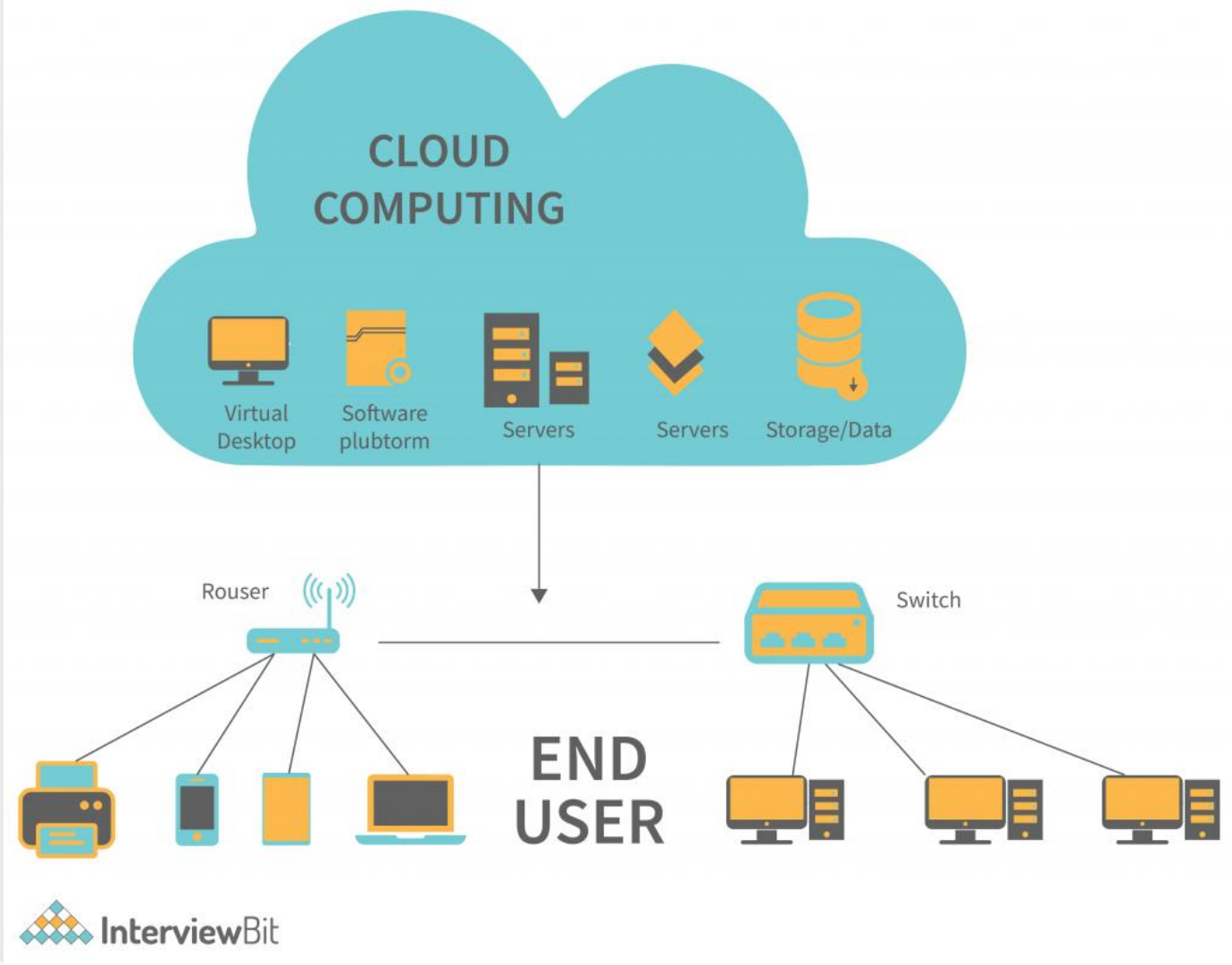
AWS Fundamentals For Beginners Hands-on

Sadok Smine

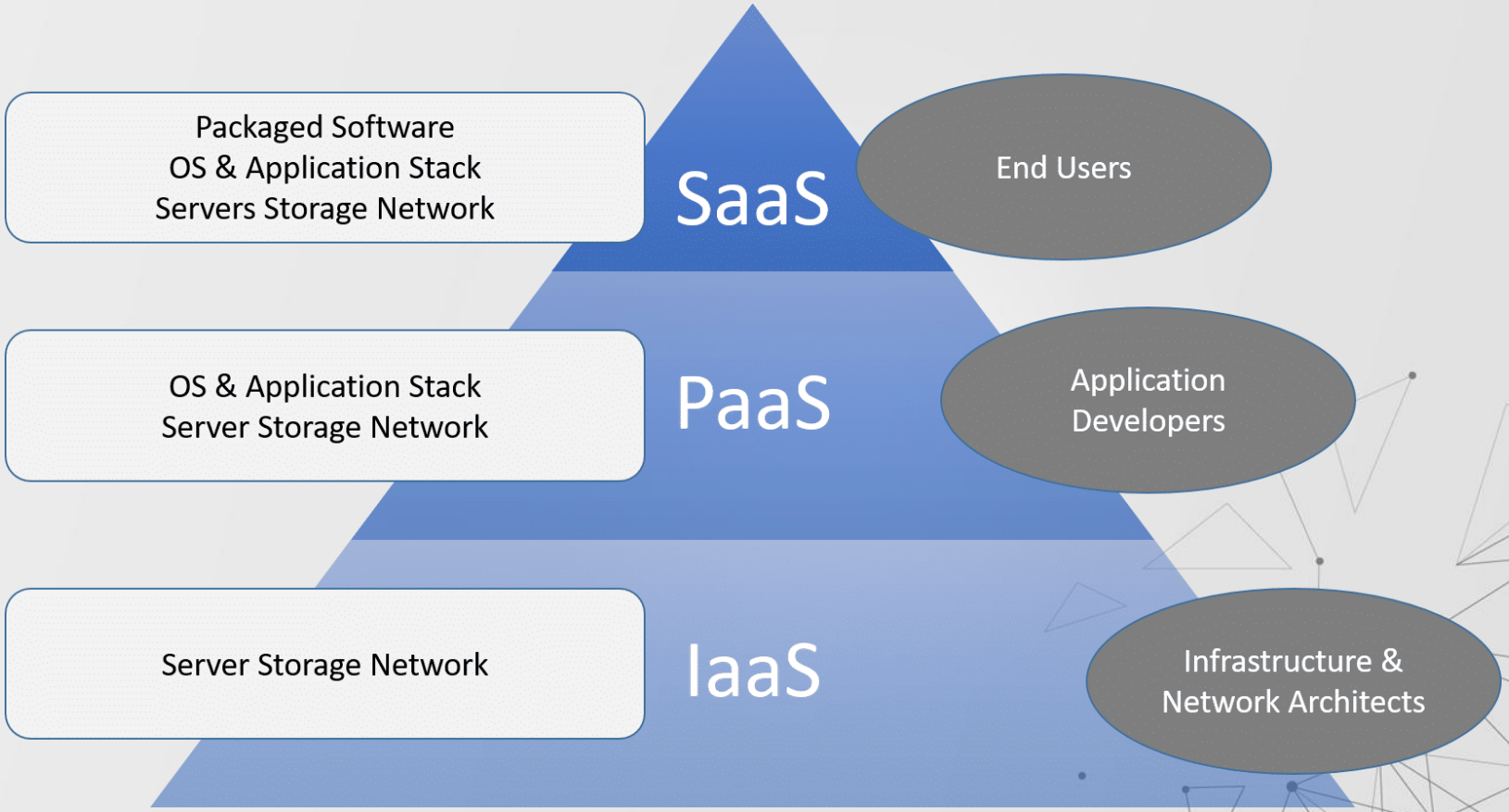
MAQTBA

Introduction To Cloud Computing and AWS

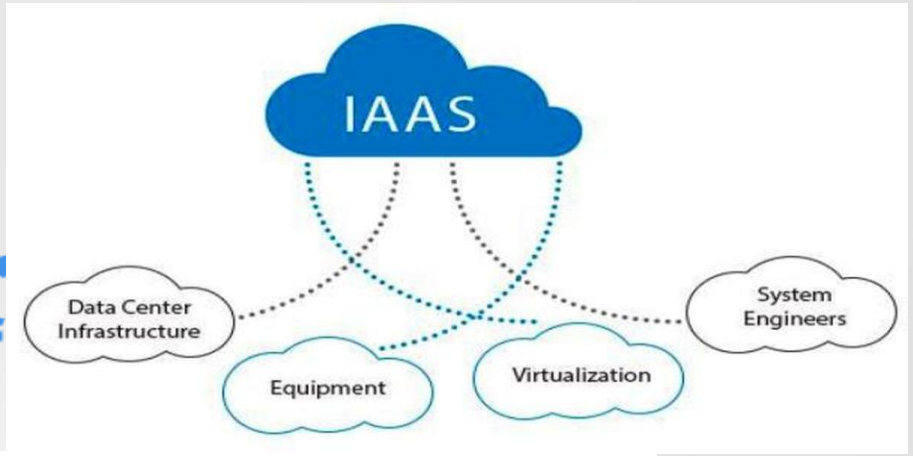
Introduction to cloud computing (IaaS, PaaS, SaaS)
AWS Global Infrastructure
Accessing the platform and setting up an account

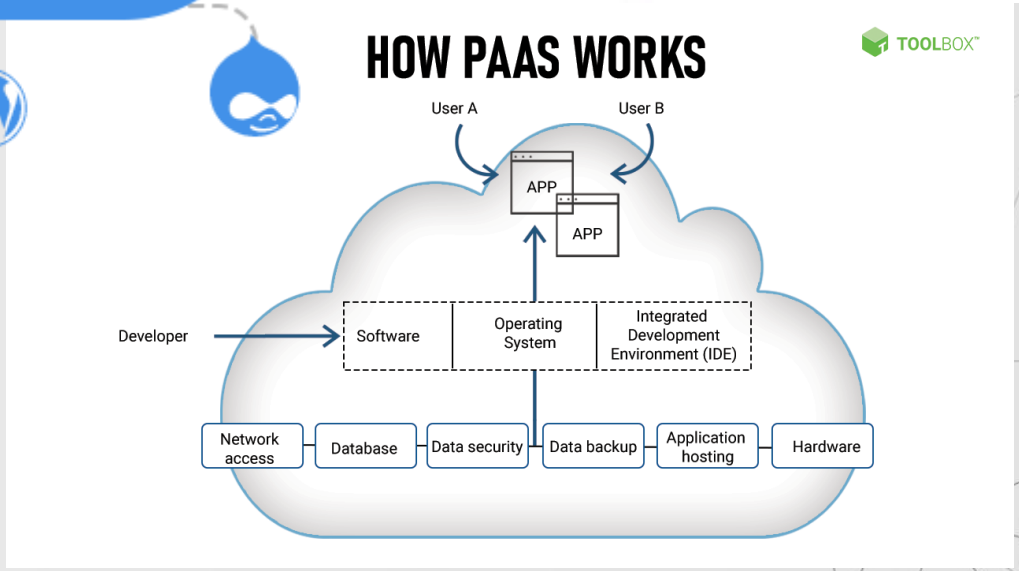

CLOUD
COMPUTING
Virtual
Desktop
Software
plubtorm
Servers
Servers
Storage/Data
Rouser
Switch
END
USER
InterviewBit

Cloud Service Models

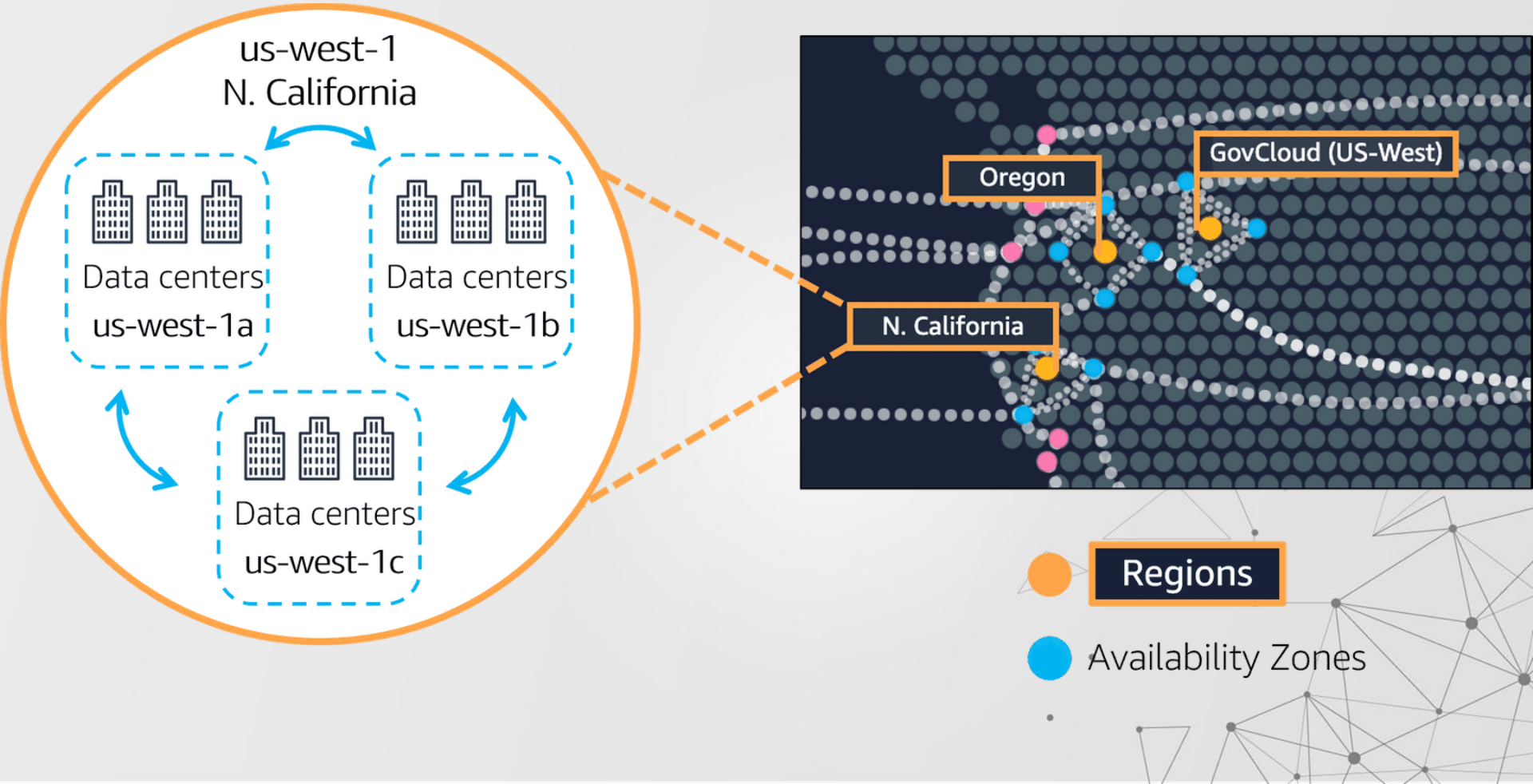


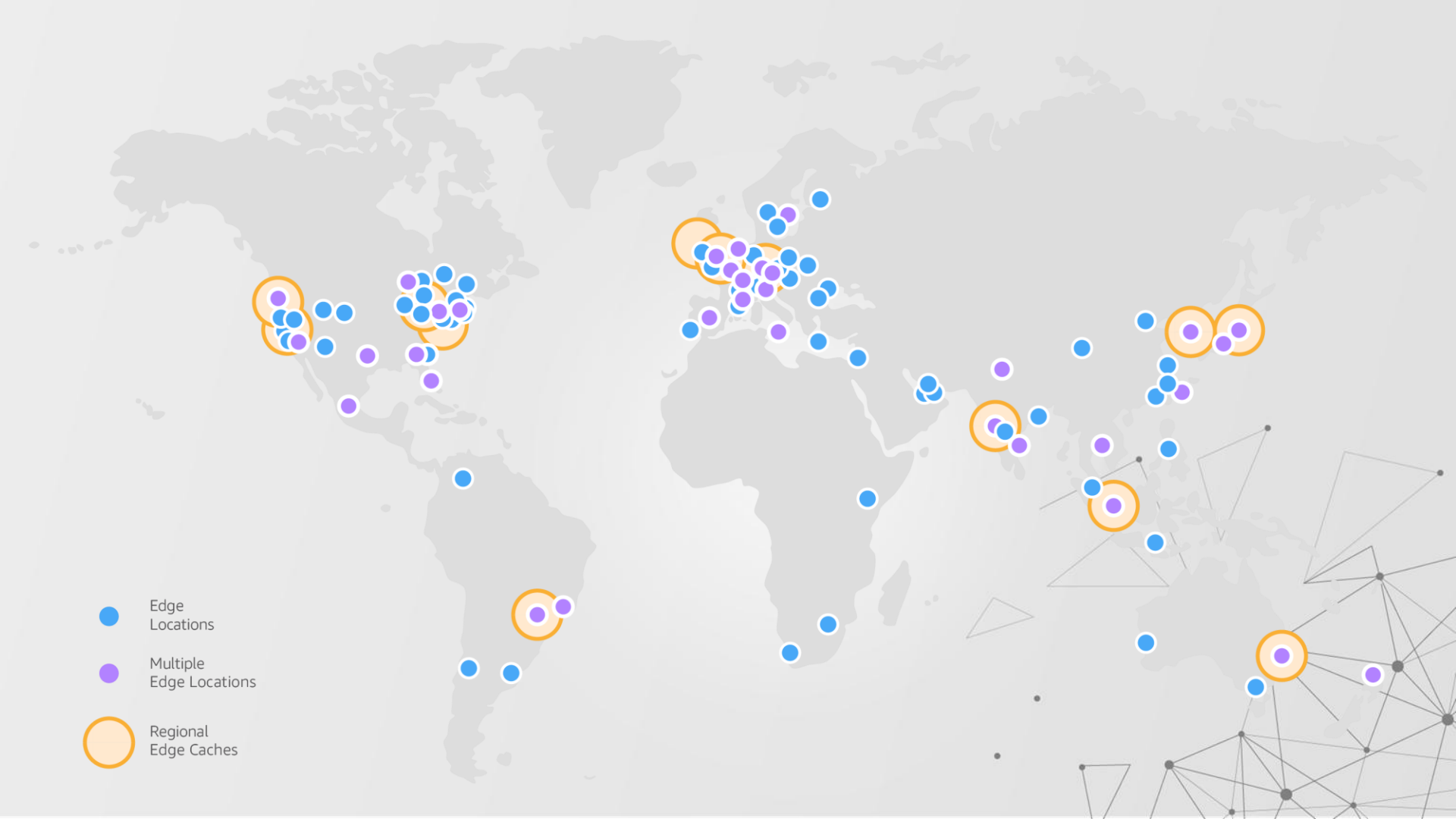

SaaS
SOFTWARE AS A SERVICE


IAAS
Data Center Infrastructure
Equipment
Virtualization
System Engineers


HOW PAAS WORKS
TOOLBOX
User A
User B
APP
APP
Developer
Software
Operating System
Integrated Development Environment (IDE)
Network access
Database
Data security
Data backup
Application hosting
Hardware

