

AMAZON WEB SERVICES (AWS) & its prime elements

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I. INTRODUCTION:

Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage. With the advent of this technology, the cost of computation, application hosting, content storage and delivery is reduced significantly. Cloud computing is a practical approach to experience direct cost benefits and it has the potential to transform a data center from a capital-intensive set up to a variable priced environment. The idea of cloud computing is based on a very fundamental principal of „reusability of IT capabilities. The difference that cloud computing brings compared to traditional concepts of “grid computing”, “distributed computing”, “utility computing”, or “autonomic computing” is to broaden horizons across organizational boundaries.

Forrester defines cloud computing as: “A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end-customer applications and billed by consumption.”

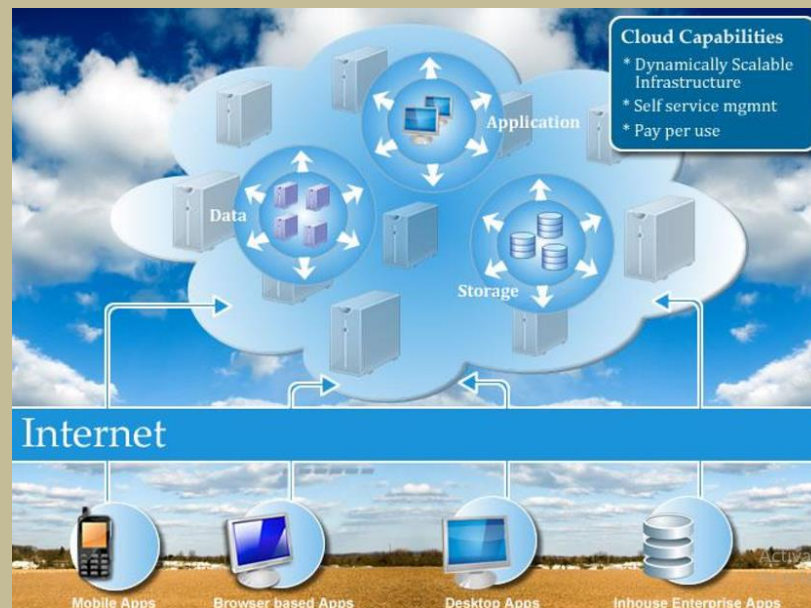


Figure: Conceptual view of Cloud Computer

II. THE AMAZON WEB SERVICES (AWS):

The Amazon Web Services (AWS) Cloud Adoption Framework¹ (CAF) provides guidance for coordinating the different parts of organizations migrating to cloud computing. The CAF guidance is broken into a number of areas of focus relevant to implementing cloud-based IT systems. These focus areas are called perspectives, and each perspective is further separated into components.

Amazon Web Services (AWS) is a subsidiary of Amazon that provides on-demand cloud computing platforms to individuals, companies and governments, on a metered pay-as-you-go basis. In aggregate, these cloud computing web services provide a set of primitive, abstract technical infrastructure and distributed computing building blocks and tools. One of these services is Amazon Elastic Compute Cloud, which allows users to have at their disposal a virtual cluster of computers, available all the time, through the Internet. AWS's version of virtual computers emulate most of the attributes of a real computer including hardware (CPU(s) & GPU(s) for processing, local/RAM memory, hard-disk/SSD storage); a choice of operating systems; networking; and pre-loaded application software such as web servers, databases, CRM, etc.

The AWS technology is implemented at server farms throughout the world, and maintained by the Amazon subsidiary. Fees are based on a combination of usage, the hardware/OS/software/networking features chosen by the subscriber, required availability, redundancy, security, and service options. Subscribers can pay for a single virtual AWS computer, a dedicated physical computer, or clusters of either. As part of the subscription agreement, Amazon provides security for subscribers' system. AWS operates from many global geographical regions including 6 in North America.

In 2017, AWS comprised more than 90 services spanning a wide range including computing, storage, networking, database, analytics, application services, deployment, management, mobile, developer tools, and tools for the Internet of Things. The most popular include Amazon Elastic Compute Cloud (EC2) and Amazon Simple Storage Service (S3). Most services are not exposed directly to end users, but instead offer functionality through APIs for developers to use in their applications. Amazon Web Services' offerings are accessed over HTTP, using the REST architectural style and SOAP protocol. Amazon markets AWS to subscribers as a way of obtaining large scale computing capacity more quickly and cheaply than building an actual physical server farm. All services are billed based on usage, but each service measures usage in varying ways.

III. OBJECTIVES OF THE STUDY:

- a) To study different features of relational database services in Amazon web Services
- b) To study AWS architecture.
- c) To study Amazon EC2 (Elastic Compute Cloud)

VI. DATA ANALYSIS:

OBJECTIVE NO. 1: *To study different features of relational database services in Amazon web Services*

➔ **AMAZON DATABASE SERVICES:**

Amazon Relational Database Service (Amazon RDS) makes it easy to set up, operate, and scale a relational database in the cloud. It provides cost-efficient and resizable capacity while automating time-consuming administration tasks such as hardware provisioning, database setup, patching and backups. It frees you to focus on your applications so you can give them the fast performance, high availability, security and compatibility they need. Amazon RDS is available on several database instance types - optimized for memory, performance or I/O - and provides you with six familiar database engines to choose from, including Amazon Aurora, PostgreSQL, MySQL, MariaDB, Oracle Database, and SQL Server. You can use the AWS Database Migration Service to easily migrate or replicate your existing databases to Amazon RDS.

Amazon RDS (Relational Database Service) is a fully-managed SQL database cloud service that allows to create and operate relational databases. Using RDS you can access your files and database anywhere in a cost-effective and highly scalable way.

Features of Amazon RDS

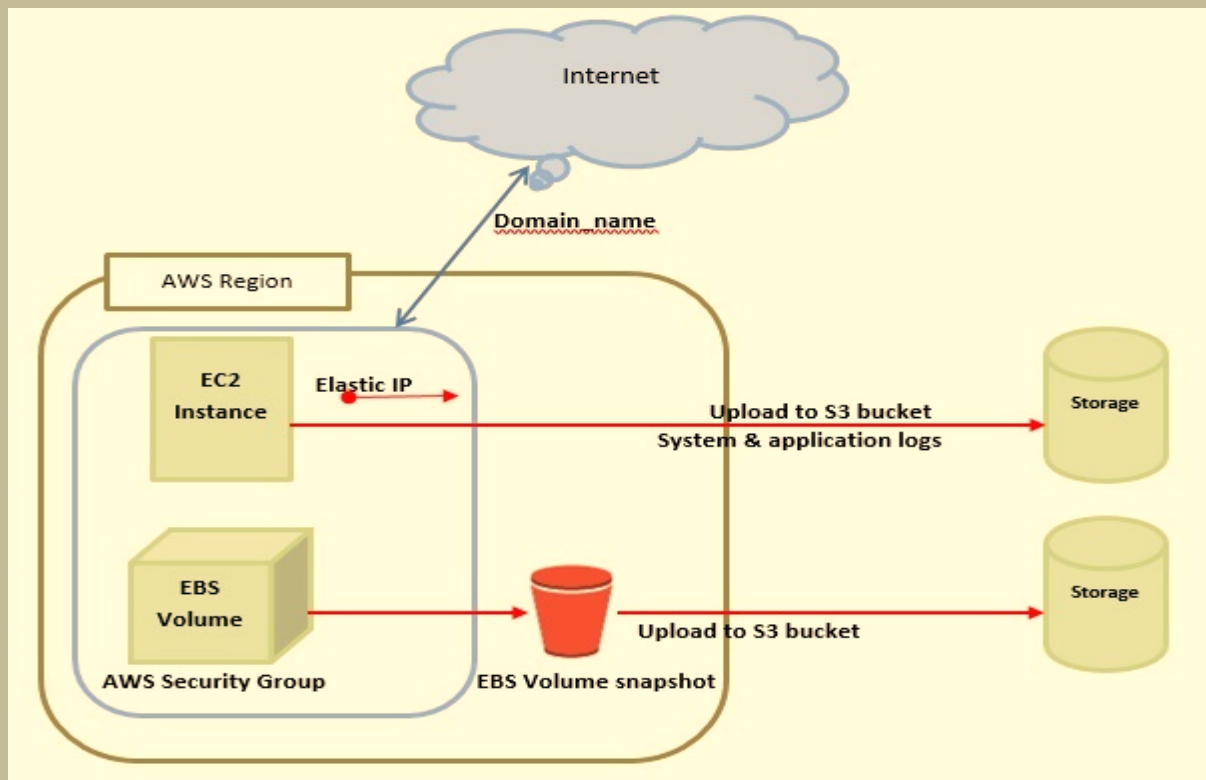
Amazon RDS has the following features –

- **Scalable** – Amazon RDS allows to scale the relational database by using AWS Management Console or RDS-specific API. We can increase or decrease your RDS requirements within minutes.
- **Host replacement** – Sometimes these situations occur when the hardware of Amazon RDS fails. There is no need to worry, it will be automatically replaced by Amazon.
- **Inexpensive** – Using Amazon RDS, we pay only for the resources we consume. There is no up-front and long-term commitment.
- **Secure** – Amazon RDS provides complete control over the network to access their database and their associated services.

