Cloud and
Amazon Web Services Fundamentals

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Why Cloud?

Why Cloud?

Traditional IT Infrastructure Issues

Limited Resource Capacity

High Capital Expenditure (CAPEX)

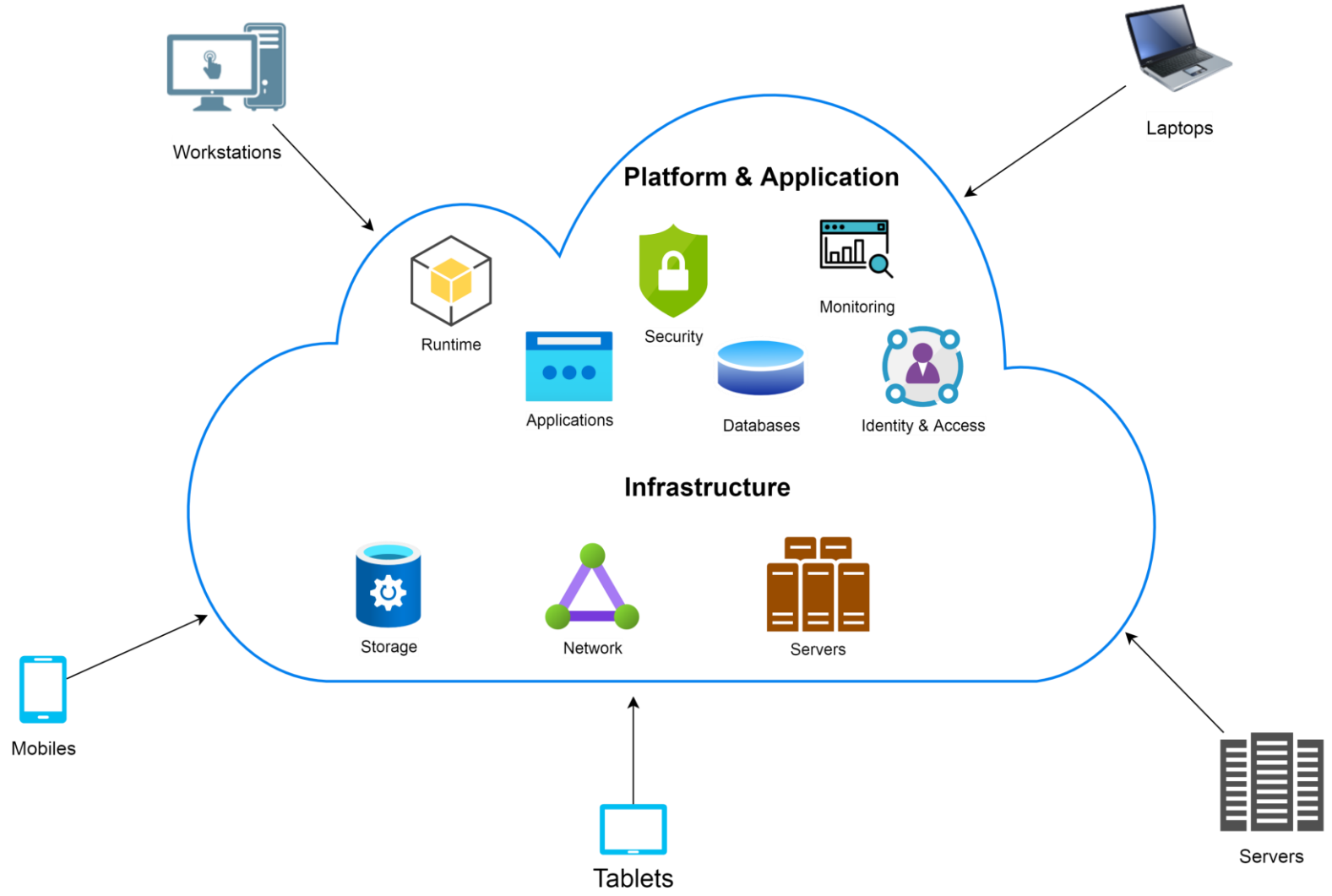
Less Productive

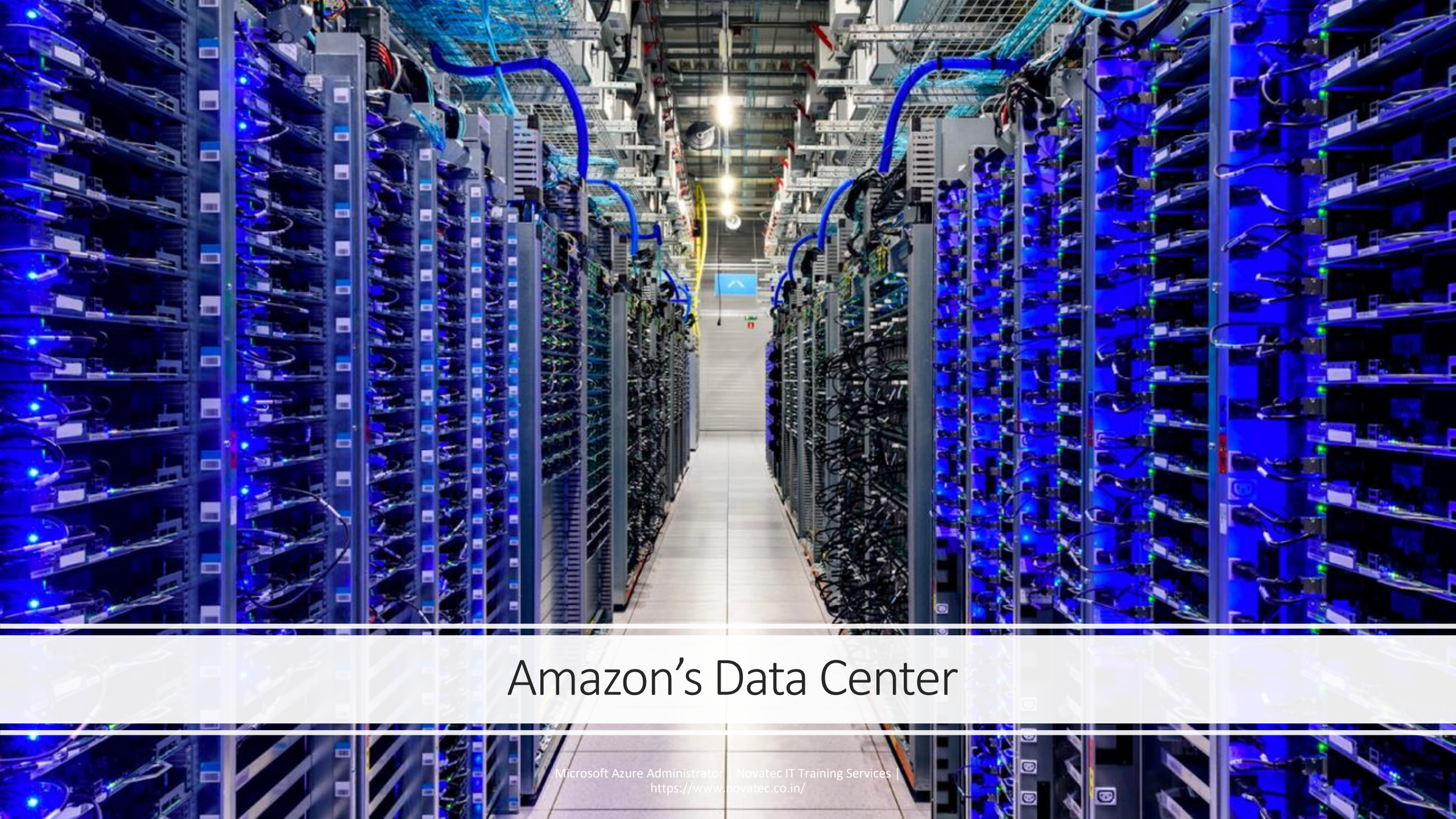
Management of Infrastructure

Limited Scalability and Elasticity

Limited Data Access

What is Cloud Computing?





Amazon’s Data Center

What is Cloud Computing?

