AWS

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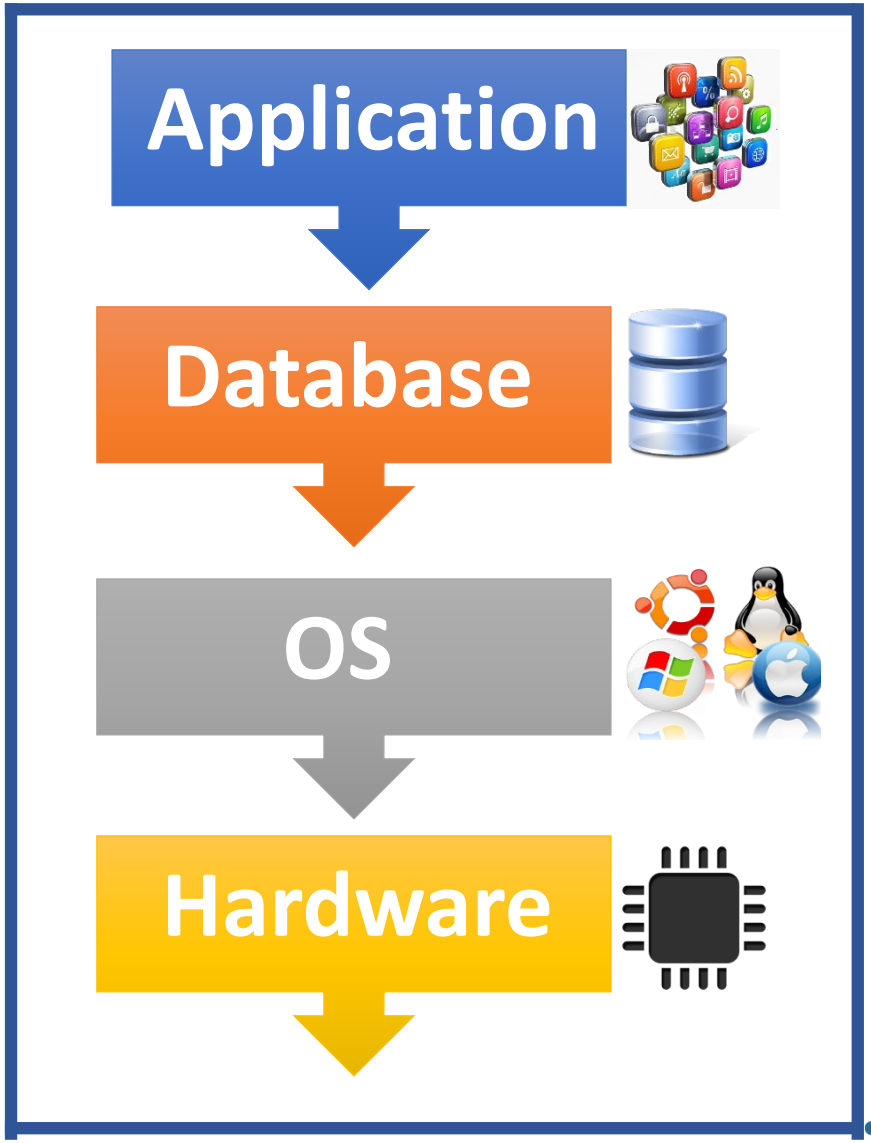
Infrastructure



