Name: Vrushaket P. Chaudhari
Class : TE-03
Roll No: 31305
Batch: K-3
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Title: Case study on Amazon EC2 and learn about Amazon EC2 web services.

Amazon EC2 History

Amazon announced a limited public beta test of EC2 on August 25, 2006, offering access on a first-come, first-served basis. Amazon added two new instance types (Large and Extra-Large) on October 16, 2007. On May 29, 2008, two more types were added, High-CPU Medium and High-CPU Extra Large. There were twelve types of instances available.

Amazon added three new features on March 27, 2008, static IP addresses, availability zones, and user selectable kernels. On August 20, 2008, Amazon added Elastic Block Store (EBS) This provides persistent storage, a feature that had been lacking since the service was introduced.

Amazon EC2 went into full production when it dropped the beta label on October 23, 2008. On the same day, Amazon announced the following features: a service level agreement for EC2, Microsoft Windows in beta form on EC2, Microsoft SQL Server in beta form on EC2, plans for an AWS management console, and plans for load balancing, auto-scaling, and cloud monitoring services. These features were subsequently added on May 18, 2009.

Amazon EC2 was developed mostly by a team in Cape Town, South Africa led by Chris Pinkham. Pinkham provided the initial architecture guidance for EC2 and then built the team and led the development of the project along with Willem van Biljon.

What is Amazon EC2?

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers.

Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction. It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use. Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.

Amazon Elastic Compute Cloud (Amazon EC2) offers the broadest and deepest compute platform, with over 475 instances and choice of the latest processor,

storage, networking, operating system, and purchase model to help you best match the needs of your workload. We are the first major cloud provider that supports Intel, AMD, and Arm processors, the only cloud with on-demand EC2 Mac instances, and the only cloud with 400 Gbps Ethernet networking. We offer the best price performance for machine learning training, as well as the lowest cost per inference instances in the cloud. More SAP, high performance computing (HPC), ML, and Windows workloads run on AWS than any other cloud.

Amazon EC2 as IaaS

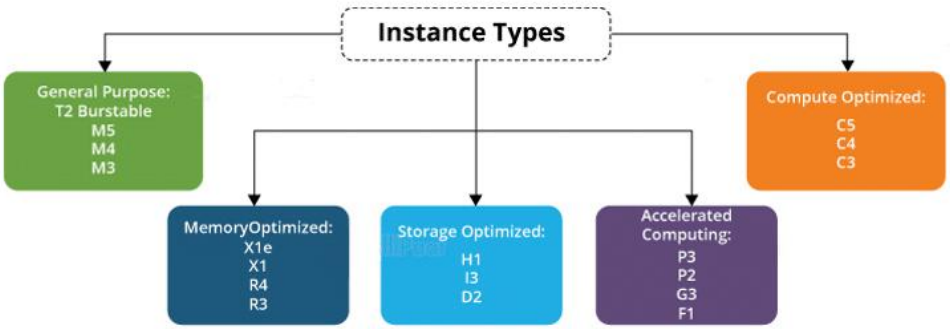
AWS Elastic Compute Service or EC2 is **IaaS(Infrastructure as a Service).** This is because Amazon takes the responsibility of networking, storage, server and virtualization and the user is responsible for managing the Operating System, middleware, runtime, data and application. In **PaaS** aka **Platform as a Service** the user only needs to take care of data and application, the management of rest of the layers lies in hands of the service provider. AWS Elastic BeanStalk is PaaS.

Amazon EC2 Instance Types

Initially, EC2 used Xen virtualization exclusively. However, on November 6, 2017, Amazon announced the new C5 family of instances that were based on a custom architecture around the KVM hypervisor, called Nitro. Each virtual machine, called an "instance", functions as a virtual private server. Amazon sizes instances based on "Elastic Compute Units". The performance of otherwise identical virtual machines may vary. On November 28, 2017, AWS announced a bare-metal instance type offering marking a remarkable departure from exclusively offering virtualized instance types.

As of January 2019, the following instance types were offered:

- General Purpose: A1, T3, T2, M5, M5a, M4, T3a
- Compute Optimized: C5, C5n, C4
- Memory Optimized: R5, R5a, R4, X1e, X1, High Memory, z1d
- Accelerated Computing: P3, P2, G3, F1
- Storage Optimized: H1, I3, D2



Amazon EC2 Use Cases

1. Run cloud-native and enterprise applications
Amazon EC2 delivers secure, reliable, high-performance, and cost-effective compute infrastructure to meet demanding business needs.

2. Scale for HPC applications
Access the on-demand infrastructure and capacity you need to run HPC applications faster and cost-effectively.

3. Develop for Apple platforms
Build, test, and sign on-demand macOS workloads. Access environments in minutes, dynamically scale capacity as needed, and benefit from AWS's pay-as-you-go pricing.

4. Train and deploy ML applications
Amazon EC2 delivers the broadest choice of compute, networking (up to 400 Gbps), and storage services purpose-built to optimize price performance for ML projects.