AWS Global Infrastructure


us-west-1
N. California
Data centers
us-west-1a
Data centers
us-west-1b
Data centers
us-west-1c
Oregon
GovCloud (US-West)
N. California
Regions
Availability Zones

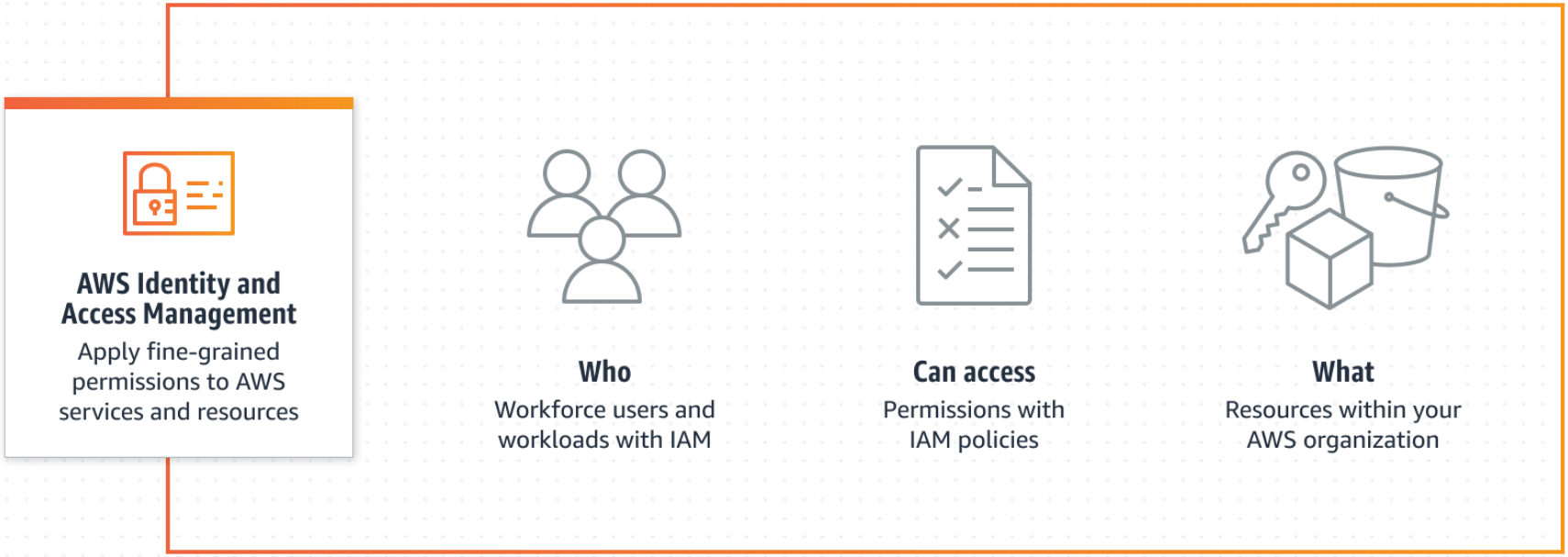

Edge
Locations
Multiple
Edge Locations
Regional
Edge Caches

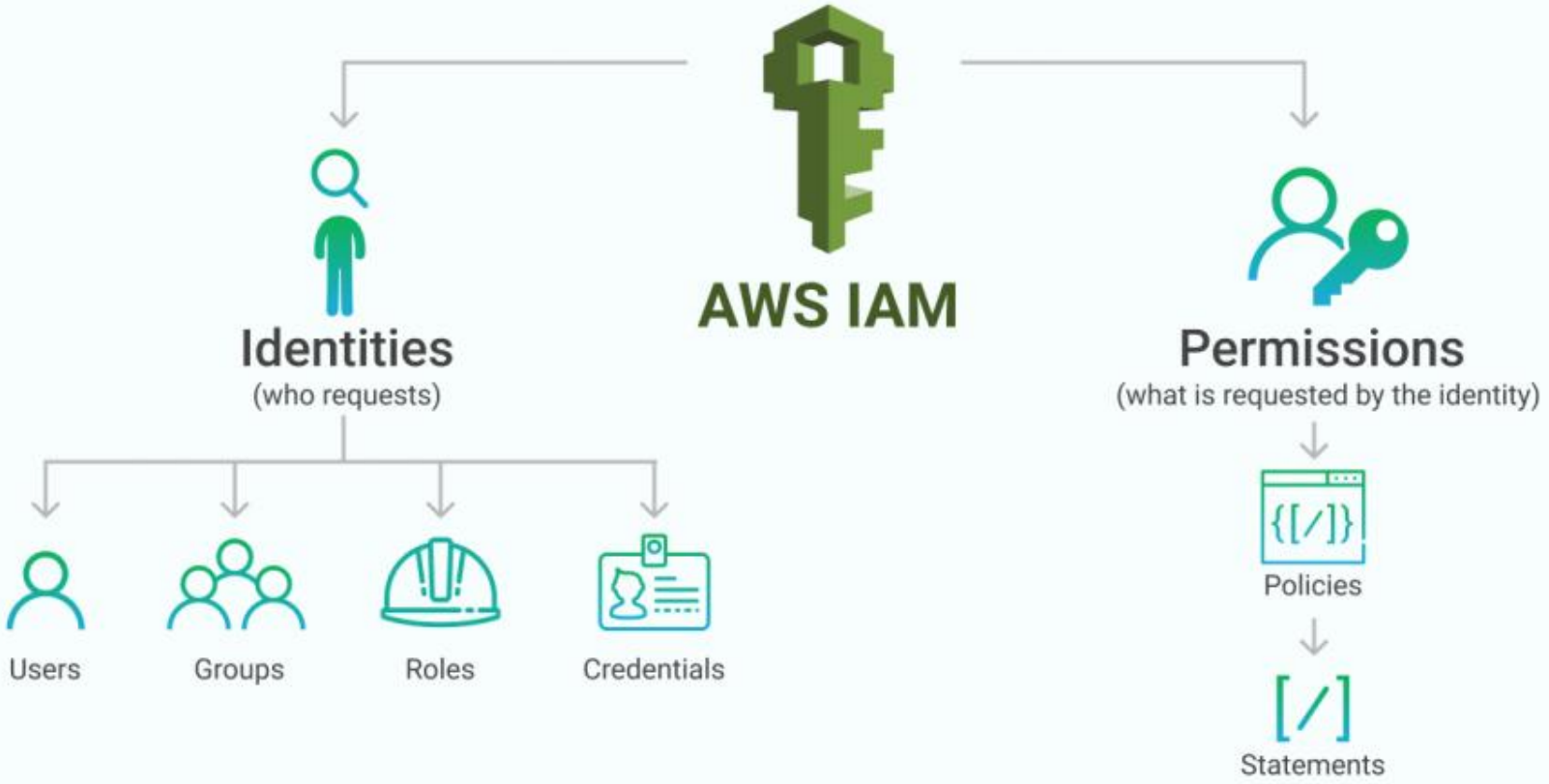
Identity and Access Management (IAM) in AWS

Understanding IAM users, groups, roles, and policies
AWS Security Best Practices

Understanding IAM users, groups, roles, and policies

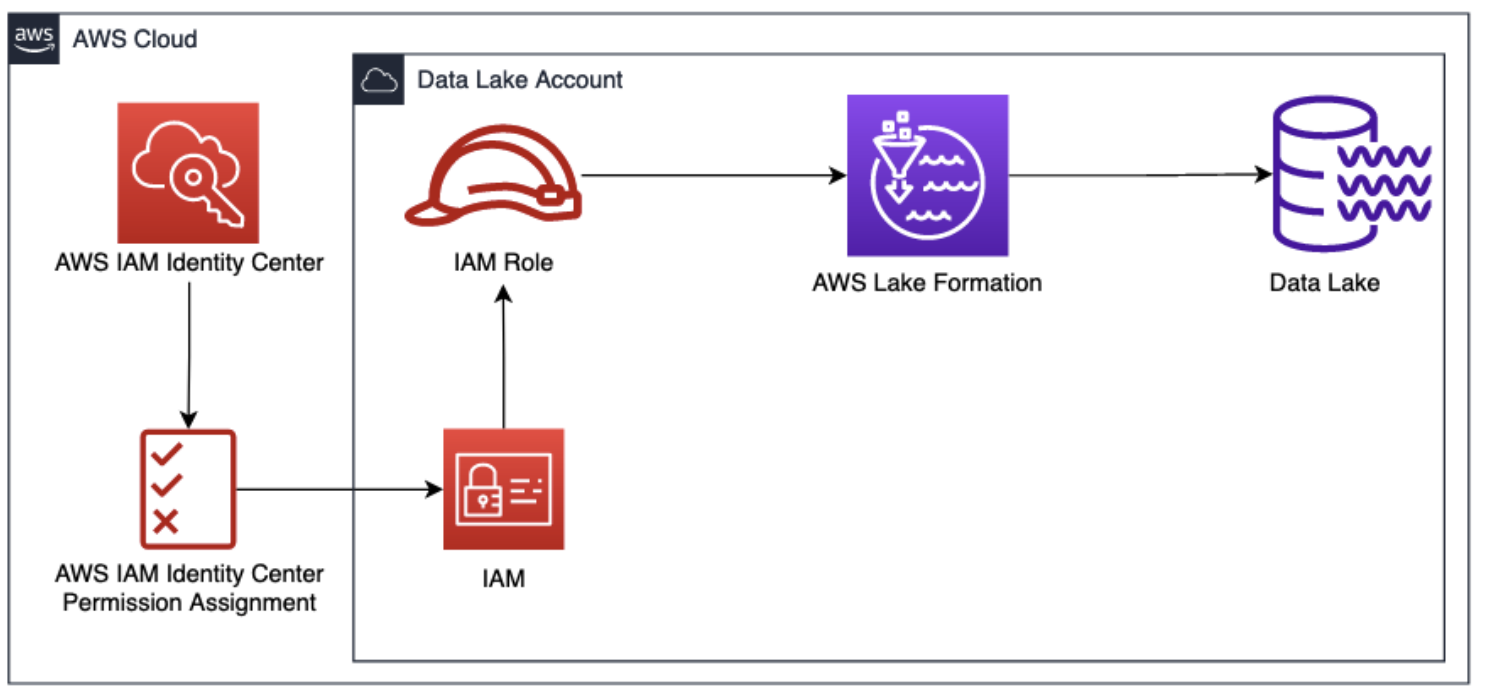
AWS Identity and Access Management (IAM) is a critical component of AWS that allows you to manage access to AWS services and resources securely.

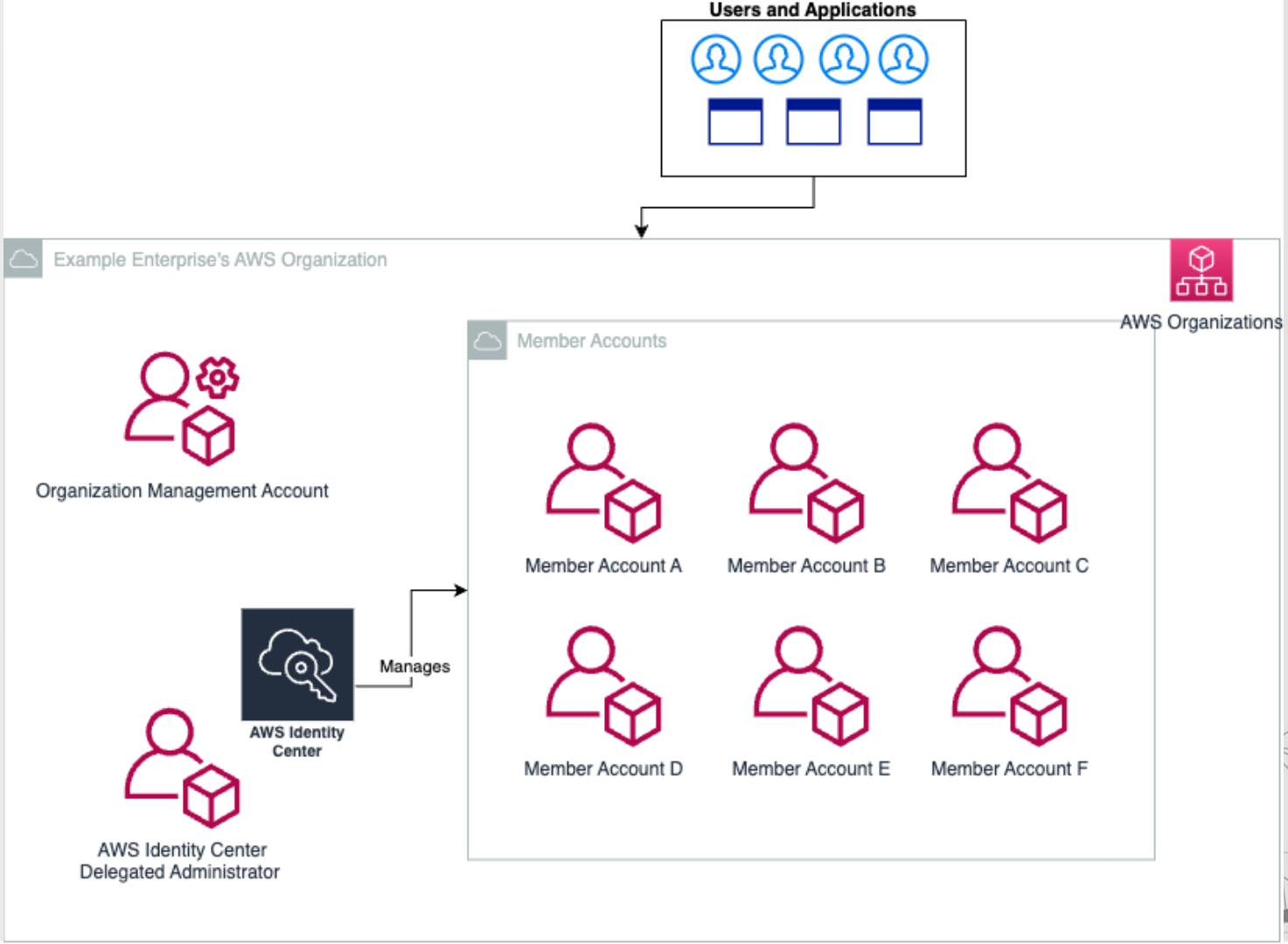



AWS IAM
Identities
(who requests)
Users
Groups
Roles
Credentials
Permissions
(what is requested by the identity)
Policies
Statements

Introduction to IAM Identity Center

AWS Identity Center (formerly AWS Single Sign-On or SSO) is a cloud service that simplifies managing access to AWS accounts and business applications. It allows users to access multiple AWS accounts and applications with a single login, integrating seamlessly with existing identity providers (IdPs) like Microsoft Active Directory.



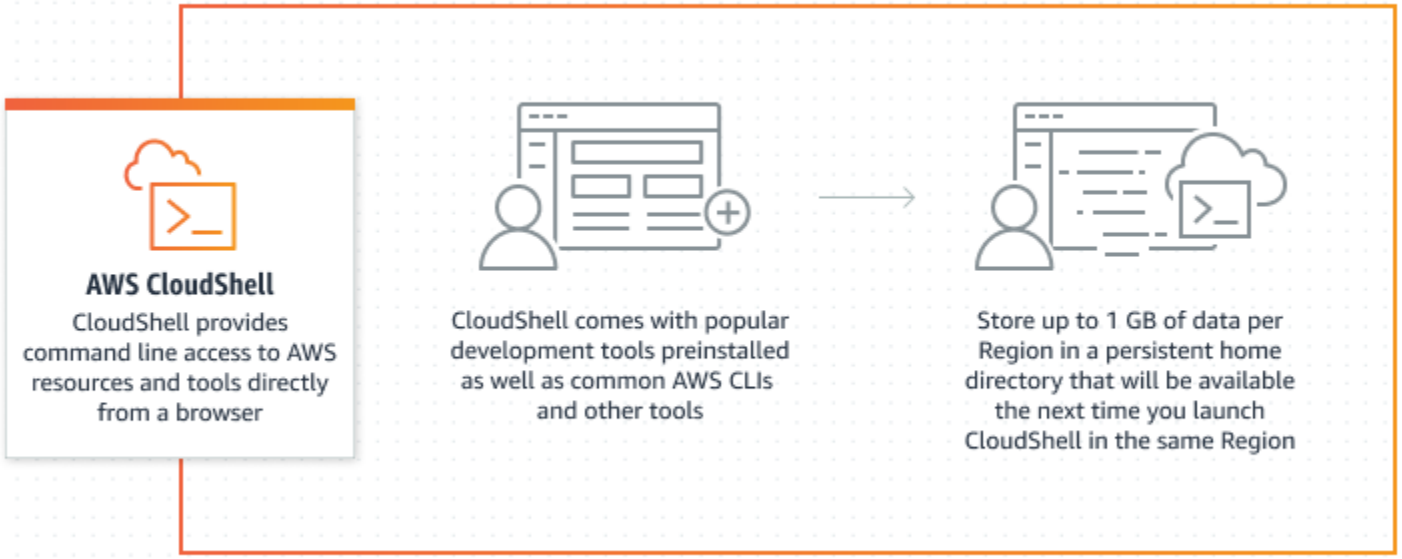

Users and Applications
Example Enterprise's AWS Organization
AWS Organizations
Member Accounts
Organization Management Account
Member Account A
Member Account B
Member Account C
Manages
AWS Identity Center
Member Account D
Member Account E
Member Account F
AWS Identity Center Delegated Administrator

AWS Security Best Practices

- Identity and Access Management (IAM)
- Secure Your AWS Account
- Network Security
- Data Encryption
- Monitoring and Logging
- Ensure Compliance
- Disaster Recovery and Data Backup

AWS CloudShell

AWS CloudShell is a browser-based, pre-authenticated shell that provides a command-line interface to AWS resources directly from your web browser. It simplifies managing AWS resources without the need to install or configure the AWS CLI on your local machine.



