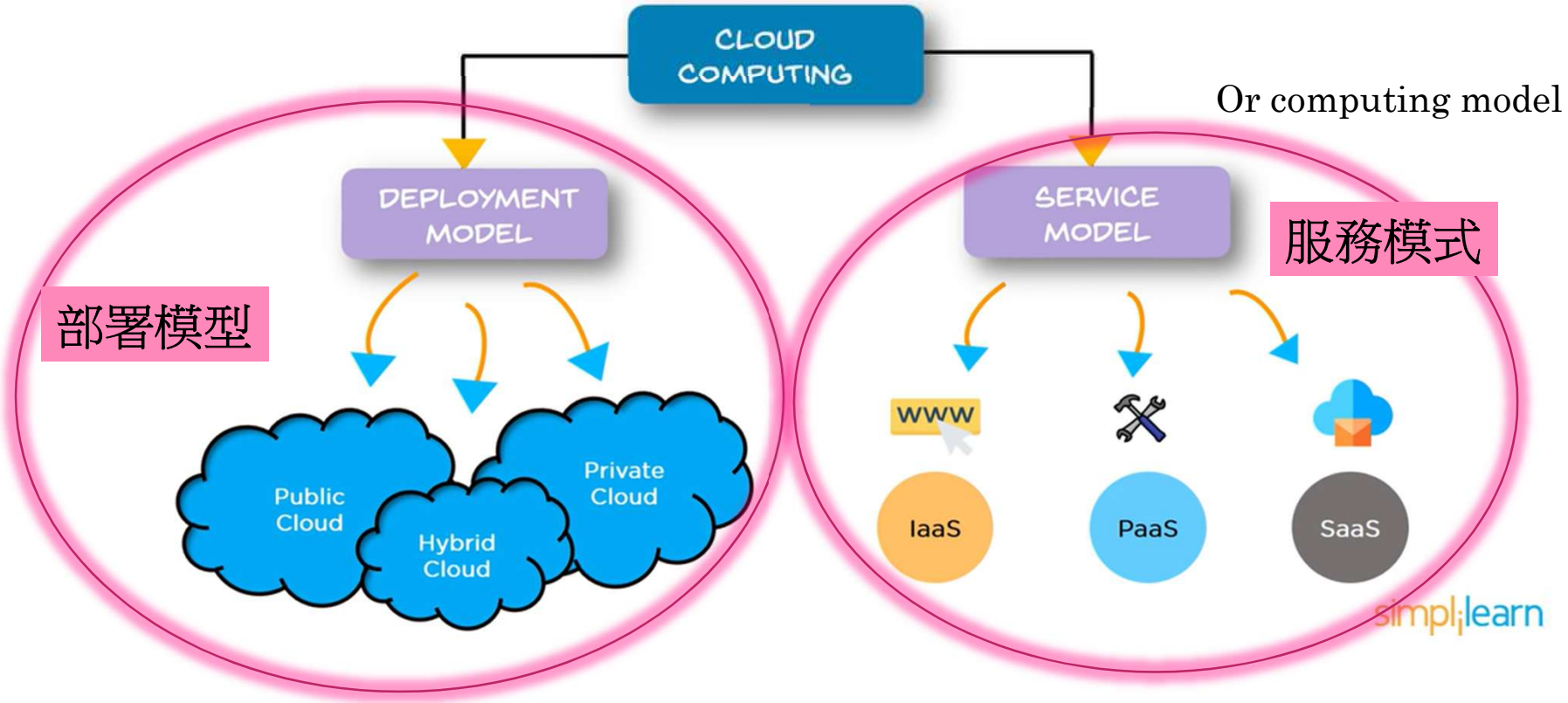
3. Categorizations of cloud computing

Two Categorizations



Or computing model

部署模型

服務模式

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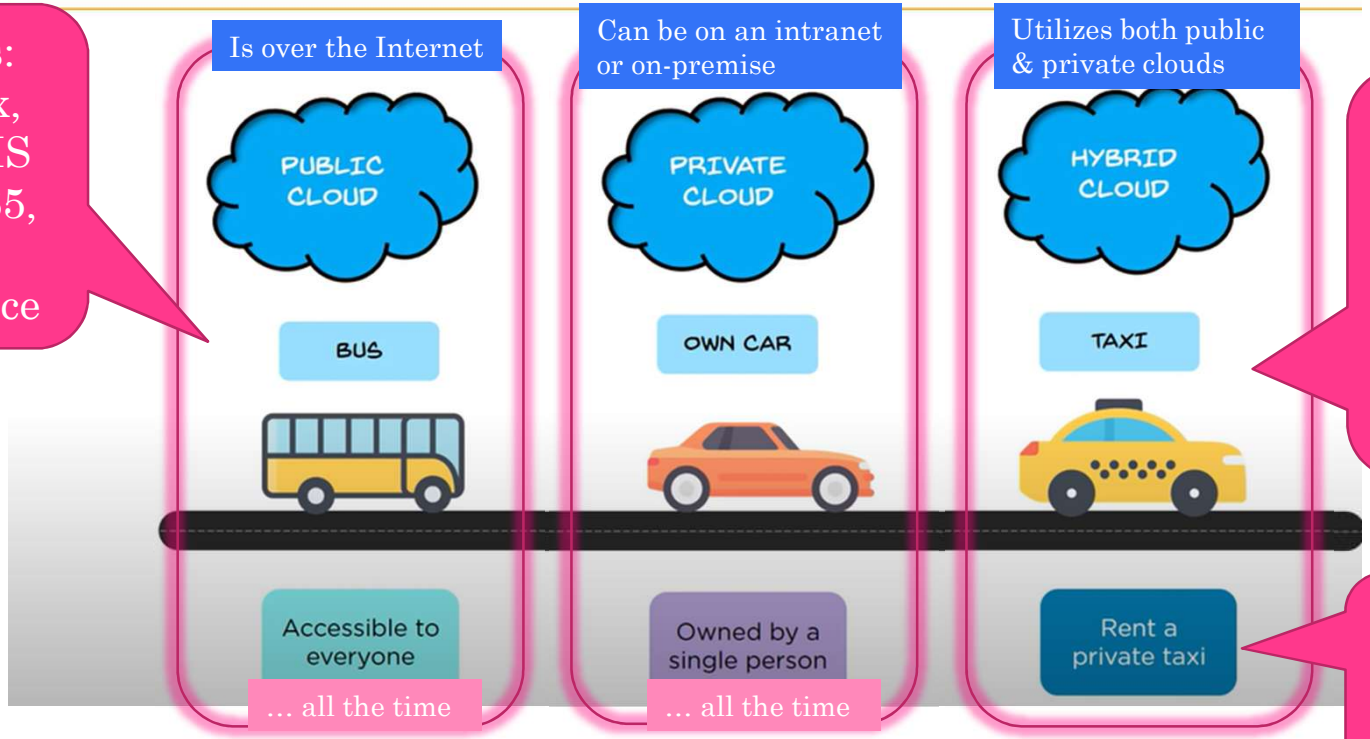
3.1. Deployment models