- **Automatic backups** – Amazon RDS backs up everything in the database including transaction logs up to last five minutes and also manages automatic backup timings.
- **Software patching** – Automatically gets all the latest patches for the database software. We can also specify when the software should be patched using DB Engine Version Management.

OBJECTIVE NO. 2: *To study AWS architecture and its load balancing.*

➔ This is the basic structure of **AWS EC2**, where **EC2** stands for Elastic Compute Cloud. EC2 allow users to use virtual machines of different configurations as per their requirement. It allows various configuration options, mapping of individual server, various pricing options, etc. We will discuss these in detail in AWS Products section. Following is the diagrammatic representation of the architecture.



Load balancing simply means to hardware or software load over web servers, that improves the efficiency of the server as well as the application. Following is the diagrammatic representation of AWS architecture with load balancing. Hardware load balancer is a very common network appliance used in traditional web application

architectures. AWS provides the Elastic Load Balancing service, it distributes the traffic to EC2 instances across multiple available sources, and dynamic addition and removal of Amazon EC2 hosts from the load-balancing rotation.

Elastic Load Balancing can dynamically grow and shrink the load-balancing capacity to adjust to traffic demands and also support sticky sessions to address more advanced routing needs.

Amazon Cloud-front

It is responsible for content delivery, i.e. used to deliver website. It may contain dynamic, static, and streaming content using a global network of edge locations. Requests for content at the user's end are automatically routed to the nearest edge location, which improves the performance. Amazon Cloud-front is optimized to work with other Amazon Web Services, like Amazon S3 and Amazon EC2. It also works fine with any non-AWS origin server and stores the original files in a similar manner. In Amazon Web Services, there are no contracts or monthly commitments. We pay only for as much or as little content as we deliver through the service.

Elastic Load Balancer

It is used to spread the traffic to web servers, which improves performance. AWS provides the Elastic Load Balancing service, in which traffic is distributed to EC2 instances over multiple available zones, and dynamic addition and removal of Amazon EC2 hosts from the load-balancing rotation. Elastic Load Balancing can dynamically grow and shrink the load-balancing capacity as per the traffic conditions.

Security Management

Amazon's Elastic Compute Cloud (EC2) provides a feature called security groups, which is similar to an inbound network firewall, in which we have to specify the protocols, ports, and source IP ranges that are allowed to reach your EC2 instances. Each EC2 instance can be assigned one or more security groups, each of which routes the appropriate traffic to each instance. Security groups can be configured using specific subnets or IP addresses which limits access to EC2 instances.

Elastic Caches

Amazon Elastic Cache is a web service that manages the memory cache in the cloud. In memory management, cache has a very important role and helps to reduce the load on the services, improves the performance and scalability on the database tier by caching frequently used information.

Amazon RDS

Amazon RDS (Relational Database Service) provides a similar access as that of MySQL, Oracle, or Microsoft SQL Server database engine. The same queries, applications, and tools can be used with Amazon RDS.

It automatically patches the database software and manages backups as per the user's instruction. It also supports point-in-time recovery. There are no up-front investments required, and we pay only for the resources we use.

Hosting RDMS on EC2 Instances

Amazon RDS allows users to install RDBMS (Relational Database Management System) of your choice like MySQL, Oracle, SQL Server, DB2, etc. on an EC2 instance and can manage as required. Amazon EC2 uses Amazon EBS (Elastic Block Storage) similar to network-attached storage. All data and logs running on EC2 instances should be placed on Amazon EBS volumes, which will be available even if the database host fails. Amazon EBS volumes automatically provide redundancy within the availability zone, which increases the availability of simple disks. Further if the volume is not sufficient for our databases needs, volume can be added to increase the performance for our database. Using Amazon RDS, the service provider manages the storage and we only focus on managing the data.