AWS Command Line Interface (CLI)

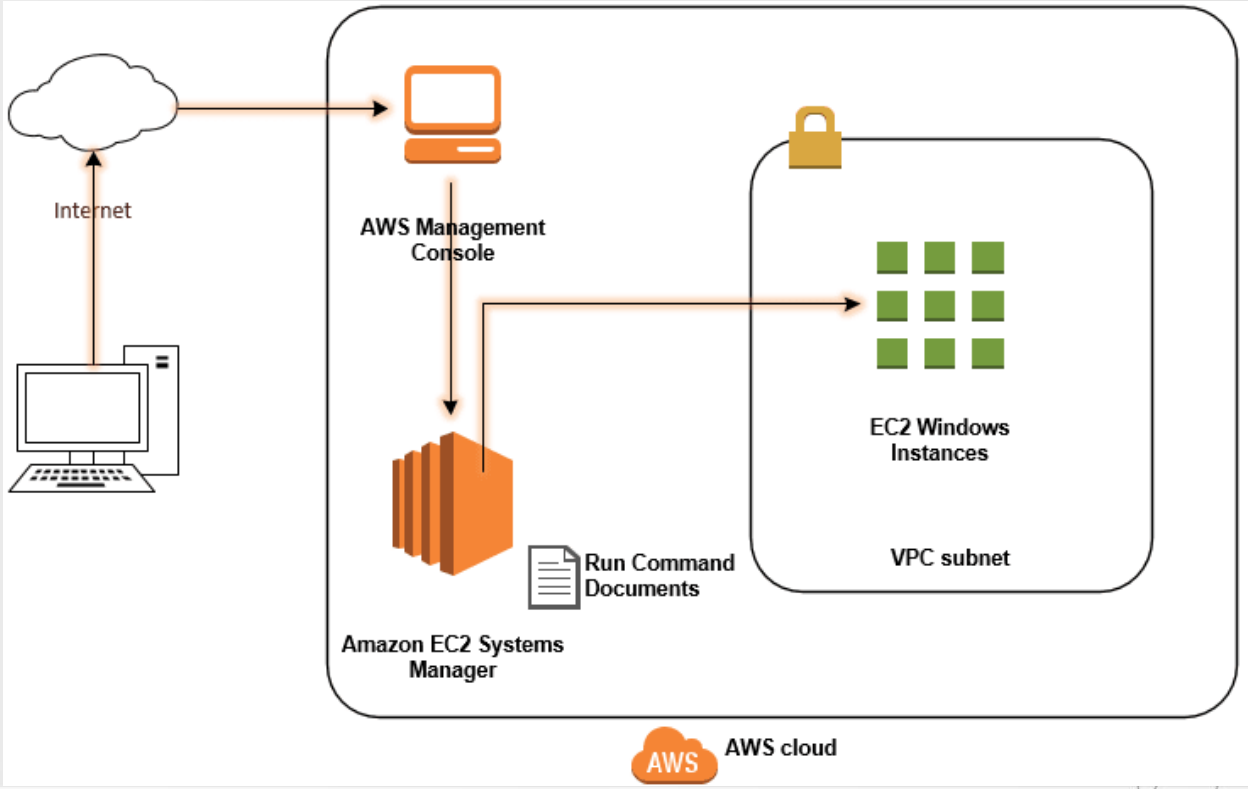
The AWS Command Line Interface (CLI) is a unified tool to manage your AWS services from a terminal session on your own client. It allows you to control multiple AWS services directly from the command line within one tool.

Core AWS Compute Services

Introduction to Amazon Elastic Compute Cloud (EC2)
Introduction to Lambda
Introduction to Elastic Beanstalk
Auto Scaling and Load Balancing in AWS

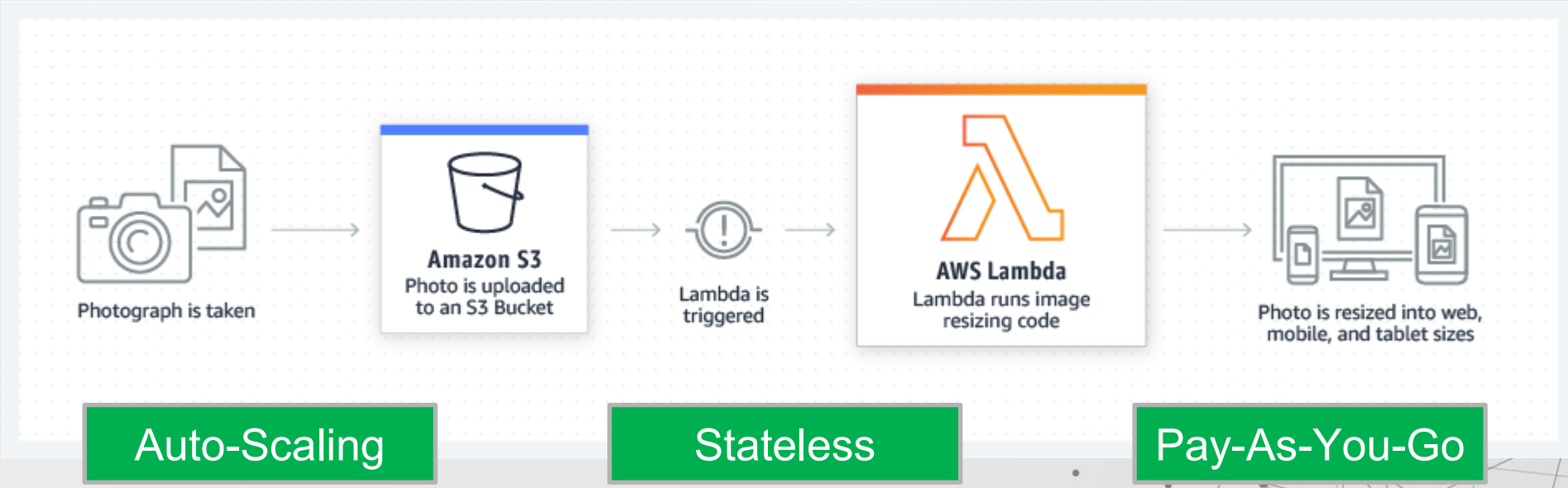
Introduction to Amazon Elastic Compute Cloud (EC2)

AWS EC2 provides resizable compute capacity in the cloud. It is designed to facilitate web-scale computing for developers, offering virtual servers—known as instances—for computing power.



Introduction to AWS Lambda

AWS Lambda is a serverless computing service that lets you run code without provisioning or managing servers. With Lambda, you can run code for virtually any type of application or backend service with zero administration. AWS Lambda automatically scales your application by running code in response to each trigger.



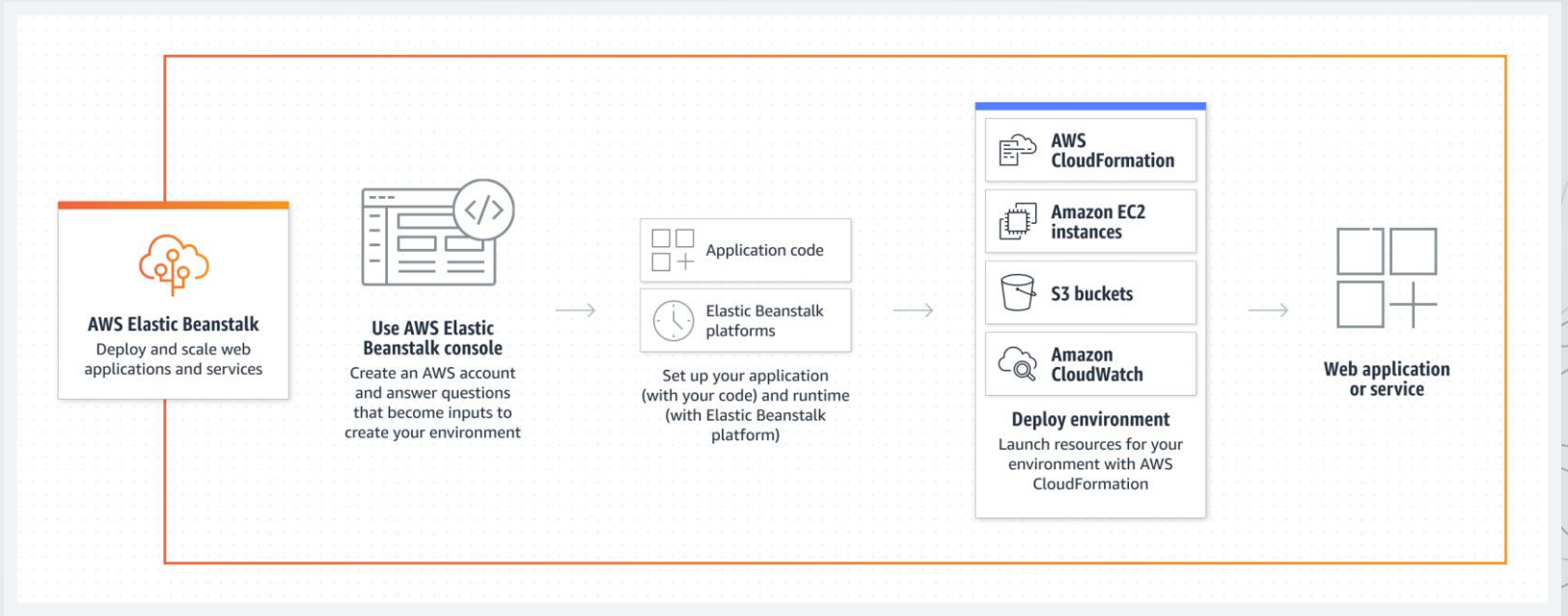
Auto-Scaling

Stateless

Pay-As-You-Go

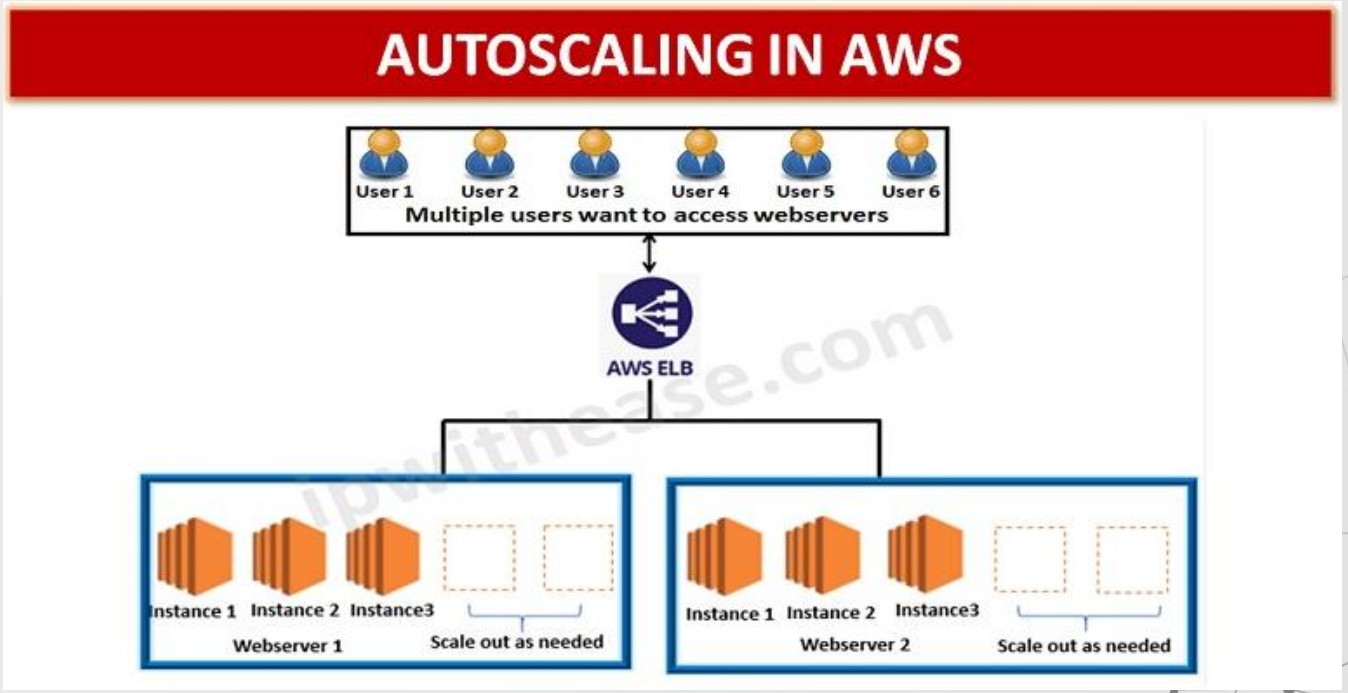
Introduction to Amazon Elastic Beanstalk

Amazon Elastic Beanstalk is an AWS service that provides an easy-to-use solution for deploying and managing applications in the AWS Cloud. It automates the deployment process, from capacity provisioning, load balancing, and auto-scaling to application health monitoring.

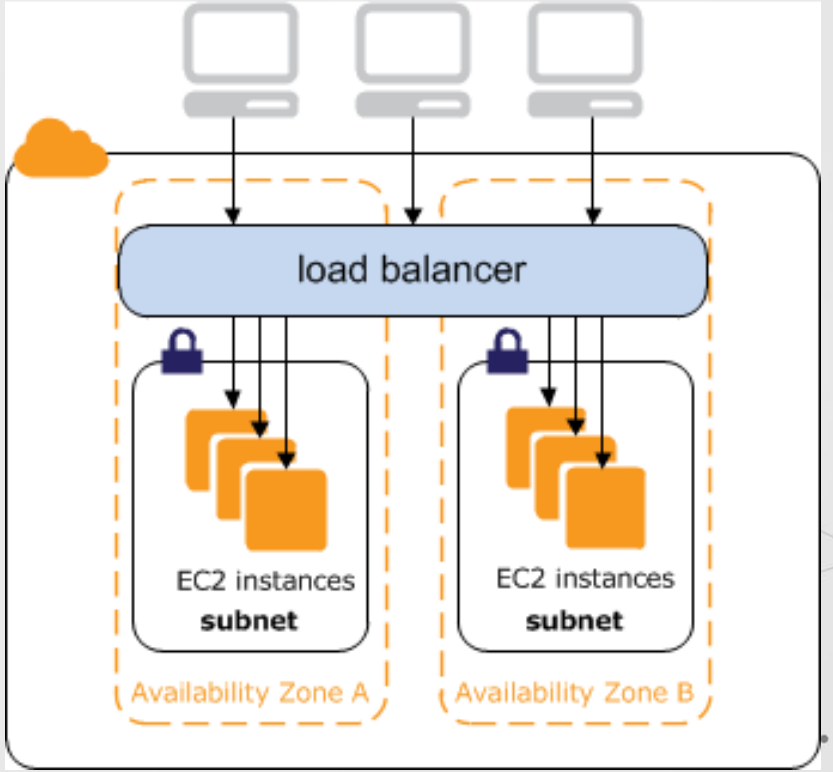


Introduction to Autoscaling and Load Balancing

AWS Auto Scaling monitors your applications and automatically adjusts capacity to maintain steady, predictable performance at the lowest possible cost. Using Auto Scaling, you can setup scaling for multiple resources across multiple services in minutes.



Elastic Load Balancing automatically distributes incoming application traffic across multiple targets, such as EC2 instances, containers, and IP addresses. It can handle varying loads without requiring manual intervention.



AWS Storage Services

Introduction to Amazon Simple Storage Service (S3)
Introduction to Amazon S3 Glacier
Introduction to Elastic Block Store (EBS)
Introduction to Amazon Elastic File System (EFS)

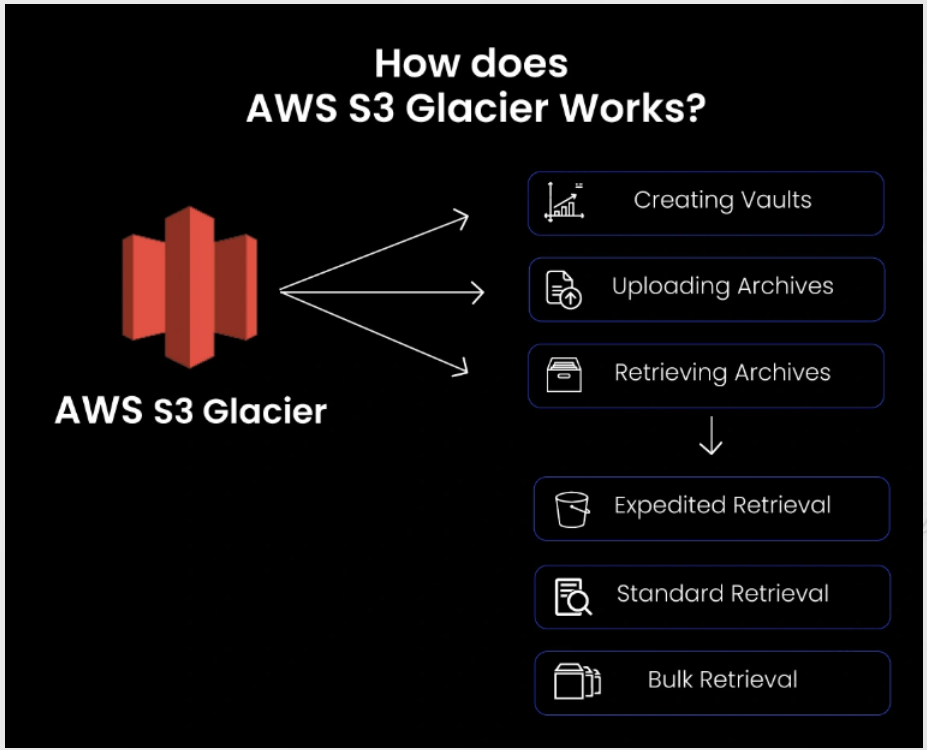
Introduction to Amazon Simple Storage Service (S3)

Amazon Simple Storage Service (Amazon S3) is an object storage service that offers industry-leading scalability, data availability, security, and performance. It's designed to make web-scale computing easier for developers by providing a simple web services interface to store and retrieve any amount of data, at any time, from anywhere on the web.

- Data Storage
- Data Retrieval
- Data Backup and Archiving
- Application Hosting
- Big Data Analytics

Introduction to Amazon S3 Glacier

Amazon S3 Glacier (now part of Amazon S3 Glacier storage classes) is a secure, durable, and low-cost cloud storage service for data archiving and long-term backup. S3 Glacier is designed to deliver 99.999999999% (11 9's) of durability and provides comprehensive security and compliance capabilities that can meet even the most stringent regulatory requirements.