Celeste: They are based on the perspective of "the ownership" of the cloud

Types of Deployment Models - A comparison



Such as: Dropbox, Zoom, MS Office 365, Google Workspace

Such as: IBM Cloud Private, MS Azure Stack, VMware Cloud on AWS, Google Anthos

There are
- Moments when it is owned by the passenger, and
- Moments when it is owned by the taxi driver

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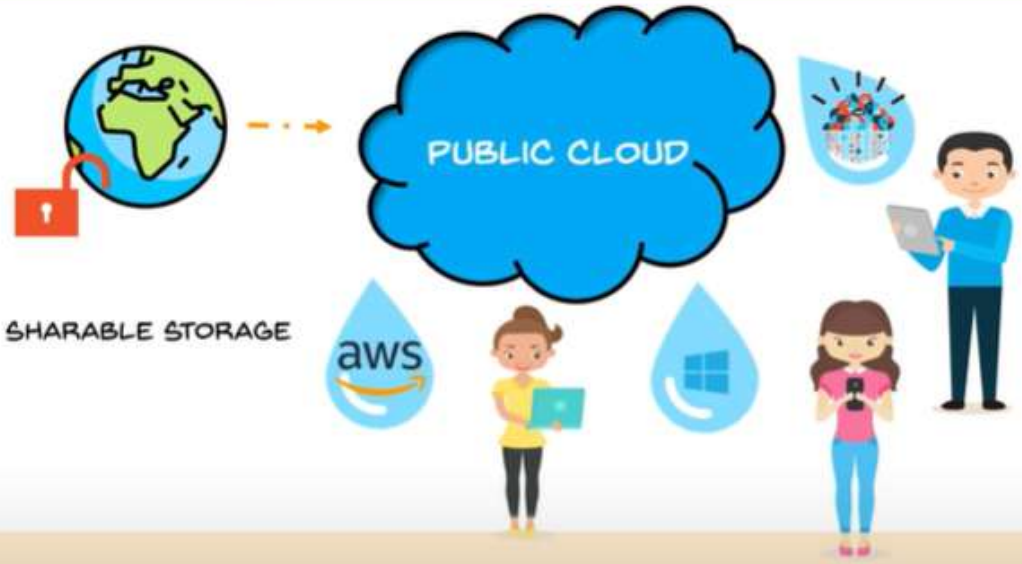
3.1. Deployment models – cloud providers

Public Cloud



The cloud infrastructure is made available to the general public over the internet and is owned by a cloud provider

Example: AWS, Microsoft Azure, IBM's Blue Cloud and Sun Cloud

Celeste:
- Google Cloud Platform,
- Alibaba Cloud

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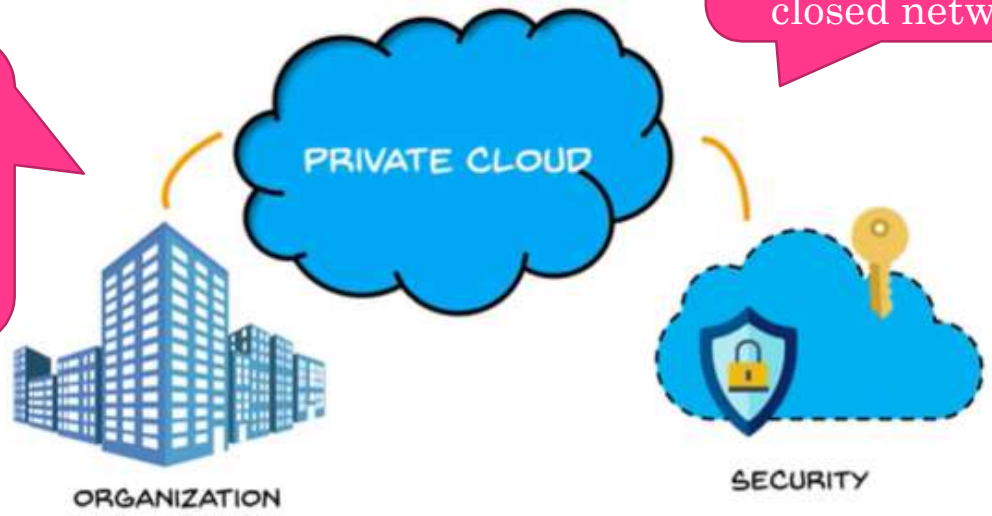
3.1. Deployment models – cloud providers

