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Title – Case Study about cloud services – AWS EC2

Problem Statement - Case study on Amazon EC2 and learn about Amazon EC2 web services

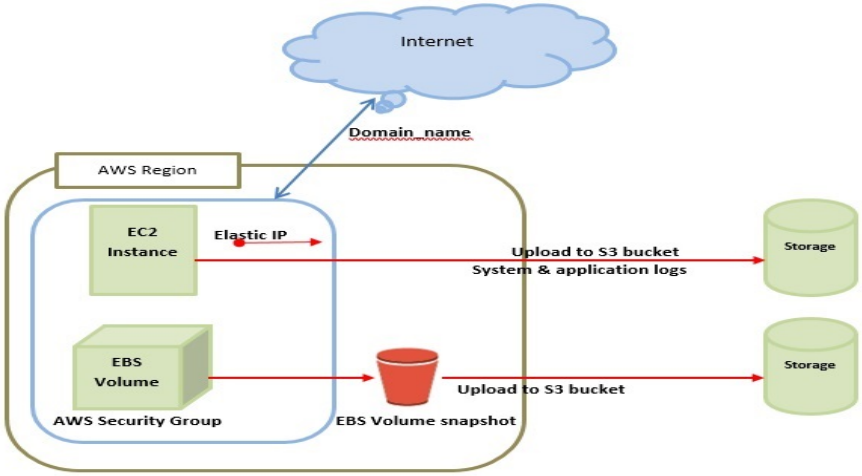
Objectives – Learn about variety of Cloud services and Cloud architectures

Outcomes – Learnt about Amazon EC2 cloud service

Theory -

AWS offers plenty of services out of which EC2 is one of the compute services . EC2 is a web service which aims to make life easier for developers by providing secure and resizable computer capacity in the cloud.

Architecture of Amazon EC2-



Amazon Elastic Compute Cloud (Amazon EC2) is a web service offered by Amazon Web Services (AWS) that provides resizable compute capacity in the cloud. EC2 enables users to run virtual machines, known as instances, with various configurations to meet diverse computing needs. The architecture of Amazon EC2 involves several key components:

1. Region:
   - A region is a geographical area where AWS data centers are located. Each region is entirely independent and consists of multiple availability zones.

2. Availability Zone (AZ):
   - An availability zone is a distinct location within a region, isolated from other zones. Each availability zone has its own power, cooling, and networking infrastructure to ensure fault isolation.

3. Data Centers:
   - Within each availability zone, there are multiple data centers housing the physical hardware, including servers and networking equipment.

4. Virtual Private Cloud (VPC):
- VPC is a logically isolated section of the AWS Cloud where you can launch AWS resources. It provides a virtual network environment in which you can define your own IP address range, create subnets, and configure route tables.

5. Instance:
- An instance is a virtual server in the cloud that you can use to run applications. EC2 instances come in various types, optimized for different use cases such as compute-intensive, memory-intensive, storage-optimized, etc.

6. Amazon Machine Image (AMI):
- An AMI is a pre-configured virtual machine image, which includes the operating system and other software. Users can choose from existing AMIs or create their own, customizing the instance to their requirements.

7. Key Pairs:
- EC2 instances use key pairs for secure access. A key pair consists of a public key that AWS stores and a private key that the user downloads. The private key is used to securely connect to the instance.

8. Security Groups:
- Security groups act as virtual firewalls for EC2 instances. They control inbound and outbound traffic by specifying rules, such as allowing or denying traffic based on protocols, ports, and source/destination IP addresses.

9. Elastic Load Balancer (ELB):
- ELB distributes incoming application traffic across multiple EC2 instances to ensure high availability and fault tolerance.

10. Auto Scaling:
- Auto Scaling automatically adjusts the number of EC2 instances in a group based on policies you define. This helps in maintaining performance and availability, scaling in or out as demand changes.

11. Elastic Block Store (EBS):
- EBS provides persistent block-level storage volumes for use with EC2 instances. It allows you to create, attach, and detach storage volumes, and you can also take snapshots for backup and recovery.

12. Amazon S3 (Simple Storage Service):
- Amazon S3 is often used for storing and retrieving any amount of data at any time. EC2 instances can interact with S3 to store or retrieve data.

Steps to use / create EC2 instance -

1. Choosing an AMI (Amazon Machine Image)
2. Choose an instance type
3. Configure Instance
4. Adding Storage
5. Adding Tags
6. Configure Security group (Firewall)
7. Review

AMI is a template used to create a new instance / machine based on user requirement. AMI contains Software Information , Operating System information , Volume Information and Acccess permissions.
There are two types of AMI -
1. Predefined AMIs – amazon provides these kind of AMIs
2. Custom AMIs – created by used

Instance type specifies the hardware specifications that are required in the machine from the previous step. (AMI creation)
They are majorly divided into 5 Families -

1. Computer Optimized – Used when lot of processing power is required.
2. Memory Optimized – Used when in memory caching i required .
3. GPU Optimized – Used for gaming or large graphical requirements.
4. Storage Optimized – Used when lots of storage required.
5. General Purpose – All features are balanced.

These instances type are fixed as we dont hold control on hardware.

Configure Instance – Here number of instances have to be specified . Variety of things like subnet to be assigned to public IP , kind or network and many more are done in this step. The shutdown behaviour is also specified / configured in this step. Multiple payment options are available – on demand instance , bidding instance.

Storage – There are 3 types of storage -
1. Ephemeral Storage (Temporary Storage)
2. Amazon Elastic Block Storage
3. Amazon S3
Users are given 30Gbs of free storage , any further requirement needs to be paid for.

Tags – we add tags to indentify machines.
Security groups – protects the EC2 instance from unwanted outside access. Basically it sets up firewall.

Review – We review all the changes and steps done.

Once done , we get a public and private key from amazon. We need to store private key to access the instance.

Use Cases of Amazon EC2-

1. Run cloud native enterpirse applications
2. Scale for HPC applications
3. Develop apple applications.
4. Develop and deploy ML models, etc

Advantages of AWS EC2 -

1. Not requiring any hardware on client side.
2. Easily scalable (up and down)Bot: Implement depth first search algorithm and Breadth First Search algorithm, Use an undirected graph and develop a recursive algorithm for searching all the vertices of a graph or tree data structure.
3. User:
4. You only pay for what you use(instead of whole system)
5. Complete control on privacy and securtiy of processes
6. Can be operated anywhere from the world.

Amazon EC2 Limitations-

1. Limit on number of instances (20 per region)
2. General Cloud computing issues like down time.

Conclusion -

In the above assignment , we learnt about Amazon EC2 sevice , its architecture, initialization process , use cases and advantages of it.