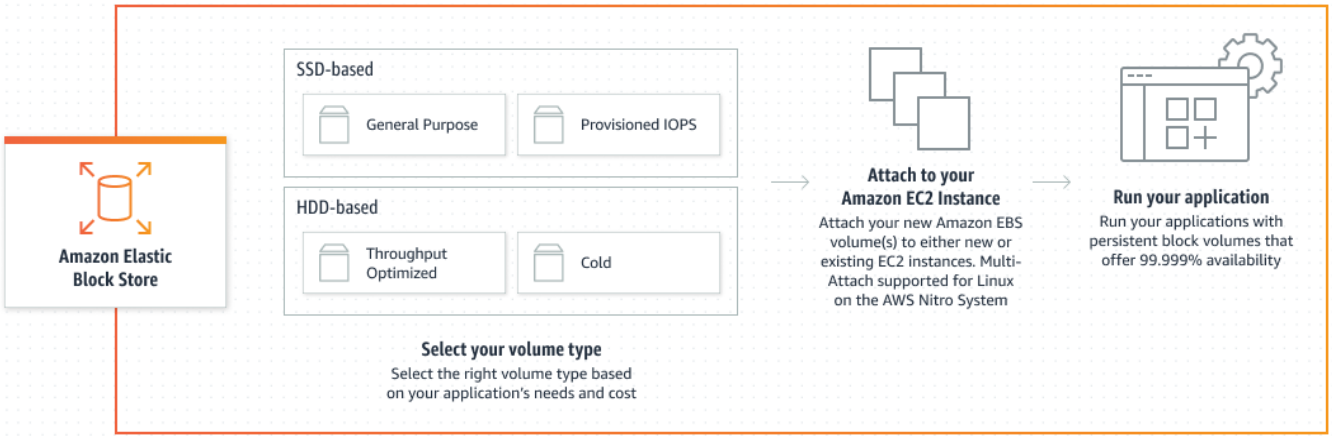
Retrieval options

Storage class or tier	Expedited	Standard	Bulk
S3 Glacier or S3 Intelligent-Tiering Archive Access	1–5 minutes	3–5 hours	5–12 hours
S3 Glacier Deep Archive or S3 Intelligent-Tiering Deep Archive Access	Not available	Within 12 hours	Within 48 hours

Introduction to Elastic Block Store (EBS)

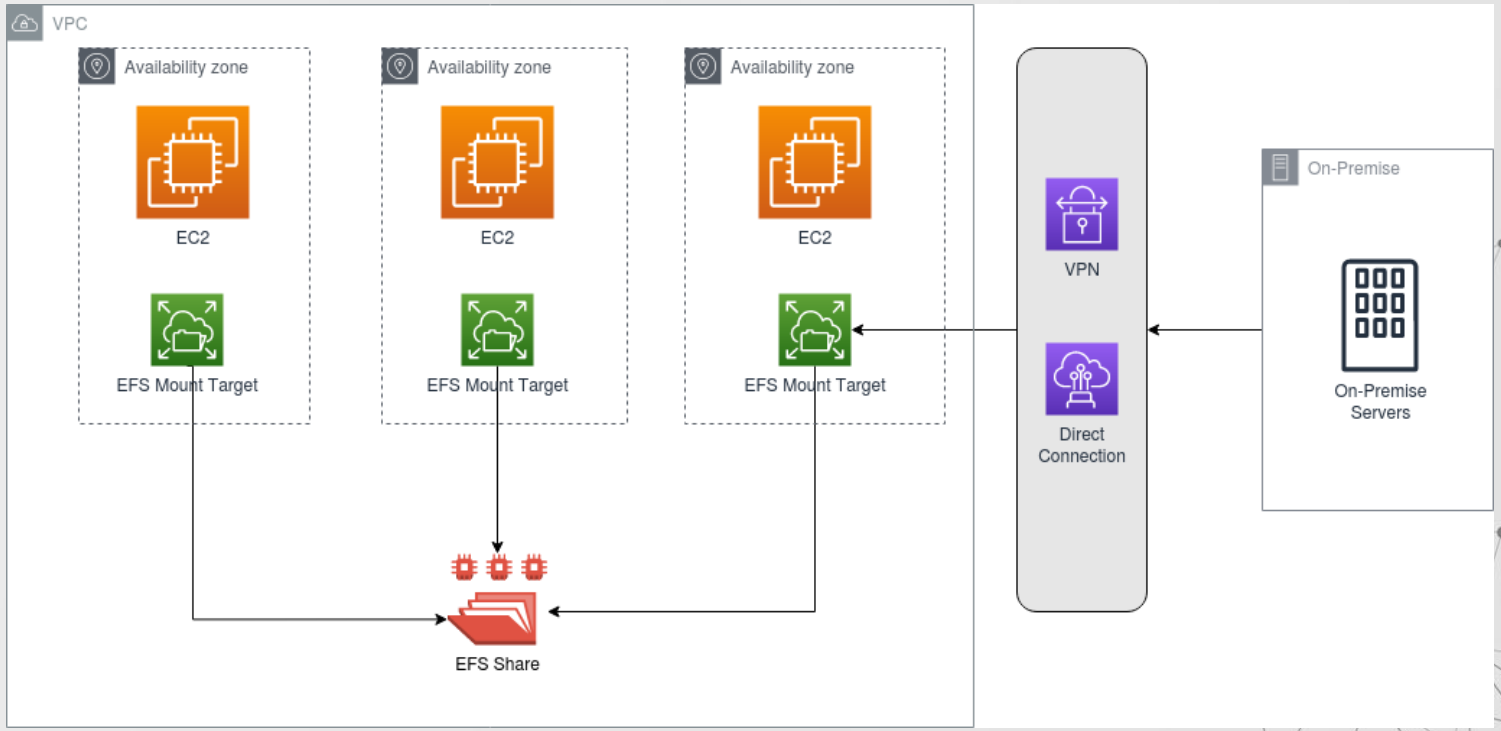
Amazon Elastic Block Store (Amazon EBS) is a high-performance block storage service designed to be used with Amazon Elastic Compute Cloud (EC2) for both throughput and transaction-intensive workloads at any scale. It provides persistent block storage volumes for use with Amazon EC2 instances.

- Integration with EC2
- Persistent Storage
- Performance
- Encryption
- Scalability and Flexibility



Introduction to Amazon Elastic File System (EFS)

Amazon Elastic File System (EFS) is a cloud-based file storage service for applications and workloads running on Amazon Web Services. It provides a simple, scalable, elastic file system for Linux-based workloads for use with AWS cloud services and on-premises resources.

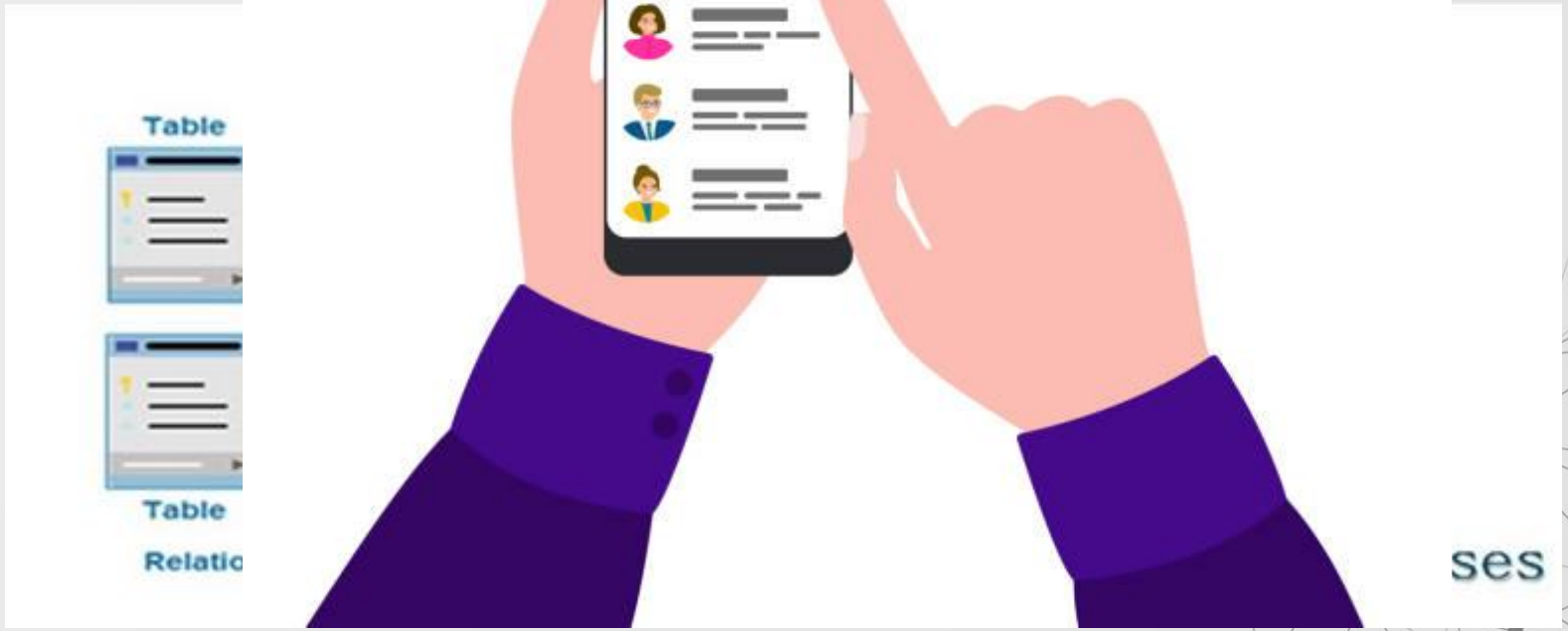


AWS Database Services

Understanding SQL (Relational) Databases
Introduction to Amazon RDS (Relational Database Service) and Amazon Aurora
Introduction to Amazon Redshift
Understanding NoSQL (Non-Relational) Databases
Introduction to Amazon DynamoDB
Introduction to Amazon DocumentDB
Introduction to Neptune
In-memory Cache: Introduction to ElastiCache

Understanding

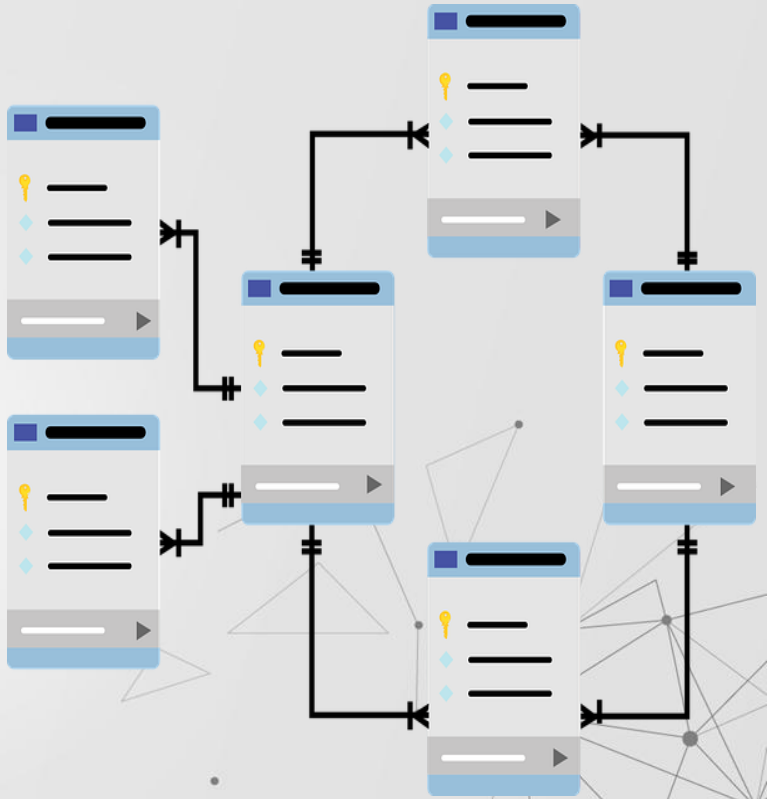
SQL databases allow for the creation, qu
collections of rc epresents an attribute of tl a manipulation ar sting data, retrieving data,



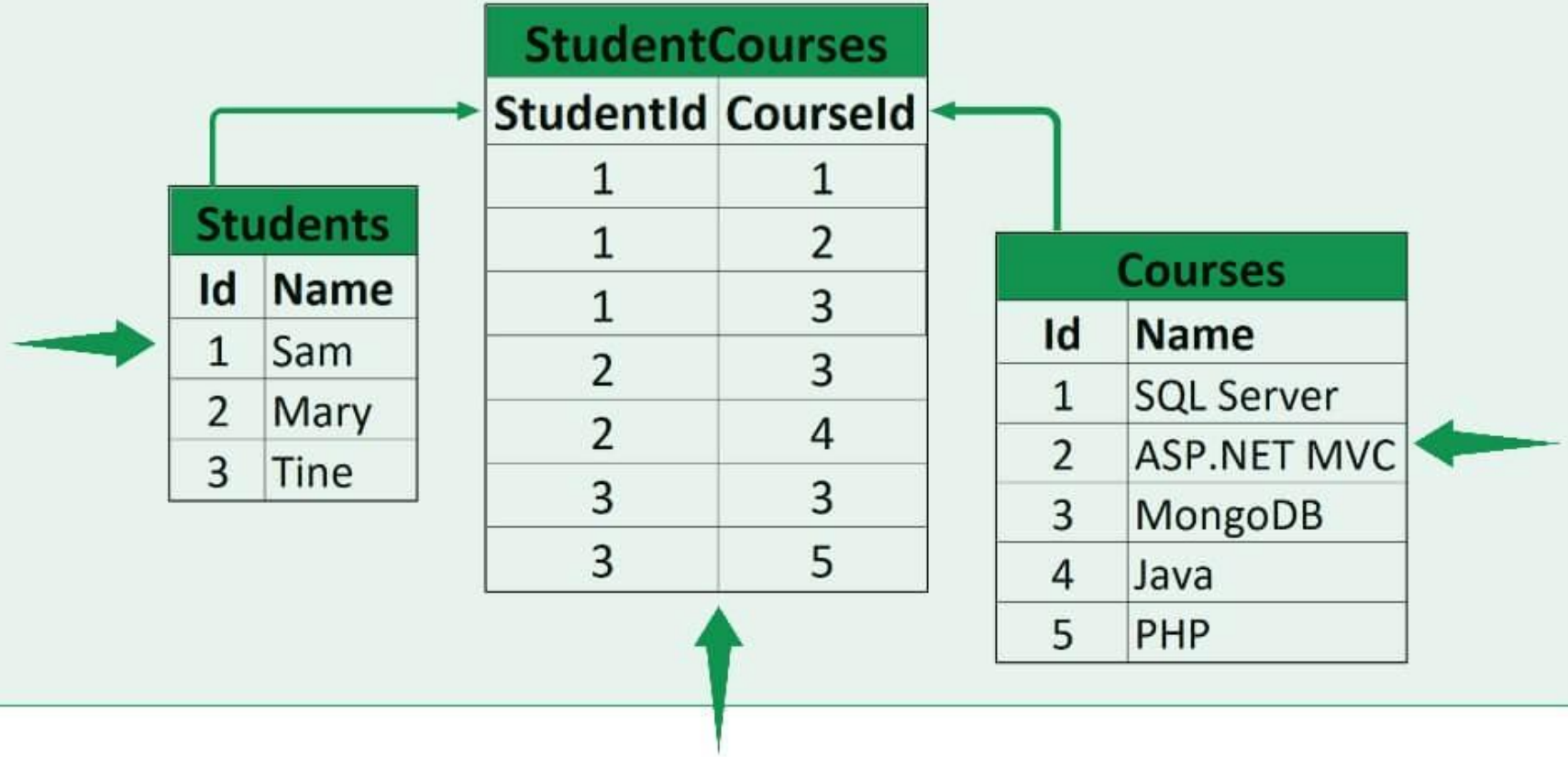
- Rows represent individual entries or instances of an entity.
- Columns represent the properties of the entity.

- Primary Key: A column (or a set of columns) used to uniquely identify each row in a table. No two rows can have the same primary key value.
- Foreign Key: A column (or a set of columns) in one table that refers to the primary key in another table. Foreign keys establish a relationship between two tables and enforce referential integrity.

- One-to-One: Each row in Table A relates to one, and only one, row in Table B, and vice versa.
- One-to-Many (or Many-to-One): Each row in Table A can relate to many rows in Table B, but each row in Table B relates to only one row in Table A.
- Many-to-Many: Rows in Table A can relate to many rows in Table B, and rows in Table B can relate to many rows in Table A. This relationship typically requires a junction table.



Relational Database



Students

Id	Name
1	Sam
2	Mary
3	Tine

StudentCourses

StudentId	CourseId
1	1
1	2
1	3
2	3
2	4
3	3
3	5

Courses

Id	Name
1	SQL Server
2	ASP.NET MVC
3	MongoDB
4	Java
5	PHP

Introduction to Amazon RDS and Amazon Aurora

Amazon RDS is a managed relational database service that supports a variety of database engines. It automates database setup, hardware provisioning, patching, and backups, offering scalable and secure database instances.

amazon RDS

RDS supports several popular SQL database engines including MySQL, PostgreSQL, Oracle, SQL Server, and even Amazon's own high-performance database engine, Aurora.