- **Cloud computing** is the on-demand delivery of IT resources including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet with pay-as-you-go pricing
- Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider like Amazon
- You typically pay only for cloud services you use, helping lower your operating costs, run your infrastructure more efficiently and scale as your business needs change

Features of Cloud Computing

Cloud computing is about "renting" resources (vs purchasing hardware)

Pay for what you use

Run your applications in cloud provider's (Ex. AWS) datacentre

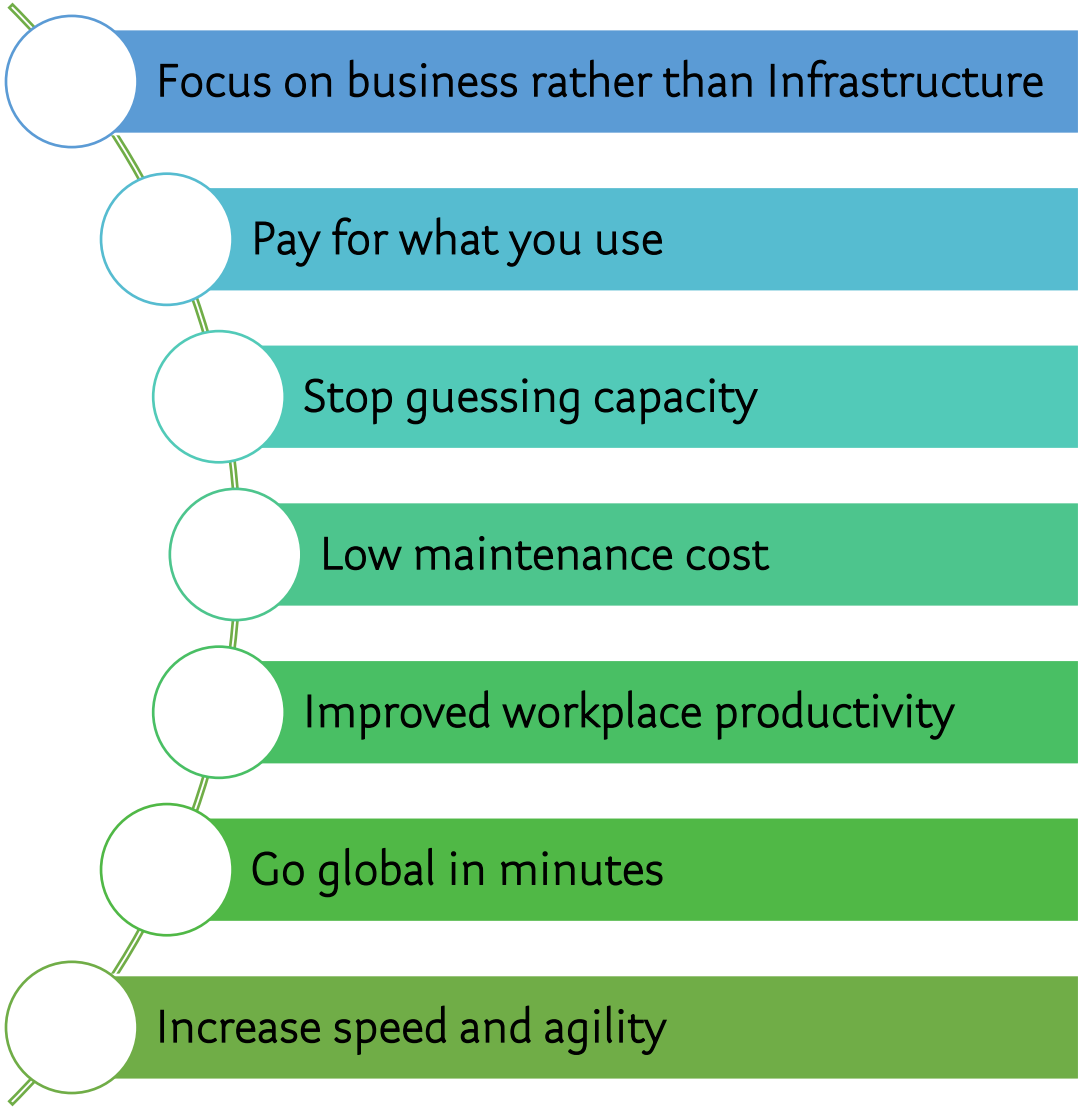
Cloud provider is responsible for the physical hardware and facilities necessary to execute your work

Cloud provider responsible for keeping the services they provide up to date

Examples of Cloud providers:

Microsoft, Amazon, Google, Alibaba, Oracle, Dell, IBM

Benefits of Cloud Computing



Characteristics of Cloud Computing

ON-DEMAND SELF-SERVICES

RESOURCE POOLING

ELASTICITY

BROAD NETWORK ACCESS

MEASURED SERVICE

PAY AS YOU GO

AVAILABILITY

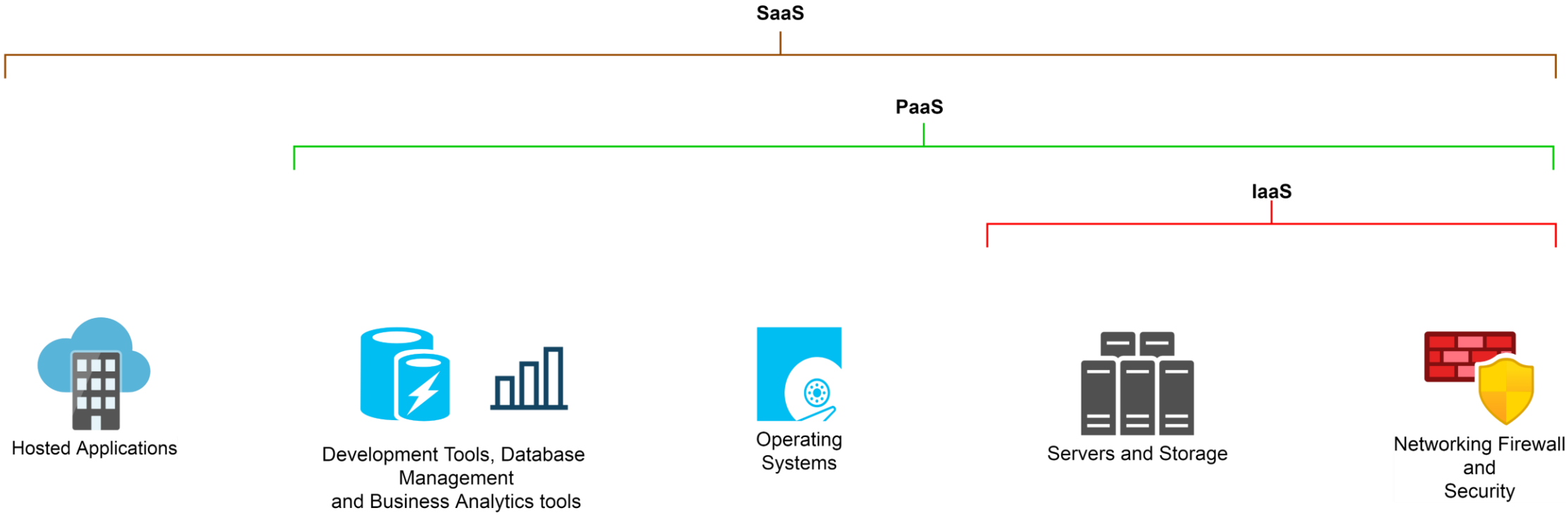
Cloud Computing Models

Cloud Computing Models

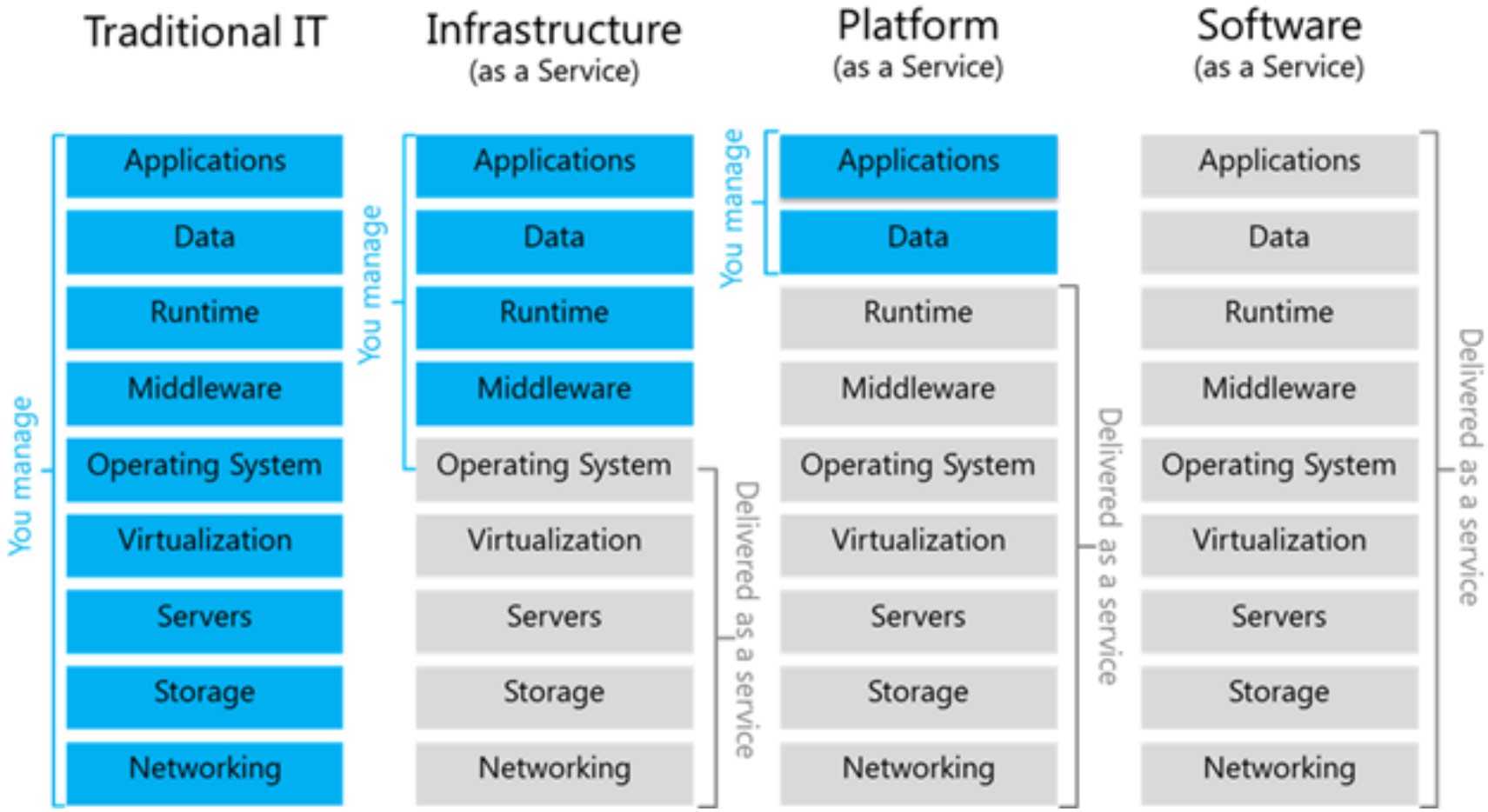
There are three main models for cloud computing. Each model represents a different part of the cloud computing stack

1. Infrastructure as a service (IaaS)
2. Platform as a service (PaaS)
3. Software as a service (SaaS) – e.g.,Office 365

Types of Cloud Services



IaaS vs PaaS vs SaaS



Infrastructure as a service (IaaS)

- With IaaS, you rent IT infrastructure—servers and virtual machines (VMs), storage, networks, operating systems—from a cloud provider on a pay-as-you-go basis
- It typically provides access to networking features, computers (virtual or on dedicated hardware), and data storage space
- IaaS gives you the highest level of flexibility and management control over your IT resources
- It is most like the existing IT resources with which many IT departments and developers are familiar

Infrastructure as a Service (IaaS) – Advantages

- Reduces capital expenditures and optimizes costs
- Increases scale and performance of IT workloads
- Increases stability, reliability and supportability
- Improves business continuity and disaster recovery (BCDR)
- Helps you innovate and get new apps to users faster

Platform as a Service (PaaS) – Overview

- Platform as a Service (PaaS) provides the user with a platform equipped with top-of-the-range hardware and software tools hosted by the service provider
- PaaS eliminates the need to manage the complex infrastructure of hardware and operating systems
- It allows developers to focus on their application development, deployment, and management
- Ideal cloud model for organizations looking to remove the resource procurement, software maintenance - including patches application and rollback - and capacity planning

Software as a Service (SaaS) – Overview 1 of 2

- Software as a Service (SaaS) is a method for delivering software applications over the Internet, on demand and typically on a subscription basis
- 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
- They don’t have to consider which operating systems are needed to execute the email programs

Software as a Service (SaaS) – Overview 2 of 2

- Ex. Gmail, Office 365
- SaaS allows users to access technical products and services without worrying about configuration and management
- SaaS represents end-user applications for a particular software without the trouble of underlying infrastructure

Cloud Deployment Models

Types of Cloud Deployment Models

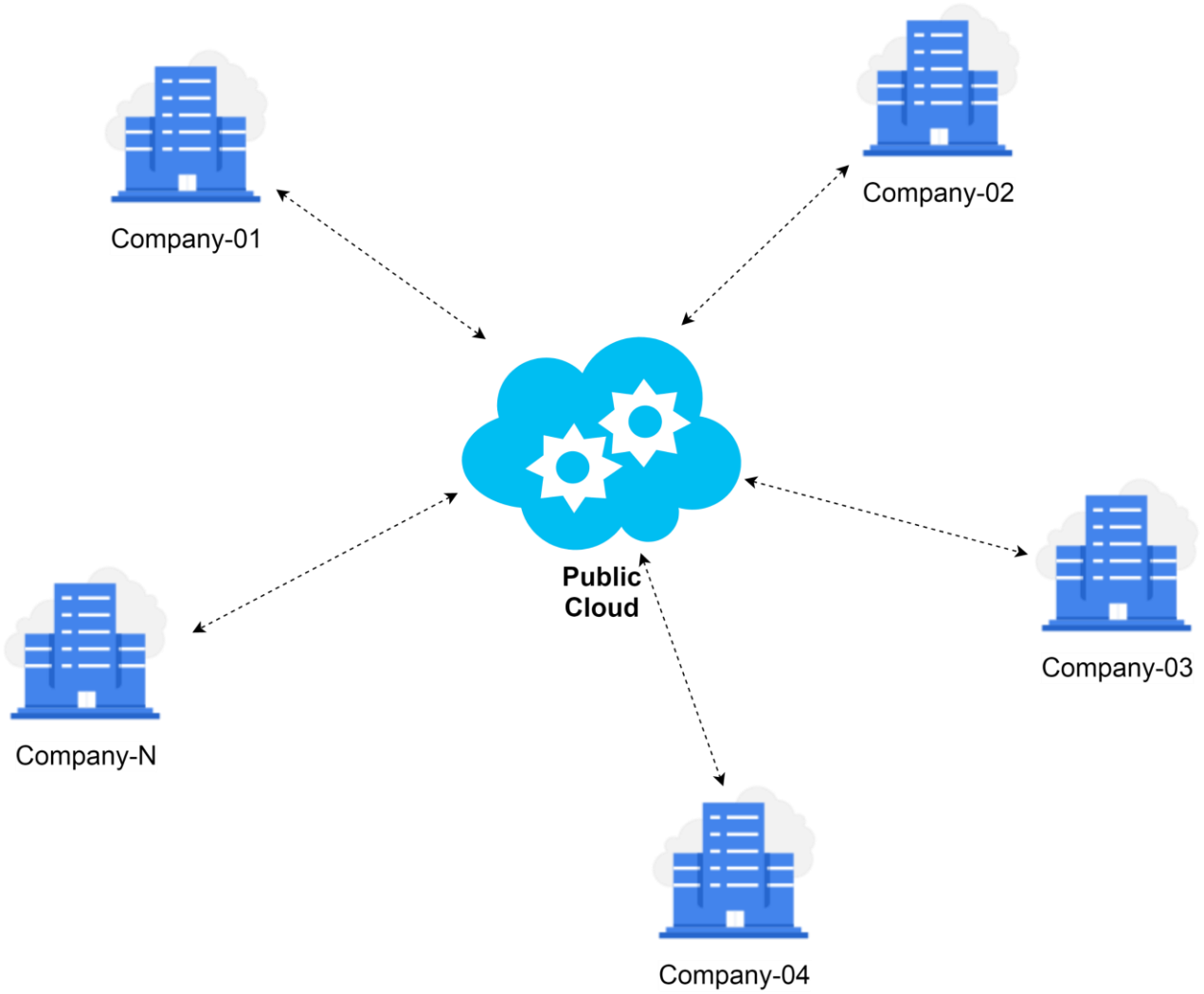
- The cloud deployment model identifies the specific type of cloud environment based on ownership, scale, and access, as well as the cloud's nature and purpose
- The Cloud Deployment Model can be basically categorized into below types:
    1) Cloud
        I. Public Cloud
        II. Private Cloud
    2) Hybrid
    3) On-Premise

Ref: For more details, you may check out https://aws.amazon.com/types-of-cloud-computing/

Public Cloud – Overview

- Public clouds are owned and operated by a third-party cloud service providers, which deliver their computing resources like servers and storage over the Internet
- Amazon Web Services and Microsoft Azure are some of the examples of a public cloud
- With a public cloud, all hardware, software and other supporting infrastructure is owned and managed by the cloud provider
- You access these services and manage your account using a web browser
- The catch here is that multiple customers could potentially be sharing the same piece of physical hardware at the data-center level