Datacenter

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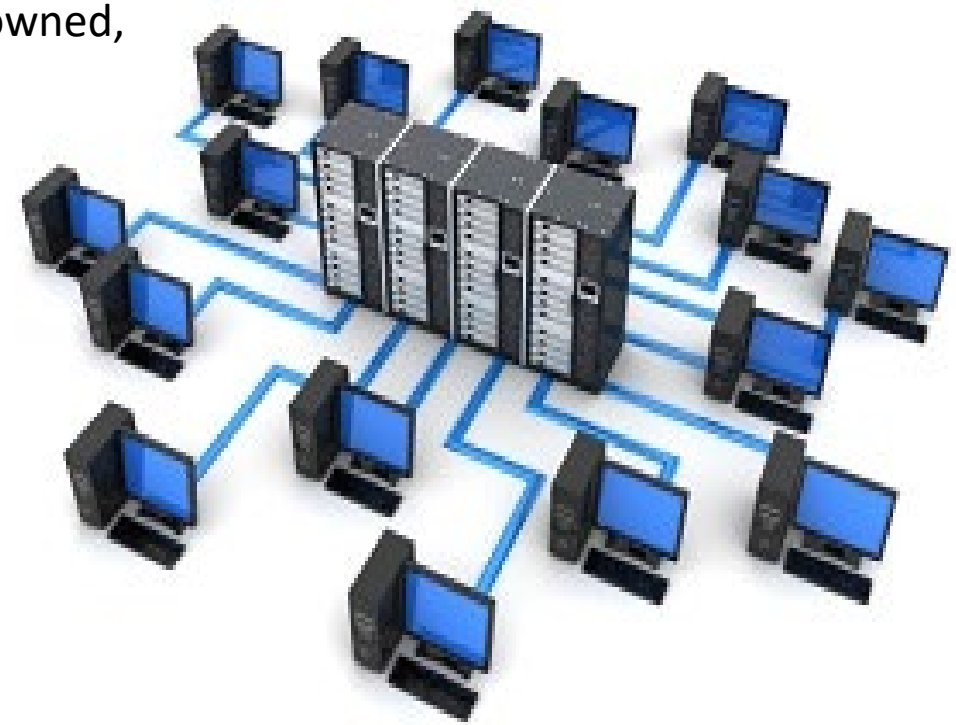
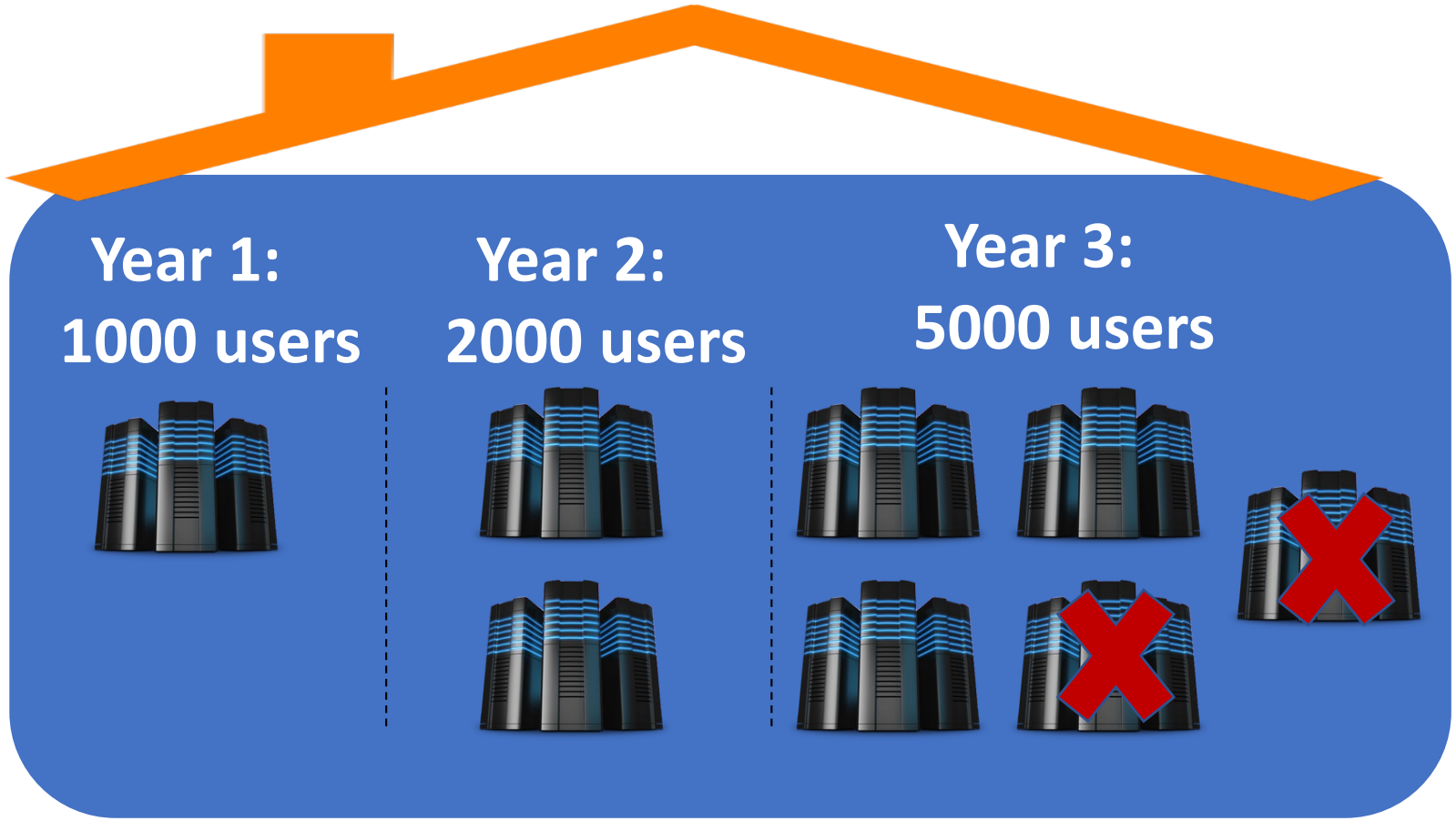
On-premise Data Center

An on-prem data center simply means that the organization maintains all of the IT infrastructure(Servers, Storage, Networks, etc) needed by the business is owned, located, operated, and used by companies inside their premises.