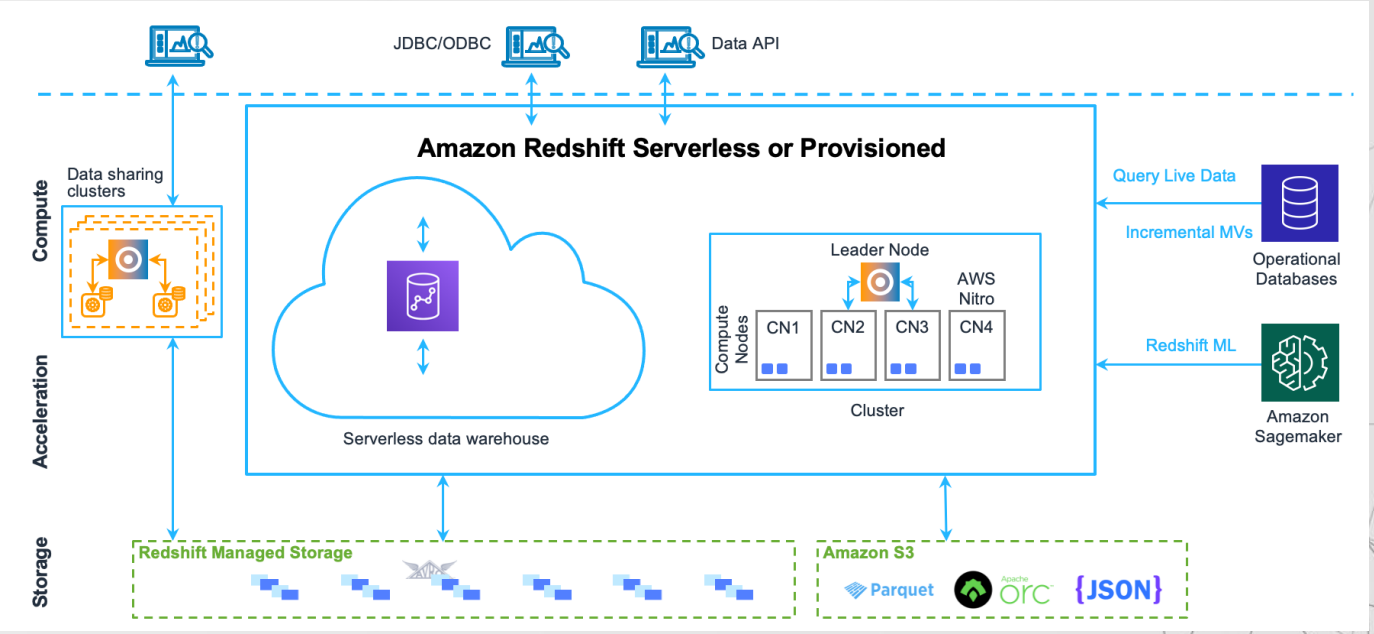
amazon AURORA

Among the database engines available in Amazon RDS, Amazon Aurora stands out as a fully managed, MySQL and PostgreSQL-compatible relational database built for the cloud. Aurora offers several advantages over traditional database systems:

- Performance
- Scalability
- Availability
- Cost-effectiveness

Introduction to Amazon Redshift

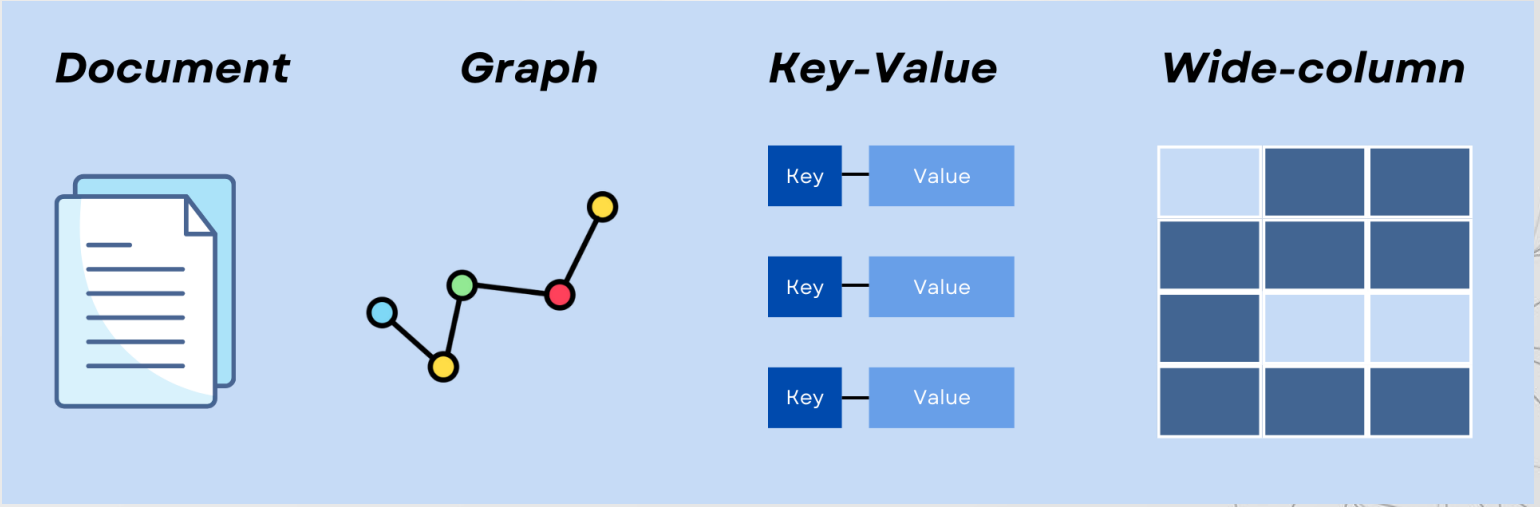
Amazon Redshift is a cloud-based data warehousing service that enables businesses to analyze and visualize vast amounts of data in near real-time. It harnesses the power of Massively Parallel Processing (MPP) to quickly execute complex queries across petabytes of data stored in columnar format, which optimizes data compression and reduces the amount of data scanned during queries.



Understanding NoSQL (Non-Relational) Databases

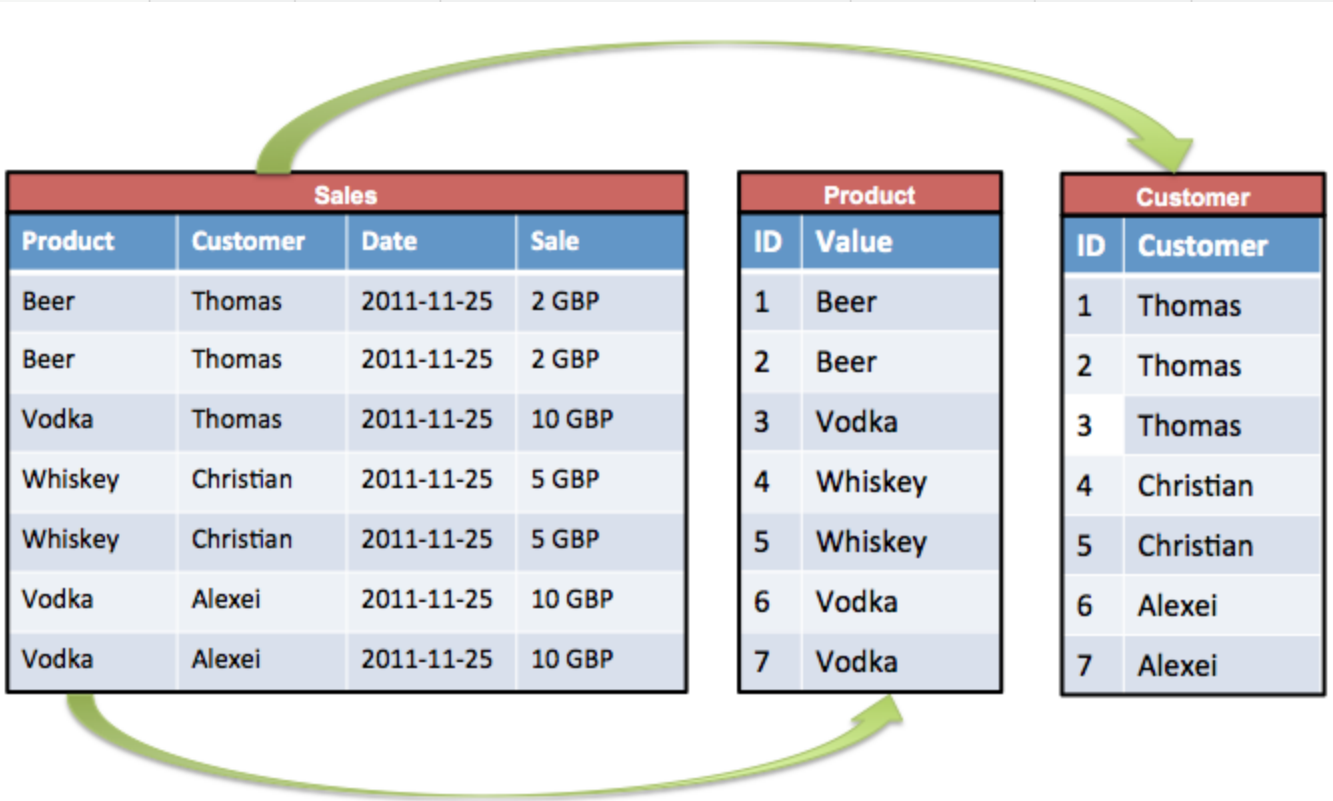
NoSQL databases are designed to store, retrieve, and manage data in ways that differ significantly from traditional relational databases. The term "NoSQL" stands for "Not Only SQL," highlighting that these databases can handle a wide variety of data models, including document, key-value, wide-column, and graph formats.

Schema-less | Scalability | Performance | Flexibility



Members

20 rows



Sales

Product	Customer	Date	Sale
Beer	Thomas	2011-11-25	2 GBP
Beer	Thomas	2011-11-25	2 GBP
Vodka	Thomas	2011-11-25	10 GBP
Whiskey	Christian	2011-11-25	5 GBP
Whiskey	Christian	2011-11-25	5 GBP
Vodka	Alexei	2011-11-25	10 GBP
Vodka	Alexei	2011-11-25	10 GBP

Product

ID	Value
1	Beer
2	Beer
3	Vodka
4	Whiskey
5	Whiskey
6	Vodka
7	Vodka

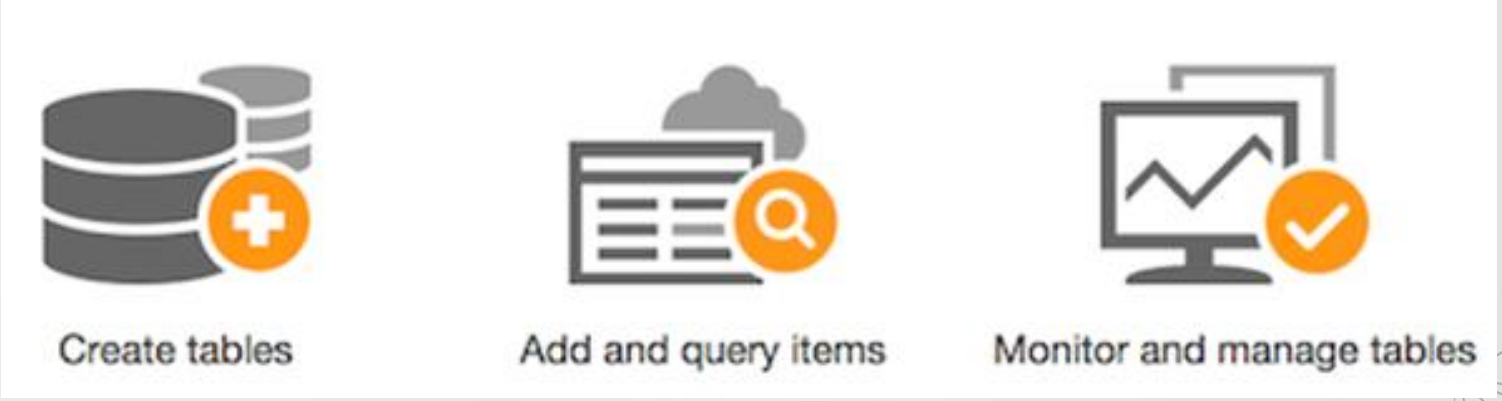
Customer

ID	Customer
1	Thomas
2	Thomas
3	Thomas
4	Christian
5	Christian
6	Alexei
7	Alexei

Use cursor keys or scroll bars to view member records. Click on a member name to view their profile. Edit a cell by typing, double clicking or . Click to view full screen.

Introduction to Amazon DynamoDB

Amazon DynamoDB is a fast and flexible NoSQL database service for all applications that need consistent, single-digit millisecond latency at any scale. It's a fully managed cloud database and supports both document and key-value store models. DynamoDB makes it simple and cost-effective to store and retrieve any amount of data, and it serves any level of request traffic.



Table

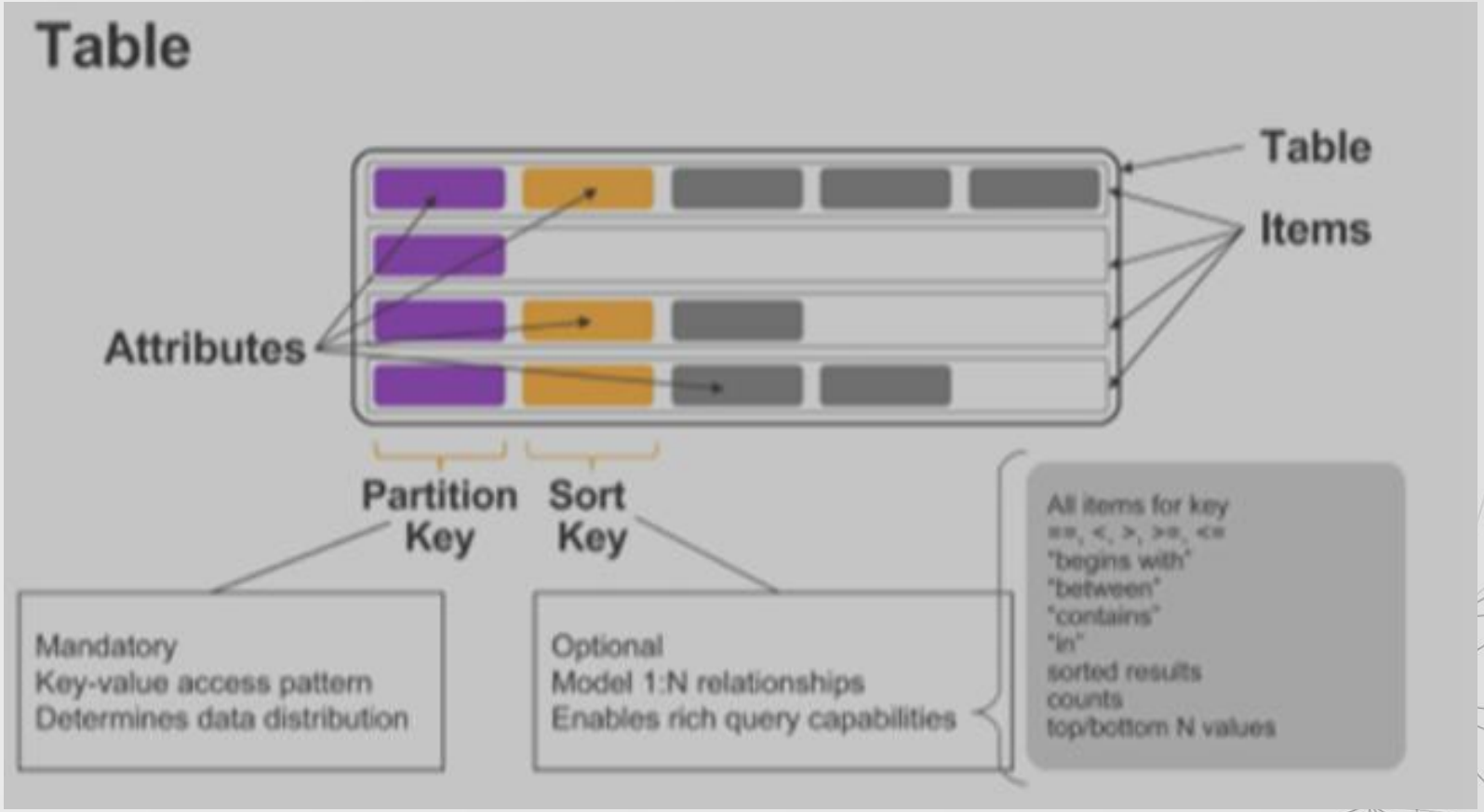


Table
Items
Attributes
Partition Key
Sort Key
Mandatory
Key-value access pattern
Determines data distribution
Optional
Model 1:N relationships
Enables rich query capabilities
All items for key
==, <, >, >=, <=
"begins with"
"between"
"contains"
"in"
sorted results
counts
top/bottom N values

Introduction to Amazon DocumentDB

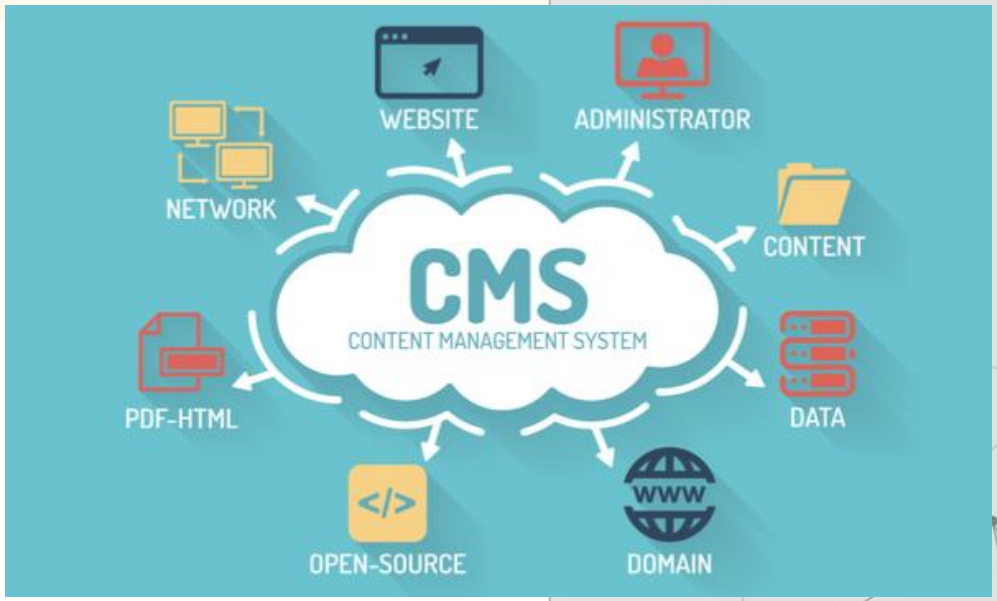
Amazon DocumentDB is a fully managed document database service designed by AWS to be compatible with MongoDB, a popular NoSQL database. It allows you to store, retrieve, and manage semi-structured data in a document-oriented format. DocumentDB is designed to give developers the scalability, durability, and availability needed for mission-critical applications with the same MongoDB application code, drivers, and tools.