Storage & Backups

AWS cloud provides various options for storing, accessing, and backing up web application data and assets. The Amazon S3 (Simple Storage Service) provides a simple web-services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web. Amazon S3 stores data as objects within

resources called **buckets**. The user can store as many objects as per requirement within the bucket, and can read, write and delete objects from the bucket. Amazon EBS is effective for data that needs to be accessed as block storage and requires persistence beyond the life of the running instance, such as database partitions and application logs. Amazon EBS volumes can be maximized up to 1 TB, and these volumes can be striped for larger volumes and increased performance. Provisioned IOPS volumes are designed to meet the needs of database workloads that are sensitive to storage performance and consistency. Amazon EBS currently supports up to 1,000 IOPS per volume. We can stripe multiple volumes together to deliver thousands of IOPS per instance to an application.

Auto Scaling

The difference between AWS cloud architecture and the traditional hosting model is that AWS can dynamically scale the web application fleet on demand to handle changes in traffic. In the traditional hosting model, traffic forecasting models are generally used to provision hosts ahead of projected traffic. In AWS, instances can be provisioned on the fly according to a set of triggers for scaling the fleet out and back in. Amazon Auto Scaling can create capacity groups of servers that can grow or shrink on demand.

Objective No. 3: *To study components and features of Amazon EC2 (Elastic Compute Cloud)*

➔ **EC2 Components**

In AWS EC2, the users must be aware about the EC2 components, their operating systems support, security measures, pricing structures, etc.

Operating System Support

Amazon EC2 supports multiple OS in which we need to pay additional licensing fees like: Red Hat Enterprise, SUSE Enterprise and Oracle Enterprise Linux, UNIX, Windows Server, etc. These OS needs to be implemented in conjunction with Amazon Virtual Private Cloud (VPC).

Security

Users have complete control over the visibility of their AWS account. In AWS EC2, the security systems allow create groups and place running instances into it as per the requirement. You can specify the groups with which other groups may communicate, as well as the groups with which IP subnets on the Internet may talk.

Pricing

AWS offers a variety of pricing options, depending on the type of resources, types of applications and database. It allows the users to configure their resources and compute the charges accordingly.

Fault tolerance

Amazon EC2 allows the users to access its resources to design fault-tolerant applications. EC2 also comprises geographic regions and isolated locations known as availability zones for fault tolerance and stability. It doesn't share the exact locations of regional data centers for security reasons.

When the users launch an instance, they must select an AMI that's in the same region where the instance will run. Instances are distributed across multiple availability zones to provide continuous services in failures, and Elastic IP (EIPs) addresses are used to quickly map failed instance addresses to concurrent running instances in other zones to avoid delay in services.

Migration

This service allows the users to move existing applications into EC2. It costs \$80.00 per storage device and \$2.49 per hour for data loading. This service suits those users having large amount of data to move.

FEATURES OF EC2

Here is a list of some of the prominent features of EC2 –

- **Reliable** – Amazon EC2 offers a highly reliable environment where replacement of instances is rapidly possible. Service Level Agreement commitment is 99.9% availability for each Amazon EC2 region.

- **Designed for Amazon Web Services** – Amazon EC2 works fine with Amazon services like Amazon S3, Amazon RDS, Amazon DynamoDB, and Amazon SQS. It provides a complete solution for computing, query processing, and storage across a wide range of applications.
- **Secure** – Amazon EC2 works in Amazon Virtual Private Cloud to provide a secure and robust network to resources.
- **Flexible Tools** – Amazon EC2 provides the tools for developers and system administrators to build failure applications and isolate themselves from common failure situations.
- **Inexpensive** – Amazon EC2 wants us to pay only for the resources that we use. It includes multiple purchase plans such as On-Demand Instances, Reserved Instances, Spot Instances, etc. which we can choose as per our requirement.

V. RESEARCH TYPE: The present research is a descriptive research.

VI. CONCLUSION:

Amazon Web Services (AWS) is Amazon's cloud web hosting platform that offers flexible, reliable, scalable, easy-to-use, and cost-effective solutions. The AWS architecture is a distributed approach designed to overcome the limitations of traditional monolithic architectures. The relational database management system and services of AWS works in relation on 1:1, 1: many & many to many bases. AWS help to scale applications and organizations while improving cycle times. However, they also come with challenges that might cause additional architectural complexity and operational burden. AWS offers a large portfolio of managed services that help product teams build microservices architectures and minimize architectural and operational complexity. The Elastic Compute Cloud (E2C) of Amazon web services are reliable, secure and the most important is that the tools are flexible that is they can be changed with the change in time.

VII. REFERENCES:

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