On-premise Infrastructure



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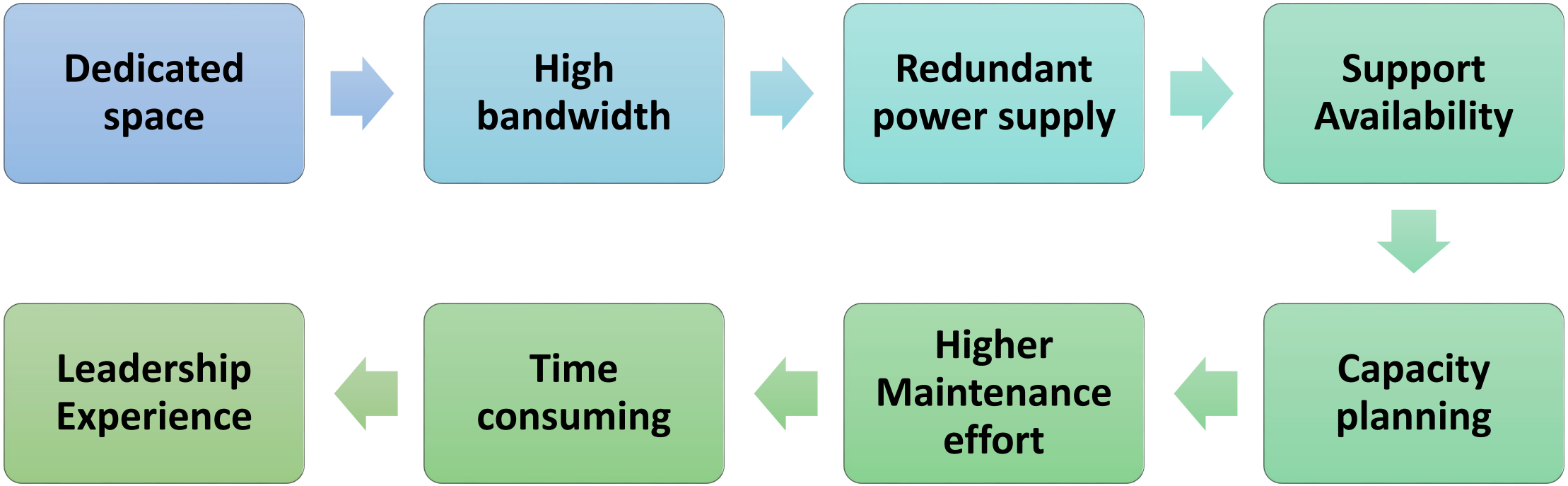
Datacenter Infrastructure Management



Business Requirements

High Availability

Creating the architecture in such a way that your system is always available
HA ensure that we can always access our data in the cloud

Fault Tolerant

The ability of our system to withstand failures in one/more of its components & still remain available
FT ensure that if one of our web server failed, the backup server immediately took over

Scalability

Scalability handles the changing needs of an application within the confines of the infrastructure via statically adding or removing resources to meet applications demands if needed.

Elasticity

Elasticity is the ability to grow or shrink infrastructure resources dynamically as needed to adapt to workload changes in an autonomic manner, maximizing the use of resources. This can result in savings in infrastructure costs overall.

What is Cloud Service ?

A **cloud service** is any **service** made available to users on demand via the Internet from a **cloud** computing provider's servers

What is Cloud Computing ?

Cloud computing is the **delivery** of computing services—**servers, storage, databases, networking, software**, **analytics**, and **more** —over the Internet (“the cloud”) hosted at a remote **data center managed** by a cloud services provider (**CSP**).

Cloud Computing Service Providers give the ability to manage services & applications through a global network using GUI,CLI,API & SDK.

Instead of buying, owning, and maintaining physical data centres and servers, you can access technology services, such as computing power, storage, and databases ,etc.. on an as-needed basis from a cloud provider with pay-as-you-go model.

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.

Advantages Of Cloud

Cost

Cloud computing eliminates the capital expense of buying hardware and software and setting up and running on-premise datacenters—the racks of servers, the 24/7 electricity for power and cooling, the IT experts for managing the infrastructure.

Speed

With cloud, your organization can start using(deploying) enterprise applications in minutes.

You can provision(create) computing resources (Servers, Storage, databases, networks ..etc.) in a matter of minutes, typically with just a few mouse clicks.

Scalability & Elasticity

In Cloud you can provision the right amount of resources(Servers, Storage, etc.) that you actually need. And you can scale these resources up or down to instantly grow and shrink capacity as your business needs change(Based on load) manually or automatically(auto scaling).

Deploy globally in minutes

With the cloud, you can expand to new geographic regions and deploy globally in minutes. For example, AWS has infrastructure all over the world, so you can deploy your application in multiple physical locations with just a few clicks. Putting applications in closer proximity to end users reduces latency and improves their experience.

High Availability & **Reliability**

High availability is the ultimate goal of moving to the cloud. The idea is to make your products, services, and tools available to your customers and employees at any time from anywhere using any device with an internet connection.

Types of cloud computing

Public cloud. 

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. AWS, Microsoft Azure, GCP is an example 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, API'S, CLI'S.

Private cloud. 

A private cloud refers to cloud computing resources used exclusively by a single business or organisation. A private cloud can be physically located on the company's on-site(premise) datacentre. Some companies also pay third-party service providers to host their private cloud.

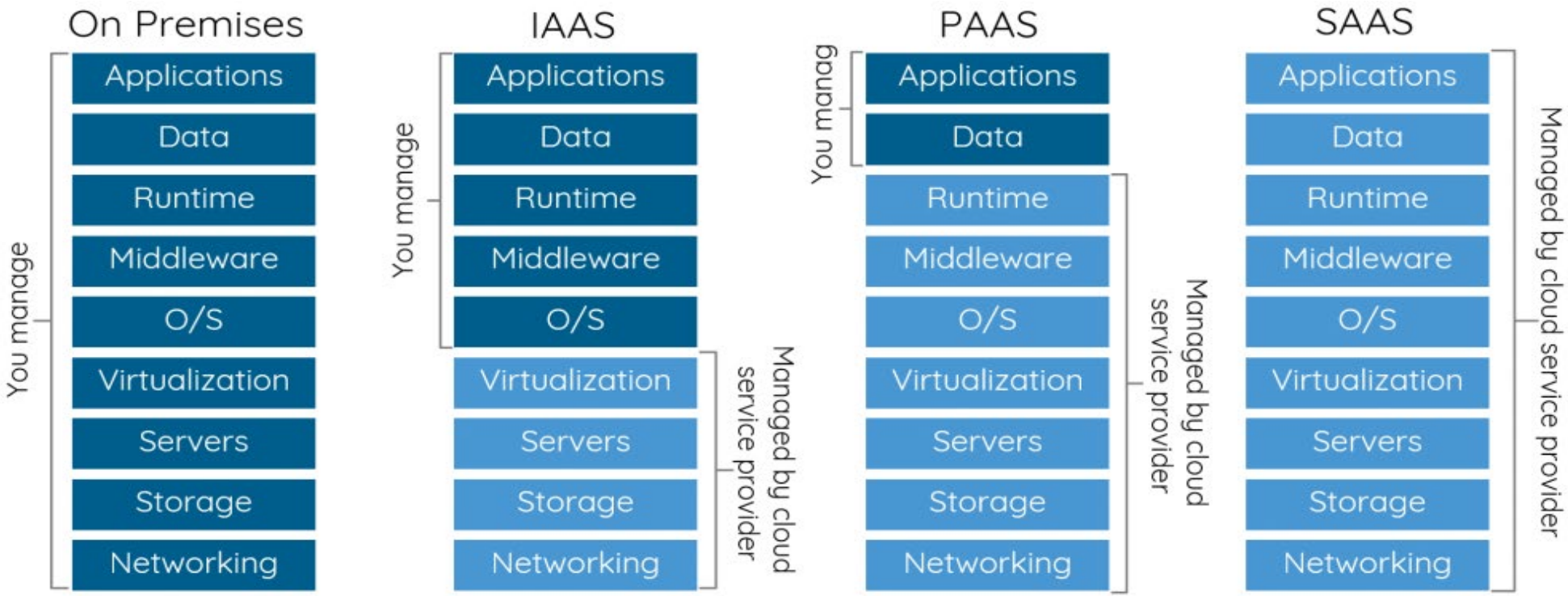
Hybrid cloud. 

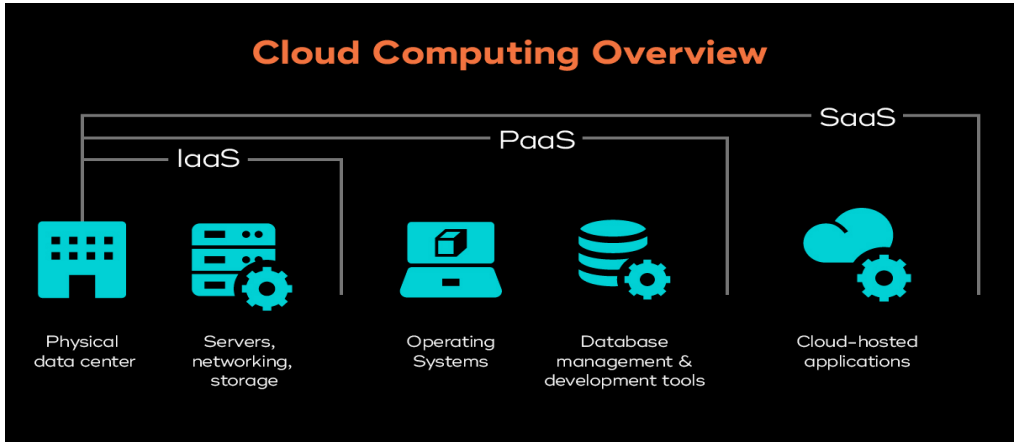
Hybrid clouds combine public and private clouds, bound together by technology that allows data and applications to be shared between them. By allowing data and applications to move between private and public clouds, a hybrid cloud gives your business greater flexibility, more deployment options and helps optimise your existing infrastructure, security and compliance.

Multi cloud 

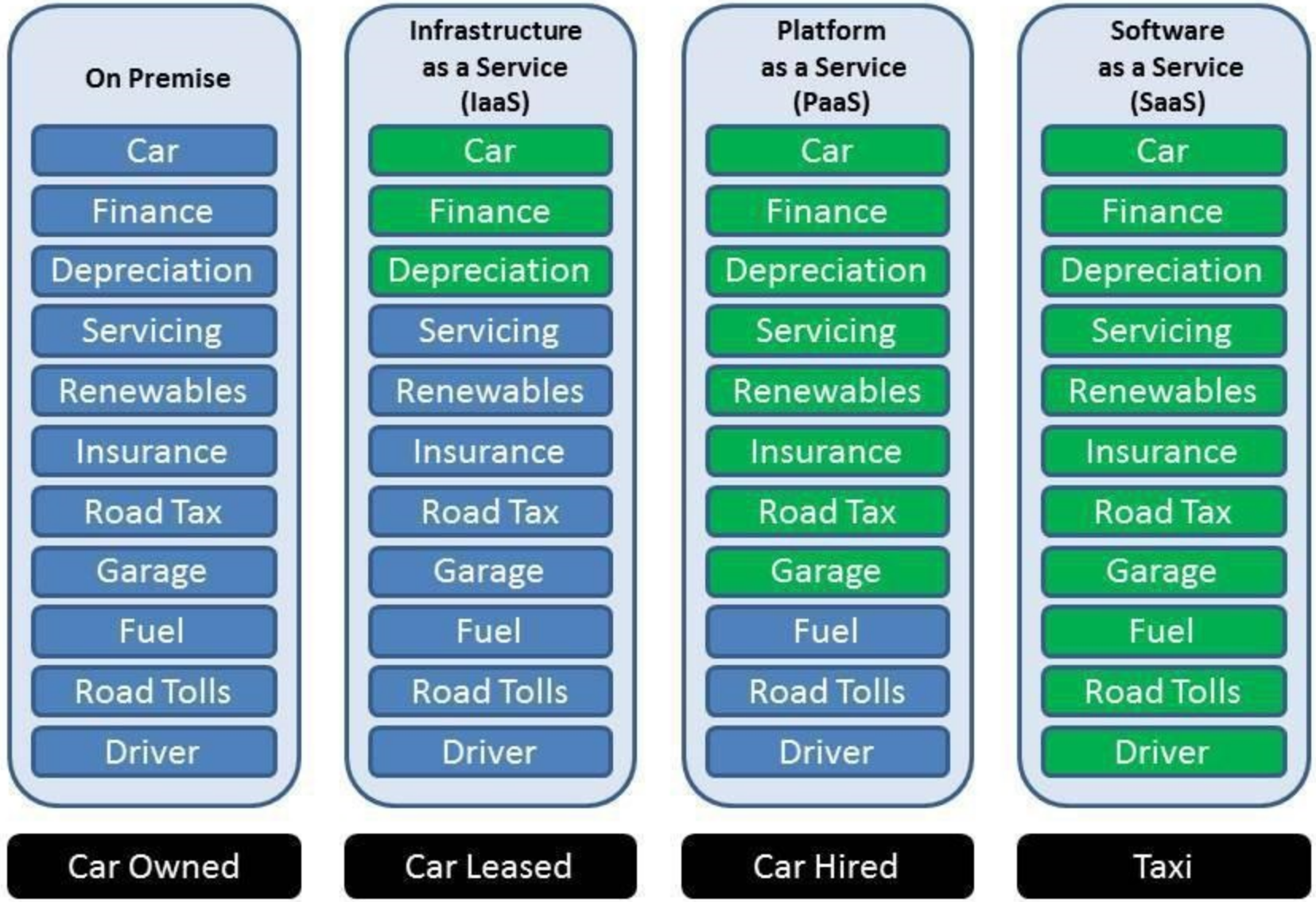
Multi-cloud is a strategy where an organization leverages two or more cloud computing platforms to perform various task**s**. Organizations that do not want to depend on a single cloud provider may choose to use resources from several providers to get the best benefits from each unique service.