- MongoDB Compatibility
- Scalability
- Durability and Availability
- Performance
- Fully Managed

tslint.json

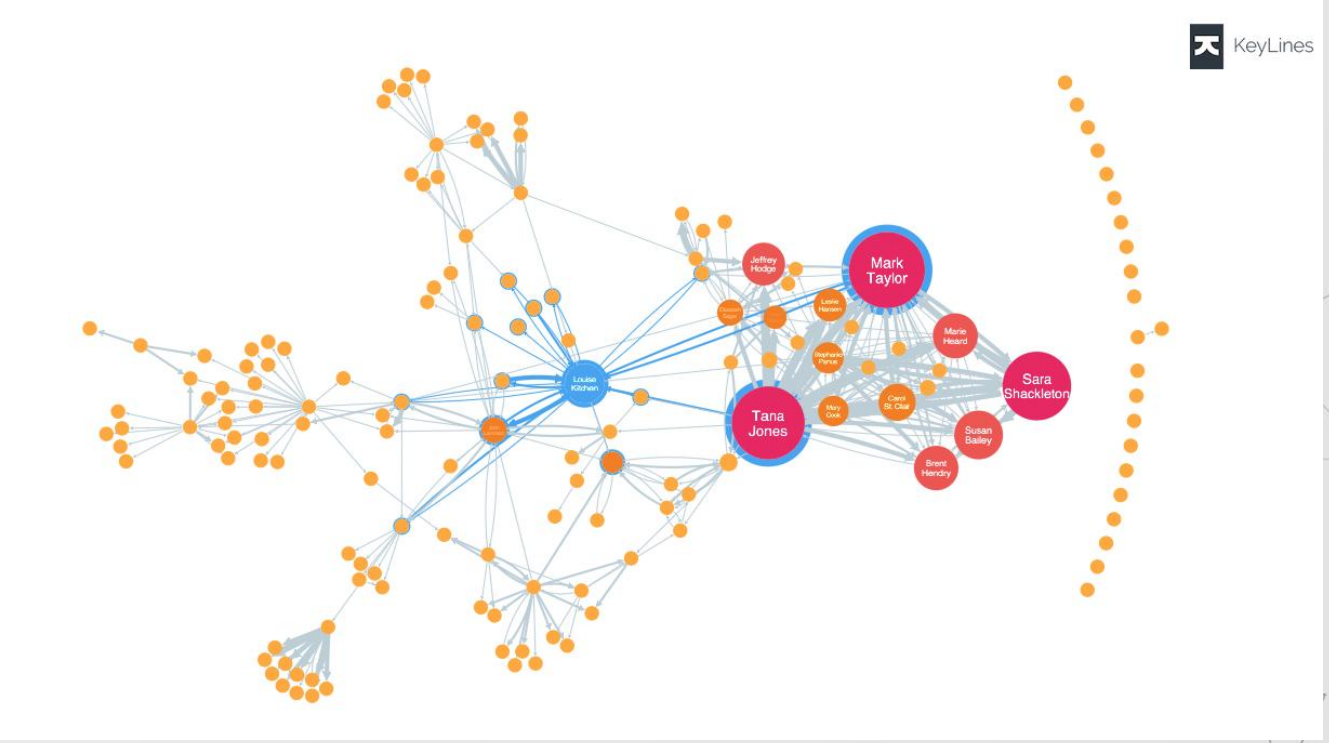
```
{
  "rules": {
    "align": [false,
      "parameters",
      "arguments",
      "statements"],
    "ban": [true,
      ["angular", "forEach"]
    ],
    "class-name": true,
    "comment-format": [false,
      "check-space",
      "check-lowercase"
    ],
```

1:2 LF UTF-8 2 spaces JSON: TSLint 602 of 2487M



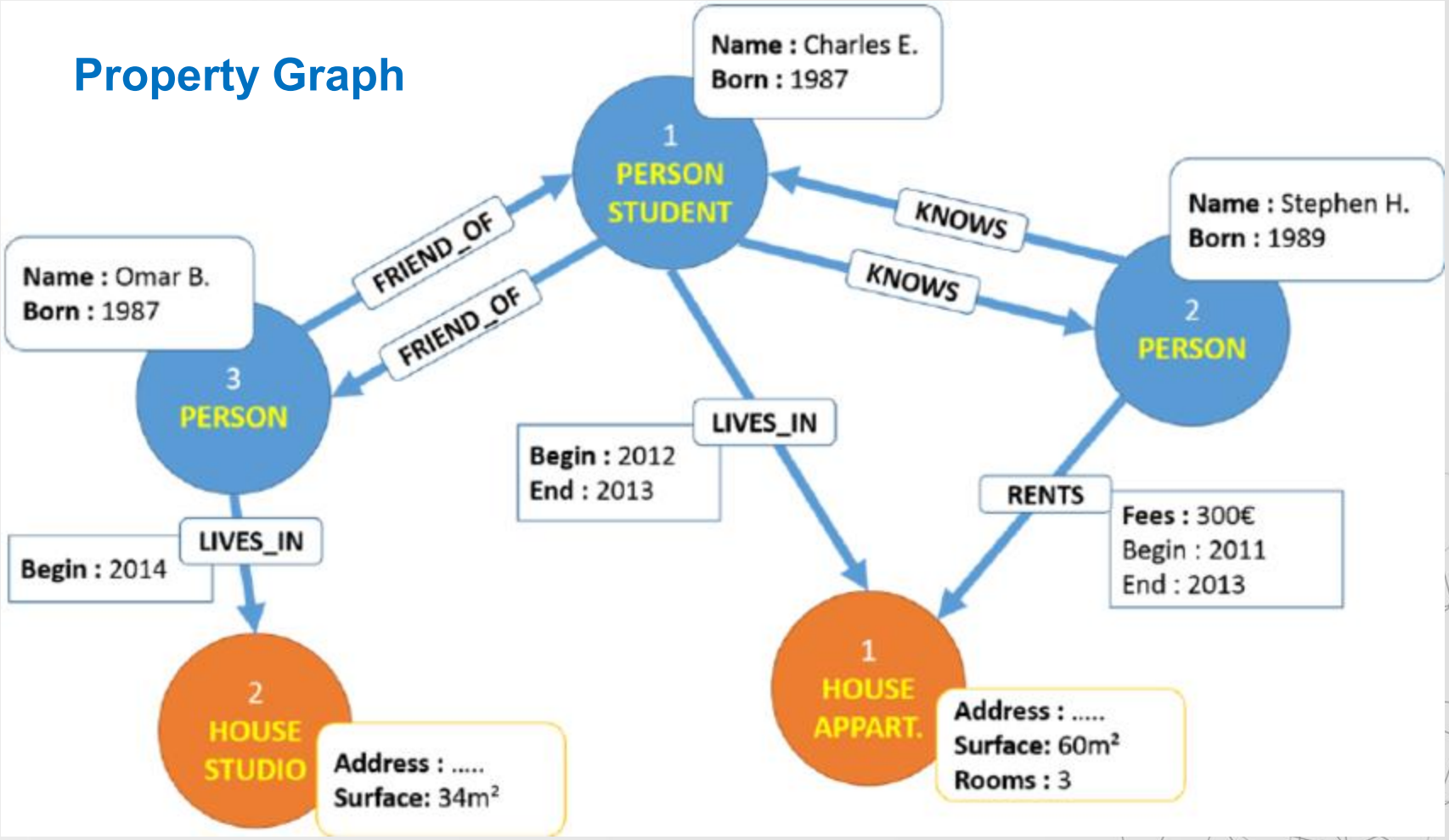
Introduction to Amazon Neptune

Amazon Neptune is a managed service from AWS that lets you work with connected data, like a network of friends on social media or links between various topics on the internet. It’s built specifically to handle data that's highly interconnected, making it easier to explore relationships and patterns within the data.

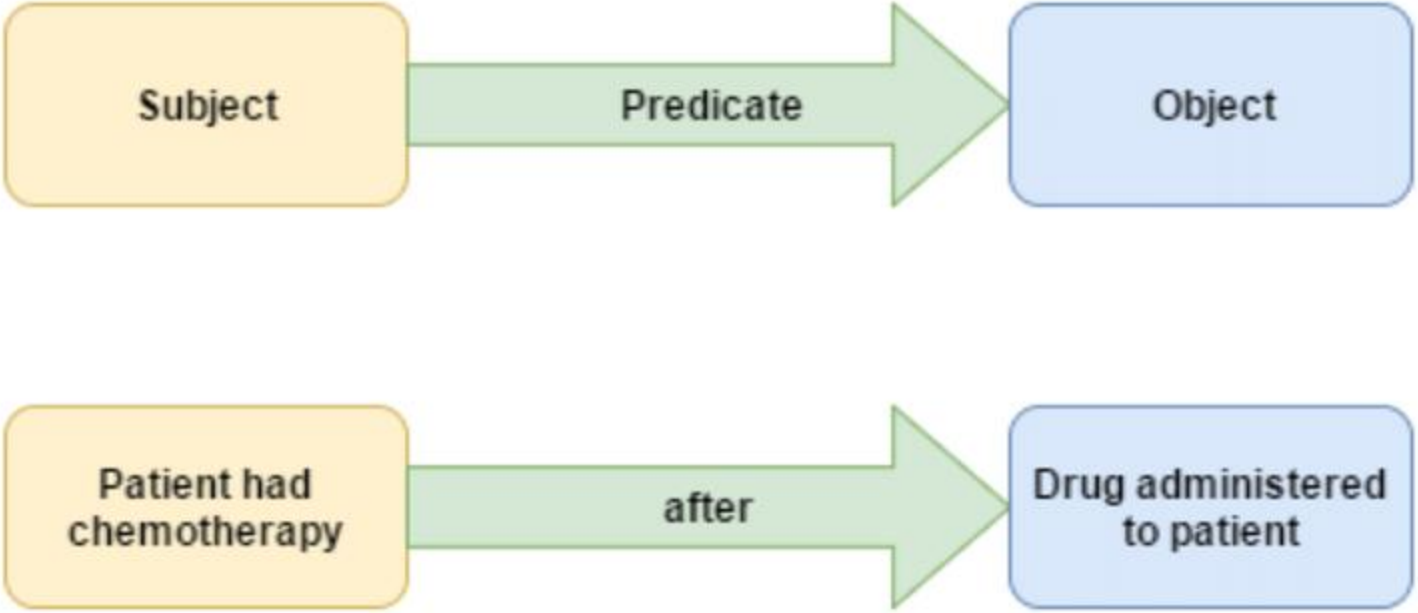


Amazon Neptune

Property Graph



Resource Description Framework (RDF)



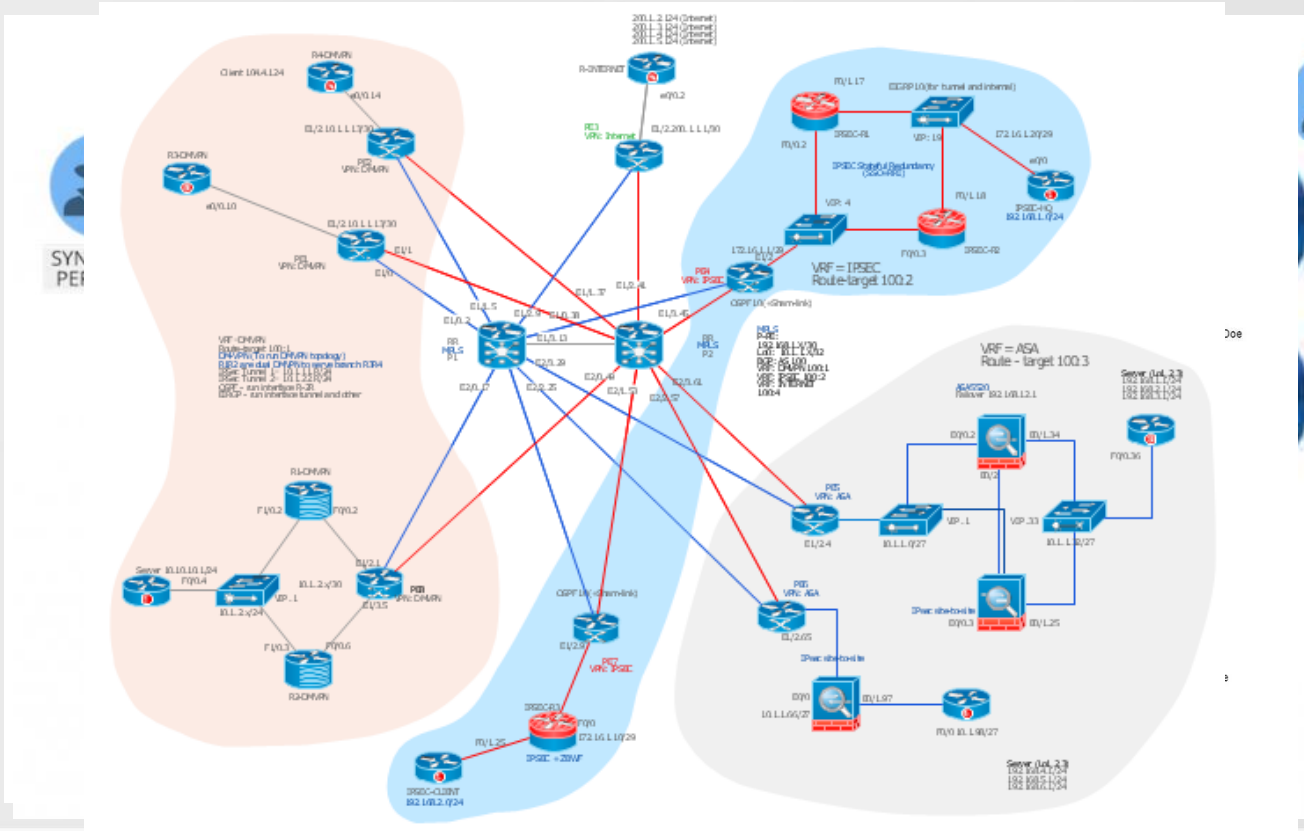
Social Networking

Fraud Detection

Recommendation Engines

Knowledge Graphs

Network and IT Operations



Introduction to Amazon ElastiCache

Amazon ElastiCache is a fully managed in-memory caching service provided by AWS, designed to improve the performance of web applications by allowing you to retrieve data from fast, managed, in-memory caches, instead of relying solely on slower disk-based databases.

Internet-scale applications

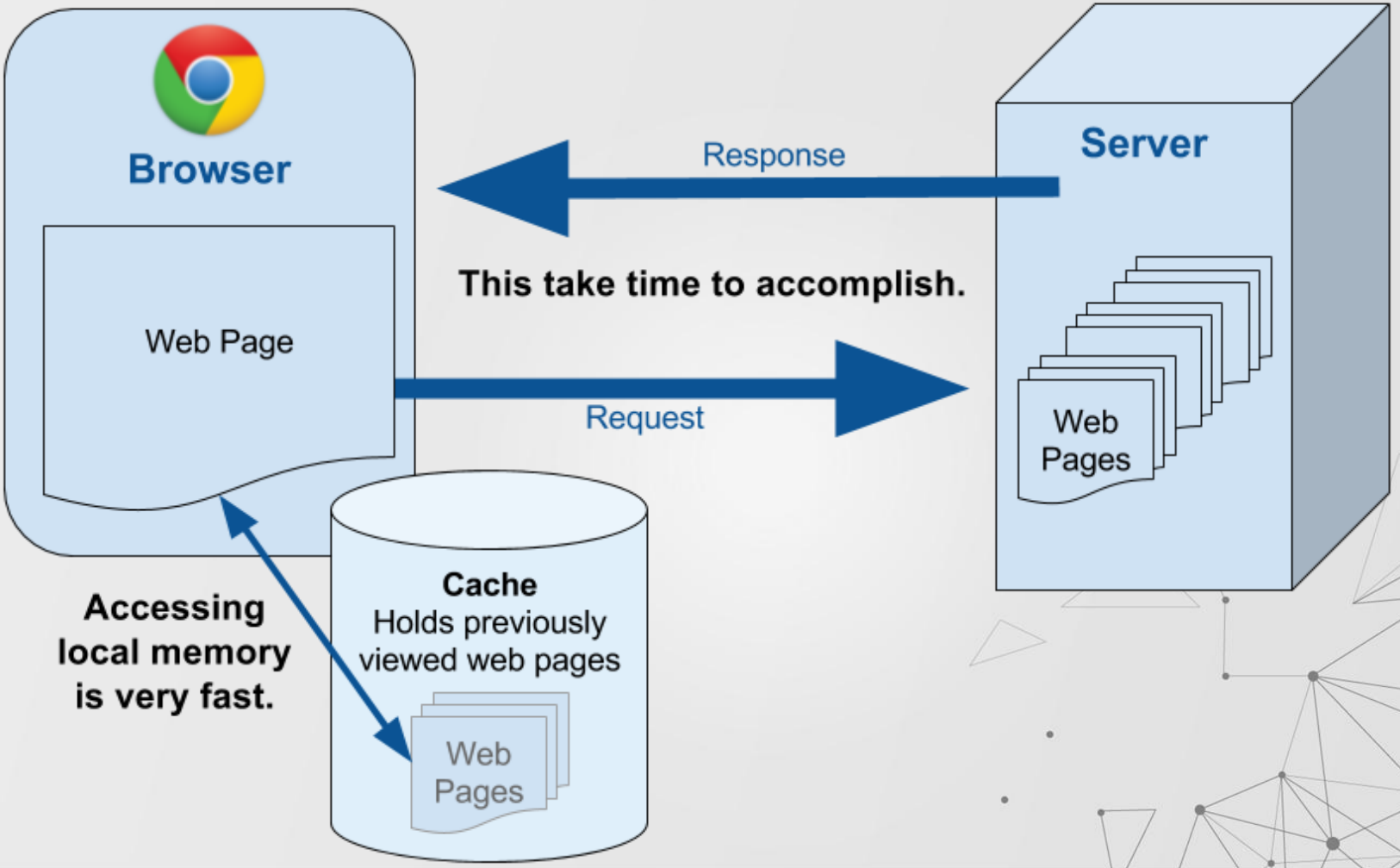
Real-time apps in Gaming, Ride Hailing, Media Streaming, Dating, and Social media need fast data access

Amazon ElastiCache

Blazing fast in-memory data store for use as a database, cache, message broker, and queue. Store ephemeral data in-memory for sub-millisecond response

Use cases

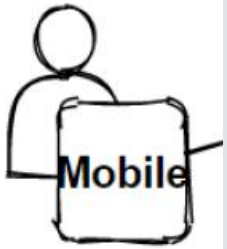
Real-time transactions, chat, BI and analytics, session store, gaming leaderboards, and cache


Browser
Web Page
Response
Server
This take time to accomplish.
Request
Web Pages
Accessing local memory is very fast.
Cache
Holds previously viewed web pages
Web Pages

REDIS	MEMCACHE
REDIS doesn't have native clustering yet but working on developing this feature.	It does native clustering. Hence if you need robust clustering mechanism, go for Memcached solution.
Redis is a data structure server which can do not only caching but you can also do shared queue, message solution (pub/sub), sessions and sorted sets. So, it is good for KEY => SOME_OBJECT	Great at doing simple key-value Cache. Simpler. But, if you want to use other feature or requirement changes, REDIS is the right way to go. So, it is good for KEY => STRING
You can cache bigger values in Redis. Values upto 512MB per key	Size is limited for the values cached. Values cached up to 1MB/key.
Powerful data types and powerful commands to leverage them (Hashes, Sorted Sets, Lists and more)	Great for multi-threaded environment.
	MEMCACHE is faster compared to REDIS

