

<image/nation>

Tech Training Series

Exclusive for



# Fundamental Cloud Computing

2023/2024

Hands on Cloud Computing for Data Scientists

*by*

Sunny NG

<image/nation>

# 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 AWS Cloud Practicing
  - free AWS lab accounts will be provided

# Sunny Ng



- Founder / Master Trainer Image Nation
- Developer Web, Mobile, WeChat & IoT
- Content Creator Video producing / Live streaming
- AWS Solution Architect – Associate
- Alibaba Cloud Professional
- AWS Academy Educator
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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 layout. At the top, the AWS logo is on the left, and navigation links for 'Contact Us', 'Support', 'English', 'My Account', and 'Sign In' are on the right. A prominent orange button labeled 'Create an AWS Account' is also visible. Below the header is a main navigation bar with categories like 'Products', '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 features a 'Featured Services' section with a list of service categories 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 lists 'Featured Services' such as 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 is titled 'Resources and Media' and includes sections for 'Blog' (Read the latest AWS blogs), 'What's New on AWS' (See announcements for AWS services), 'Customer Enablement' (AWS IQ: Complete your projects faster with help from AWS Certified third-party experts; AWS Managed Services: Operate your AWS infrastructure for you), and 'AWS Training and Certification' (Build and validate your skills and technical expertise).

# Microsoft Azure - Products

<https://azure.microsoft.com>

**Azure** Explore **Products** Solutions Pricing Partners Resources

Search Learn Support Contact Sales **Free account** Sign in

Search all products [View all products \(200+\)](#)

Results will display instantly

**Popular**

AI + machine learning

Analytics

Compute

Containers

Databases

DevOps

Developer tools

Hybrid + multicloud

Identity

Integration

Internet of Things

Management and governance

**Popular**  
Explore some of the most popular Azure products

- 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>

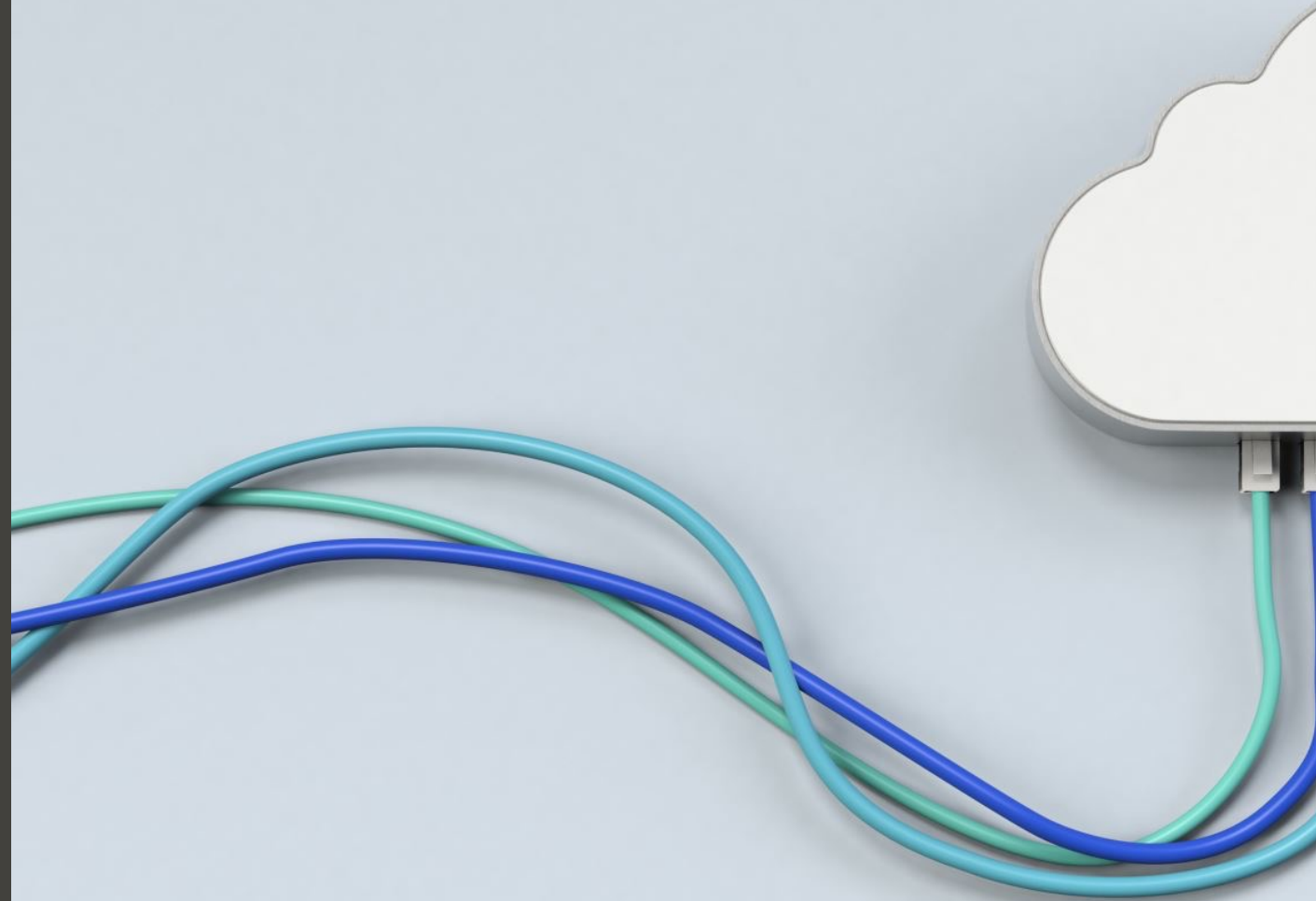
The screenshot shows the Alibaba Cloud website's 'Products' page. The navigation bar includes the Alibaba Cloud logo, 'Contact Sales', 'Call Us (800-931-108)', a search bar, 'Intl - English', 'Cart', 'Console', and 'Log In'. The main navigation menu includes 'Why Us', 'Pricing', 'Products', 'Solutions', 'Marketplace', 'Developers', 'Partners', 'Documentation', and 'Service'. A 'Free Trial' button is located on the right side of the navigation bar. The main content area is titled 'Search Products' and features a grid of product categories: 'Featured Products', 'New Products', and 'Updates & Promotions'. The 'Featured Products' section lists items such as Elastic Compute Service (ECS), Simple Application Server (SAS), Elastic GPU Service, Object Storage Service (OSS), Cloud Enterprise Network (CEN), PolarDB for MySQL, Web Application Firewall (WAF), and Domains and Web Service. The 'New Products' section lists Managed Service for Prometheus, Cloud Data Transfer (CDT), Transit Router (TR), Managed Service for Grafana, Phone Number Verification Service, CloudBox, Intelligent Advisor, and EMAS Superapp. The 'Updates & Promotions' section lists 'Alibaba Cloud ECS - Cater All Your Cloud Hosting Needs', 'Mobile Application Development-Full Lifecycle Mobile Development Tools and Services', '1TB CDN—Get Free 1 TB Outbound Traffic Plan Now', '7th Gen ECS Free Tier is Available Now', 'Security—Under Attack? Get Free Security Support', and 'Short Message Service - Free'.



A more friendly cloud definition

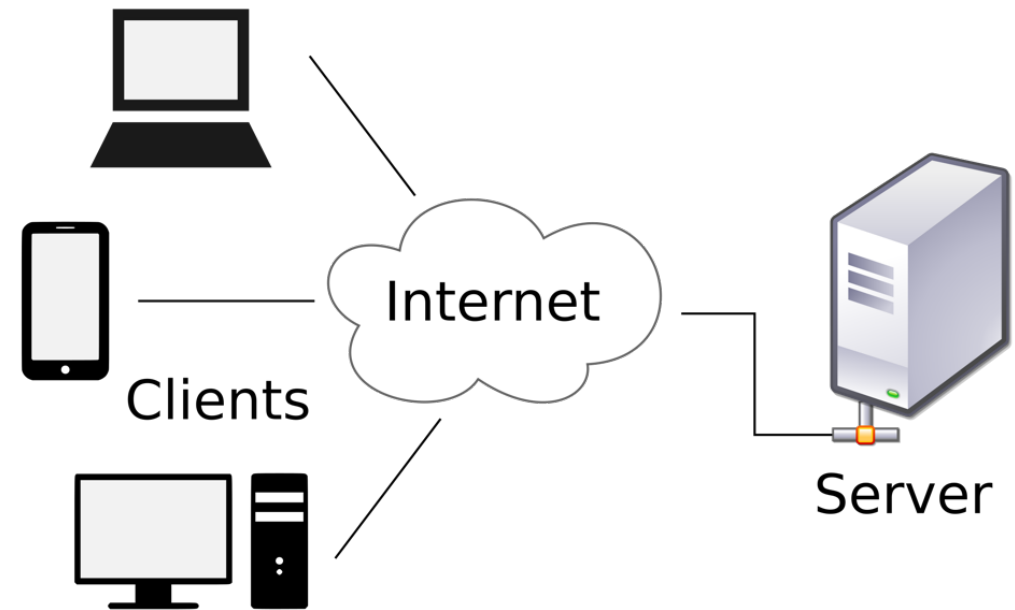
Consuming  
**computation**

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



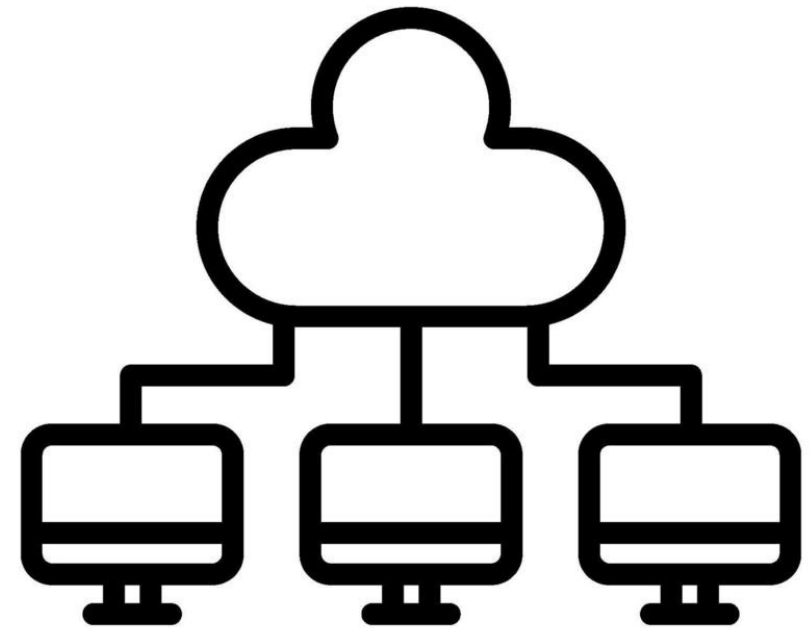
# Why the name Cloud Computing?

- 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

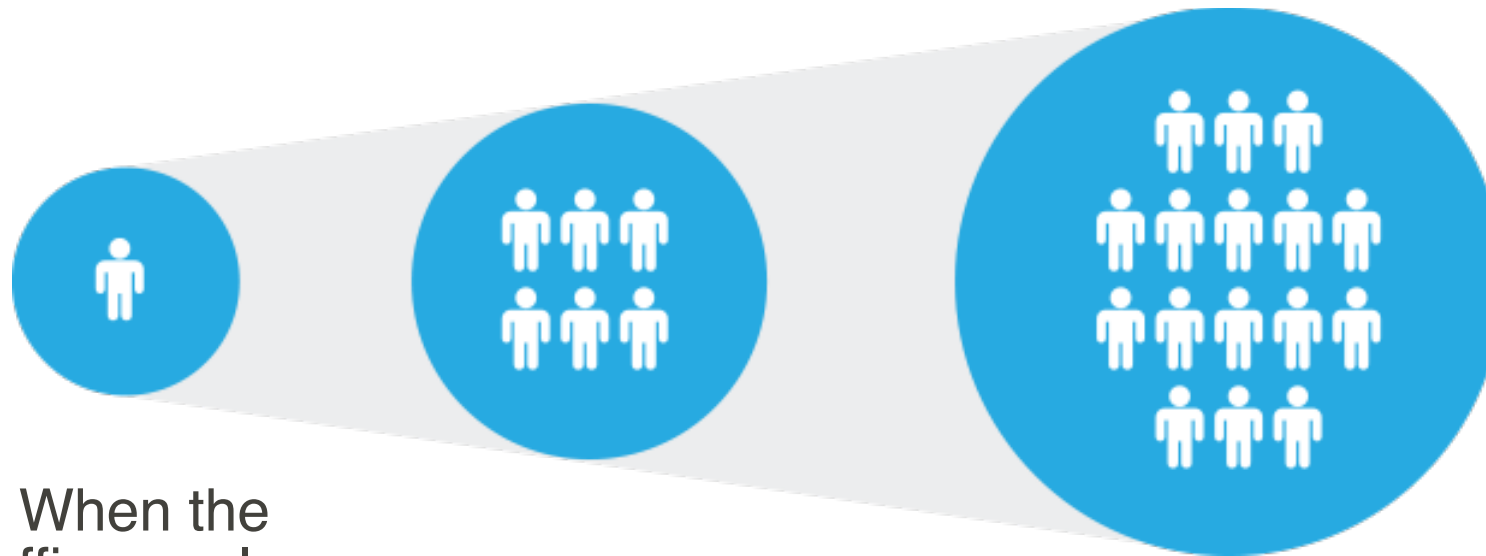
- we rent computation
- We rent it as we need it
- We don't have to plan/purchase ahead. Just a few click to gain cloud.
- We can stop anytime if we no longer need it.

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



When the traffics are low, 1 server is good enough

When traffics start to increase, additional servers join in to split workload

At seasonal peak traffics periods, more servers are temporarily joining in to handle extreme traffics

# 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** - Infrastructure as a Service
- **SaaS** - Infrastructure as a Service
- **FaaS** - Function 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



How teams of all sizes connect, create and collaborate.

A flexible, innovative solution for people and organisations to achieve more.

[Start Free Trial](#)



Productivity and collaboration tools for all the ways that we work.



# Google Workspace vs. Microsoft Office

Google Workspace  
is cloud based



Docs



Sheets



Slides

Microsoft office  
are local clients



# Microsoft 365

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Help people and organizations adapt and thrive in a new world of hybrid work. Get the latest news from Microsoft Ignite 2021 >

## Microsoft 365

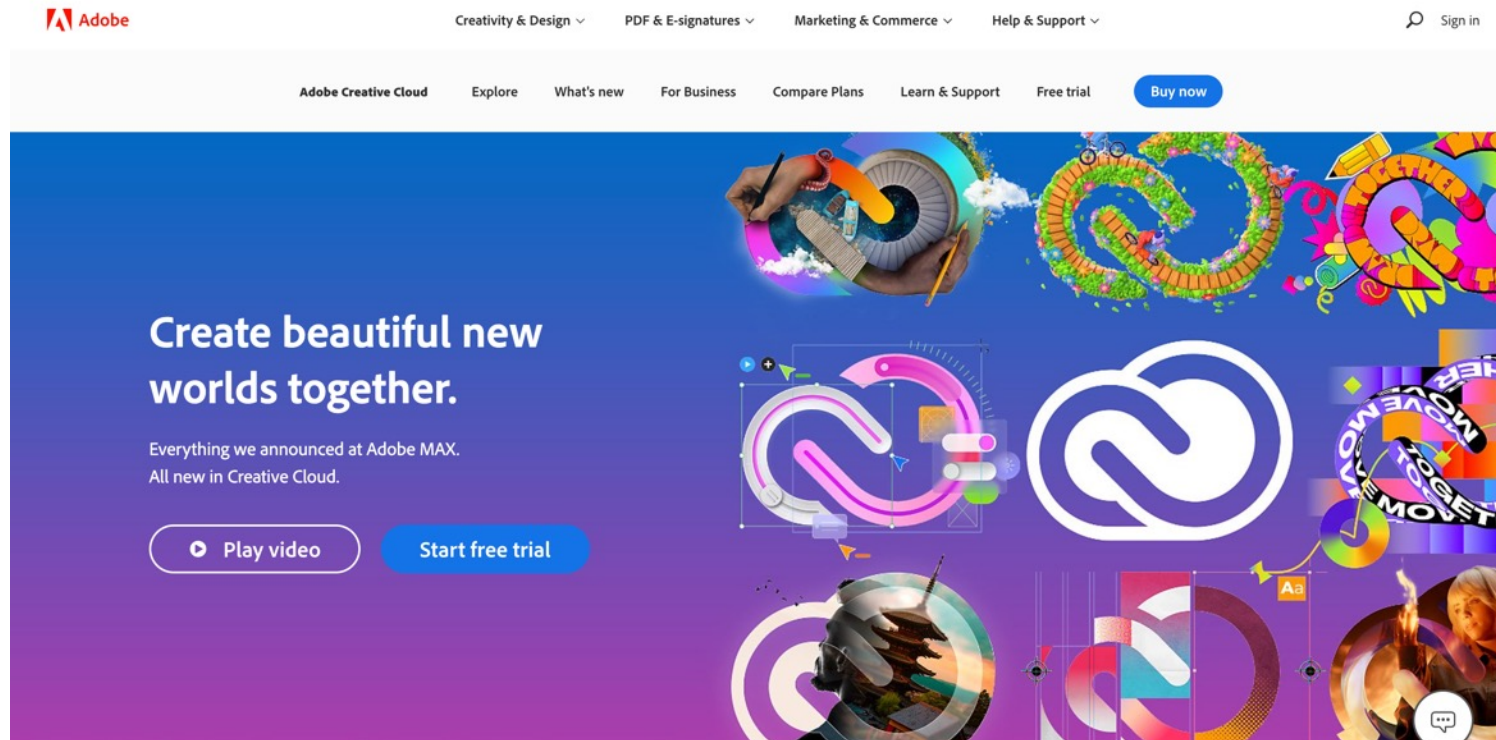
Bring out your best in school, work, and life

Find the right plan for you

Personal and family Business Enterprise Education

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

# Adobe Creative Cloud



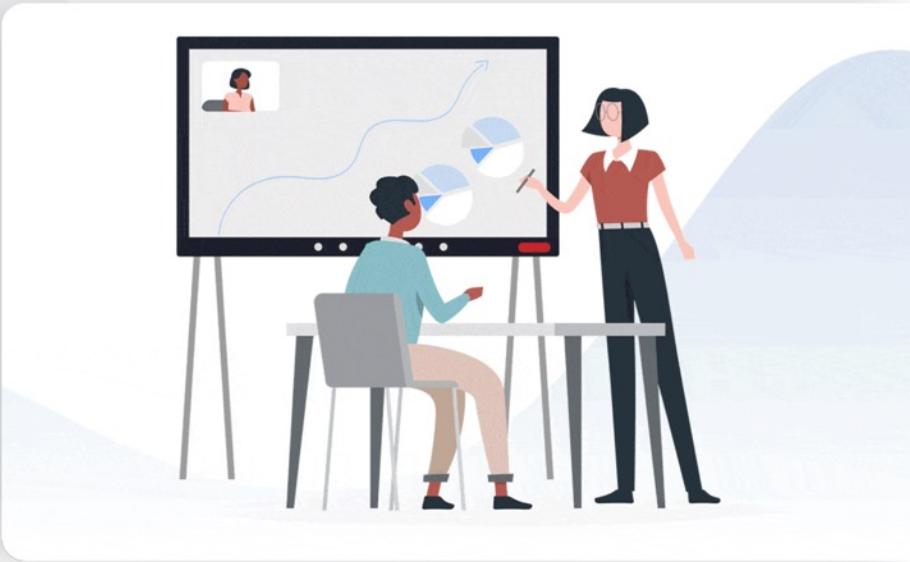
# Zoom

**zoom** SOLUTIONS ▾ PLANS & PRICING CONTACT SALES JOIN A MEETING HOST A MEETING ▾ SIGN IN **SIGN UP, IT'S FREE**

## Enabling the Hybrid Workforce

Explore how the Zoom platform seamlessly brings together remote and in-person teams, for work that goes wherever you do. [Explore hybrid solutions.](#)

**Sign Up Free** [See pricing](#)



• • • • • ||



# DropBox

## Cloud Storage

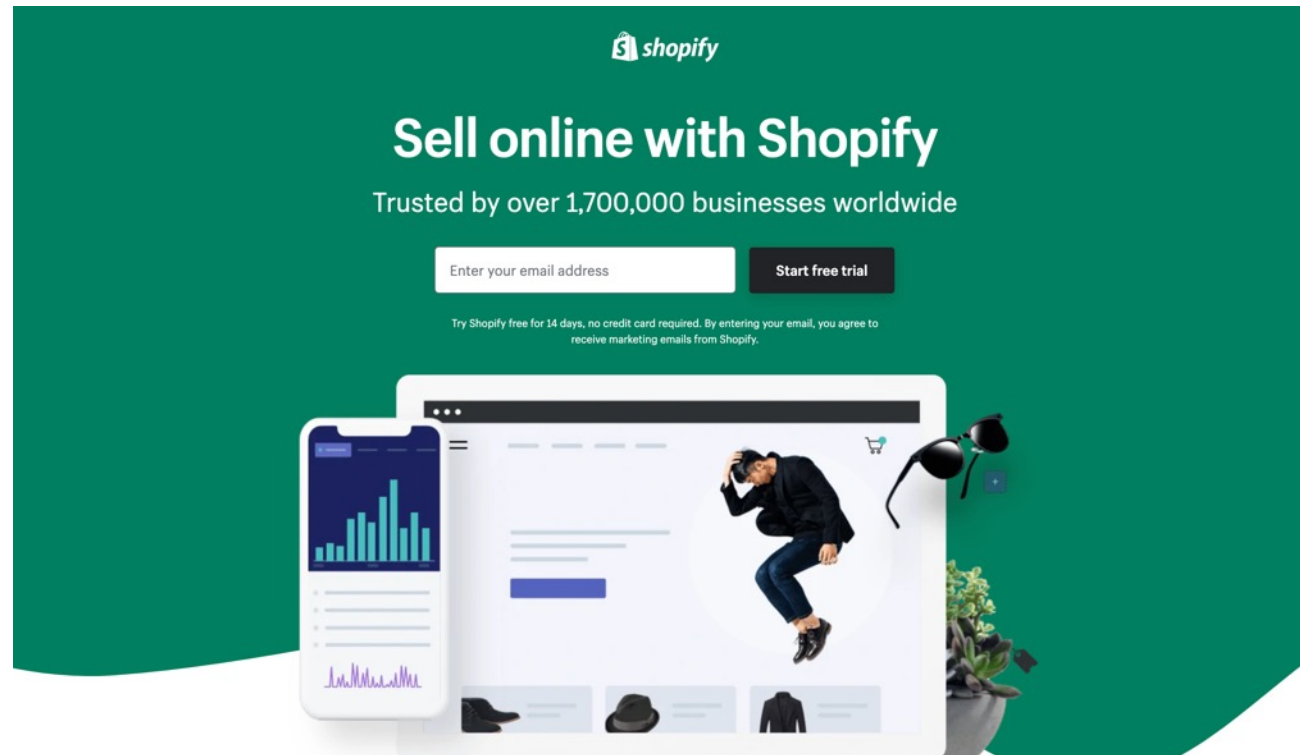
The screenshot shows the Dropbox website homepage. At the top left is the Dropbox logo and the word "Dropbox". To its right are navigation links: "Why Dropbox?", "Features", and "Plans & pricing". On the top right are links for "Support", "Contact", "Sign in", and a blue "Get started" button with a right-pointing arrow.

The main content area is split into two columns. The left column has a light gray background and contains the headline "Keep life organized and work moving—all in one place" in a large, dark font. Below the headline is a blue button with the text "Find the plan for you" and a right-pointing arrow. At the bottom of this column, there is a paragraph: "Dropbox gives you secure access to all your files. Collaborate with friends, family, and coworkers from any device."

The right column features a large image of a man and a woman in a library or office setting, looking at a laptop. Below this image is a large orange rectangular area. In the center of this orange area is a white square containing a grid of various file icons, representing the Dropbox interface.

# Shopify

e-commerce solution



# Shopline

a hong kong company

**SHOPLINE** Commerce Solutions ▾ Pricing ▾ Showcases Resources ▾ [Free Trial](#)

## Global Smart Commerce Enabler

### Empower merchants to succeed everywhere

Over 250,000 brands in Asia are using SHOPLINE! From local to international brands, SHOPLINE provides a total solution to support merchants to go online and global.

Enter your email address [Free Trial](#)

# YOOV

YOOV

最新資訊 ▾

關於我們

方案 ▾

客戶案例 ▾

聯絡我們 ▾

繁體 | 简体 | EN

登入

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 shows the top navigation bar of the AWS website. On the left is the AWS logo. On the right are links for 'Contact Us', 'Support', 'English', and 'My Account', along with a 'Sign In to the Console' button. Below the navigation bar is a horizontal menu with links for 'Products', 'Solutions', 'Pricing', 'Documentation', 'Learn', 'Partner Network', 'AWS Marketplace', 'Customer Enablement', 'Events', and 'Explore More'. The main content area features a dark blue banner for 'Amazon RDS Custom' with the text 'Managed database service for legacy, custom, and packaged business applications' and a 'Learn more' link. A database icon is visible on the right side of the banner.

**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

The screenshot shows the Alibaba Cloud website homepage during the 11.11 Cloud Services Sale. The top banner features a gift icon, the text "11.11 CLOUD SERVICES SALE", and a promotion "Get started on cloud with \$1" with a "\$1 Cloud Offers" button. The navigation bar includes the Alibaba Cloud logo, contact information, a search bar, and links for "MY - English", "Cart", "Console", and "Log In". Below the navigation bar are menu items for "Why Us", "Olympics", "Products", "Solutions", "Pricing", "Marketplace", "Resources & Support", "Partners", and "Documentation", along with a "Free Account" button. The main content area features a large banner for "New User Discounts" with the text "Enjoy up to 97% off on OSS" and a "Buy Now" button. Below the banner are four promotional cards: "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...), and "Cloud Servers Up to 95% Off" (Special Sale from \$0.43 per month). Each card has an arrow pointing right.

# Microsoft Azure

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

INVENT WITH PURPOSE

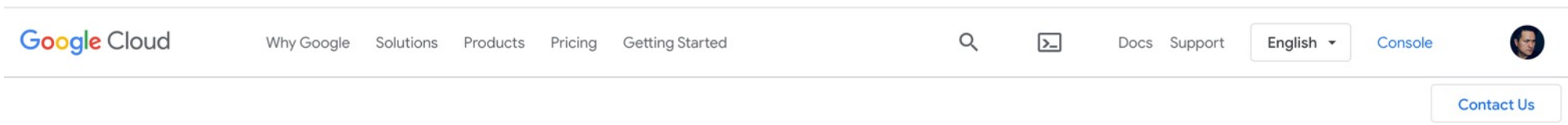
## Azure. The innovate-anywhere, create-everything cloud.

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

Contact sales

Go to console

# 騰訊雲 Tencent Cloud

The screenshot shows the Tencent Cloud website interface. At the top, there is a navigation bar with the Tencent Cloud logo, a 'HOT' badge, and links for '最新活动', '产品', '解决方案', '定价', '企业中心', '云市场', '开发者', '客户支持', '合作与生态', and '了解腾讯云'. On the right side of the navigation bar, there is a search icon, a dropdown menu for '中国站', and links for '文档', '备案', '控制台', and '登录'. The main content area features a large banner for the '腾讯云数据库TDSQL精英挑战赛' (Tencent Cloud Database TDSQL Elite Challenge). The banner text includes '腾讯云数据库TDSQL精英挑战赛' and '首届TDSQL大赛正式启动, 奖金池高达35万, 一起Change SQL!'. Below the banner is a blue button labeled '了解详情'. At the bottom of the page, there are three service category cards: '云服务器 CVM' (Cloud Virtual Machine) with the description '提供安全可靠的弹性计算服务'; '人工智能' (Artificial Intelligence) with the description '共享 AI 领域最新场景和方案'; and '金融行业方案' (Financial Industry Solutions) with the description '助力金融行业上云, 智创未来'. On the right side of the page, there is a 3D graphic of a blue and white trophy or award structure.

腾讯云 HOT 最新活动 产品 解决方案 定价 企业中心 云市场 开发者 客户支持 合作与生态 了解腾讯云

中国站 文档 备案 控制台 登录

## 腾讯云数据库TDSQL精英挑战赛

首届TDSQL大赛正式启动, 奖金池高达35万, 一起Change SQL!

了解详情

- 云服务器 CVM**  
提供安全可靠的弹性计算服务
- 人工智能**  
共享 AI 领域最新场景和方案
- 金融行业方案**  
助力金融行业上云, 智创未来

# 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 center, 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.

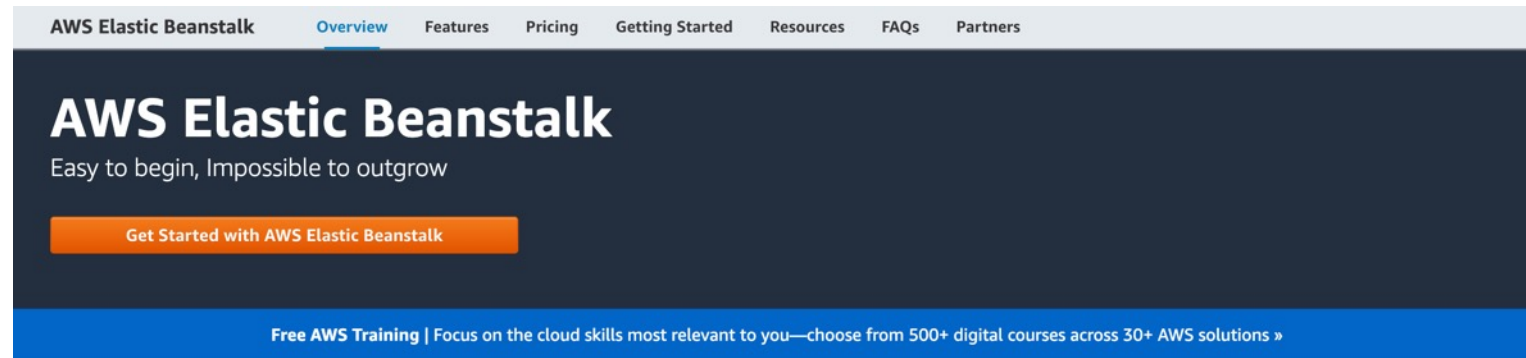
# PaaS - 2

- 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



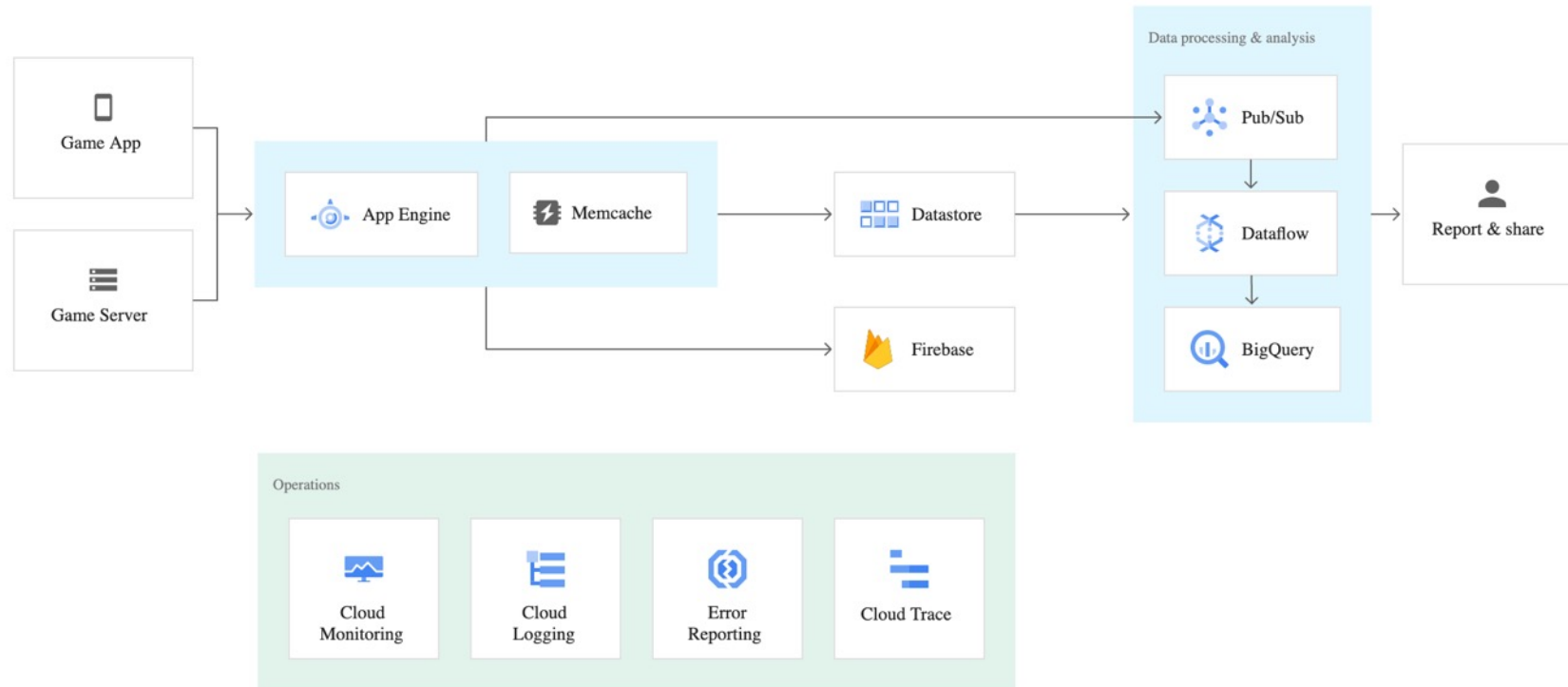
AWS Elastic Beanstalk is an easy-to-use service for deploying and scaling web applications and services developed with Java, .NET, PHP, Node.js, Python, Ruby, Go, and Docker on familiar servers such as Apache, Nginx, Passenger, and IIS.

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.



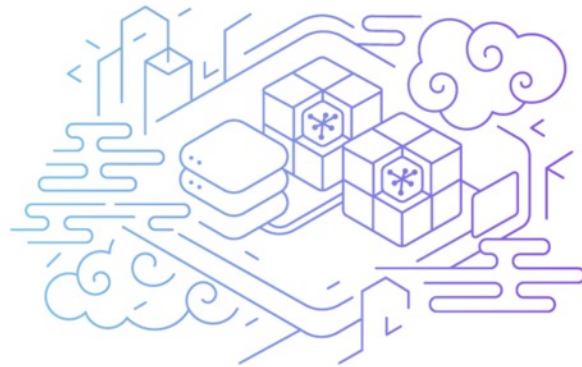
# Google App Engine



# Heroku

 **HEROKU** [Products](#) [Marketplace](#) [Pricing](#) [Documentation](#) [Support](#) [COVID-19](#) [More](#)

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



## SPOTLIGHT

### Data on Heroku

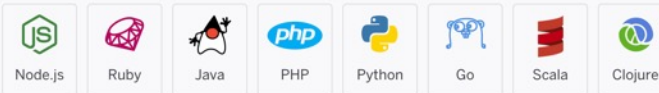
Build data-driven apps with fully managed data services.

[SIGN UP FOR FREE](#)

[Explore Managed Data Services](#)



## OFFICIALLY SUPPORTED LANGUAGES



# Salesforce Platform

The screenshot shows the Salesforce Platform website homepage. At the top, there is a navigation bar with the Salesforce logo, contact information (800 1301 448 (SG), 800 967 655 (HK), +65 6302 5700 (Intl)), a 'Contact Us' link, a 'Login' button, and a 'TRY FOR FREE' button. Below the navigation bar, the main content area features a large blue banner with the headline 'Force.com is now Salesforce Platform'. To the left of the banner is a sidebar menu with a lightning bolt icon and the text 'Salesforce Platform', followed by a 'WATCH DEMO' button and a list of menu items: Overview, Solutions, Infrastructure, Architecture, Features, Related Products, Pricing, and Customer Stories. The banner itself contains two buttons: 'TAKE THE TOUR' and 'TRY NOW'. To the right of the banner is an image of a laptop displaying a Salesforce dashboard. Below the banner, there is a section titled 'Extend CRM data with apps.' with the text 'Unlock the power of your Salesforce data with custom apps and intelligent workflows. Build predictive sales dashboards, smart service workflows, and more.' and a 'SEE HOW >' link. To the right of this text is another image of a laptop displaying a custom Salesforce app interface with various data visualizations and maps.



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



最新活动 产品 解决方案 云市场 合作伙伴 支持与服务 开发者 了解阿里云



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< 查看全部产品

## 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)