Cloud Service Models





Car as a Service



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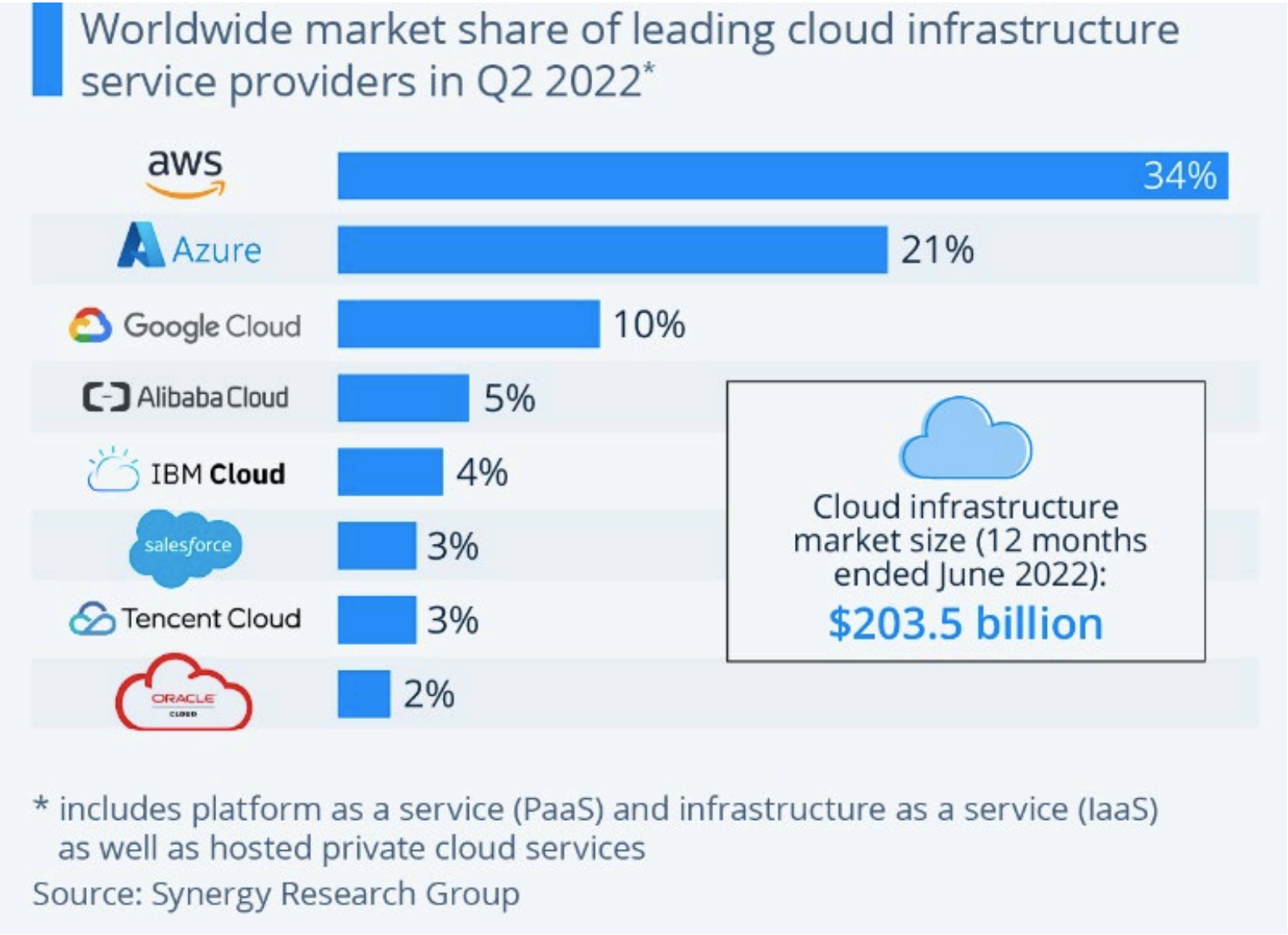
Popular Cloud Providers

- Amazon Web Services
- Microsoft Azure
- Google Cloud Platform
- Alibaba Cloud
- IBM Cloud
- Oracle Cloud
- Rackspace
- Salesforce
- VMware Cloud



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Amazon Web Services is a subsidiary of Amazon.com that provides on-demand cloud computing platforms

- **Cost-Effectiveness – Pay as you Go**
- **Elasticity and Agility**
- **Flexibility and Openness**
- **Security**
- **Reliable & High Performance**

AWS “Free Tier”

- AWS Free Tier refers to the limited free usage of AWS services
- AWS offers the Free Tier as means for a user to learn, experiment and get hands-on experience with AWS services
- Almost all AWS services offer some kind of Free Tier usage
- Free Tier is available for 12 months for an AWS account
- Some services extend past 12 months
- Free Tier is only available for new accounts

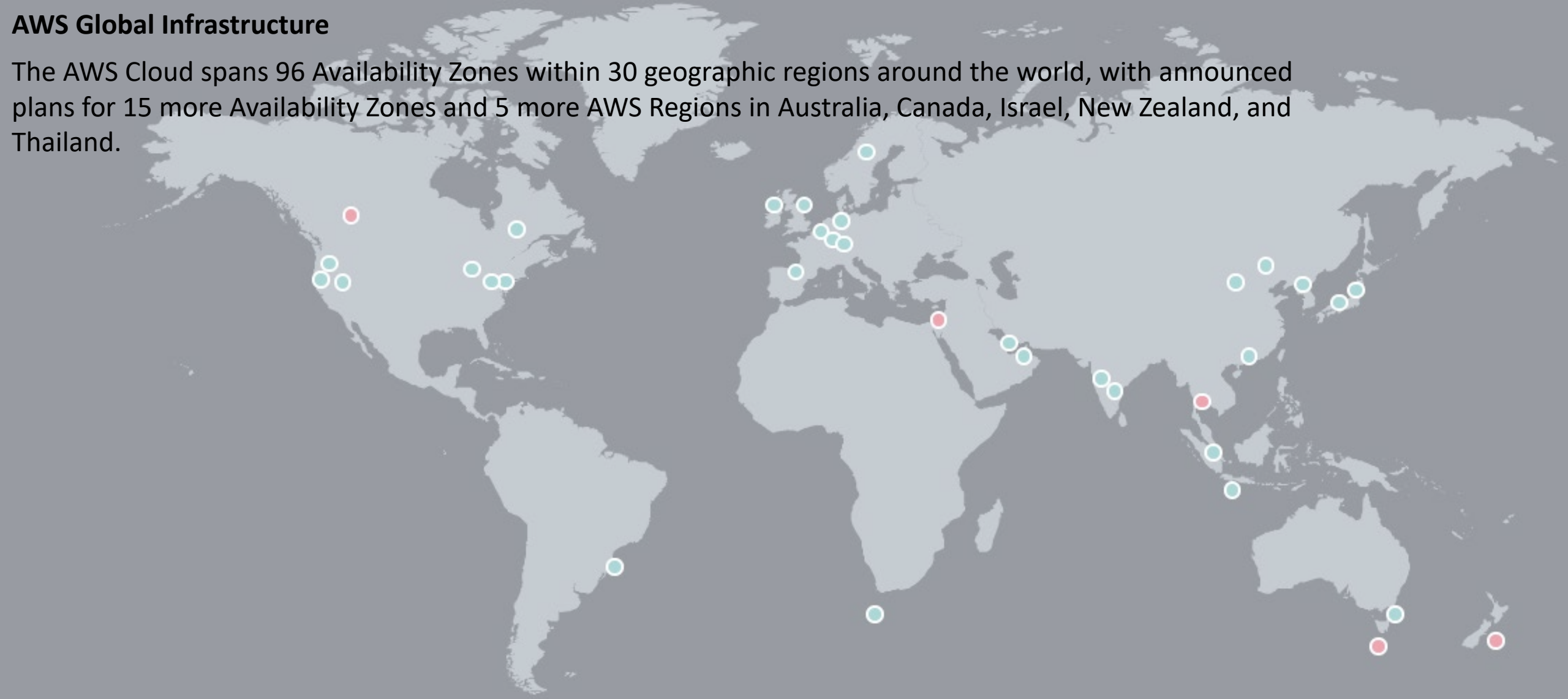
Create an AWS account

URL: https://aws.amazon.com

1) Click on "Create a New AWS Account"
2) Enter your email address
3) Make sure "I am a new user" is selected
4) Complete the "Login Credentials" form
5) Select "Company" or "Personal" Account
6) Complete the rest of the "Contact Information" form
7) Complete the "Payment Information" form
   You will need a validate credit/debit card
8) Complete "Identity Verification" form & follow instructions to input the verification PIN number
9) Select a "Support Plan"
   Select "Basic" for no fee/free tier use
10) Sign in to the AWS Console with your newly created credentials

AWS Global Infrastructure

The AWS Cloud spans 96 Availability Zones within 30 geographic regions around the world, with announced plans for 15 more Availability Zones and 5 more AWS Regions in Australia, Canada, Israel, New Zealand, and Thailand.



https://aws.amazon.com/about-aws/global-infrastructure/

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Regions

- Amazon services are hosted in multiple locations world-wide.
- These locations are composed of regions(Logical Name) and Availability Zones(Physical).
- Each *region* is a separate geographic area.
- Each region has multiple, isolated locations known as *Availability Zones*.

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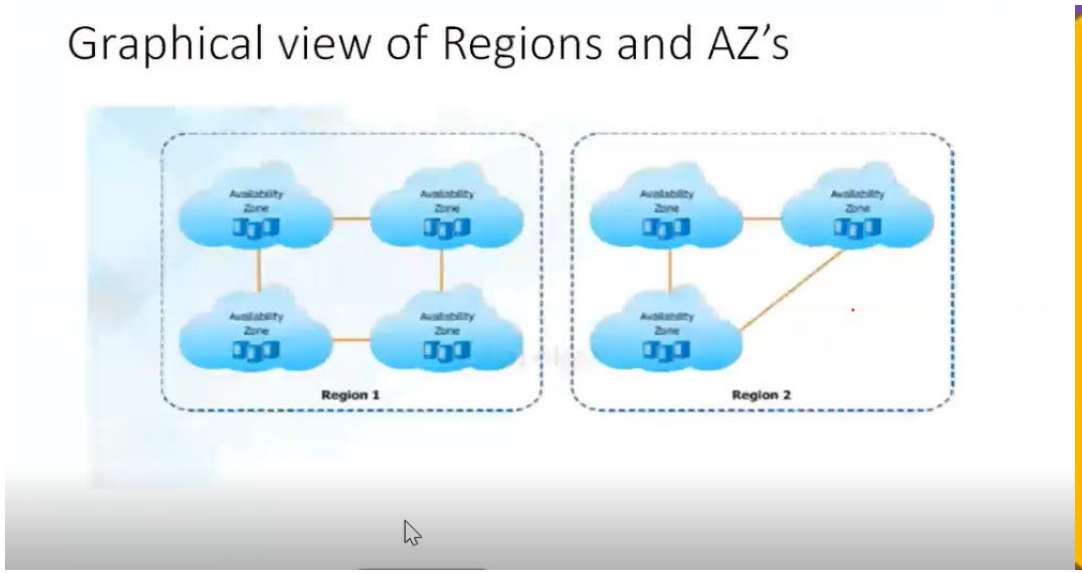
Availability Zone

- Availability Zone are distinct locations that are engineered to be isolated from failures in other AZ
- By launching instances in separate Availability zones, we can protect our application from the failure of a single location.
- AZ is a local data center in a region & it can be a collection more than one data center.