Public Cloud – Architecture



Public Cloud – Advantages

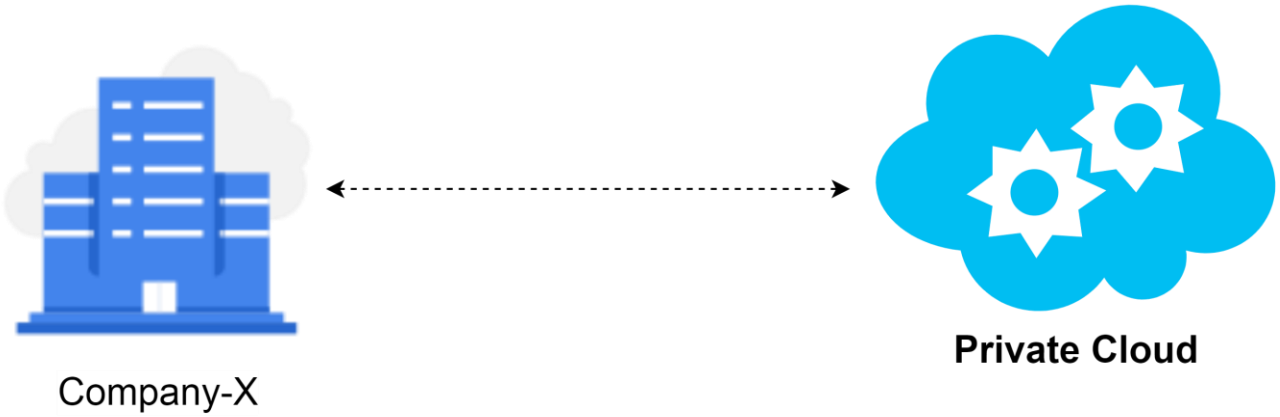
1. Scalability
2. Low Complexity
3. Pay-as-you-Go
4. Quick go to Market – Make you application live quickly

Some of the examples of Public cloud are AWS, Microsoft Azure and Google Cloud Platform

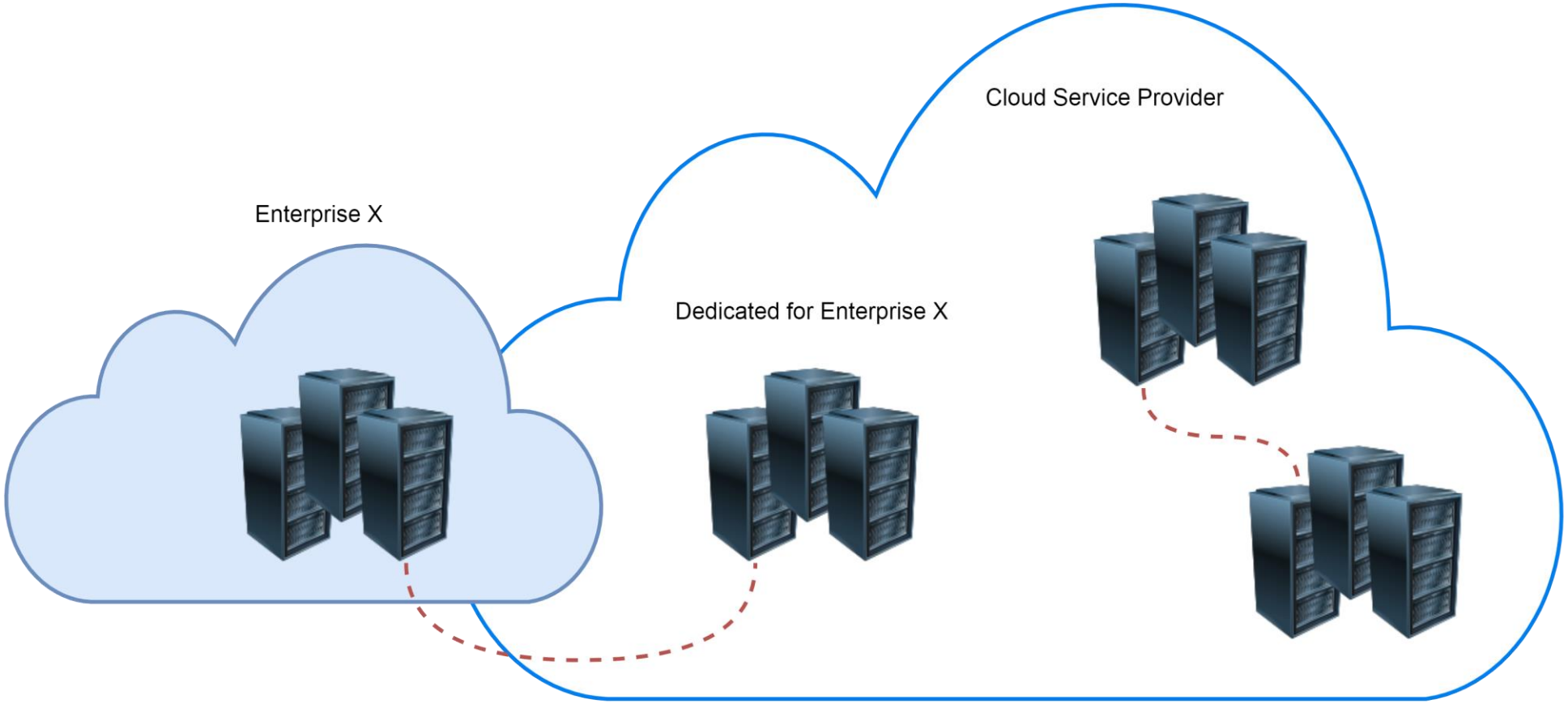
Private Cloud – Overview

- A private cloud refers to cloud computing resources used exclusively by a single business or organization
- A private cloud can be physically located on the company's on-site datacenter. Some companies also pay third-party service providers to host their private cloud
- The services and infrastructure are maintained on a private network
- The catch here is that this solution is generally ideal for larger and more security focused organizations
- Examples: VMware, HP Data Centers, Elastra etc.

Private Cloud – Architecture



Private Cloud: DC-as-a-Service



Private Cloud – Advantages

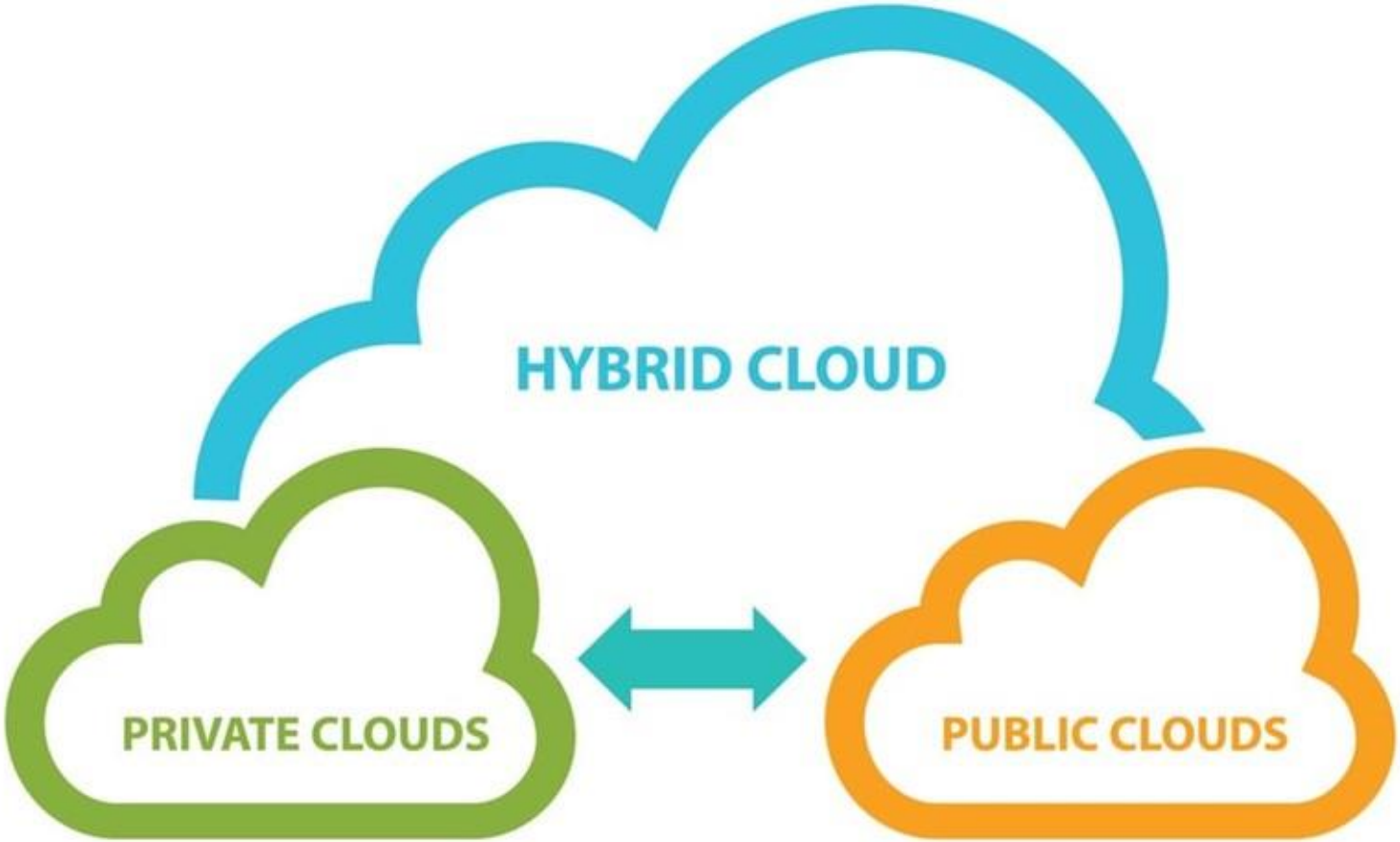
- The main thing that sets a private cloud apart from a commercially-used public cloud is where the hardware is kept and how it's maintained
- A private cloud is typically hosted on the company's own servers, within their own network infrastructure
- The main advantage one has with a privately-managed cloud is direct control over every aspect of the cloud's implementation: the hardware, the networking, the operating system and other software used to create the cloud itself
- Security and Isolation of organization's workload

