

<image/nation>

Tech Training Series

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BUSINESS  
SCHOOL  
港大經管學院

# Fundamental Cloud Computing

2024/2025

Hands on Cloud Computing for Data Scientists

*by*

Sunny NG

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To download the slides

[bit.ly/in-download](https://bit.ly/in-download)



# In this workshop (3 hours)

- What is cloud computing?
- Cloud Deployment: Public, Private & Hybrid
- Cloud Services Delivery Model: IaaS, PaaS, SaaS
- Cloud professional certification examinations
- Hands-on Cloud Practicing
  - free AWS lab accounts will be provided

# Sunny Ng 吳新陸



Master of Fine Art, CityU (HK)  
Master of Science, HKU  
Bachelor of Science, UH (UK)

- Founder / Master Trainer Image Nation
- Part-time Lecturer HKU, HKUSPACE, City University of Hong Kong
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- Certified Azure AI Engineer
- AWS Solution Architect - Associate
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- [github.com/ngsanluk](https://github.com/ngsanluk)

# What is Cloud Computing?

## Formal Cloud Definition

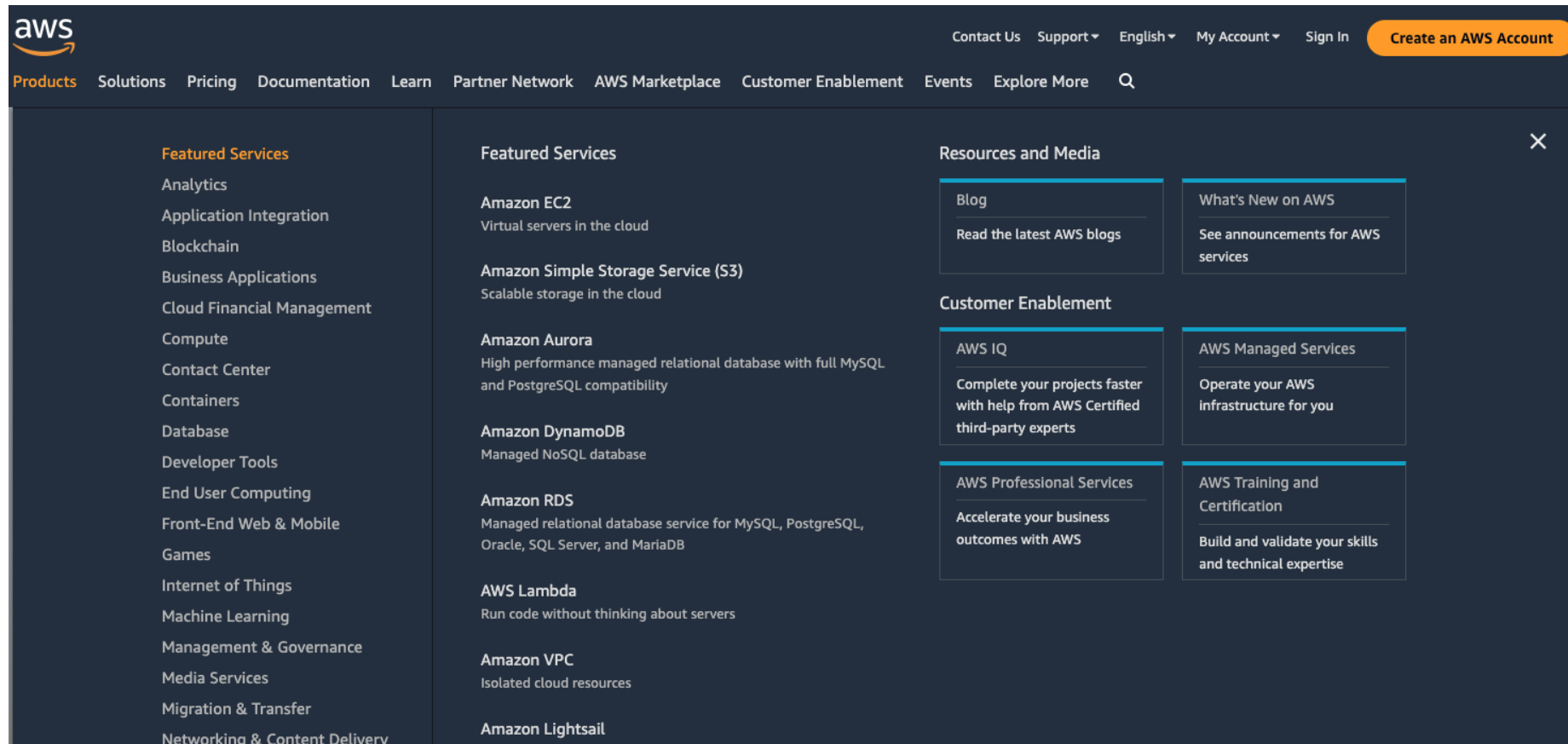
Cloud computing is the **on-demand** availability of **computer system resources**, especially **data storage** and **computing power**, without direct active management by the user.

# Wide varieties cloud services

- Cloud providers usually offer wide collection of cloud services.
- Some of the services are aiming at **technical users**.
- While some the services are aiming at **average computer users**.

# Amazon Web Service - Products

<https://aws.amazon.com>



The screenshot displays the AWS Products page. At the top, the AWS logo is on the left, and navigation links for 'Contact Us', 'Support', 'English', 'My Account', 'Sign In', and 'Create an AWS Account' are on the right. Below this is a horizontal menu with 'Products' highlighted, followed by 'Solutions', 'Pricing', 'Documentation', 'Learn', 'Partner Network', 'AWS Marketplace', 'Customer Enablement', 'Events', and 'Explore More'. The main content area is divided into three columns. The left column, titled 'Featured Services', lists various AWS services including Analytics, Application Integration, Blockchain, Business Applications, Cloud Financial Management, Compute, Contact Center, Containers, Database, Developer Tools, End User Computing, Front-End Web & Mobile, Games, Internet of Things, Machine Learning, Management & Governance, Media Services, Migration & Transfer, and Networking & Content Delivery. The middle column, also titled 'Featured Services', provides detailed descriptions for Amazon EC2 (Virtual servers in the cloud), Amazon Simple Storage Service (S3) (Scalable storage in the cloud), Amazon Aurora (High performance managed relational database with full MySQL and PostgreSQL compatibility), Amazon DynamoDB (Managed NoSQL database), Amazon RDS (Managed relational database service for MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB), AWS Lambda (Run code without thinking about servers), Amazon VPC (Isolated cloud resources), and Amazon Lightsail. The right column, titled 'Resources and Media', includes a 'Blog' section with the link 'Read the latest AWS blogs', a 'What's New on AWS' section with the link 'See announcements for AWS services', an 'AWS IQ' section with the link 'Complete your projects faster with help from AWS Certified third-party experts', an 'AWS Managed Services' section with the link 'Operate your AWS infrastructure for you', an 'AWS Professional Services' section with the link 'Accelerate your business outcomes with AWS', and an 'AWS Training and Certification' section with the link 'Build and validate your skills and technical expertise'. A close button (X) is located in the top right corner of the main content area.

**Featured Services**

- Analytics
- Application Integration
- Blockchain
- Business Applications
- Cloud Financial Management
- Compute
- Contact Center
- Containers
- Database
- Developer Tools
- End User Computing
- Front-End Web & Mobile
- Games
- Internet of Things
- Machine Learning
- Management & Governance
- Media Services
- Migration & Transfer
- Networking & Content Delivery

**Featured Services**

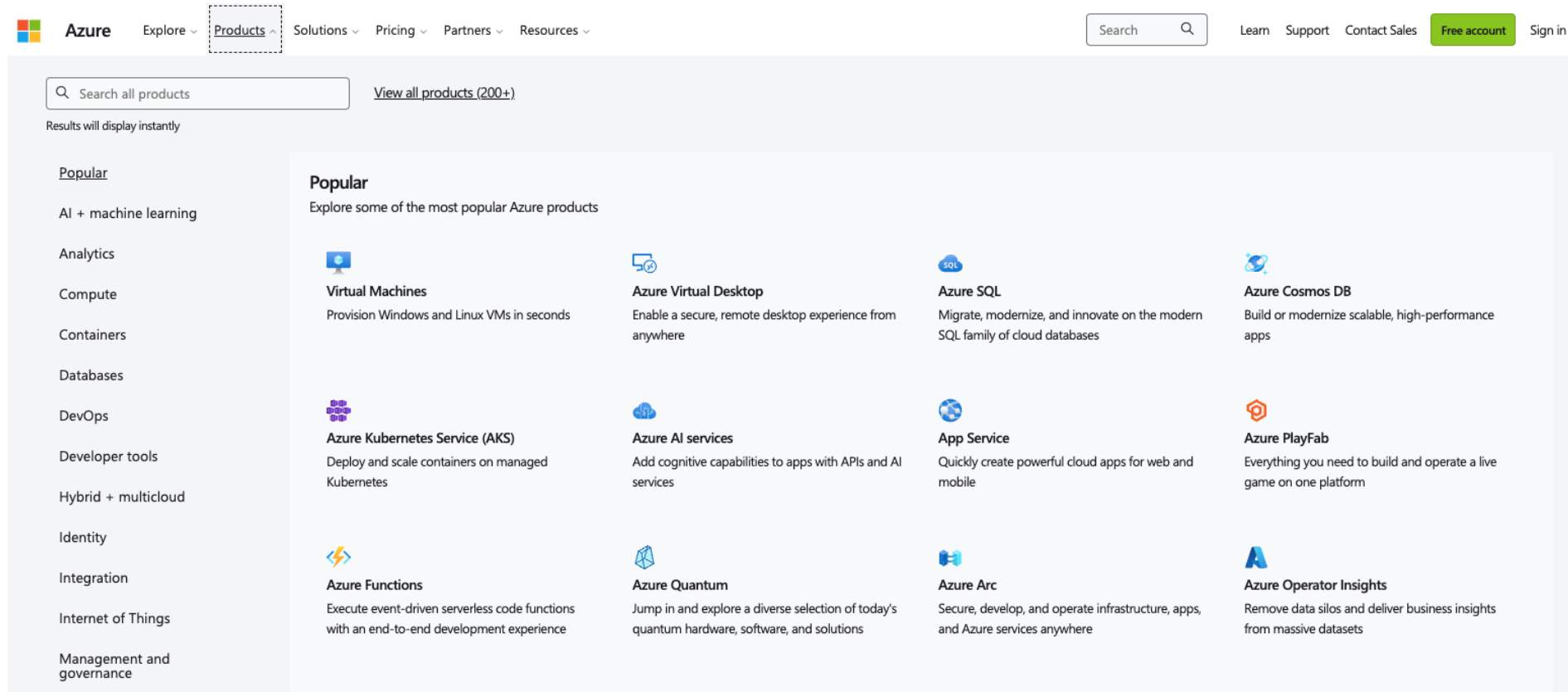
- Amazon EC2**  
Virtual servers in the cloud
- Amazon Simple Storage Service (S3)**  
Scalable storage in the cloud
- Amazon Aurora**  
High performance managed relational database with full MySQL and PostgreSQL compatibility
- Amazon DynamoDB**  
Managed NoSQL database
- Amazon RDS**  
Managed relational database service for MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB
- AWS Lambda**  
Run code without thinking about servers
- Amazon VPC**  
Isolated cloud resources
- Amazon Lightsail**