Private Cloud

… can be completely offline or within a secure, closed network

Celeste: it could simply be your own intranet (internal network)



… operated by a single organization or for an organization

The cloud infrastructure is exclusively operated by a single organization. It can be managed by the organization or a third party and may exist on-premise or off-premise

Example: AWS, VMware

3.1. Deployment models – cloud providers

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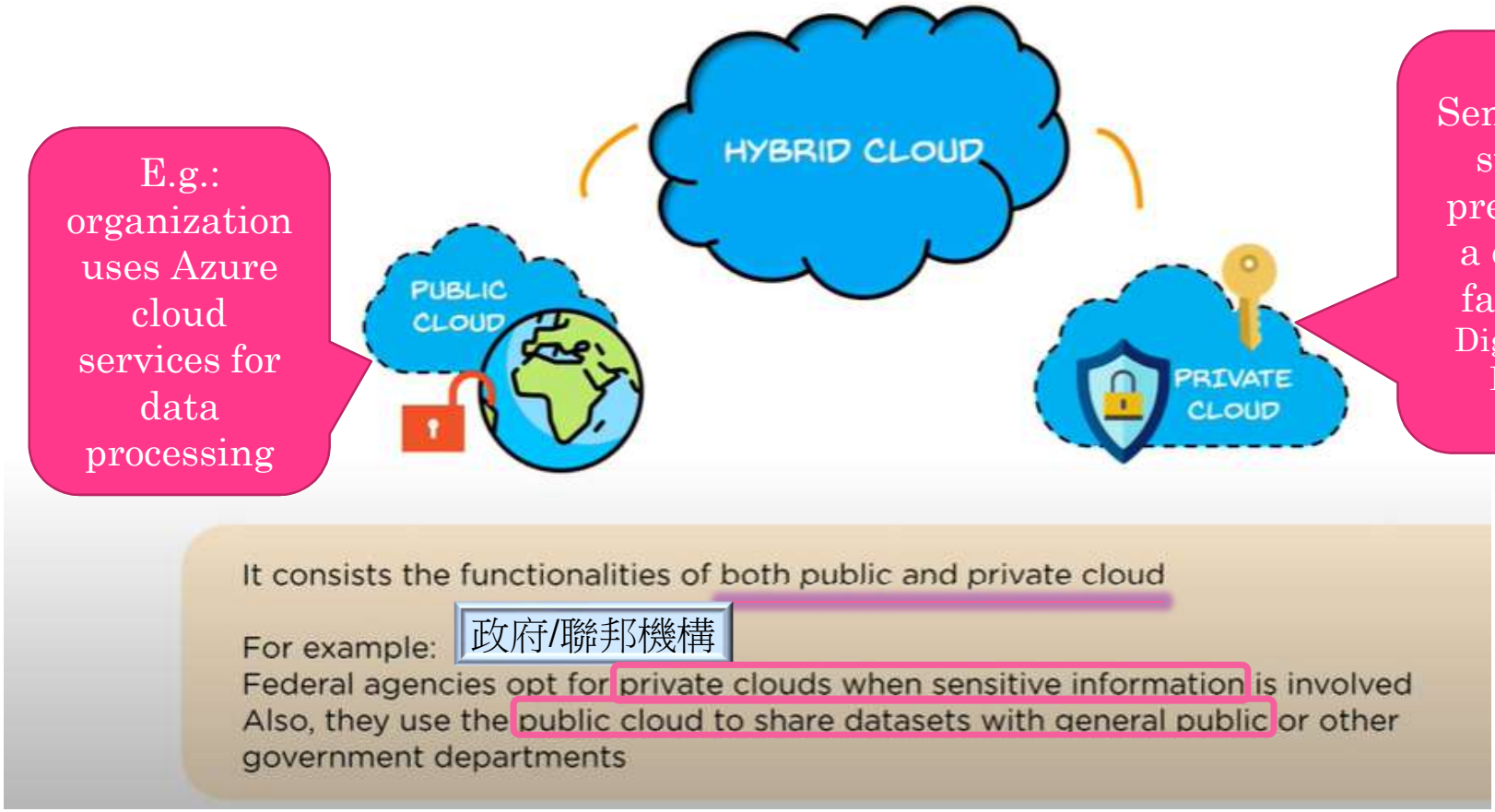
Hybrid Cloud