Hybrid Cloud – Overview

- Hybrid clouds combine public and private clouds, bound together by technology that allows data and applications to be shared between them
- A hybrid cloud gives your business greater flexibility, more deployment options and helps optimize your existing infrastructure, security and compliance

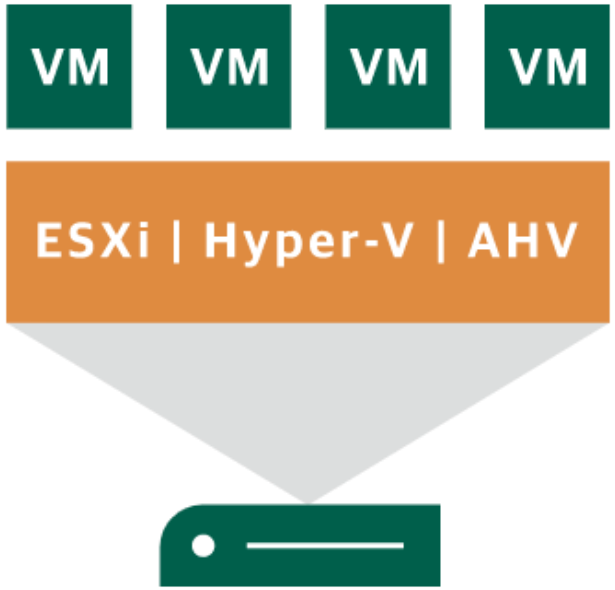
Use-case: Any Organization may have a desire to operate their non-critical or sensitive operations to a cheaper public hosting solution, while also leveraging a private solution for say their sensitive customer information and proprietary data

Hybrid Cloud – Architecture



Hybrid Cloud – Advantages

1. Scalability
2. Very Secure
3. Improved Cost
4. High Reliability
5. Customization (can get best of both Public and Private clouds)
6. High Performance



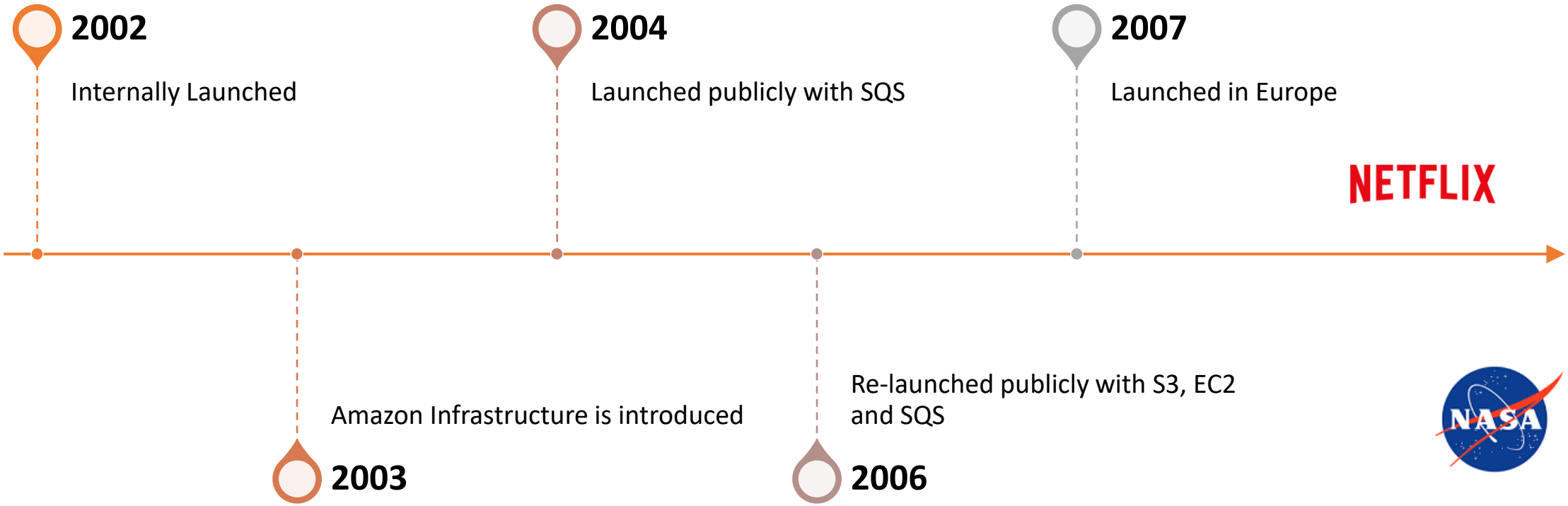
Virtualization

Overview of Amazon Web Services (AWS)

Overview of AWS

- In 2006, Amazon Web Services (AWS) is a cloud platform which began offering IT infrastructure services to businesses as web services
- One of the key benefits of leveraging AWS is the opportunity to replace upfront capital infrastructure expenses with low variable costs that scale with your business
- With the AWS (cloud), businesses no longer need to plan for and procure servers and other IT infrastructure weeks or months in advance
- Today, AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers hundreds of thousands of businesses

AWS Cloud History



Case Studies
https://aws.amazon.com/solutions/case-studies/nasa-image-library/
https://aws.amazon.com/solutions/case-studies/airbnb-case-study/