**Resources and Media**

- Blog**  
Read the latest AWS blogs
- What's New on AWS**  
See announcements for AWS services
- AWS IQ**  
Complete your projects faster with help from AWS Certified third-party experts
- AWS Managed Services**  
Operate your AWS infrastructure for you
- AWS Professional Services**  
Accelerate your business outcomes with AWS
- AWS Training and Certification**  
Build and validate your skills and technical expertise

# Microsoft Azure - Products

<https://azure.microsoft.com>



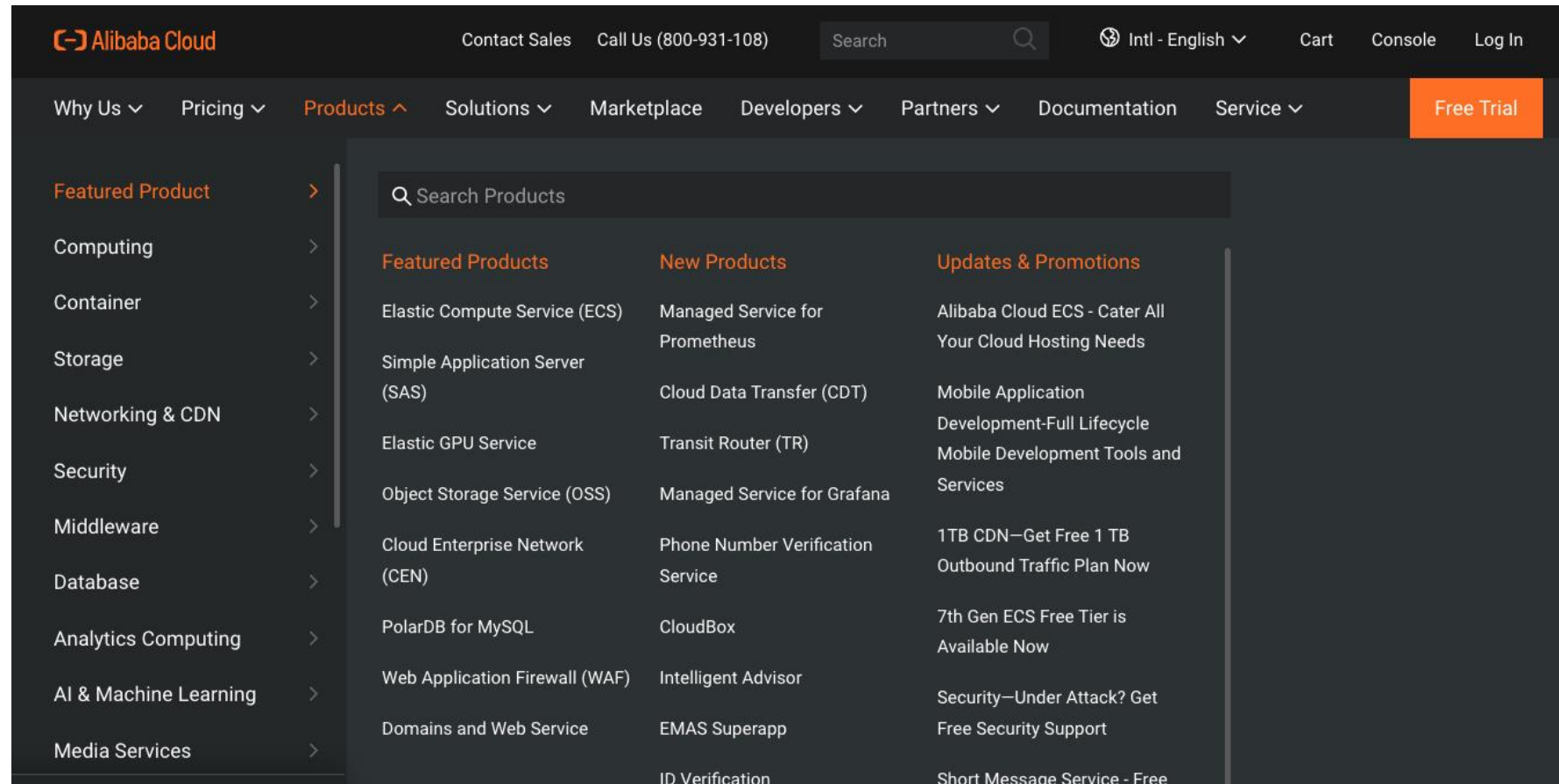
The screenshot shows the Microsoft Azure website's 'Products' section. The top navigation bar includes the Azure logo, 'Explore', 'Products' (highlighted with a dashed box), 'Solutions', 'Pricing', 'Partners', and 'Resources'. On the right, there is a search bar, links for 'Learn', 'Support', 'Contact Sales', a 'Free account' button, and a 'Sign in' link. Below the navigation bar, a search bar on the left says 'Search all products' with a 'View all products (200+)' link. A sidebar on the left lists various categories: 'Popular', 'AI + machine learning', 'Analytics', 'Compute', 'Containers', 'Databases', 'DevOps', 'Developer tools', 'Hybrid + multicloud', 'Identity', 'Integration', 'Internet of Things', and 'Management and governance'. The main content area is titled 'Popular' and 'Explore some of the most popular Azure products'. It features a grid of 12 product cards, each with an icon, title, and brief description.

Product	Description
Virtual Machines	Provision Windows and Linux VMs in seconds
Azure Virtual Desktop	Enable a secure, remote desktop experience from anywhere
Azure SQL	Migrate, modernize, and innovate on the modern SQL family of cloud databases
Azure Cosmos DB	Build or modernize scalable, high-performance apps
Azure Kubernetes Service (AKS)	Deploy and scale containers on managed Kubernetes
Azure AI services	Add cognitive capabilities to apps with APIs and AI services
App Service	Quickly create powerful cloud apps for web and mobile
Azure PlayFab	Everything you need to build and operate a live game on one platform
Azure Functions	Execute event-driven serverless code functions with an end-to-end development experience
Azure Quantum	Jump in and explore a diverse selection of today's quantum hardware, software, and solutions
Azure Arc	Secure, develop, and operate infrastructure, apps, and Azure services anywhere
Azure Operator Insights	Remove data silos and deliver business insights from massive datasets



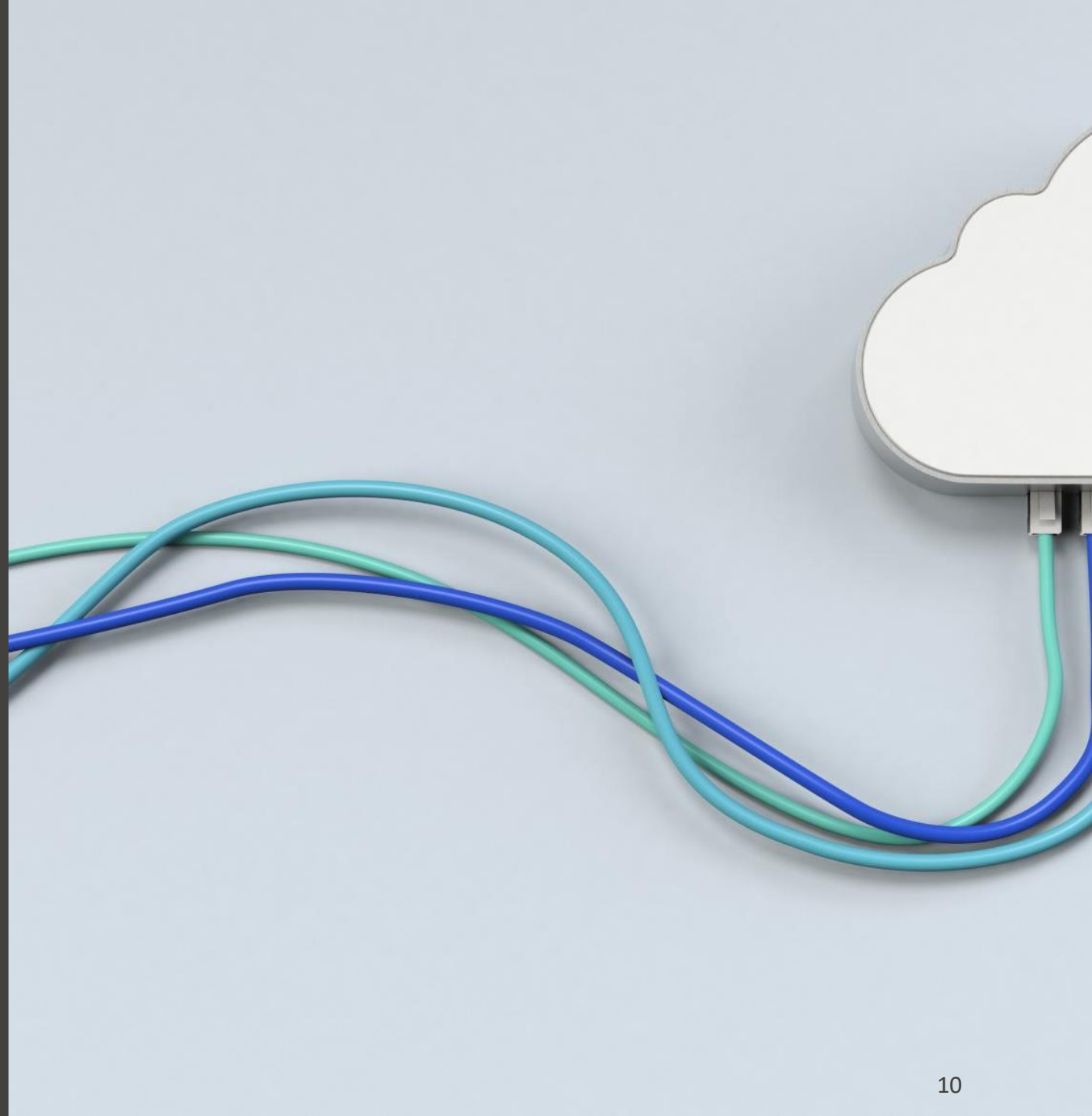
# Alibaba Cloud - Products

<https://www.alibabacloud.com>



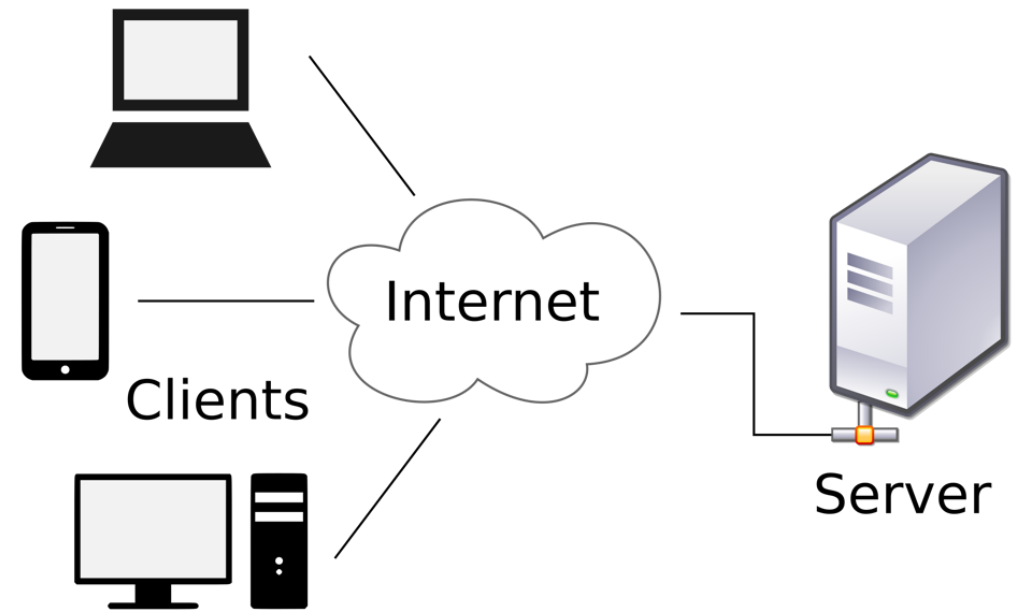
A more friendly cloud definition

Consuming  
**computation**  
**resources** (hardware and  
software) **by rental**



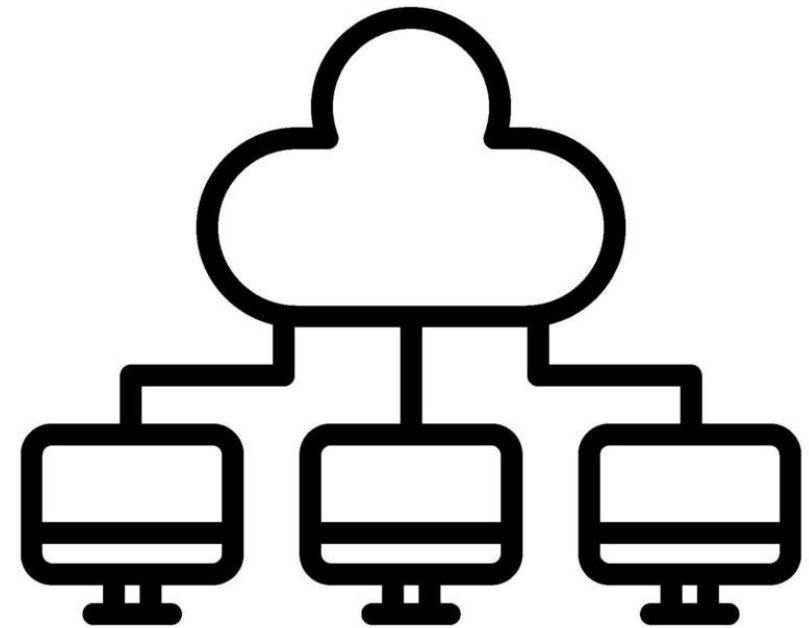
# Why the name Cloud Computing?

- Cloud is the symbol to represent the **Internet** in the classical client/server application architecture
- The cloud symbol means many intermediate nodes in between a client and a server
  - Imagine a client at HK connects to a server at the US
  - The internet is HUGE network



# So, Cloud Computing is ...

The **provision** of  
computation  
resources over **the**  
**cloud** (the Internet)  
by rental



# Before & After

## ■ Before cloud, we need to

- setup our own data center/server room
- invest enormously to purchase hardware and software
- we need to plan and purchase advanced

## ■ After cloud computing enters market

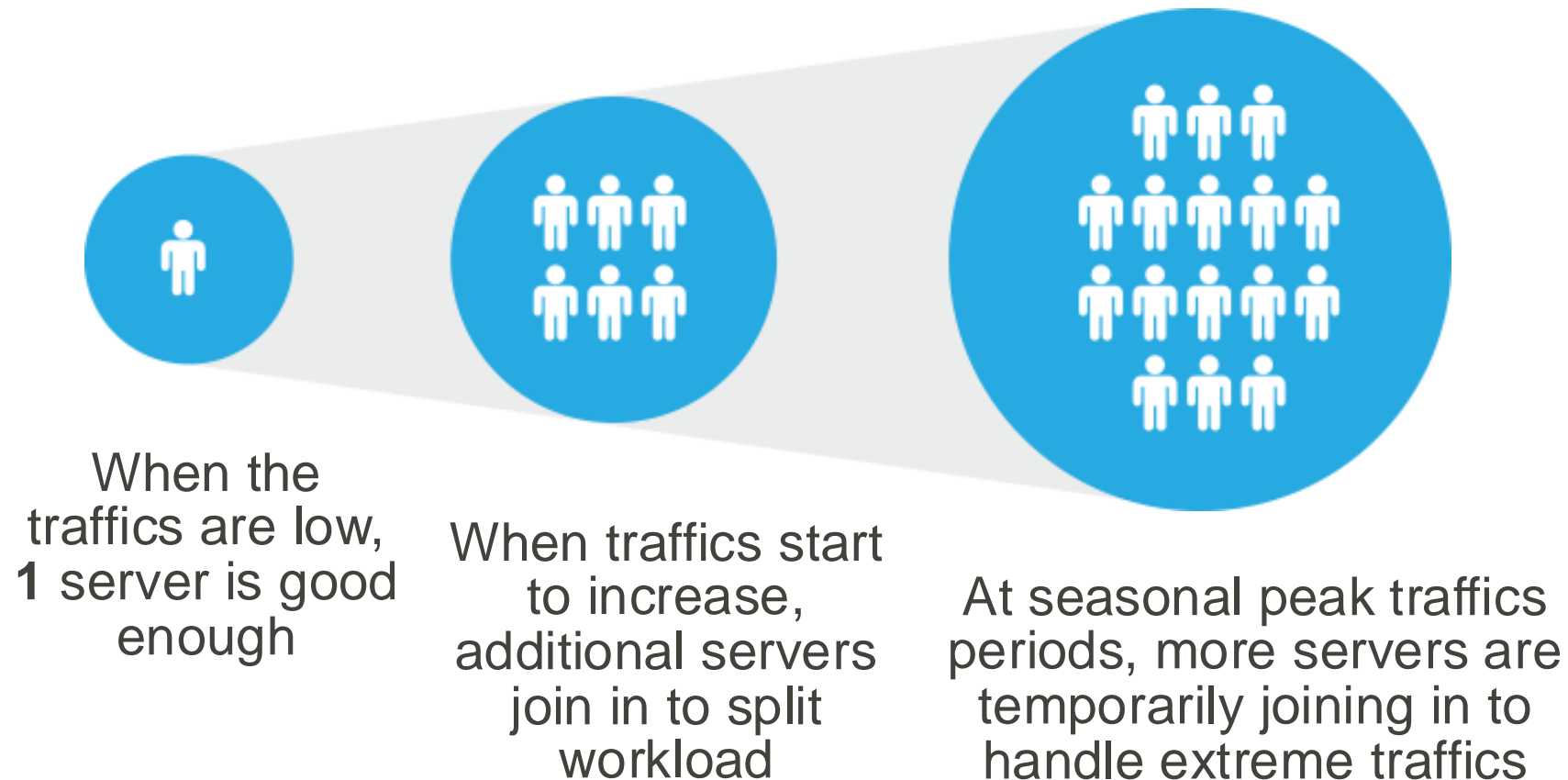
- we rent computation
- We rent it as we need it
- We don't have to plan/purchase ahead. Just a few click to gain cloud.
- We can stop anytime if we no longer need it.

Understanding what benefit  
cloud computing is bring will  
help you know cloud better

# The benefits of Cloud Computing

- You don't have to own the computation equipment
- You rent it when you need it
- You pay as you use
- You can rent a server for one **MINUTE**
- You can stop anytime
- You can easily scale up and scale down your computation power to fit your business needs.
- And it's automatic

# Cloud is effortlessly scalable





# Limitless Computation Power

Cloud providers build their data center to provide “limitless” computation power.







○ Regions  
○ Coming Soon

# AWS Global Infrastructure

# Cloud Deployment Types

- Public Cloud
  - E.g. AWS, Azure, Alibaba Cloud
- Private Cloud
- Hybrid Cloud

# Public Cloud

- The most common type of cloud computing deployment
- With a public cloud, all hardware, software, and other supporting infrastructure are owned and managed by the cloud provider
- In a public cloud, you share the same hardware, storage, and network devices with other organizations (cloud tenants)
- One can access cloud services and manage your cloud account using a web browser.

# Private Cloud

- A private cloud consists of cloud computing resources used exclusively by one business or organization.
  - Some organization are required to use private cloud for compliance
- The private cloud can be physically located at an organization's on-site datacenter, or it can be hosted by a third-party service provider.

# Hybrid Cloud

- A hybrid cloud is a type of cloud computing that combines private cloud with a public cloud.
- Hybrid clouds allow data and apps to move between the two environments in a very flexible manners.

# Cloud Services Delivery Types

- **IaaS** - Infrastructure as a Service
- **PaaS** - Platform as a Service
- **SaaS** - Software as a Service

SaaS



# SaaS - 1

- Software as a Service
- Targeting average users
- Delivering software applications over the Internet
- On demand and typically on a subscription basis
- The highest level of utilizing hardware/software from a cloud providers
- No maintenance nor software development are required

# SaaS - 2

- With SaaS, cloud providers host and manage the software application and underlying infrastructure, and handle any maintenance, like **software upgrades** and **security patching**.
- Users connect to the application over the Internet, usually with a web browser on their phone, tablet, or PC.

# SaaS examples

Software developments  
is NOT needed

# SaaS Examples

- In the SaaS model, cloud providers install and operate application software in the cloud and cloud users access the software from cloud clients
- Cloud User can only change application's configuration settings
- The pricing model is typically by monthly or yearly flat fee per user



# Google Workspace vs. Microsoft Office

Google Workspace  
is cloud based



Docs



Sheets

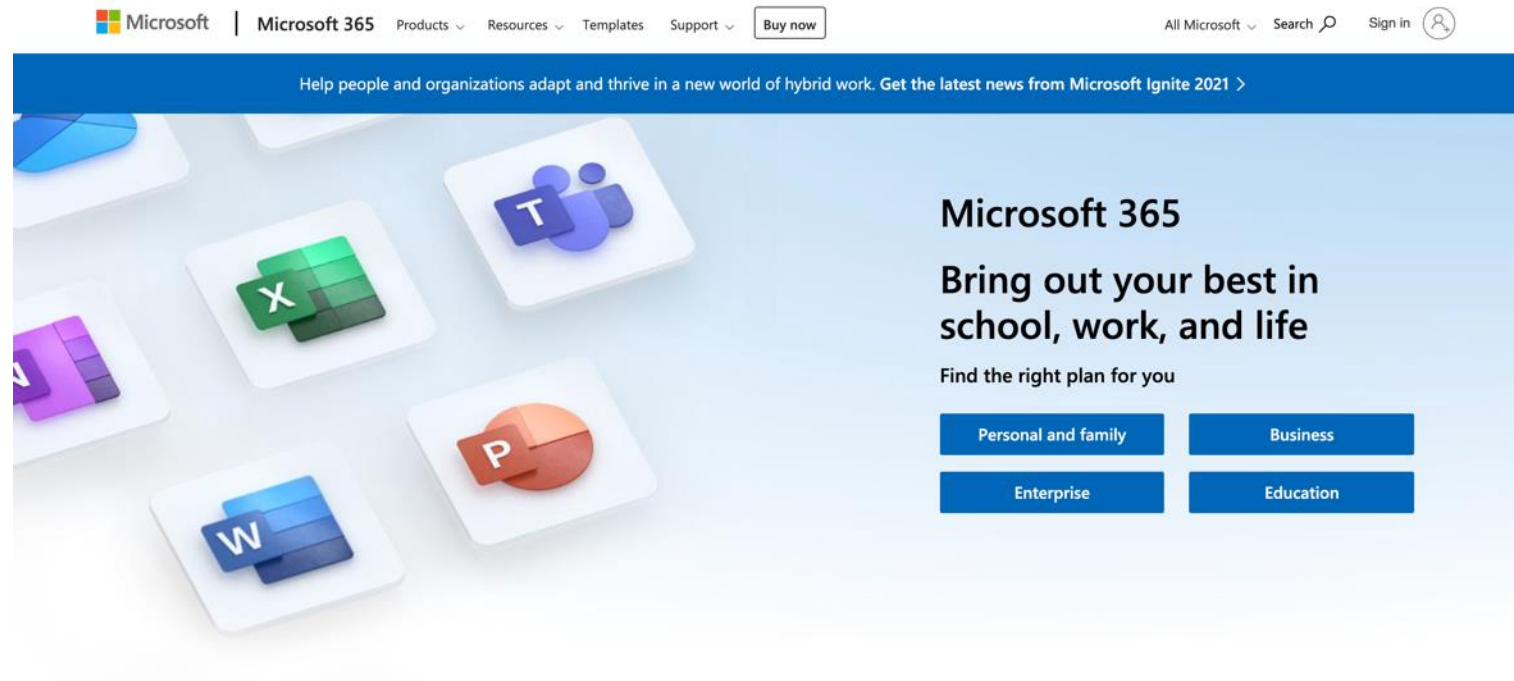


Slides

Microsoft office  
are local clients

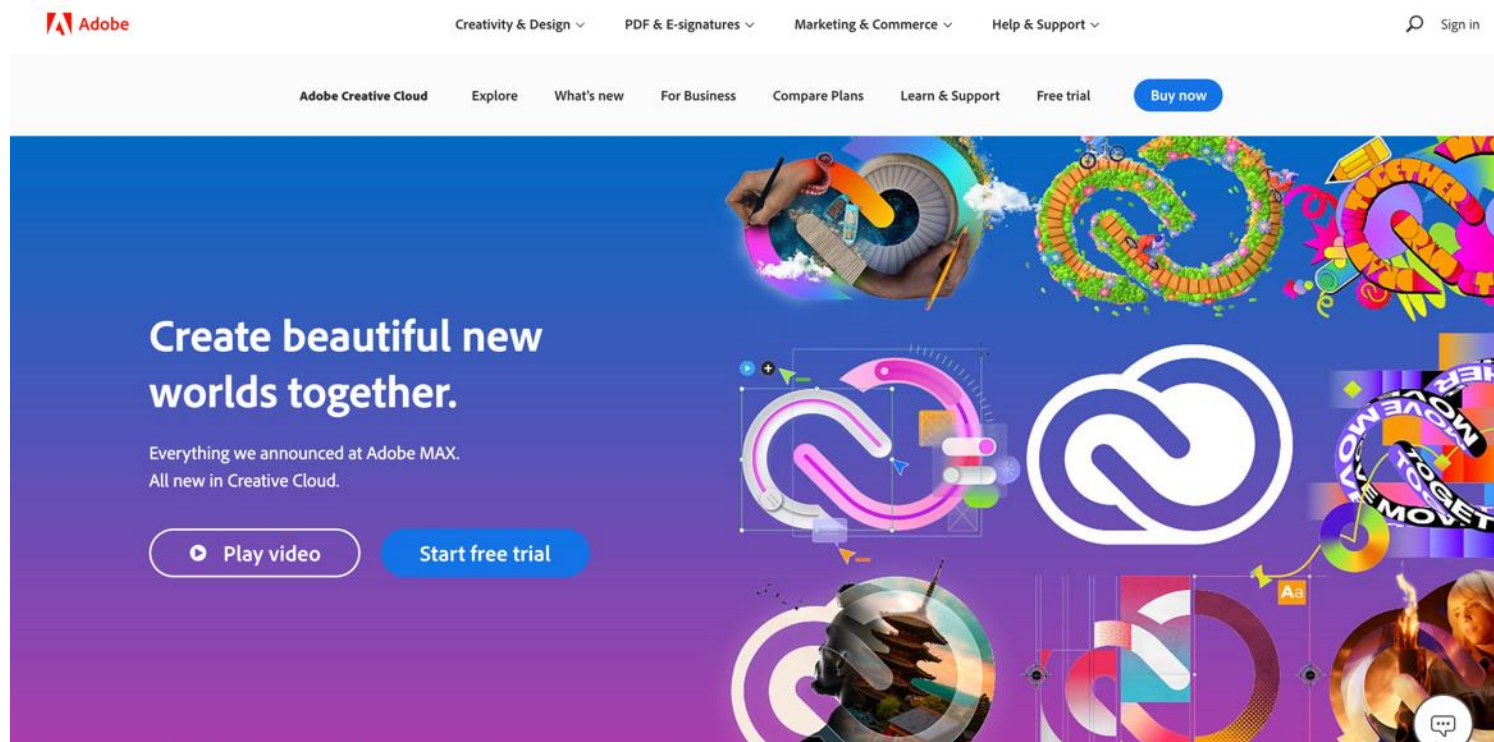


# Microsoft 365



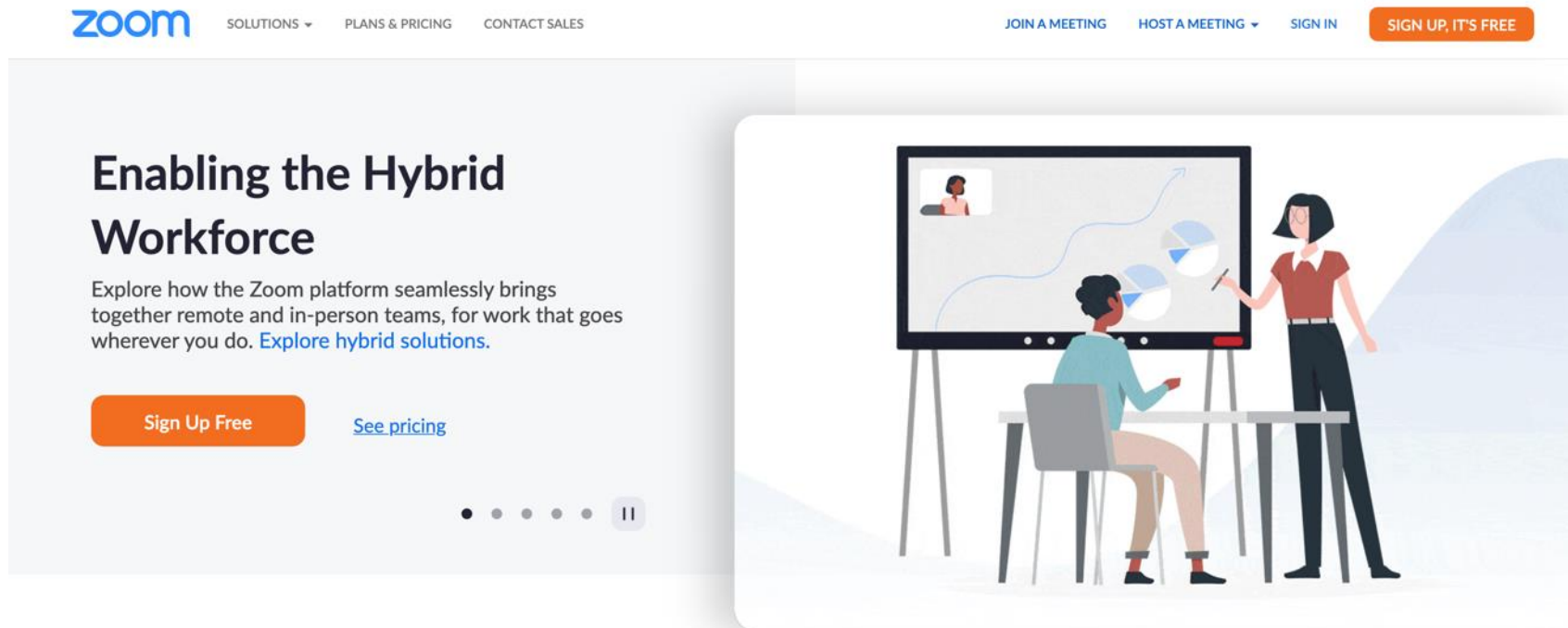
Microsoft 365 is a suite of apps that help you stay connected and get things done

# Adobe Creative Cloud






# Zoom



# DropBox

## Cloud Storage

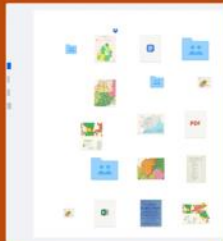

 **Dropbox** [Why Dropbox?](#) [Features](#) [Plans & pricing](#)

[Support](#) [Contact](#) [Sign in](#) [Get started](#) →

# Keep life organized and work moving—all in one place

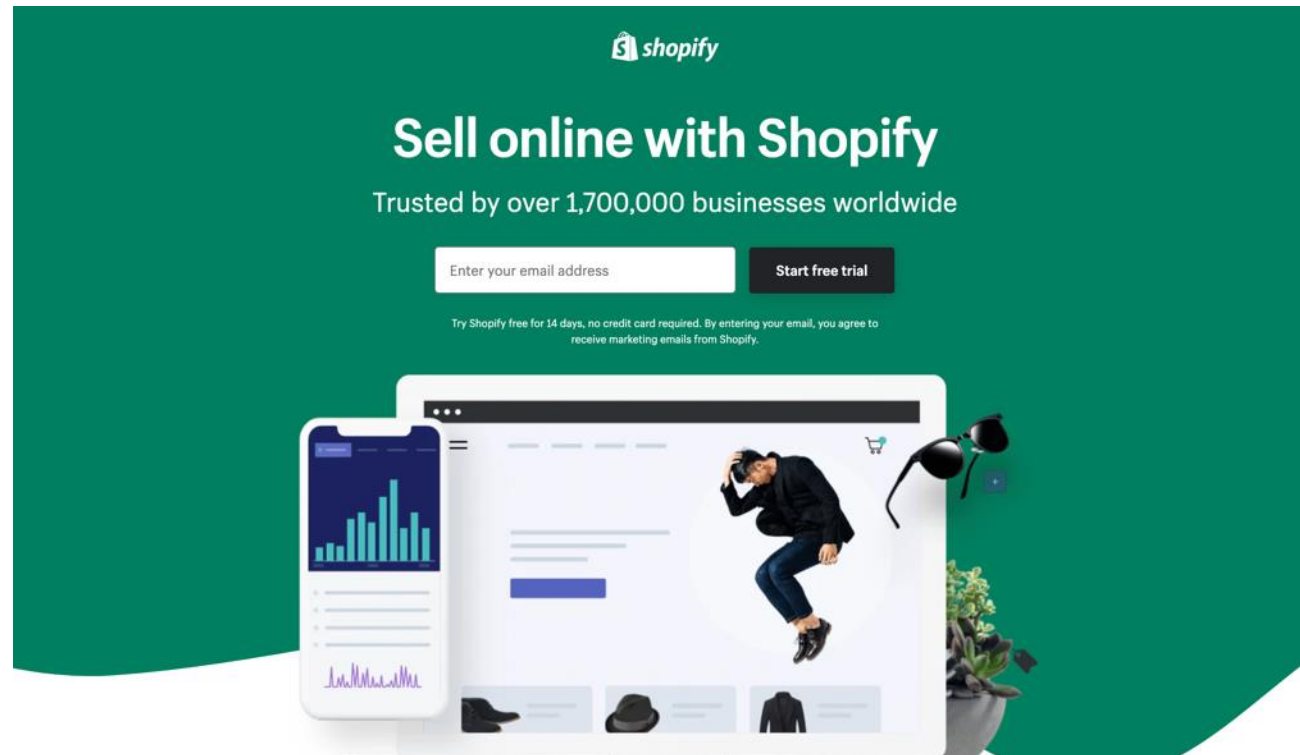
[Find the plan for you](#) →

Dropbox gives you secure access to all your files. Collaborate with friends, family, and coworkers from any device.



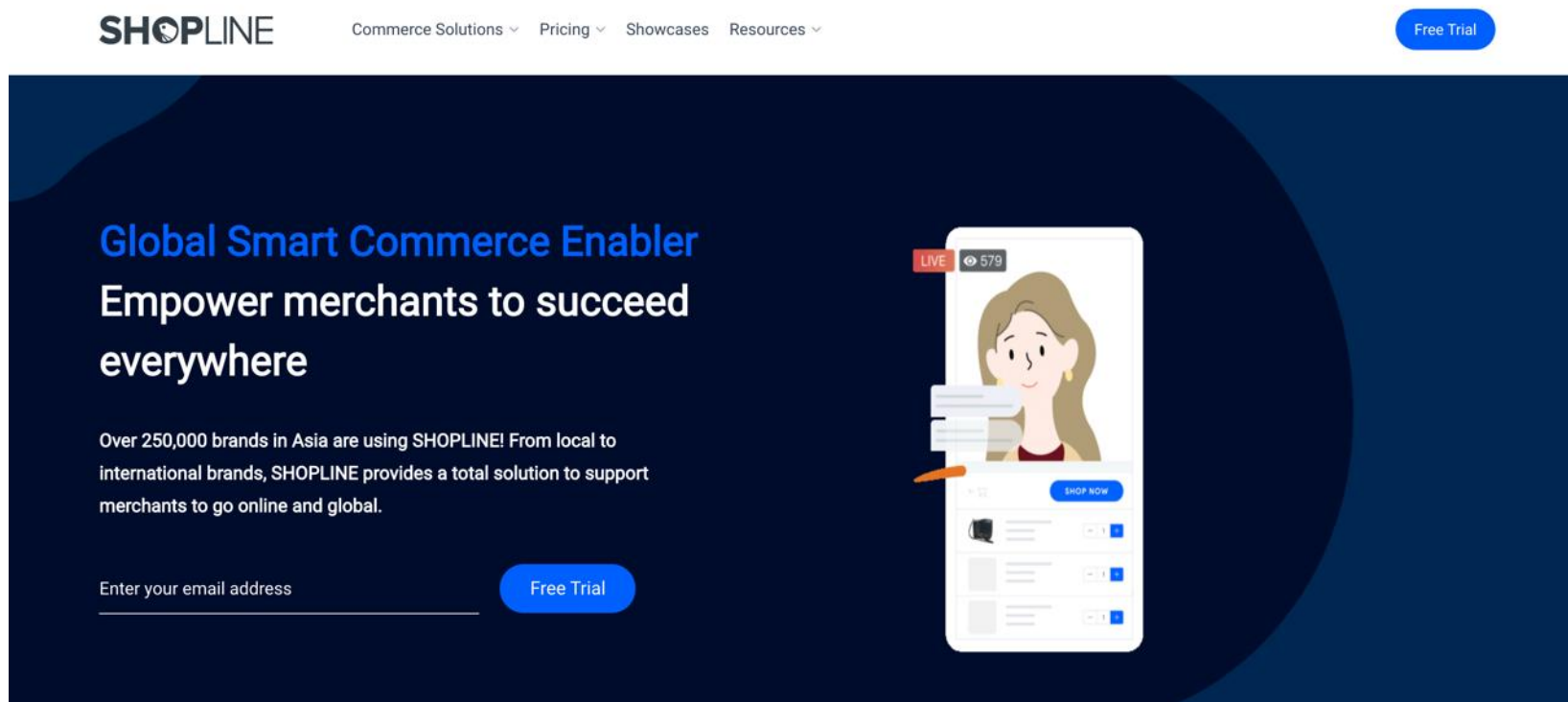
# Shopify

e-commerce solution



# Shopline

a hong kong company



# YOOV

YOOV®

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方案 ▾

客戶案例 ▾

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而家仲用人手落單，  
生意又點會夠人爭？



雲端餐飲管理系統

自助點餐 · 出餐爽 · 埋單易 · 翻枱快



# Characteristics of SaaS

- Pay-as-you-go basis
- The service provider manages the hardware and software and ensure the availability and the security of the app and your data as well.
- SaaS allows your organization to get quickly up and running with an app at **minimal upfront cost**.
  - Low TCO - Total Cost of Ownership

# Advantages of SaaS

- Gain access to sophisticated applications
- Pay only for what you use
- Use free client software
- Thinner client devices. Mobilize your workforce easily.
  - Easier to setup
  - Requires less maintenance
- Access app data from anywhere

laaS



# IaaS

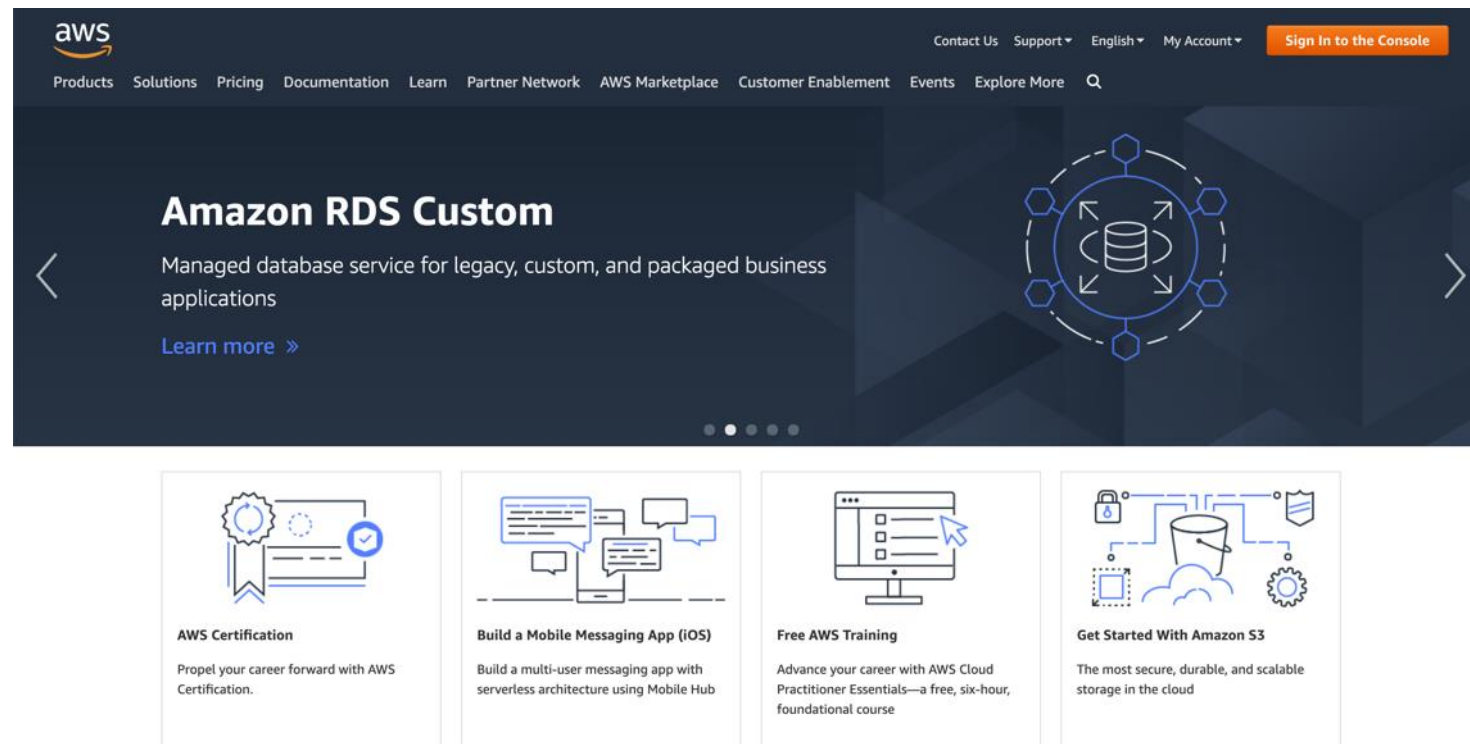
- Infrastructure **as a Service**
- Targeting users with technical system admin skills
- This is the most basic category of cloud computing services.
- With IaaS, you rent IT infrastructure such as servers and virtual machines (VMs), storage, networks, and operating systems from a cloud provider on a **pay-as-you-go** basis.

# laaS examples

Offers the highest level of flexibility  
in software developments

# AWS

## Amazon Web Services



The screenshot displays the AWS website's navigation bar at the top, featuring the AWS logo, links for Products, Solutions, Pricing, Documentation, Learn, Partner Network, AWS Marketplace, Customer Enablement, Events, and Explore More, along with links for Contact Us, Support, English, My Account, and a Sign in to the Console button. The main content area highlights the Amazon RDS Custom service with the heading "Amazon RDS Custom" and the description "Managed database service for legacy, custom, and packaged business applications." A "Learn more" link is provided. To the right of the text is a diagram of a database instance within a cloud environment. Below the main content area are four promotional cards: "AWS Certification" (Propel your career forward with AWS Certification), "Build a Mobile Messaging App (iOS)" (Build a multi-user messaging app with serverless architecture using Mobile Hub), "Free AWS Training" (Advance your career with AWS Cloud Practitioner Essentials—a free, six-hour, foundational course), and "Get Started With Amazon S3" (The most secure, durable, and scalable storage in the cloud).

aws

Contact Us Support English My Account Sign in to the Console

Products Solutions Pricing Documentation Learn Partner Network AWS Marketplace Customer Enablement Events Explore More

### Amazon RDS Custom

Managed database service for legacy, custom, and packaged business applications

[Learn more »](#)

#### AWS Certification

Propel your career forward with AWS Certification.

#### Build a Mobile Messaging App (iOS)

Build a multi-user messaging app with serverless architecture using Mobile Hub

#### Free AWS Training


Advance your career with AWS Cloud Practitioner Essentials—a free, six-hour, foundational course

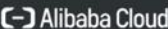
#### Get Started With Amazon S3

The most secure, durable, and scalable storage in the cloud

# 阿里雲

## Alibaba Cloud

**11.11 CLOUD SERVICES SALE**Get started on cloud with **\$1****\$1 Cloud Offers** →×

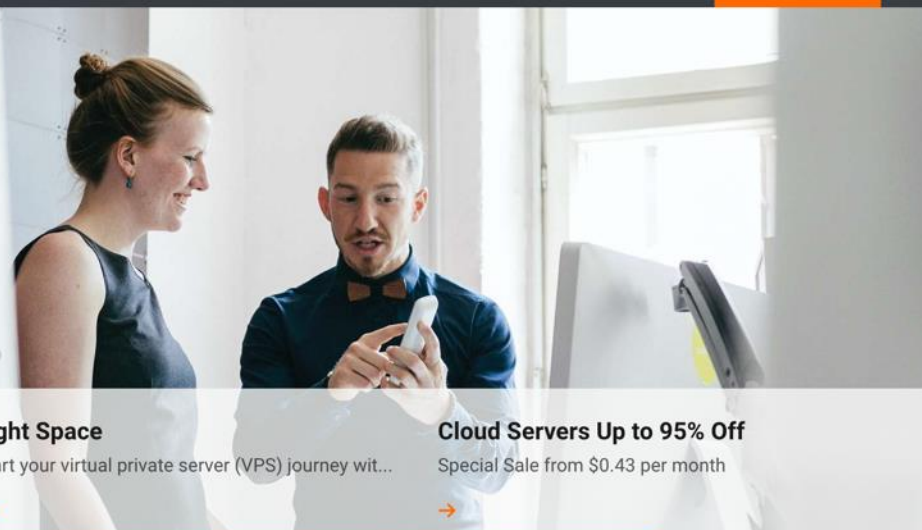
Contact Sales Call Us (+60 1546-0000-23)  MY - English ▾ Cart Console Log In

Why Us ▾ Olympics ▾ Products ▾ Solutions ▾ Pricing Marketplace Resources & Support ▾ Partners ▾ Documentation Free Account

### New User Discounts

Enjoy up to 97% off on OSS

Buy Now



#### Free Trials

Enjoy free trials for more than 50 products

→

#### New User Discounts

Enjoy up to 90% off on trending cloud products

→

#### Light Space

Start your virtual private server (VPS) journey wit...

→

#### Cloud Servers Up to 95% Off

Special Sale from \$0.43 per month

→

# Microsoft Azure



Azure

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Search



Docs

Support

Contact Sales

Sign in

We're in this together. Explore Azure resources and tools to help you navigate COVID-19 >

INVENT WITH PURPOSE

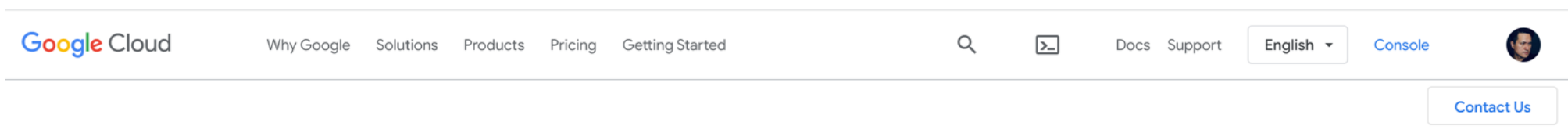
## Azure. The innovate-anywhere, create-everything cloud.

Build without boundaries across on-premises, multicloud, and the edge—using an Azure free account and the newest technologies announced at Microsoft Ignite. Sign up and get 12 months of popular services free, and a \$200 credit.

Try Azure for free

# GCP

## Google Cloud Platform



Build what's next. Better software.  
Faster.

- ✓ Use Google's core infrastructure, data analytics, and machine learning
- ✓ Secure and fully featured for all enterprises
- ✓ Committed to open source and industry-leading price-performance



# 騰訊雲 Tencent Cloud



# IaaS Resource Types

- Cloud Server
- Cloud Storage
- Cloud Database
- Cloud Network Services
- Cloud Security
- Cloud Data Analytics/Machine Learning/AI



# Advantages of IaaS

- Migrating your organization's infrastructure to an IaaS solution helps you reduce maintenance of on-premises data centre, save money on hardware costs.
- IaaS solutions give you the flexibility to **scale** your IT resources up and down with demand.
- They also help you quickly provision new applications and increase the reliability of your underlying infrastructure.

PaaS

# PaaS - 1

- Platform as a Service
- Targeting software developer
- Cloud providers supply an on-demand environment for developing, testing, delivering, and managing software applications.
- If you cannot fully appreciate PaaS, it's fine. It's aiming developers anyway.

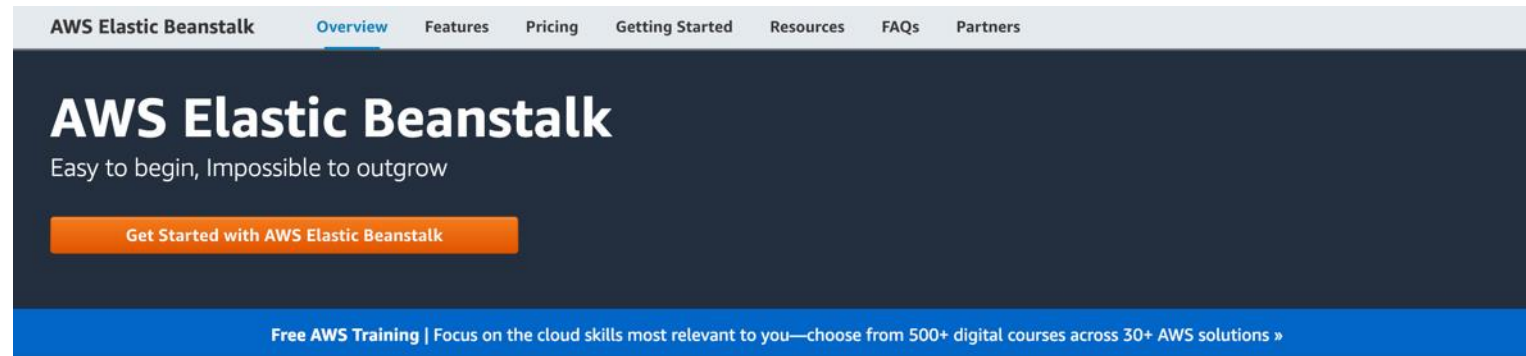
# PaaS - 2

- PaaS includes infrastructure - servers, storage, and networking, but also middleware, development tools, business intelligence (BI) services, database management systems, and more.
- PaaS is designed to support the complete web application lifecycle: building, testing, deploying, managing, and updating.

# PaaS examples

Easy kicking off  
software development

# AWS Elastic Beanstalk



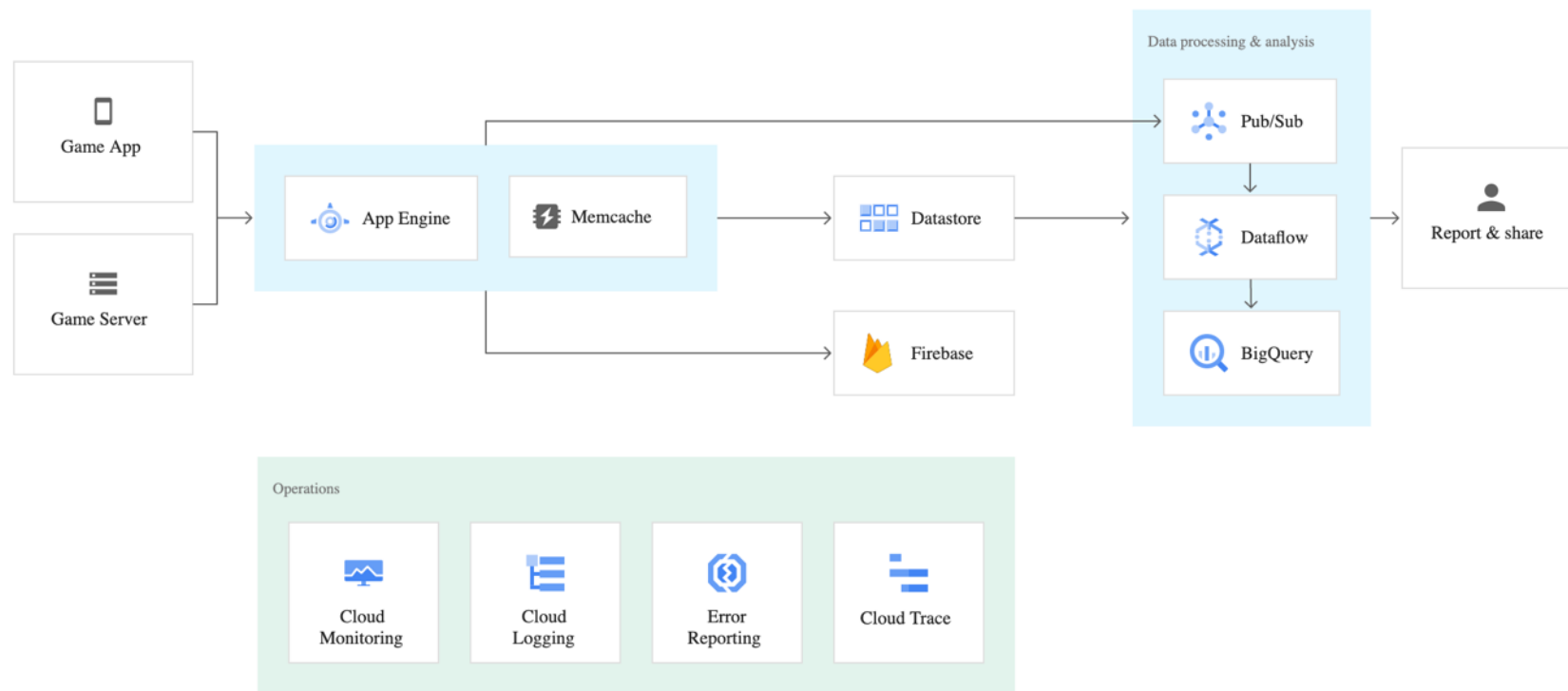
AWS Elastic Beanstalk is an easy-to-use service for deploying and scaling web applications and services developed with Java, .NET, PHP, Node.js, Python, Ruby, Go, and Docker on familiar servers such as Apache, Nginx, Passenger, and IIS.

You can simply upload your code and Elastic Beanstalk automatically handles the deployment, from capacity provisioning, load balancing, auto-scaling to application health monitoring. At the same time, you retain full control over the AWS resources powering your application and can access the underlying resources at any time.