Features of Amazon EC2

Amazon EC2 provides the following features:

1. Virtual computing environments, known as instances
2. Preconfigured templates for your instances, known as Amazon Machine Images (AMIs), that package the bits you need for your server (including the operating system and additional software)
3. Various configurations of CPU, memory, storage, and networking capacity for your instances, known as instance types
4. Secure login information for your instances using key pairs (AWS stores the public key, and you store the private key in a secure place)
5. Storage volumes for temporary data that's deleted when you stop, hibernate, or terminate your instance, known as instance store volumes
6. Persistent storage volumes for your data using Amazon Elastic Block Store (Amazon EBS), known as Amazon EBS volumes
7. Multiple physical locations for your resources, such as instances and Amazon EBS volumes, known as Regions and Availability Zones
8. A firewall that enables you to specify the protocols, ports, and source IP ranges that can reach your instances using security groups
9. Static IPv4 addresses for dynamic cloud computing, known as Elastic IP addresses
10. Metadata, known as tags, that you can create and assign to your Amazon EC2 resources

11. Virtual networks you can create that are logically isolated from the rest of the AWS Cloud, and that you can optionally connect to your own network, known as virtual private clouds (VPCs)

Benefits

1. **ELASTIC WEB-SCALE COMPUTING**
   Amazon EC2 enables you to increase or decrease capacity within minutes, not hours or days. You can commission one, hundreds or even thousands of server instances simultaneously. Of course, because this is all controlled with web service APIs, your application can automatically scale itself up and down depending on its needs.

2. **COMPLETELY CONTROLLED**
   You have complete control of your instances. You have root access to each one, and you can interact with them as you would any machine. You can stop your instance while retaining the data on your boot partition and then subsequently restart the same instance using web service APIs. Instances can be rebooted remotely using web service APIs. You also have access to console output of your instances.

3. **FLEXIBLE CLOUD HOSTING SERVICES**
   You have the choice of multiple instance types, operating systems, and software packages. Amazon EC2 allows you to select a configuration of memory, CPU, instance storage, and the boot partition size that is optimal for your choice of operating system and application. For example, your choice of operating systems includes numerous Linux distributions, and Microsoft Windows Server.

4. **DESIGNED FOR USE WITH OTHER AMAZON WEB SERVICES**
   Amazon EC2 works in conjunction with Amazon Simple Storage Service (Amazon S3), Amazon Relational Database Service (Amazon RDS) and Amazon Simple Queue Service (Amazon SQS) to provide a complete solution for computing, query processing and storage across a wide range of applications.

5. **RELIABLE**
   Amazon EC2 offers a highly reliable environment where replacement instances can be rapidly and predictably commissioned. The service runs within Amazon's proven network infrastructure and datacenters.

6. **SECURE**
   Amazon EC2 works in conjunction with Amazon VPC to provide security and robust networking functionality for your compute resources. Your compute instances are located in a Virtual Private Cloud (VPC) with an IP range that you specify. You decide which instances are exposed to the Internet and which remain private.
   a) Security Groups and networks ACLs allow you to control inbound and outbound network access to and from your instances.

   b) You can provision your EC2 resources as Dedicated Instances. Dedicated Instances are Amazon EC2 Instances that run on hardware dedicated to a single customer for additional isolation.

c) If you do not have a default VPC you must create a VPC and launch instances into that VPC to leverage advanced networking features such as private subnets, outbound security group filtering, network ACLs and Dedicated Instances.

7. INEXPENSIVE

Amazon EC2 passes on to you the financial benefits of Amazon's scale. You pay a very low rate for the compute capacity you actually consume.

a) On-Demand Instances

On-Demand Instances let you pay for compute capacity by the hour with no long-term commitments. This frees you from the costs and complexities of planning, purchasing, and maintaining hardware and transforms what are commonly large fixed costs into much smaller variable costs. On-Demand Instances also remove the need to buy "safety net" capacity to handle periodic traffic spikes.

b) Reserved Instances

Reserved Instances provide you with a significant discount compared to On-Demand Instance pricing. There are three Reserved Instance payment options (No Upfront, Partial Upfront, All Upfront) that enable you to balance the amount you pay upfront with your effective hourly price.

c) Spot instances

Spot instances are spare compute capacity in the Amazon Web Services cloud available to you at steep discounts compared to On-Demand prices. EC2 Spot enables you to optimize your costs on the Amazon Web Services cloud and scale your application's throughput up to 10X for the same budget. By simply selecting Spot when launching EC2 instances, you can save up-to 90% on On-Demand prices.

d) Dedicated Host

An Amazon EC2 Dedicated Host is a physical server with EC2 instance capacity fully dedicated to your use. Dedicated Hosts can help you address compliance requirements and reduce costs by allowing you to use your existing server-bound software licenses including Microsoft Windows Server, Microsoft SQL Server, SUSE Linux Enterprise Server, Red Hat Enterprise Linux, or other software licenses that are bound to VMs, sockets, or physical cores, subject to your license terms.

Disadvantages of EC2

1. Price Variations

There are various things that can affect EC2 costs, such as land, taxes, electricity, and fiber. So, you have to look at your region-specific pricing plus other personal requirements to identify your monthly bill.

2. General Issues

Since Amazon is an industry giant with millions of customers, this means that eventually, the servers may need some maintenance and you may experience downtime

AWS EC2 Pricing

Generally **Free Tier** 750 hours of free usage up to one year is provided by AWS. Only t2.micro instance can be used on Linux and Windows AMIs.

On-demand Price:

m5.large	$0.096/hour
c5.large	$0.085/hour
r4.large	$0.133/hour

Data Transfer IN:
FREE from any region in the world

Data Transfer OUT:
From EC2 to:

S3, Glacier, DynamoDB, SES, and SQS in the same region	FREE
S3, Glacier, DynamoDB, SES, and SQS in the same region	$0.020/GB
EC2, RDS, Redshift, ElastiCache, ELB, and ENI in the same AZ with private IP	FREE
EC2, RDS, Redshift, ElastiCache, ELB, and ENI in the same AZ with public IP	$0.010/GB
EC2, RDS, Redshift, ElastiCache, ELB, and ENI in different AZs	$0.010/GB

Conclusion

In conclusion, cloud computing is recently new technological development that has the potential to have a great impact on the world. It has many benefits that it provides to it users and businesses. Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers.