Amazon Cloud Services

- **Networking:**
  - **Network:** Digital highway system that lets the virtual computers and services you rent from Amazon talk to each other and with the outside world. Networking is defined from private networks to security rules, using software. Network is defined by route tables that determine where your network traffic is directed.

  - TCP: Transmission Control Protocol is reliable service for internet that ensures data arrives in the correct order without any errors. Web browsing, email, file transfers are transferred with all parts of data loaded accurately and completely.

  - **IP:** Unique address for a device on a network.

  - **Firewalls:** Enables enterprise-grade perimeter defense by filtering incoming traffic at VPC boundaries using integrated intrusion detection prevention systems and geographic IP filtering.

  - **Troubleshooting:** AWS leverages troubleshooting tools such as Amazon Q, Bedrock, and Diagnostic tools. Service specific tools such as CloudWatch/Cloud Formation.

    - **EX:** How to troubleshoot failed to connect EC2 Instance error.
      - **https://k21academy.com/amazon-web-services/aws-ec2-connection-errors-guide/**

  - **Connectivity:** AWS offers tools that allow for connectivity from on-premise networks, VPC, and other devices. Other connection types include AWS Direct Connect, VPNs, Transit Gateways, and PrivateLink.

  - **Load balancing** : Service that distributes application traffic across targets, such as EC2 instances, with the least load.
    - **Application:** HTTP/HTTPS traffic
    - **Network :** TCP, UDP, TLS traffic
    - **Gateway:** Operates at Layer 3(network layer)..deploys and manages virtual instances like firewalls and intrusion detection/prevention.

  - **F5:** F5 Distributed Cloud enables users to deploy, connect, secure and operate applications across public, private, network and edge clouds. Distributed Cloud Services provides a variety of app-to-app networking and security capabilities that include a router, load balancer, network firewall, web app firewall (WAF), API security and API gateway into a single software stack and management portal.

- **Network Design:**

- **Network topology:**

- **VPC:** Logically isolated section of AWS Cloud that enables users to launch AWS resources in a virtual network that they define and control.

- **API gateways:** AWS service that enables developers to create, publish, maintain, monitor, and secure APIs at any scale. Integrates with other services and specifically CloudWatch for monitoring API performance, tracking metrics like API calls, latency, and error rates, and providing access and execution logs for troubleshooting.

- **CloudFront:** Amazon CloudFront is a web service that speeds up distribution of your static and dynamic web content, such as .html, .css, .js, and image files, to your users. CloudFront delivers your content through a worldwide network of data centers called edge locations. When a user requests content that you're serving with CloudFront, the request is routed to the edge location that provides the lowest latency (time delay), so that content is delivered with the best possible performance.

- **Route 53:** Amazon Route 53 provides highly available and scalable Domain Name System (DNS), domain name registration, and health-checking cloud services. It is designed to give developers and businesses an extremely reliable and cost-effective way to route end users to internet applications by translating names like example.com into the numeric IP addresses, such as 192.0.2.1, that computers use to connect to each other.

- **App Mesh:** Service mesh that allows you to easily monitor and control communications across microservices applications on AWS. You can use App Mesh with microservices running on Amazon Elastic Container Service (Amazon ECS), Amazon Elastic Container Service for Kubernetes (Amazon EKS), and Kubernetes running on Amazon EC2.

- **Cloud Map:** Cloud resource discovery service. With Cloud Map, you can define custom names for your application resources, and it maintains the updated location of these dynamically changing resources. Cloud Map allows you to register any application resources, such as databases, queues, microservices, and other cloud resources, with custom names. Cloud Map then constantly checks the health of resources to make sure the location is up-to-date.

- **Direct Connect:** With AWS Direct Connect SiteLink, you can send data between AWS Direct Connect locations to create private network connections between

the offices and data centers in your global network. Can connect your on-premise database to the AWS network.

- **Global Accelerator:** Service that allows you to route traffic to your applications using the AWS global network instead of the internet. The internet can be congested and AWS claim that by using their private network infrastructure you can improve the connection speed and performance by as much as 60%. Global Accelerator (GA) provides you with two public static IP addresses that users can connect to reach your application endpoint. GA then optimizes the path from those IP addresses to your application which results in lower latency and better network performance.

- **Transit Gateway:** A managed network hub that simplifies connectivity by acting as a central router to connect multiple Amazon Virtual Private Clouds (VPCs) and on-premises networks.

- **Compute-Linux**
  - **Linux:** Amazon Linux is a Linux operating system provided by Amazon Web Services (AWS) specifically for use on Amazon Elastic Compute Cloud (Amazon EC2) and other AWS services. It is designed to offer a stable, secure, and high-performance environment for cloud and enterprise applications. AWS uses Linux as its OS kernel.

  - **RHEL:** Linux distribution version designed for enterprise use, offering stability, security, and long-term support through a subscription model. Manages computers hardware and software resources. RHEL is the enterprise-grade version, that is built for stability, security, and long-term support for businesses.

  - **Ubuntu:** Ubuntu on AWS is a set of customized Ubuntu images that allow easy access to a wide range of products and services - offered by both Amazon Web Services (AWS) and Canonical. These images have an optimized kernel that boots faster, has a smaller footprint and includes AWS-specific drivers.

  - **Unix:** Unix is the foundational, proprietary operating system family that was developed first. Unix-based instances on AWS can seamlessly integrate with other AWS services like Amazon Elastic Block Store (EBS) for persistent storage, Amazon CloudWatch for monitoring, and various networking services.

  - **Administration:** AWS Linux administration involves managing Linux-based instances and services within the Amazon Web Services (AWS) cloud environment. This encompasses a broad range of tasks and responsibilities, leveraging the scalability, flexibility, and features offered by AWS.

- **Administer:** An AWS Linux Administrator manages and maintains Linux-based server infrastructure hosted on the Amazon Web Services (AWS) cloud platform. Responsibilities include configuring, monitoring, and securing EC2 instances, implementing automation with tools like Terraform and Ansible, managing patching and backups, and ensuring high-availability and performance of the cloud environment.

- **Compute – Windows**
  - **Windows:**
  - **EC2:** Amazon EC2 (Elastic Compute Cloud) is a core service within Amazon Web Services (AWS) that provides scalable computing capacity in the cloud. It allows users to rent virtual servers, known as "instances," on which they can run their own computer applications.

  - **Auto-scaling:** Automatically adjusts the number of compute and other scalable resources for your applications to meet fluctuating demand, improving performance and controlling costs.

  - **Elastic-Containers:** General service offered by Amazon Web Services (AWS) that automatically distributes incoming application traffic across multiple targets, such as EC2 instances, in different Availability Zones.

  - **Lightsail:** Amazon Lightsail provides easy-to-use cloud resources to get your web application or websites up and running in just a few clicks. Lightsail offers simplified services such as instances, containers, databases, storage, and more.

  - **Beanstalk:** Orchestration service provided by Amazon Web Services (AWS) that simplifies the deployment, management, and scaling of web applications and services. It handles the provisioning and configuration of underlying AWS resources, allowing developers to focus on writing code rather than managing infrastructure.
  - **Fargate:** Serverless, pay-as-you-go compute engine that lets you focus on building applications without managing servers. Moving tasks such as server management, resource allocation, and scaling to AWS does not only improve your operational posture, but also accelerates the process of going from idea to production on the cloud and lowers the total cost of ownership.

  - **Lambda:** Serverless, event-driven compute service provided by Amazon Web Services (AWS). It allows you to run code without provisioning or managing servers. You simply upload your code, and Lambda handles all the underlying

infrastructure management, including server provisioning, scaling, and maintenance.

- **ELB (Elastic Load balancing):** Elastic Load Balancing (ELB) automatically distributes incoming application traffic across multiple targets and virtual appliances in one or more Availability Zones (AZs).

- **Compute – Serverless:**
  - **Amazon Web Services:** Comprehensive cloud computing platform that offers a wide array of on-demand services, including computing power, storage, databases, analytics, networking, mobile development, and more. Essentially, AWS allows individuals and businesses to access and utilize IT resources like servers, storage, and databases over the internet, eliminating the need to manage their own physical infrastructure.

  - **Google Cloud Platform:** Google's cloud service offering.

  - **Azure:** Microsoft's own cloud service offering.