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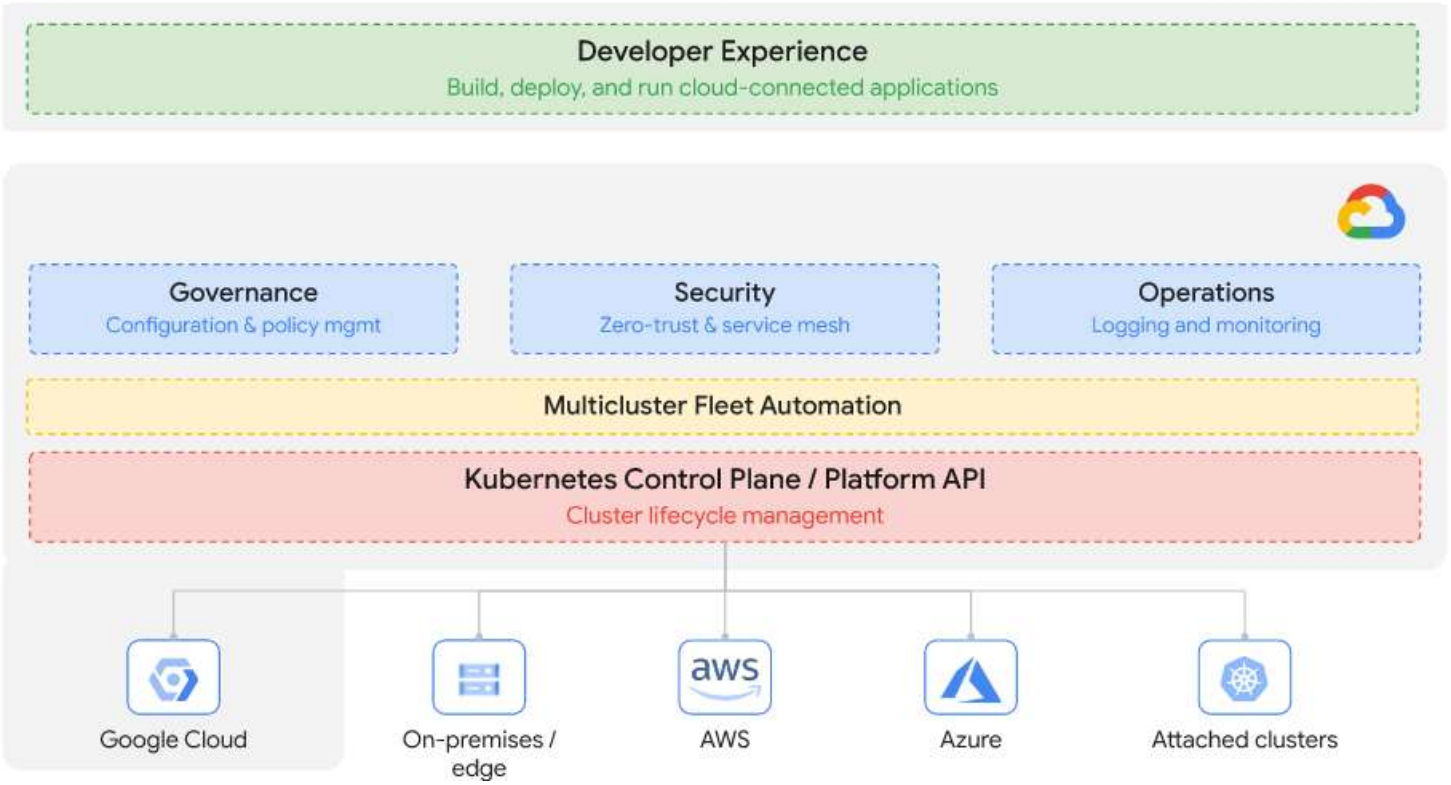
3.1. An example of a hybrid cloud: Google Anthos



- Anthos *works* across multiple clusters and infrastructure providers
- You can enable the entire Anthos platform to use all available features, including multi-cloud and hybrid cloud capabilities

Source: https://cloud.google.com/anthos/docs/concepts/overview

3.1. An example of a hybrid cloud: Google Anthos

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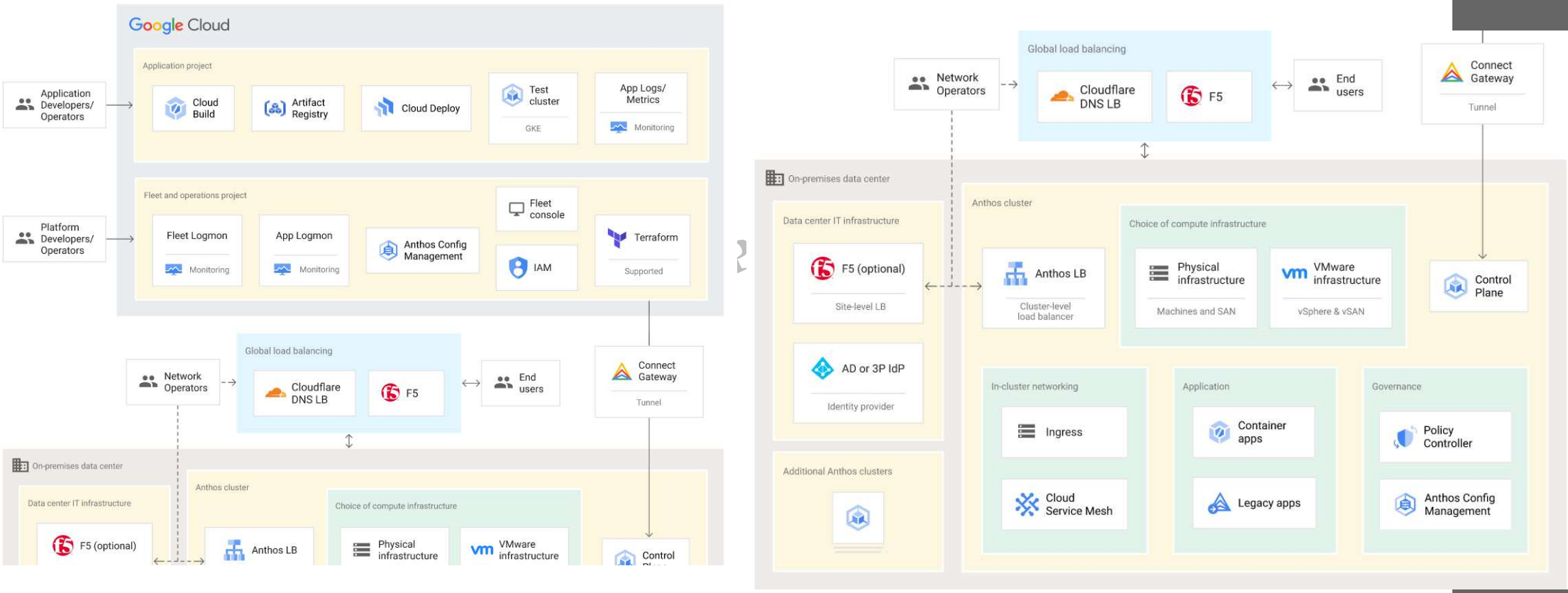

Source: https://cloud.google.com/anthos/docs/architecture/anthos-hybrid-environment

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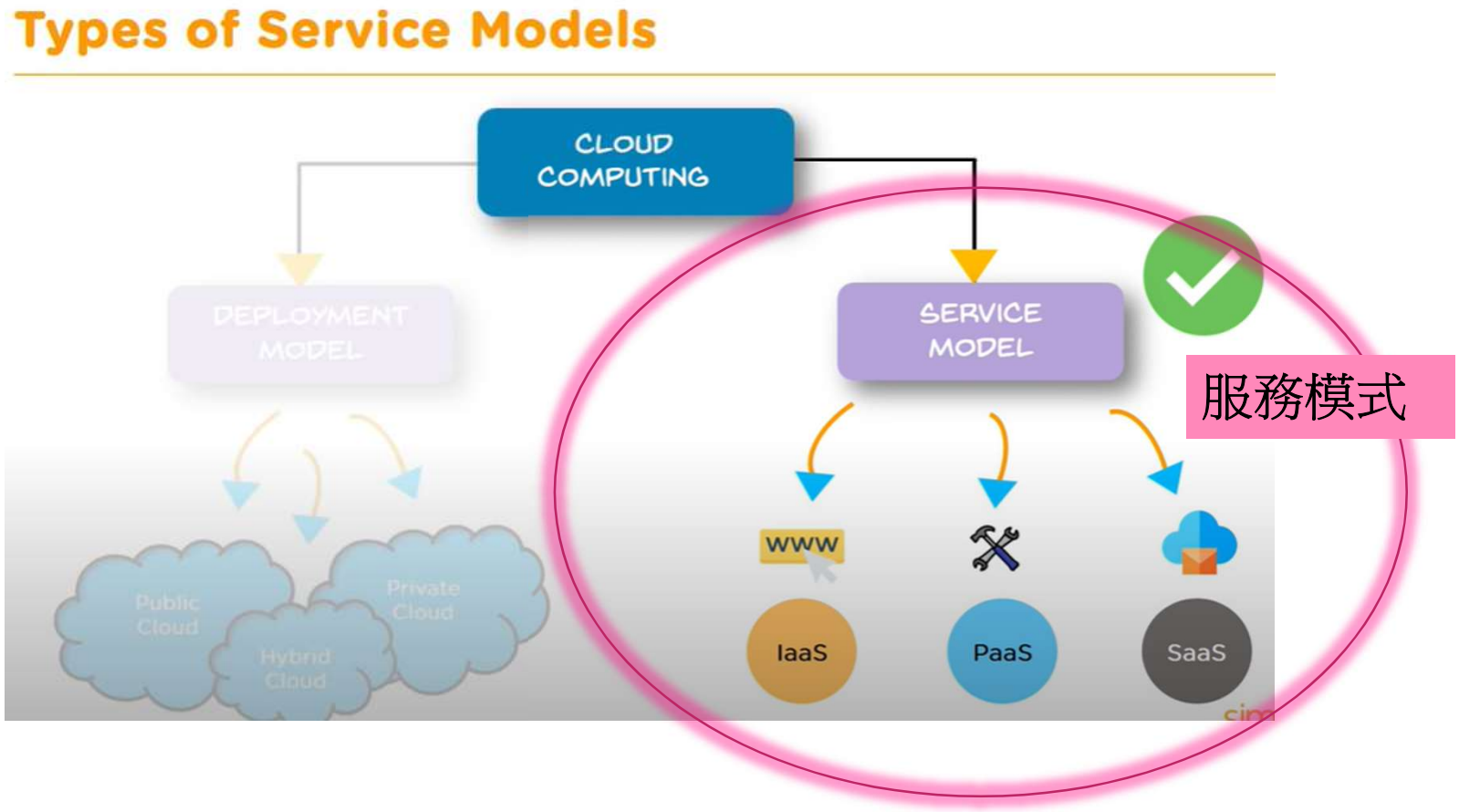
3.2. Service models



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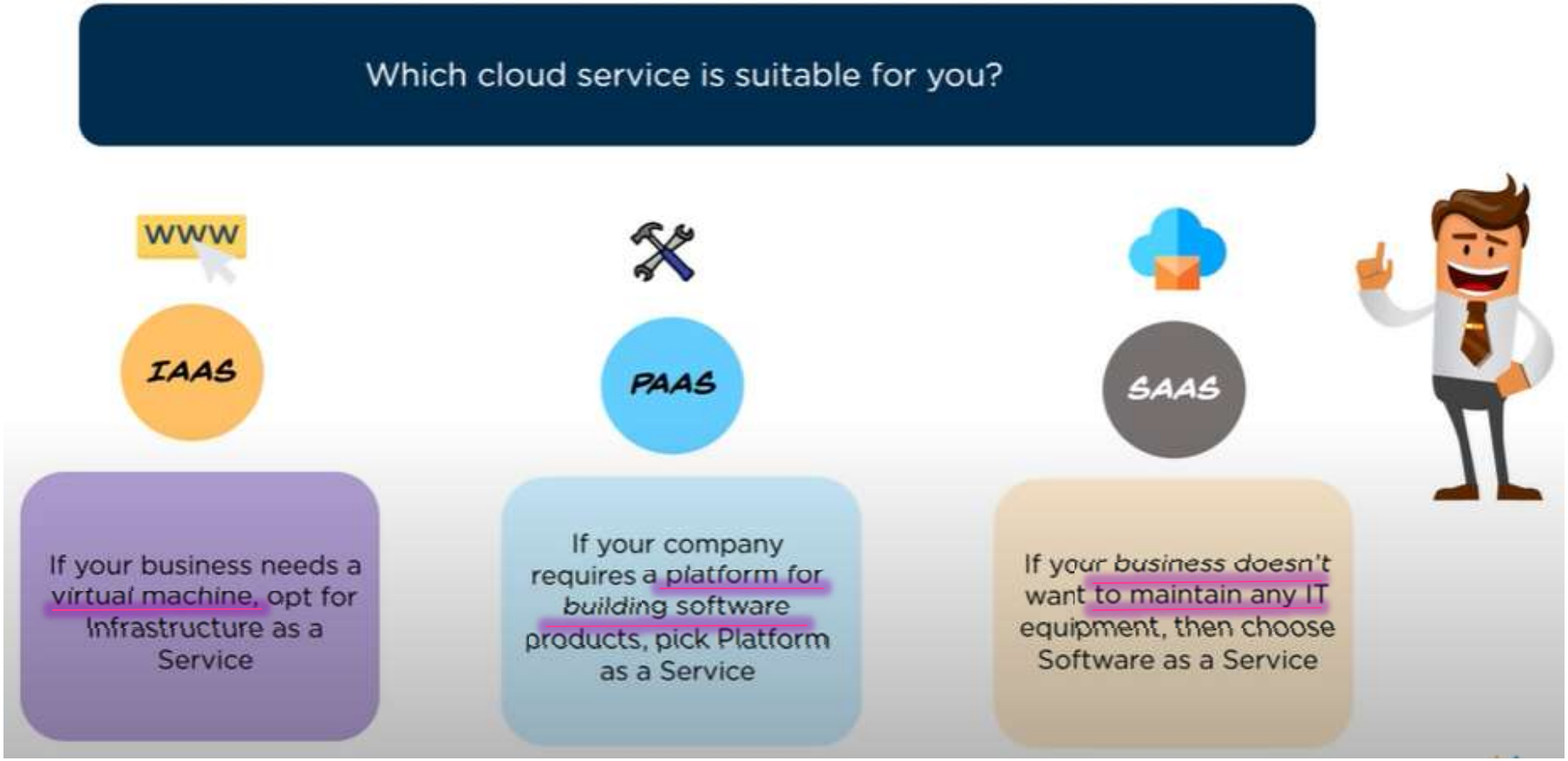
3.2. Service models



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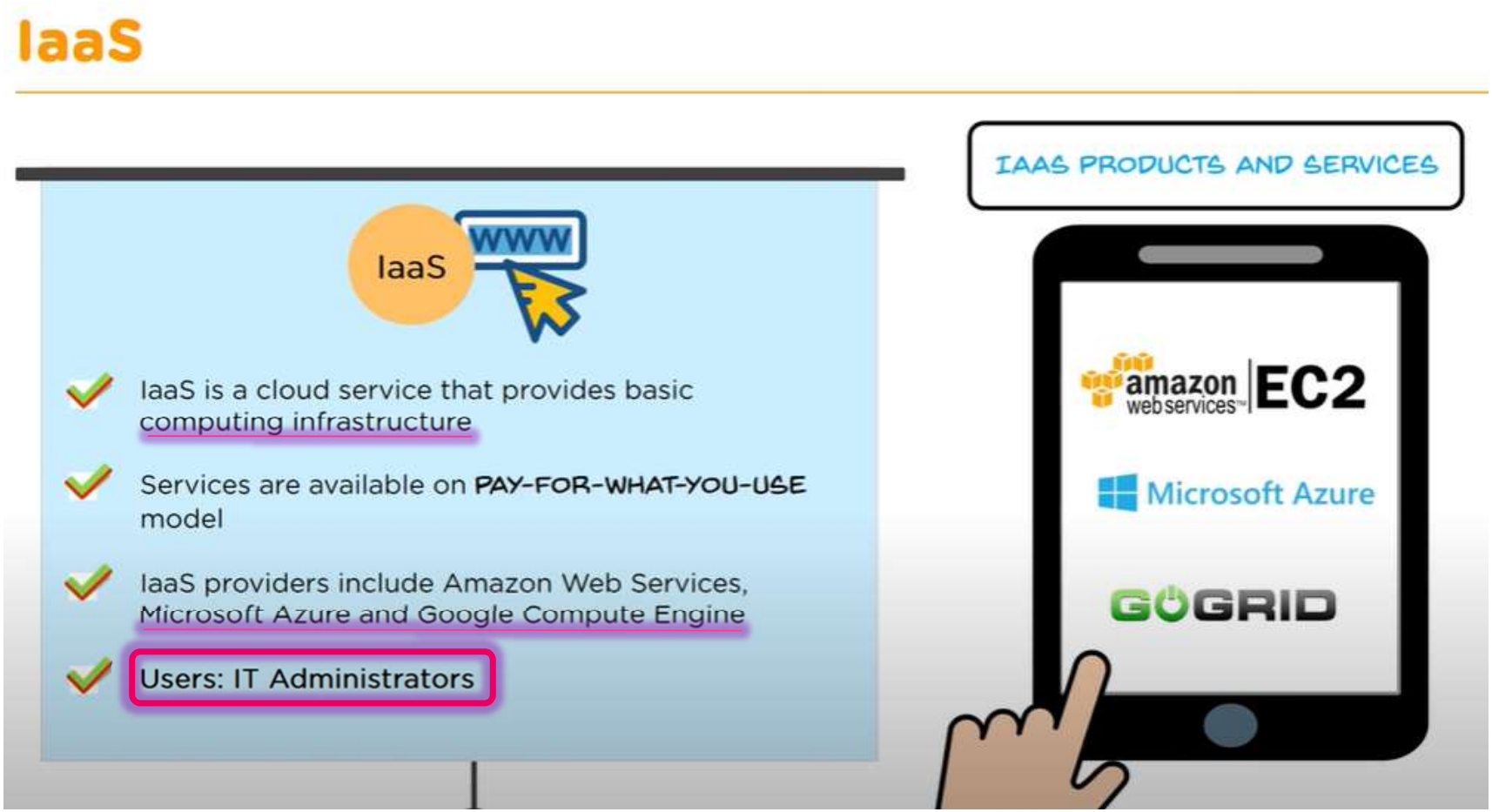
3.2. Service models – cloud providers



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3.2. Service models – cloud providers

PaaS

Celeste: is GitHub a PaaS?

PaaS

- PaaS provides cloud platforms and runtime environments for developing, testing, and managing applications
- It allows software developers to deploy applications without requiring all the related infrastructure
- Users: Software Developers

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3.2. Service models – cloud providers: PaaS

- PaaS (Platform as a Service) is a cloud computing model in which a cloud provider offers a platform to users for developing, deploying, and managing applications. Here are some examples of PaaS:
  1. **Heroku**: A cloud-based platform for building, deploying, and managing web applications in multiple programming languages, such as Ruby, Python, and Node.js.
  2. **Microsoft Azure**: A cloud computing platform that offers PaaS services, including Azure App Service for building and deploying web applications and Azure Functions for serverless computing.
  3. **Google App Engine**: A fully managed serverless platform for developing and deploying web applications in multiple programming languages, such as Python, Java, and Go.
  4. **AWS Elastic Beanstalk**: A fully managed PaaS service that enables developers to deploy and scale web applications quickly and easily using popular languages and frameworks, such as Java, .NET, and Python.
  5. **Salesforce Platform**: A cloud-based platform that offers PaaS services, including
     1. Force.com for building and deploying business applications and
     2. Heroku for developing and deploying web applications.

Source: ChatGPT-3.5, 30th April, 2023

Celeste: information verified!

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3.2. Service models – cloud providers

Celeste:

- Have you heard of eBay? Shopify? 1shop?
- ➔ are "web-based retail" services providers
- Are selling SaaS to you
- Amazon Marketplace (for third-party sellers) & Amazon Prime (for streaming video and music)

1shop.tw
https://1shop.tw ·
1shop 一頁購物

SaaS

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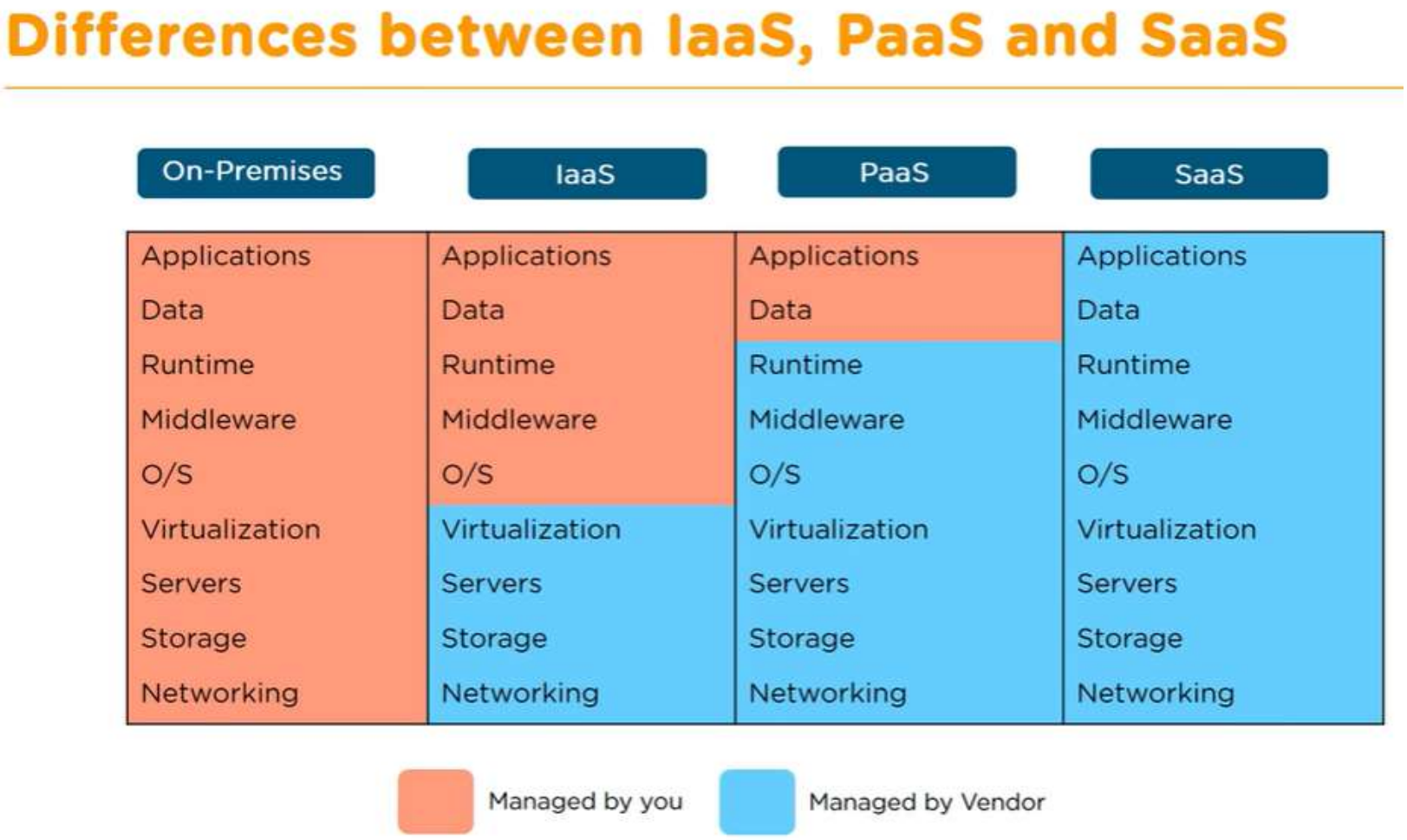
3.3. Service models – differences