There is no additional charge for Elastic Beanstalk - you pay only for the AWS resources needed to store and run your applications.



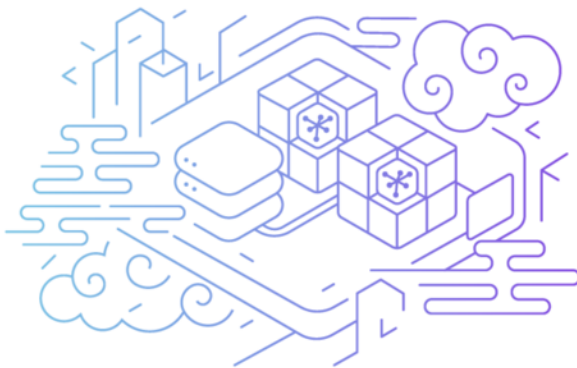
# Google App Engine



# Heroku

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[Log in](#) or [Sign up](#)




SPOTLIGHT


## Data on Heroku


Build data-driven apps with fully managed data services.


[SIGN UP FOR FREE](#)  
[Explore Managed Data Services](#)


OFFICIALLY SUPPORTED LANGUAGES


  
Node.js


  
Ruby


  
Java

  
PHP

  
Python

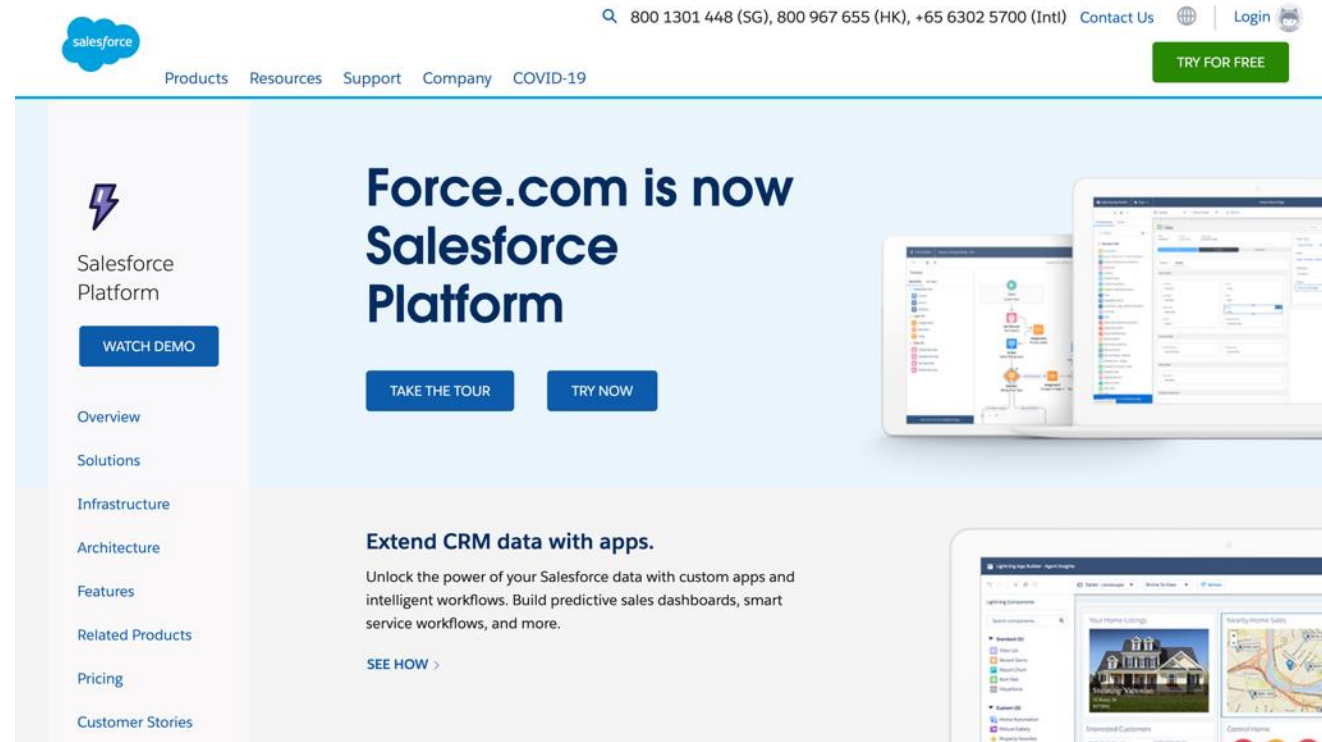
  
Go

  
Scala

  
Clojure



# Salesforce Platform



# FaaS/Serverless

# Function as a Service (FaaS)

- Also known as Serverless Computing
- Computer infrastructure and management are invisible to the developer (therefore serverless)
- Serverless computing enables developers to build applications faster by eliminating the need for them to manage infrastructure
- Automatically provisions, scales, and manages the infrastructure
- Developers can **focus on the business logic** and deliver more value to the core of the business.

# Serverless Computing

- Serverless computing helps teams **increase their productivity** and **bring products to market faster**, and it allows organizations to better optimize resources and stay focused on innovation.
- It only charges when your function is called.

# FaaS/Serverless Computing Examples

Software Development Without Servers

# AWS Lambda

## AWS Lambda

Run code without thinking about servers or clusters

Get Started with AWS Lambda

**1 million requests free**  
per month with the [AWS Free Tier](#)

Run code without provisioning or managing infrastructure. Simply write and upload code as a .zip file or container image.

Automatically respond to code execution requests at any scale, from a dozen events per day to hundreds of thousands per second.

Save costs by paying only for the compute time you use—by per-millisecond—instead of provisioning infrastructure upfront for peak capacity.

Optimize code execution time and performance with the right function memory size. Respond to high demand in double-digit milliseconds with Provisioned Concurrency.

# 阿里雲

## 函數計算



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### 函数计算 FC

[播放视频](#)

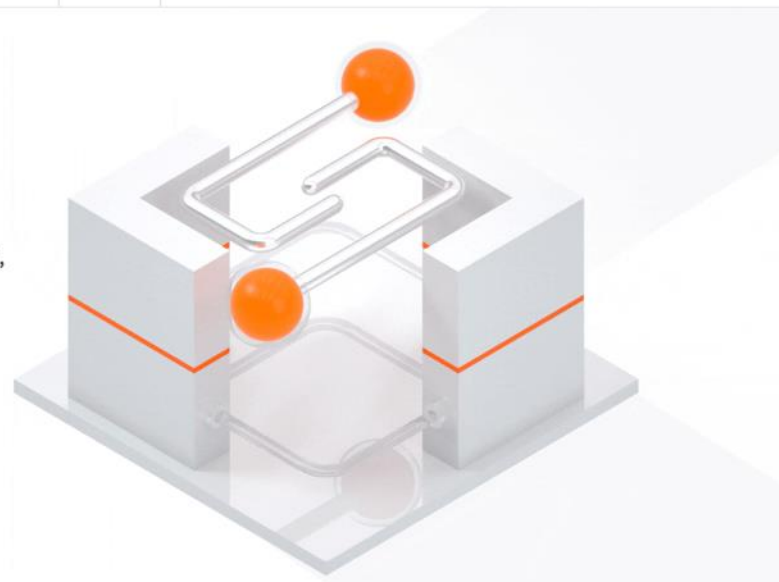
函数计算 (Function Compute) 是一个事件驱动的全托管 Serverless 计算服务, 您无需管理服务器等基础设施, 只需编写代码并上传, 函数计算会为您准备好计算资源, 并以弹性、可靠的方式运行您的代码。

函数计算入选 Forrester FaaS 领导者象限, 国内唯一







[购买资源包](#)

[管理控制台](#)

[产品文档](#) [产品价格](#)



# IaaS vs. PaaS vs. SaaS

	Service Item	Self Host	IaaS	PaaS	SaaS
	Data center physical plant/building		✓	✓	✓
	Networking firewalls/security		✓	✓	✓
	Servers and storage		✓	✓	✓
	Operating systems			✓	✓
	Development tools, database management, business analytics			✓	✓
	Applications/apps				✓



# Professional Cloud Certifications

# AWS Certification

## FOUNDATIONAL

Knowledge-based certification for foundational understanding of AWS Cloud.

**No prior experience needed.**



## ASSOCIATE

Role-based certifications that showcase your knowledge and skills on AWS and build your credibility as an AWS Cloud professional. **Prior cloud and/or strong on-premises IT experience recommended.**



## PROFESSIONAL

Role-based certifications that validate advanced skills and knowledge required to design secure, optimized, and modernized applications and to automate processes on AWS.

**2 years of prior AWS Cloud experience recommended.**



## SPECIALTY

Dive deeper and position yourself as a trusted advisor to your stakeholders and/or customers in these strategic areas. **Refer to the exam guides on the exam pages for recommended experience.**



# Alibaba Cloud Certification



Clouder

Quickly understand an Alibaba Cloud product function or solution architecture while earning a digital certification



Professional

Validate your expertise with Alibaba Cloud Certification by acquiring recognition and visibility for your proven technical competencies



Specialty

Attend online self-paced specialty trainings, learn and practice Alibaba Cloud products and solutions with certified instructors

# Hands on Cloud Practicing on AWS (2 Hours)

Fill up the following form to  
receive AWS Academy  
Invitation

[bit.ly/in-aws-acad](https://bit.ly/in-aws-acad)

# UGC Dataset Download

[bit.ly/hkugc-gra2](https://bit.ly/hkugc-gra2)

Thank You!