  - **Openstack:** OpenStack is a free and open-source software platform that enables users to build and manage their own private cloud infrastructure. It provides a suite of services for compute (Nova), storage (Swift, Cinder), networking (Neutron), identity management (Keystone), and more, allowing organizations to create a cloud environment on their own hardware.

  - **Public cloud:** A shared, multi-tenant infrastructure hosted and managed by a third-party provider, offering high scalability and cost-efficiency via a pay-as-you-go model.

  - **Private cloud:** a dedicated, single-tenant environment, either on-premises or hosted by a provider, that offers greater security, customization, and control but comes with higher costs and more management responsibility.
  - **Microservices:** A collection of small, independent, loosely coupled services, each responsible for a specific business capability and communicating with each other.

  - **APIs:** Application Programming Interfaces (APIs), which are software connectors that allow different programs to communicate with each other.

- **Multi-tier architecture:** Three-tier architecture used in web applications and is separated into three distinct logical and physical tiers, such as presentation (Client/Web Tier), application (Logic/Business Tier), and data-tier(Database Tier).

- **Multi-tier:** Divides a complex application into logical layers(tiers) for improved scalability, maintainability, and security by separating distinct functions like presentation, application processing, and data management.

- **RESTful web services:** web service built using the Representational State Transfer (REST) architectural style. REST is an architectural style for designing networked applications, emphasizing a stateless, client-server communication model. Uses HTTP methods (GET, POST, PUT, DELETE) to perform operations on resources identified by URLs.

- **Platform as a Service:** Offers a platform for developers to build, run, and manage applications without the complexity of managing the underlying infrastructure.

- **Software as a service:** Delivers complete, ready-to-use software applications over the internet.

- **Infrastructure as a Service:** Provides foundational IT resources like virtual machines, storage, and networks.

- **Storage & Content Delivery (File / Block / CDN):**
  - **Content Delivery Network:** A CDN is a geographically distributed network consisting of proxy and file servers in datacenters connected by high-speed backbone networks. CDNs are used to reduce latency and load times for a specified set of files and objects in a web site or service.

  - **Virtualization:** A set of virtualization software that creates virtual machines (VMs) to run multiple operating systems and applications on a single physical server, increasing hardware efficiency and flexibility.

  - **VMware:** A company and a set of virtualization software that creates virtual machines (VMs) to run multiple operating systems and applications on a single physical server, increasing hardware efficiency and flexibility.

  - **Hyper-V:** VMware's bare-metal server virtualization platform that allowed multiple virtual machines to run on single physical hardware by abstracting resources like CPU, memory, and storage.

- **ESX:** VMware's bare-metal server virtualization platform that allowed multiple virtual machines to run on single physical hardware by abstracting resources like CPU, memory, and storage.

- **ESXi:** Amazon EBS allows you to create storage volumes and attach them to Amazon EC2 instances. Once attached, you can create a file system on top of these volumes, run a database, or use them just like you would use block storage. Amazon EBS volumes are placed in a specific Availability Zone, where they are automatically replicated to protect from the failure of a single component. All EBS volume types offer durable snapshot capabilities and are designed for high availability.

- **Storage Design:** AWS provides different types of storage, each with unique strengths: Object storage (like S3) for unstructured data, Block storage (like EBS) for high-performance application data, File storage (like EFS) for shared, hierarchical data access, and Archive storage (like Glacier) for long-term, cost-effective data retention.

- **S3 (Simple Storage Service):** Simple Storage Service, or Amazon S3, is a cloud-based object storage service provided by Amazon Web Services that offers highly scalable, durable, and available storage for any amount of data. S3 uses "buckets" to store "objects" (files like photos, videos, or documents) and provides various storage classes for different access patterns and costs, allowing users to pay only for what they use.

- **Elastic Block Store:** Amazon EBS allows you to create storage volumes and attach them to Amazon EC2 instances. Once attached, you can create a file system on top of these volumes, run a database, or use them just like you would use block storage. Amazon EBS volumes are placed in a specific Availability Zone, where they are automatically replicated to protect from the failure of a single component. All EBS volume types offer durable snapshot capabilities and are designed for high availability.

- **Elastic File System:** Amazon Elastic File System (EFS) is a cloud-based, fully managed file storage service from AWS that provides scalable, serverless, and elastic storage for use with AWS compute services like Amazon EC2, Lambda, and containers, as well as on-premises servers.

- **FSX:** AWS FSx is a fully managed cloud service that provides high-performance file storage based on popular commercial and open-source file systems. Instead of setting up and maintaining your own file servers, you can launch a fully functional file system with a few clicks and let AWS handle the hardware, software, and backups.

- **AWS backup:** AWS Backup is a fully managed service that centralizes and automates data protection across AWS services and hybrid workloads. It provides core data protection features, ransomware recovery capabilities, and compliance insights and analytics for data protection policies and operations. AWS Backup offers a cost-effective, policy-based service with features that simplify data protection at exabyte scale across your AWS estate.

- **AWS Snow Family:** A set of physical devices offered by Amazon Web Services (AWS) for securely transferring large amounts of data to and from the cloud, or for running compute and storage workloads in edge locations with limited or no internet connectivity. It includes devices like Snowcone, Snowball, and Snowmobile, each designed for different data transfer and edge computing needs.

- **AWS Storage gateway:** WS Storage Gateway gives your applications on-premises and in-cloud access to virtually unlimited cloud storage. You can deploy Storage Gateway as a virtual machine (VM) within your VMware, Hyper-V, or Linux KVM virtual environment, or as an Amazon EC2 instance within your Amazon Virtual Private Cloud (Amazon VPC).

- **Database (RDBMS / NoSQL / DW):**
  - **SQL:** Structured query language is a standard programming language for managing and manipulating data in a relational database.

  - **Oracle:** Database better suited for large-scale, complex applications with high performance needs. Good for storing, managing, and retrieving data through RDBMS system.

  - **MySQL:** MySQL is an open source RDBMS that uses SQL to create and manage databases. As a relational database, MySQL stores data in tables of rows and columns organized into schemas. A schema defines how data is organized and stored and describes the relationship among various tables.

  - **Relational Databases:** Organizes data into structured tables with rows and columns, linked by primary and foreign keys to maintain data integrity and consistency. It uses Structured Query Language (SQL) for efficient data management, storage, retrieval, and analysis, making it a foundation for businesses to handle large volumes of structured data. Key components include tables, records (rows), and attributes (columns).

  - **RDBMS:** Relational Database Management System, is a software system that manages relational databases, which store data in structured tables of rows and columns. RDBMS use SQL (Structured Query Language) to create, update, delete, and retrieve data, ensuring data integrity and accuracy through relationships

defined by keys and constraints. Popular examples include MySQL, PostgreSQL, Oracle Database, and Microsoft SQL Server.

- **NoSQL:** Stores data in formats/keys and designed to run on distributed systems. Non-relational databases that use flexible data models to store and manage large, unstructured datasets, offering horizontal scalability and high availability. Unlike SQL databases with fixed schemas, NoSQL databases can accommodate evolving data structures, making them ideal for big data, distributed systems, and real-time applications.

- **Data Warehouse:** Central, aggregated, and historical repository of data from multiple sources, designed for reporting and analysis to support business intelligence and informed decision-making. It provides a "single source of truth" by integrating and standardizing data from various systems like transactional databases and CRM, allowing businesses to gain valuable insights through dashboards, reports, and analytics tools.

- **Aurora:** Amazon Aurora provides unparalleled high performance and availability at global scale for PostgreSQL, MySQL, and DSQL. Aurora has 5x the throughput of MySQL and 3x of PostgreSQL with full PostgreSQL and MySQL compatibility. Aurora also offers DSQL, the fastest distributed SQL database that is PostgreSQL-compatible. Aurora is designed for up to 99.999% multi-Region availability. With Aurora DSQL, Aurora provides virtually unlimited scale in and across regions with no infrastructure management.

- **DynamoDB:** A serverless, NoSQL, fully managed database with single-digit millisecond performance at any scale.

- **DocumentDB:** Amazon DocumentDB is a serverless, fully managed, MongoDB API-compatible document database service. Its serverless configuration automatically scales capacity up or down in fine grained increments based on your application's demands, offering up to 90% cost savings compared to provisioning for peak capacity. As a fully managed database, Amazon DocumentDB removes the undifferentiated heavy lifting of database management tasks such as patching, backups and monitoring.

- **Elasticache:** Fully managed in-memory data store and cache service. he service improves the performance of web applications by retrieving information from managed in-memory caches, instead of relying on slower disk-based databases. Supports Valkey, Memcahced, and Redis.

- **Amazon Neptune:** Serverless graph database and fully managed graph analytics for superior scalability and availability.

- **RDS:** Is an easy-to-manage relational database service optimized for total cost of ownership. Includes Aurora, MySQL, PostgreSQL, Oracle, MySQL, and Mariadb. automates undifferentiated database management tasks, such as provisioning, configuring, backing up, and patching.

- **Redshift:** Fully managed, petabyte-scale cloud data warehouse service. Designed for analytical workloads and business intelligence, enabling users to analyze large datasets and gain insights for decision-making.

- **Deployment and Management(Content/Code Management):**
  - **Automation:** Process of automating the setup, configuration, deployment, and ongoing management of AWS infrastructure and the applications running on it. Reduces manaual effort, improves efficiency, enhances consistency, and accelerates delivery of cloud resources and services.

  - **DevOps:** Set of flexible services designed to enable companies to build and deliver products using AWS & DevOps practices more rapidly and reliably. Combination of cultural philosophies, practices, and tools that increases an organization's ability to deliver applications and services at high velocity.

  - **Continuous Integration:** Continuous integration is a software development practice where developers frequently merge their code changes into a central repository, followed by automated builds and tests to detect integration issues early. Services include CodeCommit, CodeBuild, CodePipeline, CodeCatalyst.

  - **Continuous Delivery:** Software development practice that automates the preperaton and release of code changes to production. This ensures that every code change is automatically built, tested, and ready for deployment. Examples include. CodeCommit, CodeBuild, CodeDeploy, CodeArtifact,CodeCatalyst.

  - **CI/CD:** Where new code is submitted on one end, tested over a series of stages (source, build, test, staging, and production), and then published as production-ready code.

  - **Jenkins: J**enkins is an open-source automation server commonly used for Continuous Integration and Continuous Delivery (CI/CD) pipelines. Used to build, test, and deploy software projects. It can be integrated with various AWS services to automate the software development lifecycle on the AWS cloud. Can be deployed on EC2 instances, providing a scalable and flexible environment for hosting Jenkins server and its agents.

  - **Chef:** Chef SaaS is a cloud-based solution for infrastructure, compliance, and cloud security automation to manage entire IT estates. Enterprises can automate infrastructure configurations, view compliance and security postures of all

devices, and detect and remediate configuration drift and security vulnerabilities. Uses Ruby and domain specific language.

- **Ansible:** Chef SaaS is a cloud-based solution for infrastructure, compliance, and cloud security automation to manage entire IT estates. Enterprises can automate infrastructure configurations, view compliance and security postures of all devices, and detect and remediate configuration drift and security vulnerabilities.

- **Docker:** Platform that packages applications into standardized units called containers, making them portable and consistent across different environments.

- **Powershell:** Enables users to manage and automate AWS services using PowerShell commands.

- **Python:** AWS leverages python to work quickly while integrating systems effectively. Used for various task such as configuring EC2 instances and managing S3 buckets through AWS SDK.

- **Perl:** General purpose, interpreted, dynamic programming language. Community driven SDK in AWS that allows developers to programmatically interact with AWS APIs directly from perl code.

- **Bash:** Used to execute AWS CLI commands. Allows for automation of various AWS operations, such as creating and managing resources(EC2 instances, S3 buckets, DynamoDB tables) configuring services, and retrieving information.

- **Containerization:** Method of packaging software into standardized units called containers. A container includes everything an application needs to run: code, runtime, system tools, libraries, and settings. This ensures that the application behaves consistently across different environments, from development to production. **Containers** provides the packaging, while **Docker** is used to build and manage containers.

- **Kubernetes:** Open-source container orchestration platform that automates the deployment, scaling, and management of containerized applications. Kubernetes provides the framework to run and manager containers at scale across a cluster of machines.

- **Puppet:** Configuration management tool that can be used to automate the provisioning, configuration, management of infrastructure, including AWS resources. Enables users to define the desired state of their infrastructure as code, ensuring consistency and repeatability.