4. Cloud infrastructure service providers

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4. Cloud infrastructure service providers

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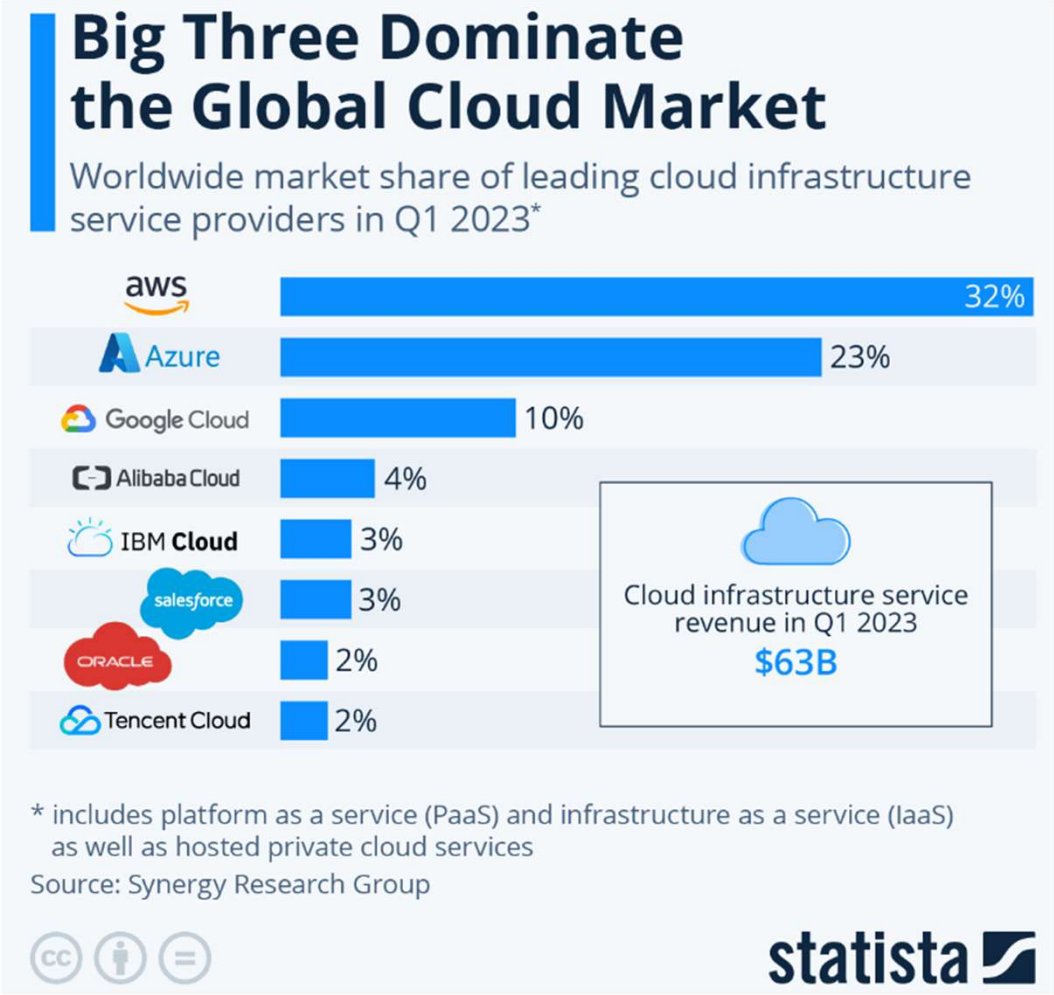

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THANK YOU!

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Hexadecimal number system

Byju's

HEXADECIMAL NUMBER SYSTEM TABLE

BYJU'S The Learning App

Decimal Numbers	4-bit Binary Number	Hexadecimal Number
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

2002:0de6:0001:0042:0100:8c2e:0370:7234

Celeste:
IPv6 ()

- Given: 128 bits IP address, 8 groups of 4 hexadecimal number
- → each group (= 128/8) = 16 bits
- → 16 bits = 4 hexadecimal number
- → each hexadecimal number (=16/4) = 4 bits
- → 2^4 = 16 (numbers + symbols)

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Cloud Computing Prediction

- With the public cloud market—cloud apps (SaaS), cloud development and data platforms (PaaS), and cloud infrastructure (IaaS)—expected to reach $411 billion by 2022,
- [For more detailed report, please refer to Forrester's Predictions 2020: Cloud Computing report.]
- According to Forrester's, the major cloud vendors:
  - AWS,
  - Google,
  - Microsoft, and
  - Alibaba
- IBM and Oracle have attempted to play the field too

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Source: Bayern, M., 2019, Forrester: The 5 ways cloud computing will change in 2020, URL: https://www.techrepublic.com/article/forrester-the-5-ways-cloud-computing-will-change-in-2020/