Client Apps

Microservices

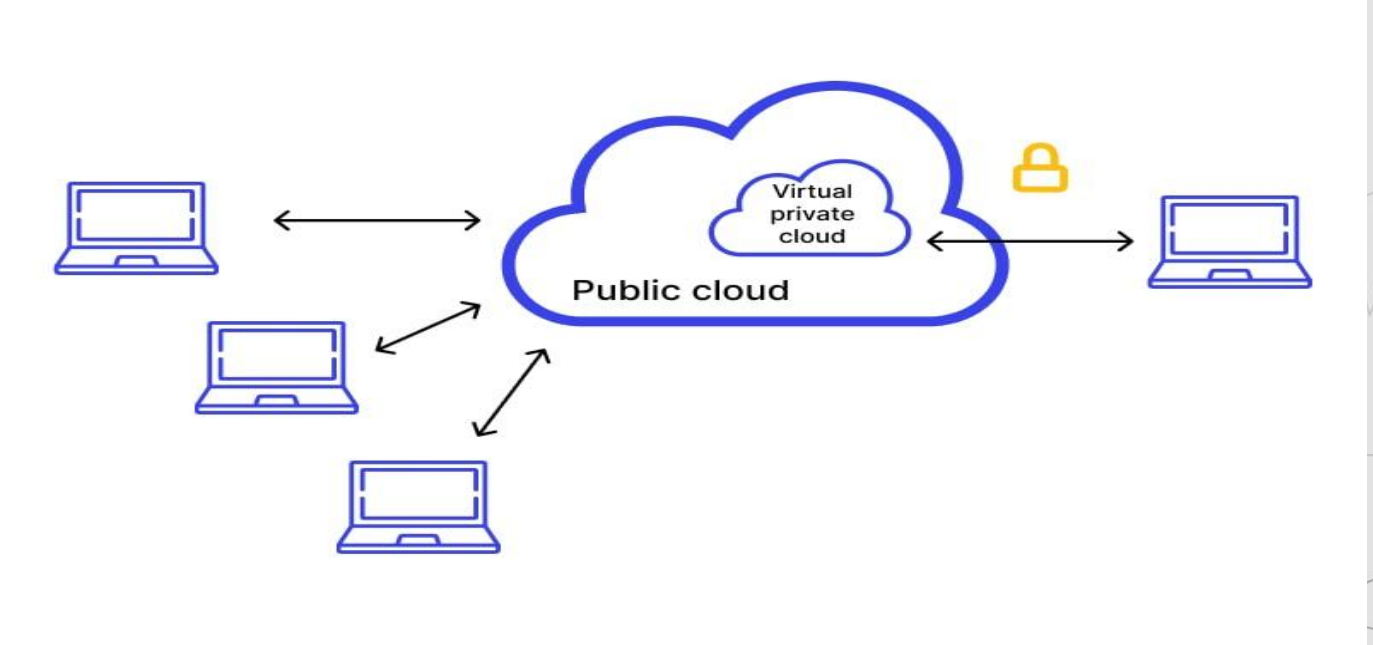


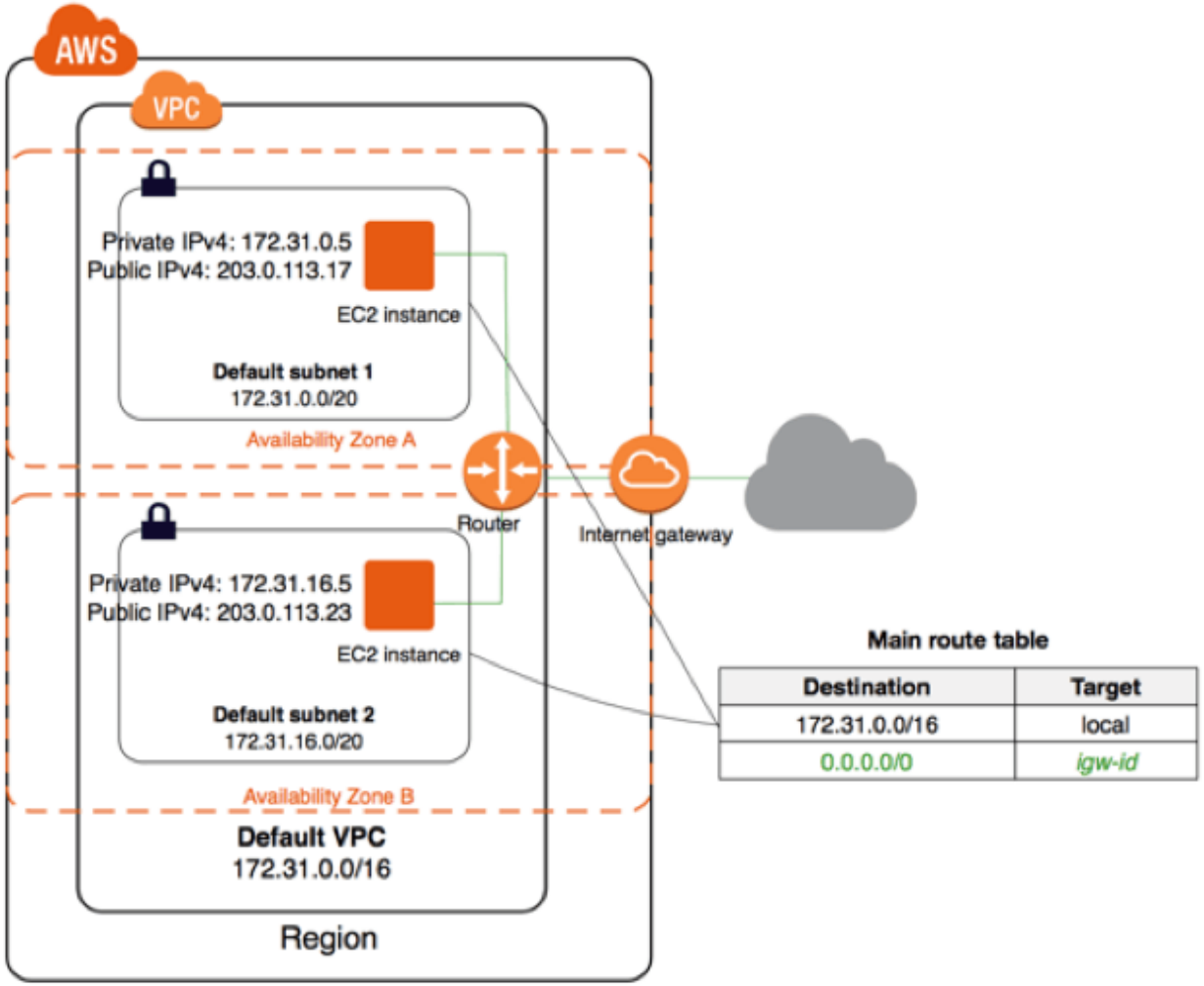
Networking and Content Delivery in AWS

Understanding Amazon Virtual Private Cloud (VPC)
Understanding Content Delivery Network (CDN) with CloudFront
Understanding Dedicated Network Connection with Direct Connect
Understanding Domain Name System (DNS) with Route 53

Understanding Amazon Virtual Private Cloud (VPC)

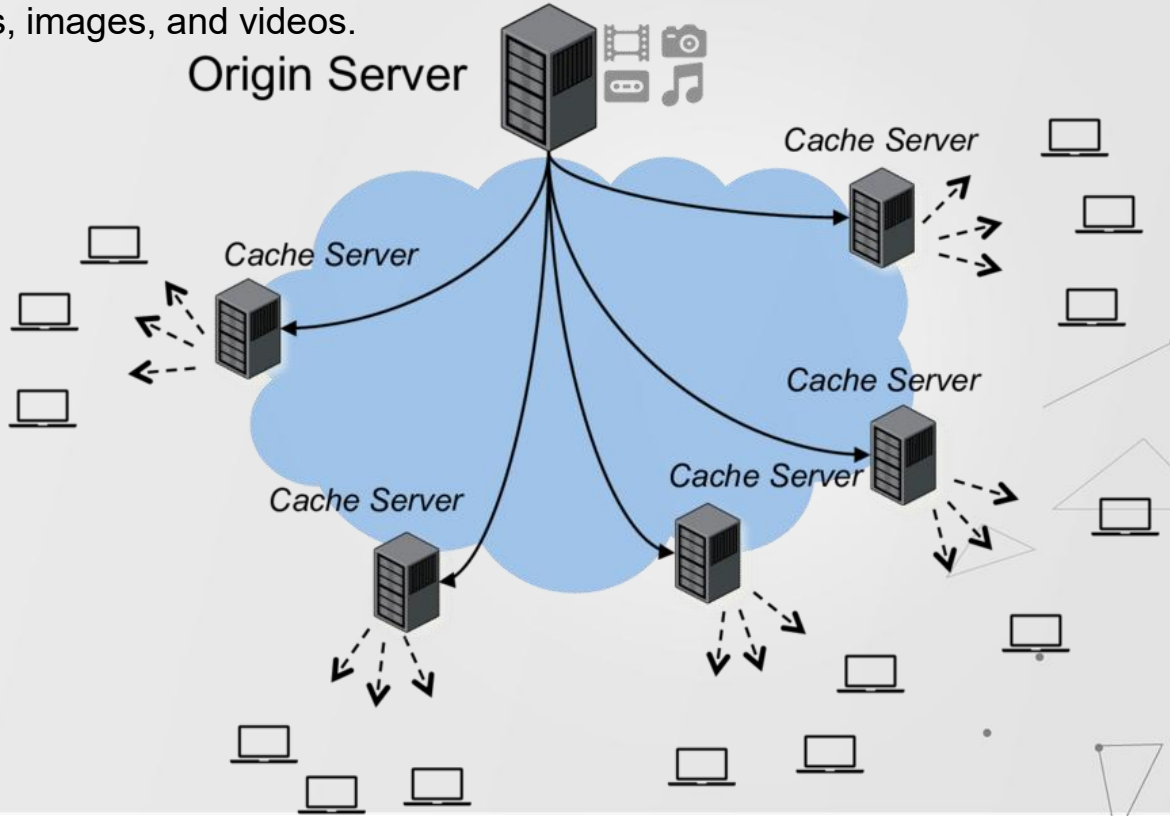
A Virtual Private Cloud (VPC) is a secure, isolated private cloud hosted within a public cloud. Essentially, a VPC offers the scalability and efficiency of a public cloud with the data isolation and security aspects of a private cloud. It allows users to create their own private space within the cloud where they can launch resources, manage networks, and define security settings with greater control over IP address ranges, subnets, and network gateways.




AWS
VPC
Private IPv4: 172.31.0.5
Public IPv4: 203.0.113.17
EC2 instance
Default subnet 1
172.31.0.0/20
Availability Zone A
Router
Internet gateway
Private IPv4: 172.31.16.5
Public IPv4: 203.0.113.23
EC2 instance
Default subnet 2
172.31.16.0/20
Availability Zone B
Default VPC
172.31.0.0/16
Region
Main route table
Destination
Target
172.31.0.0/16
local
0.0.0.0/0
igw-id

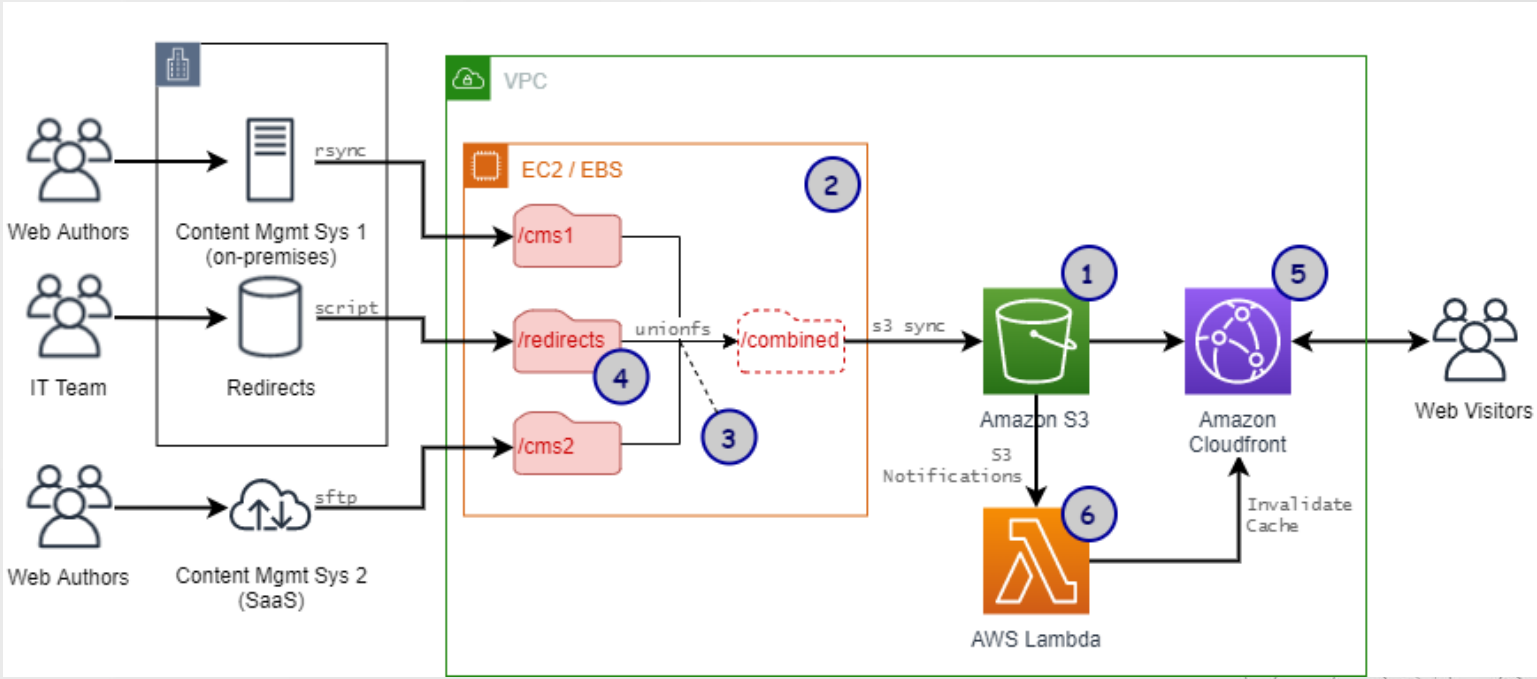
Understanding Content Delivery Network (CDN) with CloudFront

A Content Delivery Network (CDN) is a network of servers distributed across various geographical locations that work together to deliver Internet content quickly to users. A CDN allows for the quick transfer of assets needed for loading Internet content including HTML pages, javascript files, stylesheets, images, and videos.



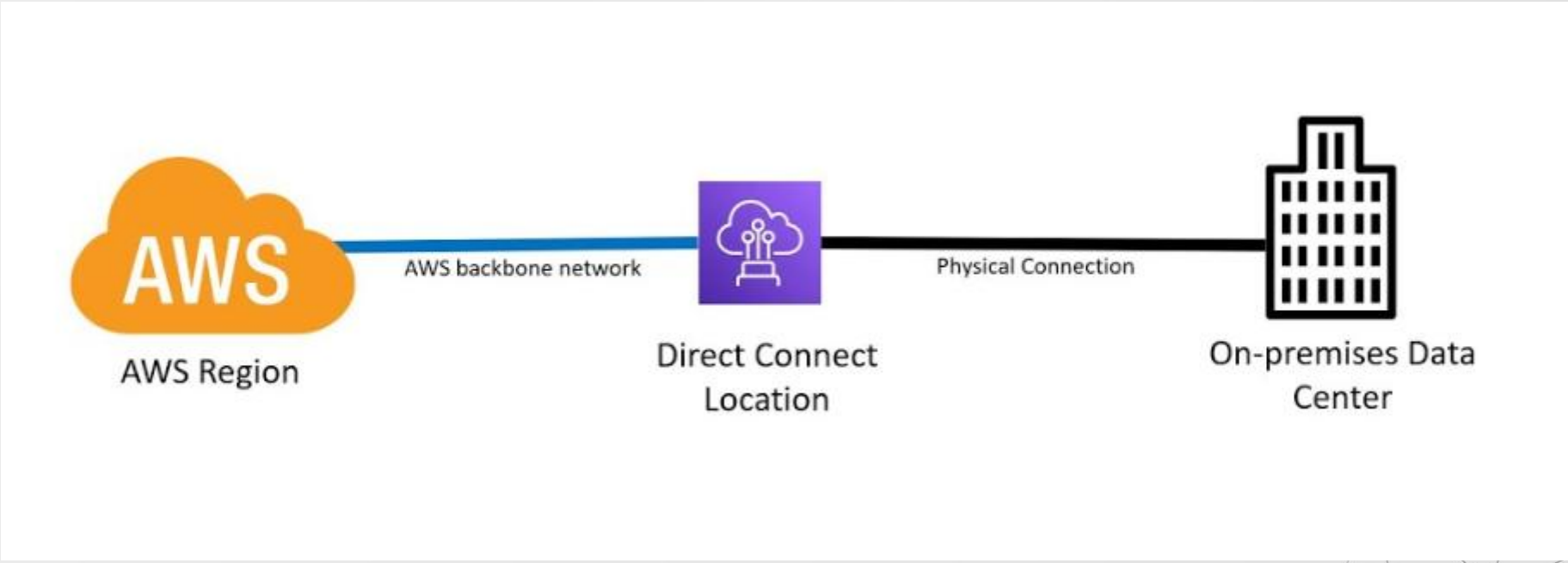
Understanding Content Delivery Network (CDN) with CloudFront

Amazon CloudFront is AWS's fast content delivery network service that securely delivers data, videos, applications, and APIs to customers globally with low latency and high transfer speeds. CloudFront integrates with other Amazon Web Services products to give developers and businesses an easy way to distribute content to end users with no minimum usage commitments.



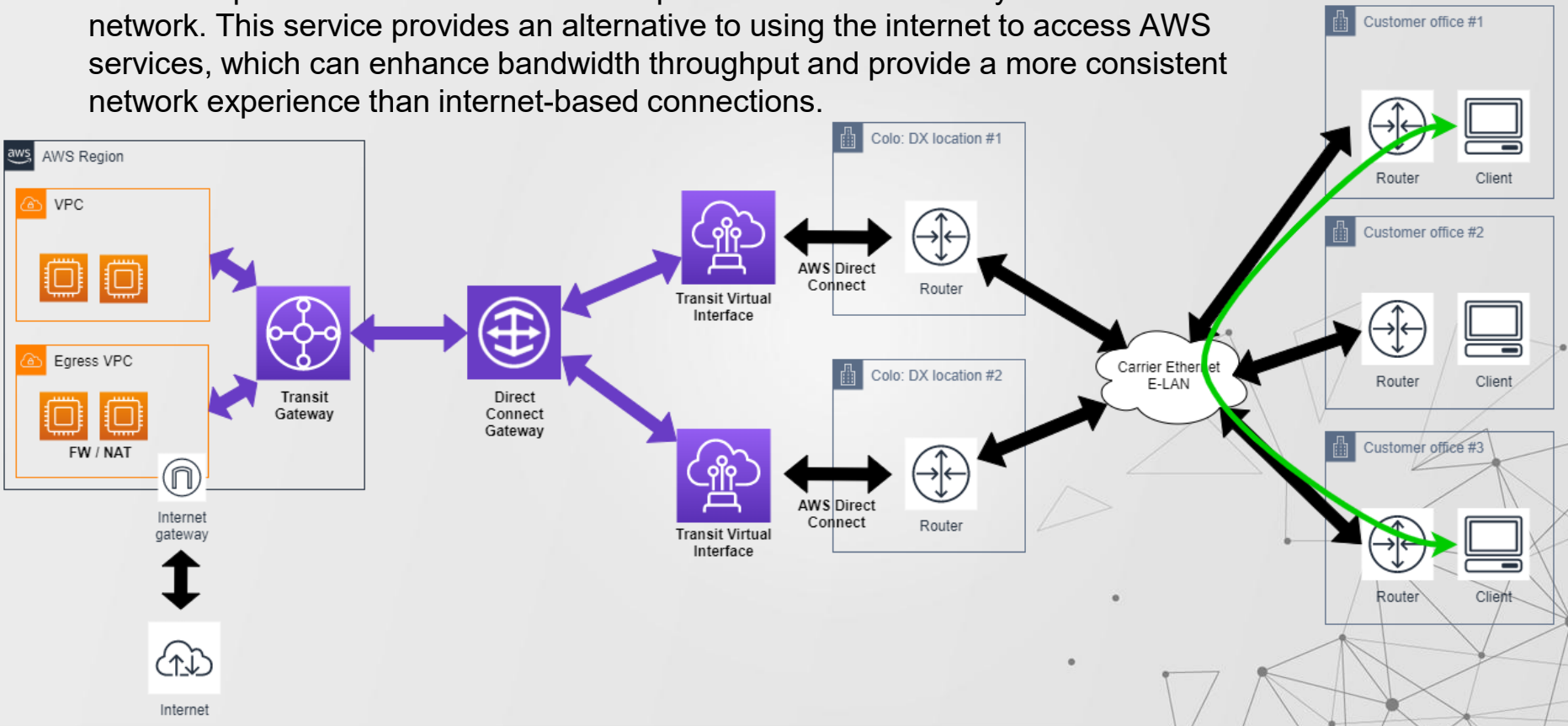
Understanding Dedicated Network Connection with Direct Connect

Dedicated Network Connection typically refers to a private, direct connection between your on-premises infrastructure and a cloud service provider's network, bypassing the public internet.