- **Infrastructure automation:** Uses code and tools to automatically provision, configure, and manage AWS resources, replacing manual, error-prone processes with efficient, repeatable, and scalable deployments. Key services include CloudFormation, Systems Manager, Terraform (3rd-party tool) , to achieve IaC practices.

- **Administration and Security Monitoring:**
  - **IAM:** Identity and Access Management. Centrally manage users, security credentials such as access keys, and permission that control which AWS resources users and applications can access.

  - **Amazon Cloud Directory:** Enables you to build flexible cloud-native directories for organizing hierarchies of data along multiple dimensions. Can create directories for a variety of use cases, such as organizational charts, course catalogs, and device registries.

  - **Amazon Cognito:** Amazon Web Services (AWS) service that provides user authentication, authorization, and user management for web and mobile applications.

  - **GuardDuty:** Amazon GuardDuty uses AI and ML with integrated threat intelligence from AWS and leading third parties to help protect your AWS accounts, workloads, and data from threats.

  - **Amazon inspector:** Amazon Inspector automatically discovers workloads, such as Amazon Elastic Compute Cloud (Amazon EC2) instances, container images, and AWS Lambda functions, as well as code repositories, and scans them for software vulnerabilities and unintended network exposure.

  - **Amazon Macie:** Amazon Macie is an AWS security service that uses machine learning and pattern matching to discover, classify, and protect sensitive data stored in Amazon S3. It provides continuous visibility into your S3 data estate to help manage your security and privacy posture.

  - **AWS artifact:** AWS Artifact is a portal that provides on-demand access to AWS's security and compliance documentation, such as ISO, PCI, and SOC reports.

  - **AWS Certificate Manager:** Handles the complexity of creating, storing, and renewing public and private SSL/TLS, 509 certificates and keys that protect your AWS websites and applications.

  - **SS;/TLS Certificates:** Establishes trust and provides security for websites and online services by verifying a server's identity and encrypting the connection

between a user and the server, protecting data like login credentials and payment information during transmission.

- **AWS Directory Services:** AWS Directory Service is a cloud-based service that simplifies the management and integration of Active Directory (AD) with AWS services. It allows you to run and manage Microsoft Active Directory in the AWS cloud, or connect your AWS resources with an existing on-premises AD.

- **AWS firewall manager:** AWS Firewall Manager is a service that simplifies and centralizes the management of your firewall and security policies across all your AWS accounts and resources, allowing you to configure, manage, and audit security policies like AWS WAF(SQL Injection), AWS Shield Advanced(DDoS), AWS Network Firewall, and Amazon VPC security groups from a single point. It ensures that consistent security policies are automatically applied to new and existing resources as your organization grows, reducing the risk of misconfigurations and improving compliance.

- **AWS**
  - **CloudWatch:** AWS CloudWatch is a monitoring and observability service used to track the performance of AWS resources and applications in real-time. It collects and monitors metrics, log files, and events, enabling users to gain insights into their systems, set alarms, and automate actions. This helps in troubleshooting, optimizing performance, and ensuring the overall health and availability of applications and infrastructure.

  - **Autoscaling:** AWS Auto Scaling monitors your applications and automatically adjusts capacity to maintain steady, predictable performance at the lowest possible cost. Using AWS Auto Scaling, it's easy to setup application scaling for multiple resources across multiple services in minutes. The service provides a simple, powerful user interface that lets you build scaling plans for resources including Amazon EC2 instances and Spot Fleets, Amazon ECS tasks, Amazon DynamoDB tables and indexes, and Amazon Aurora Replicas. AWS Auto Scaling makes scaling simple with recommendations that allow you to optimize performance, costs, or balance between them.

  - **CloudFormation:** AWS CloudFormation is a service provided by Amazon Web Services (AWS) that allows users to model and provision AWS infrastructure resources in an automated and secure manner. It enables the management of related resources as a single unit called a stack.

  - **CloudTrail:** AWS CloudTrail is a service that enables governance, compliance, and operational auditing of your AWS account by recording API calls and related events. It provides a complete event history of activities taken by a user, a role, or

an AWS service within your account, logging actions such as who performed an action, what was done, and when. This logged data can be stored in an Amazon S3 bucket for long-term retention and analysis, helping you troubleshoot issues, understand resource changes, and ensure security and compliance.