AWS Cloud Use Cases

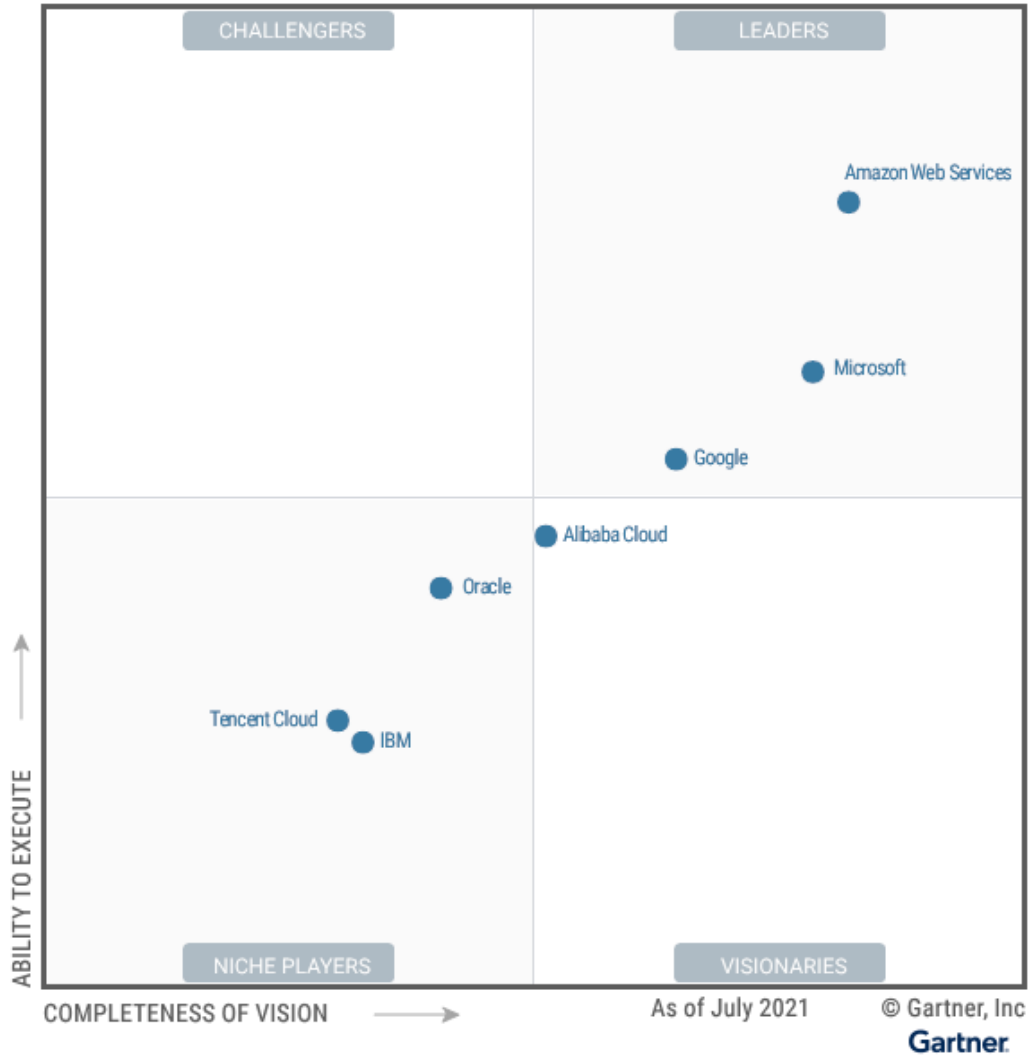
- AWS enables you to build sophisticated, scalable applications
- Applicable to a diverse set of industries
- Use cases include:
  - Enterprise IT, Backup & Storage, Big Data analytics
  - Research and Development
  - Web-site hosting, Mobile & Social Apps
  - Gaming

AWS statistics and facts

- In April 2021, AWS reported 32% yearly growth and accounted for 32% of $41.8 billion cloud market in Q1 2021
- Amazon continued to lead the worldwide IaaS market with an estimated $20 billion of revenue in 2019 and 45% of the total market
- Pioneer and Leader of the AWS Cloud Market for the 9th consecutive year
- Over 1 million AWS active users

Source: https://www.gartner.com/en/newsroom/press-releases/2020-08-10-gartner-says-worldwide-iaas-public-cloud-services-market-grew-37-point-3-percent-in-2019

How AWS is Leader in the Cloud domain?



*Gartner is the world's leading research and advisory company.

How AWS is Leader in the Cloud domain?

1. **It Has Been Around the Longest**

   Amazon introduced the world to Amazon Web Services in 2006. AWS has had a decade to refine and perfect its product as well as build a solid customer base

2. **It Is So Much Bigger Than Its Competitors**

   AWS has more than five times the computing capacity of the next 14 largest infrastructure vendors combined.” AWS has multiple data centers located across the globe. As it stands, AWS has 84 Availability Zones within 26 cloud Regions

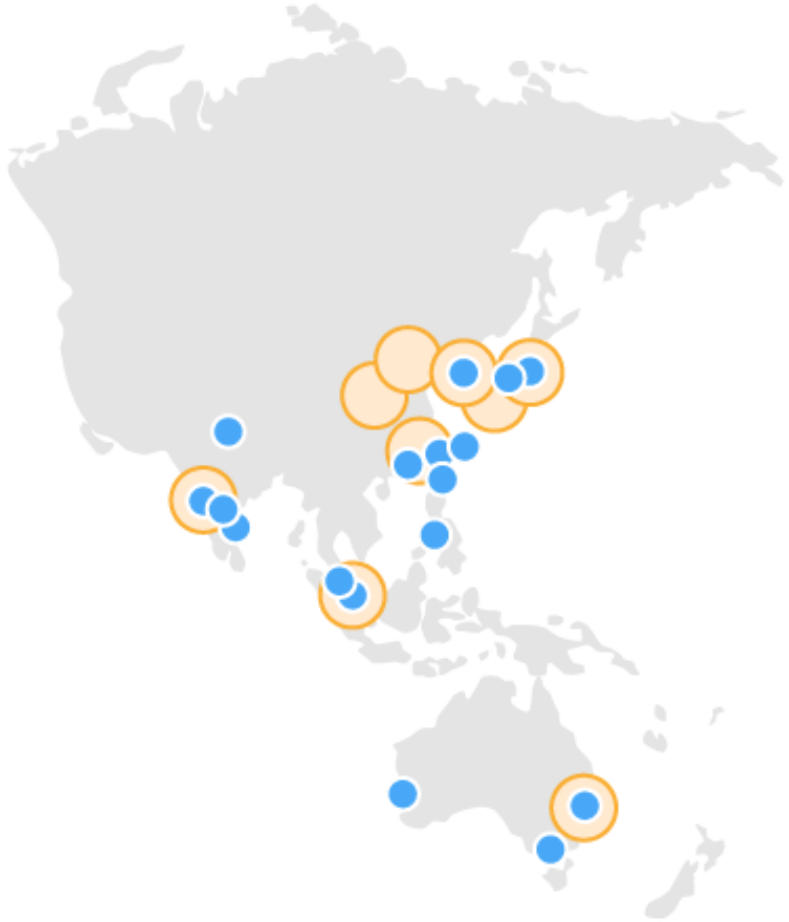
3. **You get a year to test it with free tier Account**

   Amazon offers an AWS Free Tier which lets users get hands-on experience with the AWS cloud platform, before committing to a full cloud migration, and at no cost to them

AWS Global Infrastructure

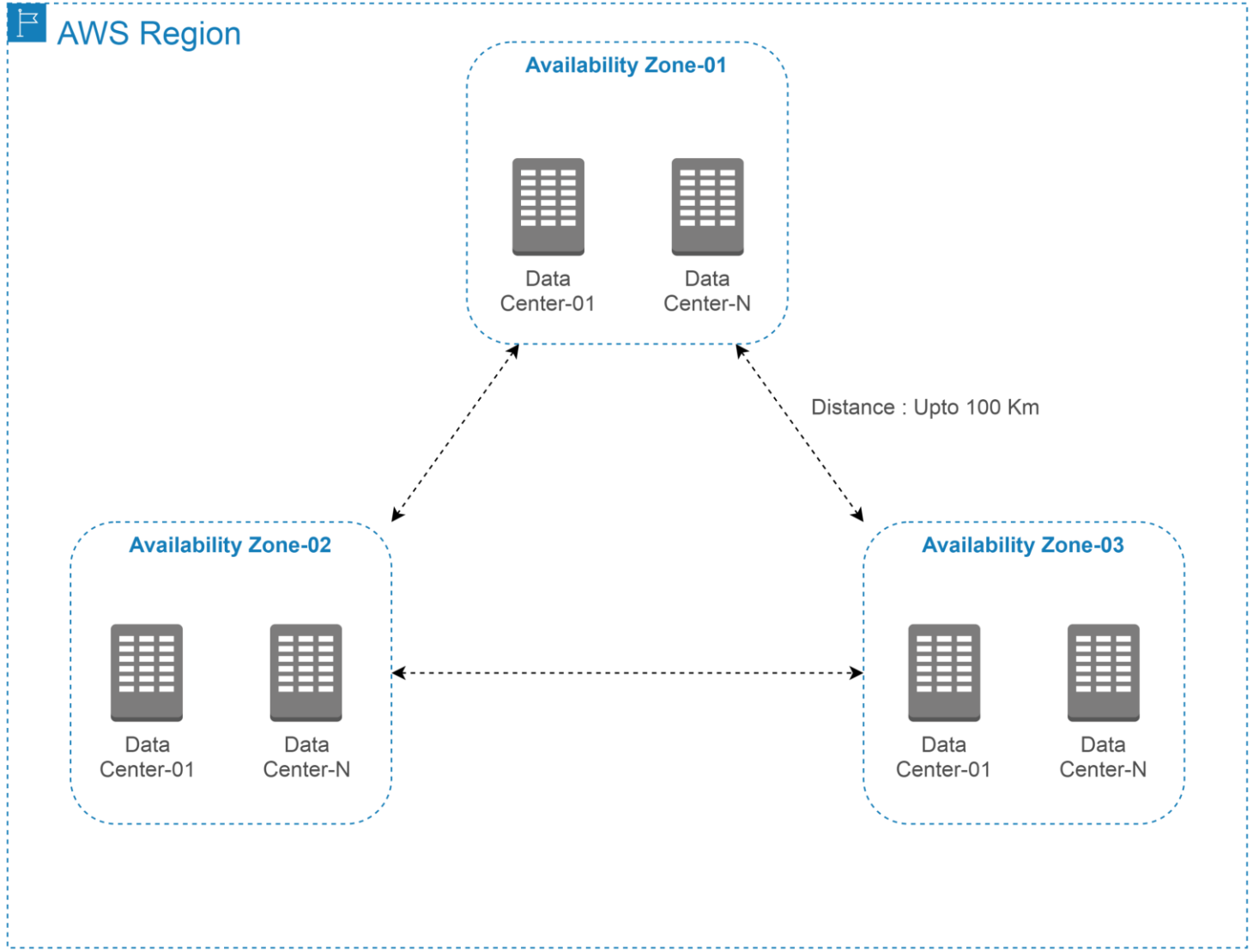
AWS Global Infrastructure

- ✓ AWS Data-centers
- ✓ AWS Regions
- ✓ AWS Availability Zones
- ✓ AWS Edge Locations / Point-of-Presence (PoP)



Ref: https://infrastructure.aws/

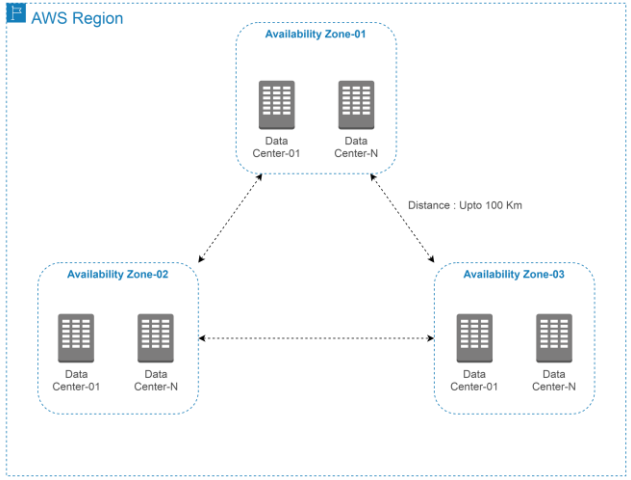
AWS Global Infrastructure



AWS Regions

- **Region** is a physical location around the world and is cluster of Amazon Data Centers
- Each group of logical data centers is called **Availability Zone** (AZ)
- Each AWS **Region** consists of multiple, isolated, and physically separate AZs within a geographic area
- Region names are like ap-south-1, us-east-1, us-west-1
- Most AWS services are Region scoped

Availability Zones



- An **Availability Zone (AZ)** is one or more discrete data centers with redundant power, networking, and connectivity in an AWS Region
- Meant for providing high availability, fault tolerance, and scalability
- All AZs in an AWS Region are interconnected with high-bandwidth, low-latency networking
- AZs are physically separated from any other AZ, although all are within 100 km (60 miles) of each other

AWS Point of Presence – POP (Edge Locations)

- Amazon has +310 Points of Presence (300+ Edge Locations & 13 Regional Caches) across 42 countries
- Content is delivered to end users with lower latency
- The POPs are used for both to deliver content to end users at high speeds, and with the lowest possible latency
- An **Edge location** is the nearest point to the consumer (user) who is consuming the AWS service
- In these locations, the server is not present, but a small setup is there

AWS Global Infrastructure

The AWS Cloud spans 81 **Availability Zones** within 26 geographic **Regions** around the world, with announced plans for 32 more Availability Zones and 8 more AWS Regions in Australia, India, Indonesia, Israel, Spain, Switzerland, and United Arab Emirates (UAE)

26 Launched Regions

Each with multiple Availability Zones (AZ's)

84 Availability Zones

17 Local Zones

24 Wavelength Zones

For ultralow latency applications

8 Announced Regions

32 Announced Local Zones

2x More Regions

With multiple AZ's than the next largest cloud provider

245 Countries and Territories Served

108 Direct Connect Locations

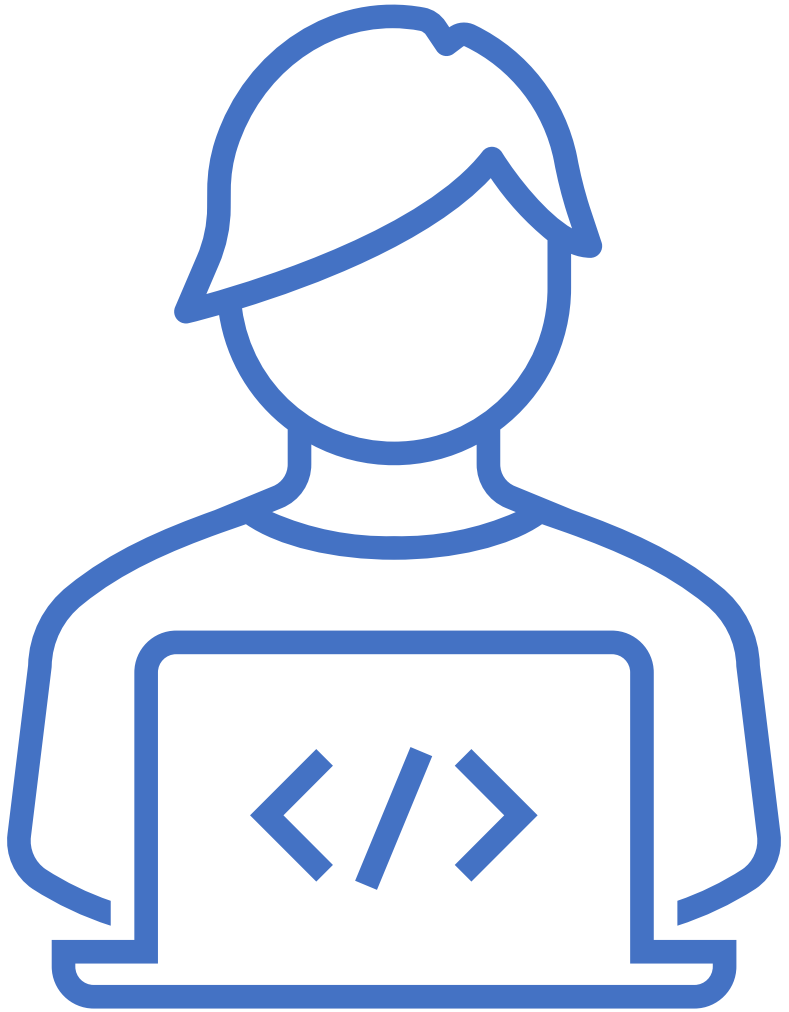
310+ Points of Presence

300+ Edge Locations and 13 Regional Edge Caches

Walkthrough of AWS Console

Walkthrough of AWS Console

Hands-on Labs



Lab: Creating an AWS Account (Free Tier)

Pre-requisites

You must have below details while creating the new AWS free tier account:

1. Credit card as a payment option
2. Valid email account
3. Valid cell phone number

Ref: https://aws.amazon.com/free/free-tier/

Different ways of accessing AWS

Different ways of accessing AWS

AWS Console

- Browser based access

  (www.console.aws.amazon.com)
- See all the resources
- Billing and Security
- Customizable

AWS CLI

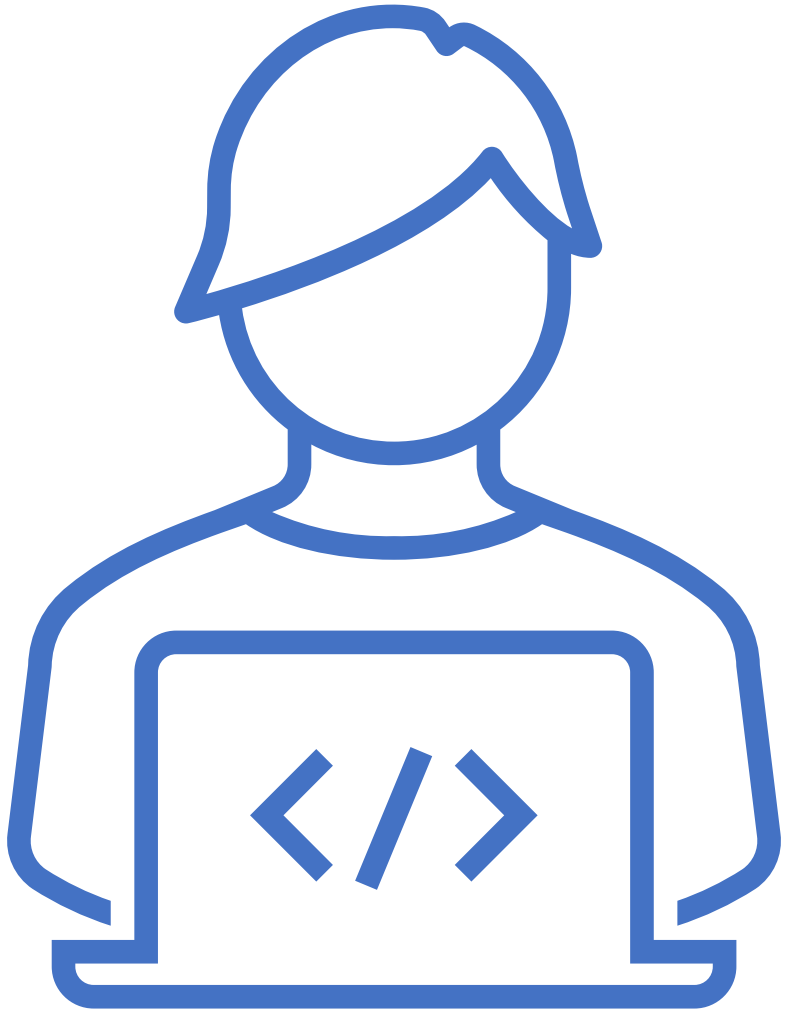
- Bash like interface
- Cross platform

AWS REST API

- Programmatic way
- Access the AWS using

  REST API

Hands-on Labs



Lab: Installing and Configuring AWS CLI Utility

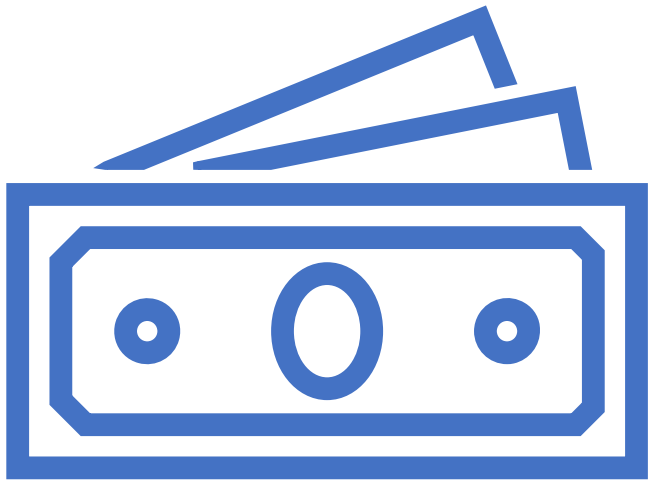
Please refer the below provided link to know the pre-requisites, and step-by-step process for installing AWS CLI on Linux and Windows platforms:

1. Windows

   https://docs.aws.amazon.com/cli/latest/userguide/install-cliv2-windows.html

2. Linux

   https://docs.aws.amazon.com/cli/latest/userguide/install-cliv2-linux.html



AWS Pricing

How does AWS Pricing work?

- AWS offers you a pay-as-you-go approach for pricing for over 160 cloud services
- With AWS you pay only for the individual services you need, for as long as you use them, and without requiring long-term contracts or complex licensing
- AWS pricing is like how you pay for utilities like water and electricity
- You only pay for the services you consume, and once you stop using them, there are no additional costs or termination fees

How does AWS Pricing work?

Pay-as-you-Go

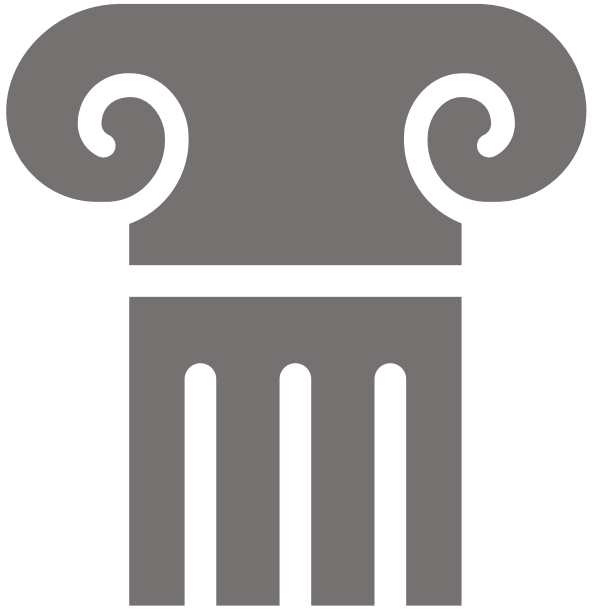
- No overcommitting budgets
- Improving your responsiveness to changes
- Reducing the risk of overprovisioning

Save when you submit

- Savings over On-Demand in exchange for a commitment to use a specific amount
- Measured in $/hour of an AWS service or a category of services, for a one or three-year period

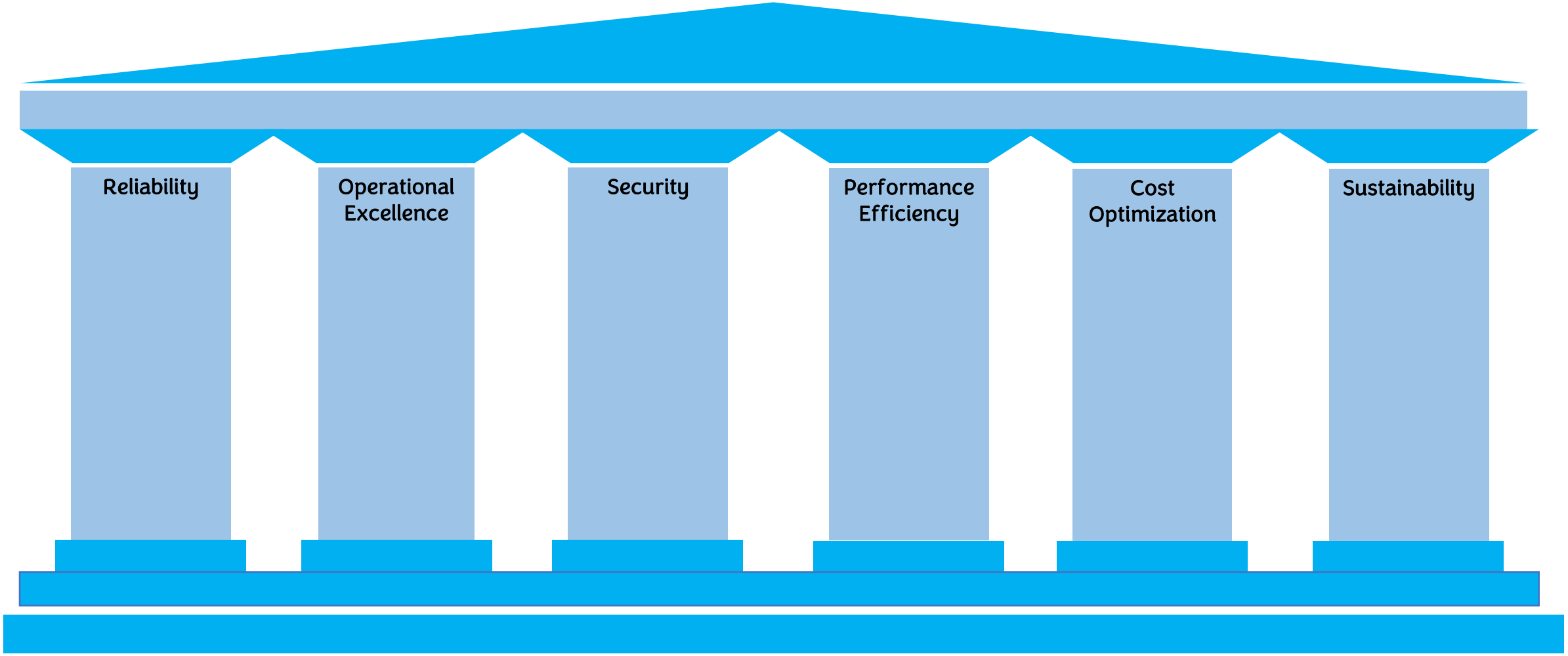
Pay less by using more

- The more you use, the less you pay per GB (storage)



The 6 Pillars of the AWS Well-Architected Framework

The 6 Pillars of the AWS Well-Architected Framework



https://aws.amazon.com/blogs/apn/the-6-pillars-of-the-aws-well-architected-framework/