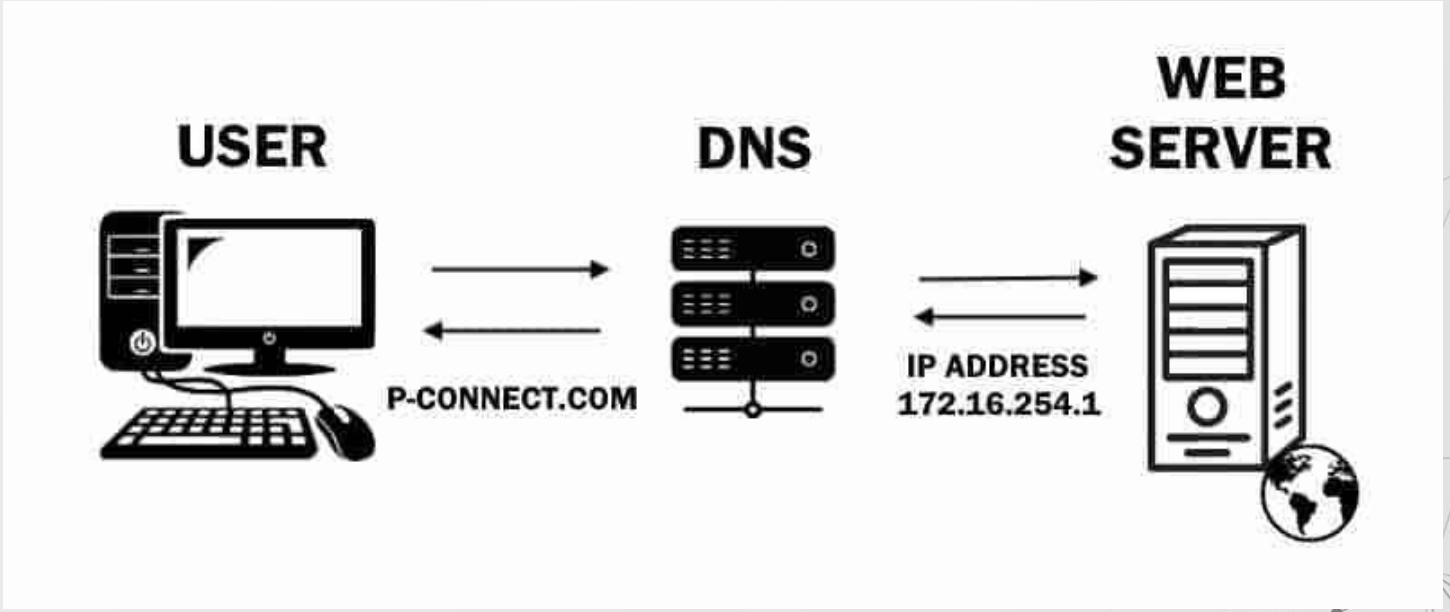
What is AWS Direct Connect

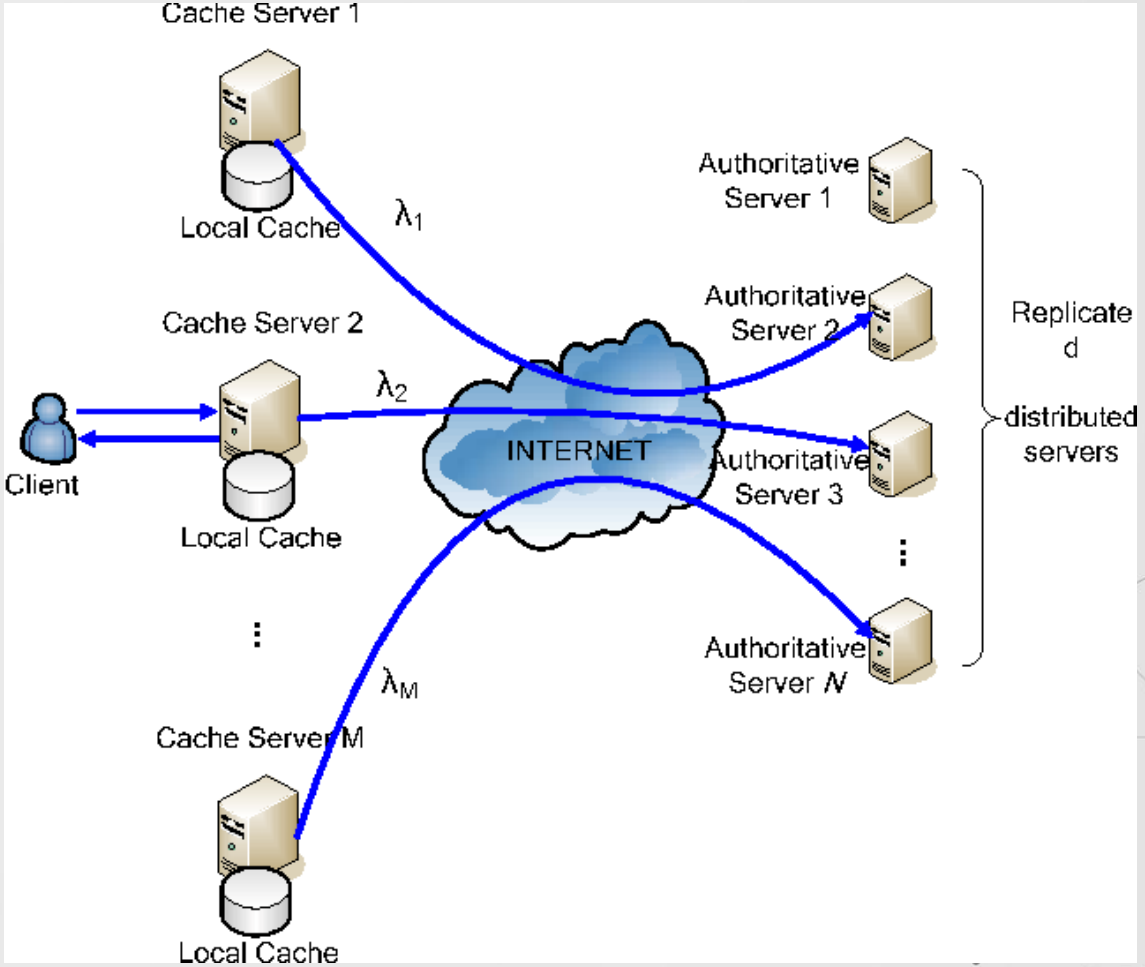
AWS Direct Connect is Amazon Web Services' dedicated network service that enables a private connection from an on-premises network directly to Amazon's network. This service provides an alternative to using the internet to access AWS services, which can enhance bandwidth throughput and provide a more consistent network experience than internet-based connections.



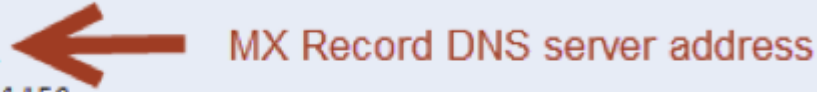
Understanding Domain Name System (DNS)

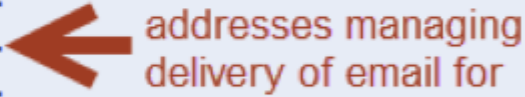
The Domain Name System (DNS) is a hierarchical and decentralized naming system used to identify computers, services, and other resources reachable through the Internet or other Internet Protocol (IP) networks. It associates various information with domain names assigned to each of the participating entities.




Cache Server 1
Local Cache
λ1
Authoritative Server 1
Authoritative Server 2
Replicated
distributed servers
Cache Server 2
λ2
Client
INTERNET
Authoritative Server 3
Local Cache
Authoritative Server N
λM
Cache Server M
Local Cache

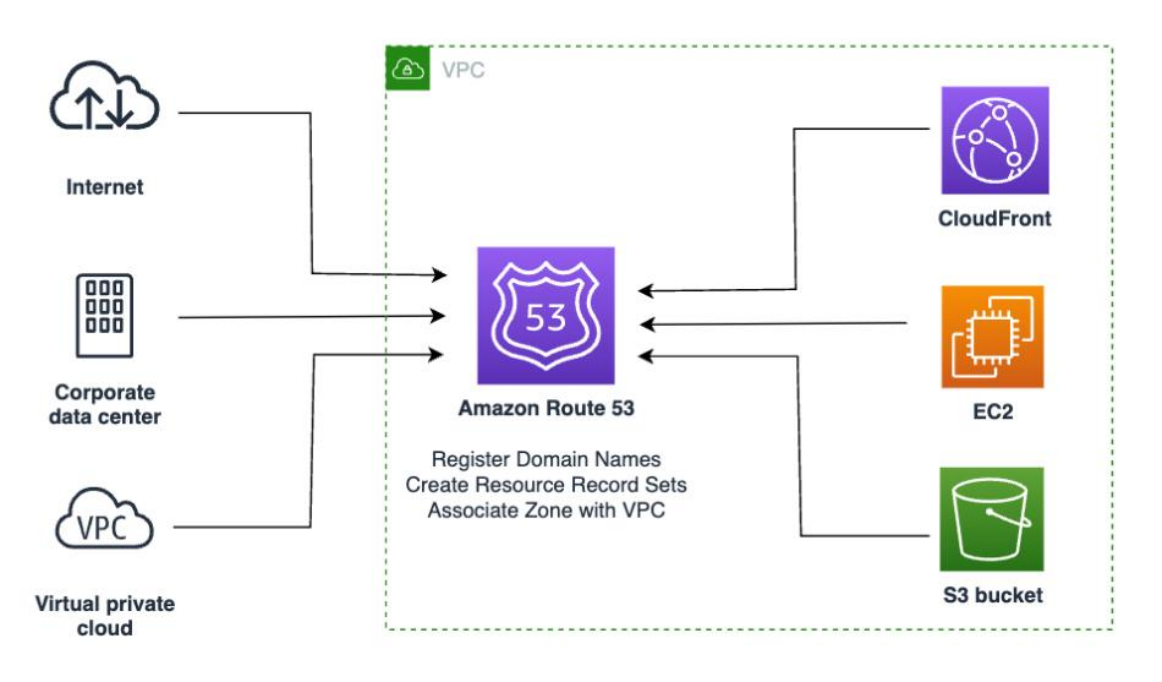
```
mac-mini: username$ nslookup
> set q=MX
> kerio.com

Server: 192.168.1.1
Address: 192.168.1.1#53

Non-authoritative answer:
kerio.com mail exchanger = 40 fw-c.kerio.cz.
kerio.com mail exchanger = 10 mx1.kerio.com.
kerio.com mail exchanger = 20 mx2.kerio.com.

Authoritative answers can be found from:
fw-c.kerio.cz internet address = 195.113.184.20
mx1.kerio.com internet address = 195.113.184.2
mx2.kerio.com internet address = 91.121.64.51
>
```

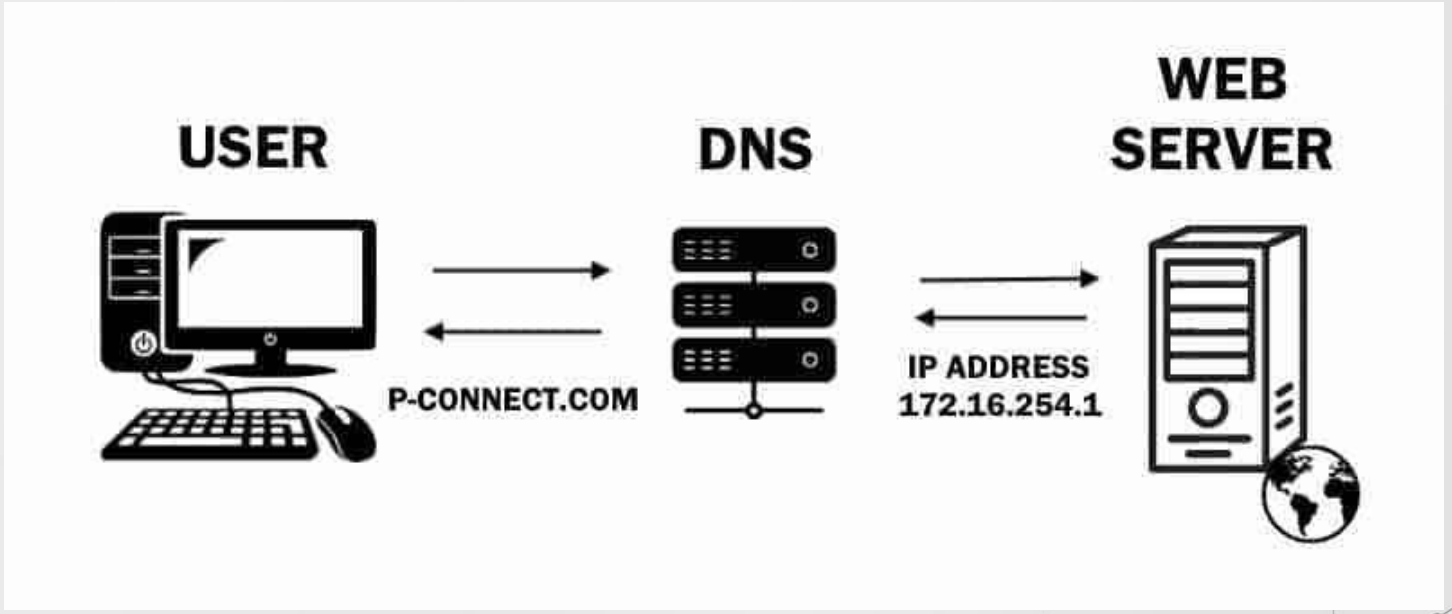


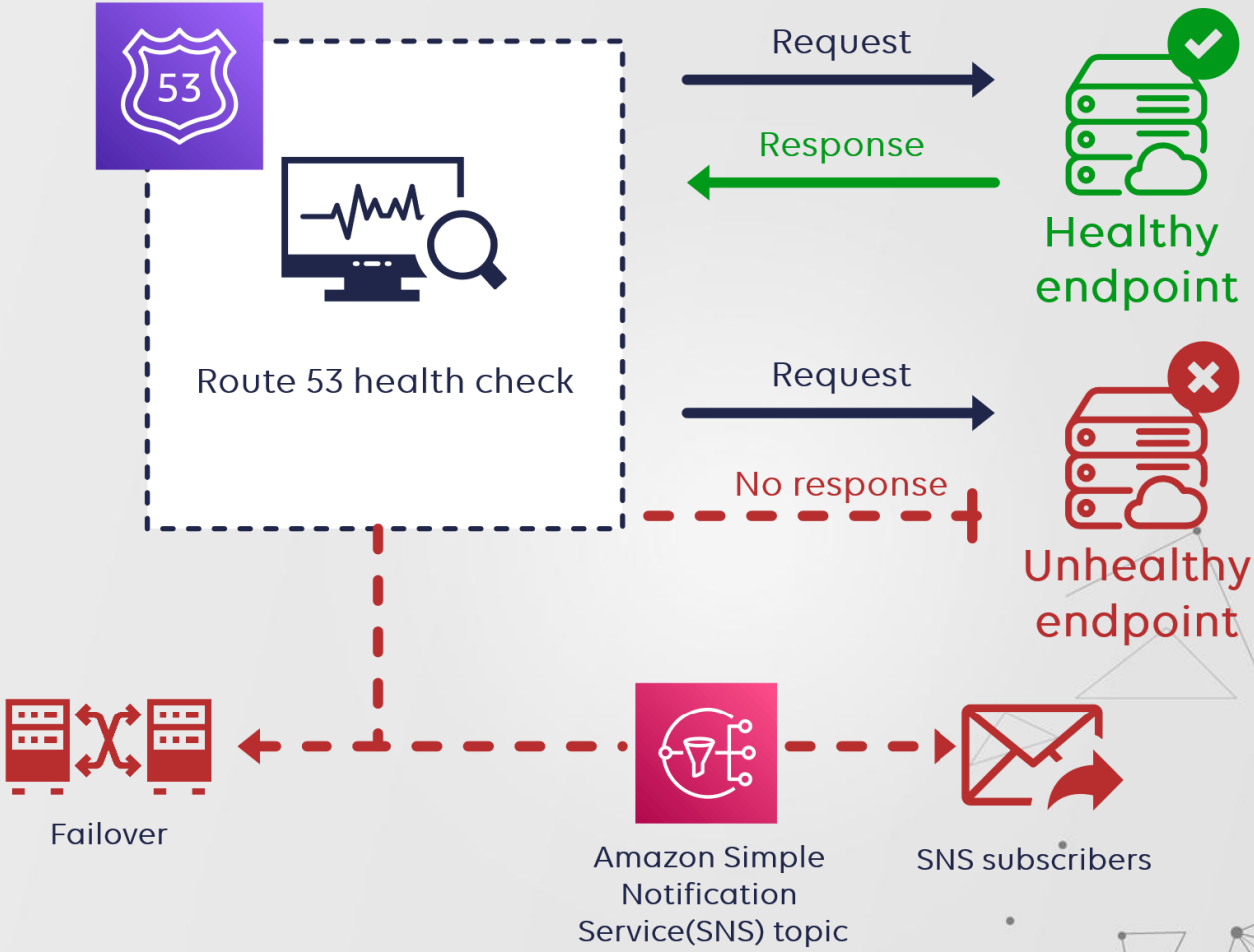


Understanding Domain Name System (DNS) with Route 53

AWS Route 53 is a highly available and scalable cloud Domain Name System (DNS) web service, designed to give developers and businesses an extremely reliable and cost-effective way to route end users to Internet applications. Route 53 effectively connects user requests to infrastructure running in AWS and can also be used to route users to infrastructure outside of AWS.




USER
DNS
WEB SERVER
P-CONNECT.COM
IP ADDRESS
172.16.254.1


53
Request
Response
Healthy endpoint
Route 53 health check
Request
No response
Unhealthy endpoint
Failover
Amazon Simple Notification Service(SNS) topic
SNS subscribers