How to choose the right region…

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EC2 Basics

- Elastic Compute Cloud is your computer in the cloud
- EC2 provides scalable computing capacity in the AWS cloud
- Use EC2 to launch as many or as few virtual servers as you need, configure security, networking & manage storage.
- EC2 enables you to scale up or down to handle changes in requirements

Conceptually understanding EC2

Basic Computer components:
Operating System
CPU
Hard Drive
Network Card
Firewall
RAM

EC2 Instance components:
AMI's
Instance type
EBS(local storage)
IP Addressing
Security Groups
RAM

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EC2 Instance Purchasing Options

On-Demand:

- Most expensive purchasing option
- Most flexible purchasing option
- You are charged only when instance is Running(billed by hour)
- You can provision/terminate an instance anytime

Reserved:

- Allows us to purchase an instance for a set time period (1/3 yrs)
- Significant price discount
- Once you buy a reserved instance, we are responsible for the entire price - regardless of how often we use it

Spot:

- Amazon sells the unused instances, for short amount of time at lower price
- We can Bid on an instance type & only use when the spot price is equal to or below your bid price
- Charged by hour
- Spot price fluctuate based on supply & demand in market

How are we charged for using EC2 ?

1) Purchasing Options:
    - on-Demand
    - Reserved
    - Spot
2) Instance Family & Type:
    - General Purpose
    - Compute Optimized
    - GPU Optimized
    - Memory optimized
    - Storage Optimizes
3) EBS Optimized (Option for higher IOPS performance)
4) AMI Type (price varies on distribution/software packages)
    - Linux
    - Windows
5) Data Transfer (in/out of the instance)
6) Regions

AMI - Amazon Machine Image

- A preconfigured package required to launch an EC2 Instance; includes an Operating system, software packages & other settings
- AMI provides the information required to launch an instance, which is a virtual server in the cloud
- We can launch as many instances from the AMI as you need

Step1: Selecting an AMI

- When you launch an EC2 Instance, the first thing you do is select an AMI

- AMIs come in 2 main categories:

1) Community AMIs:
   - Free to use
   - Generally it contains only the OS
2) AWS Marketplace AMIs:
   - pay to use
   - generally comes packaged with additional licensed software
3) My AMIs:
   - AMIs that you can create yourself

Step2: Instance Type?

- Instance type is the CPU (compute power) of your instance
- When you launch an instance, the instance type determines the hardware of the host
- Each instance type offers different compute, memory & storage capabilities
- Select an instance type based on the requirement of the software that you plan to run on your instance

Instance Type Components:

- ❑ Family: Categorizing instance types based on what they are optimized for
- ❑ Type: subcategory for each family type
- ❑ vCPUs: number of virtual CPUs the instance type uses
- ❑ Memory: Amount of RAM the instance type uses
- ❑ Instance Storage(GB): local instance storage volume(hard drive)
- ❑ EBS-Optimized Available: Indicates if EBS-optimization is an option for the instance type
- ❑ Network Performance: Rating based on its data transfer rate(bandwidth)

Families	Description	Example Use Cases
t2, m4, m3	**General Purpose** Balanced Performance	Websites, web applications, Dev, code repos, micro services, business apps
c3, c4, cc2	**Compute Optimized** High CPU Performance	Front-end fleets, web-servers, batch processing, distributed analytics, science and engineering apps, ad serving, MMO gaming, video-encoding
g2, p2	**GPU Optimized** High-end GPU	Amazon AppStream 2.0, video encoding, machine learning, high perf databases, science
r3, r4, x1, cr1	**Memory Optimized** Large RAM footprint	In-memory databases, data mining
d2, i2, i3, hi1, hs1	**Storage Optimized** High I/O, High density	NAS, data warehousing, NoSQL

Security Groups ?

- Firewall is a network security system designed to prevent unauthorized access to/from a private network
- Security groups acts as a virtual firewall that controls the traffic for one or more instances
- We add rules to each SG that allow/deny traffic from its associated instances
- Best practice is to allow only traffic that is required

Firewall

Security

Security Groups

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IP Addressing ?

- Similar to having home street address to send mail
- IP address is the instances address on the network

Private IP:

- By default every EC2 instance will be provided with a private IP address
- Private IP addresses allow instances to communicate as long as they are located in the same VPC

Public IP:

- EC2 instances can be launched with/without public IP address
- Public IP address is required for the instance to communicate with the network

Elastic IP:

- Static public IP address for the instance.
- Chargeable for each elastic IP.

Launching an EC2 Instance:

- Select an AMI
- Select an Instance Type
- Configure Instance Details:
- Add Storage
- Add a Tag (give the instance a name)
- Configure/Assign a Security Group
  - ❑ Create a new security group
- Review & Launch
- Create a new Key pair & Download it.

Connecting to an EC2 Instance(Linux/SSH)

- Select the instance
- Under "Actions", choose "connect"
- Follow these in order
  - ✓ Open a terminal to access the cmd line
  - ✓ Navigate into the dir that contains the Key pair we downloaded
  - ✓ Run the chmod on Key pair
  - ✓ Run commands

Questions ?