



A Comparative Study On Amazon Elastic Compute Cloud (Ec2)

"A Technical Comparison of EC2 for Cloud-Based Applications and Workloads"

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Abstract: A key element of Amazon Web Services (AWS) is Amazon Elastic Compute Cloud (EC2), which offers scalable cloud computing resources. This study examines the architecture, cost structures, and deployment methods of EC2, highlighting the platform's adaptability for a range of uses, including big data processing and web hosting. We examine how EC2's load-balancing and auto-scaling capabilities affect performance and cost effectiveness, emphasizing recommended practices for maximizing resource use. In addition, we discuss security issues and their resolutions, such as data protection and identity management, which are crucial for preserving strong cloud security. We evaluate EC2's efficacy in comparison to other cloud technologies, such as server less architectures, through comparative studies. In the end, this study highlights how important EC2 is in helping businesses use cloud computing to boost productivity and creativity.

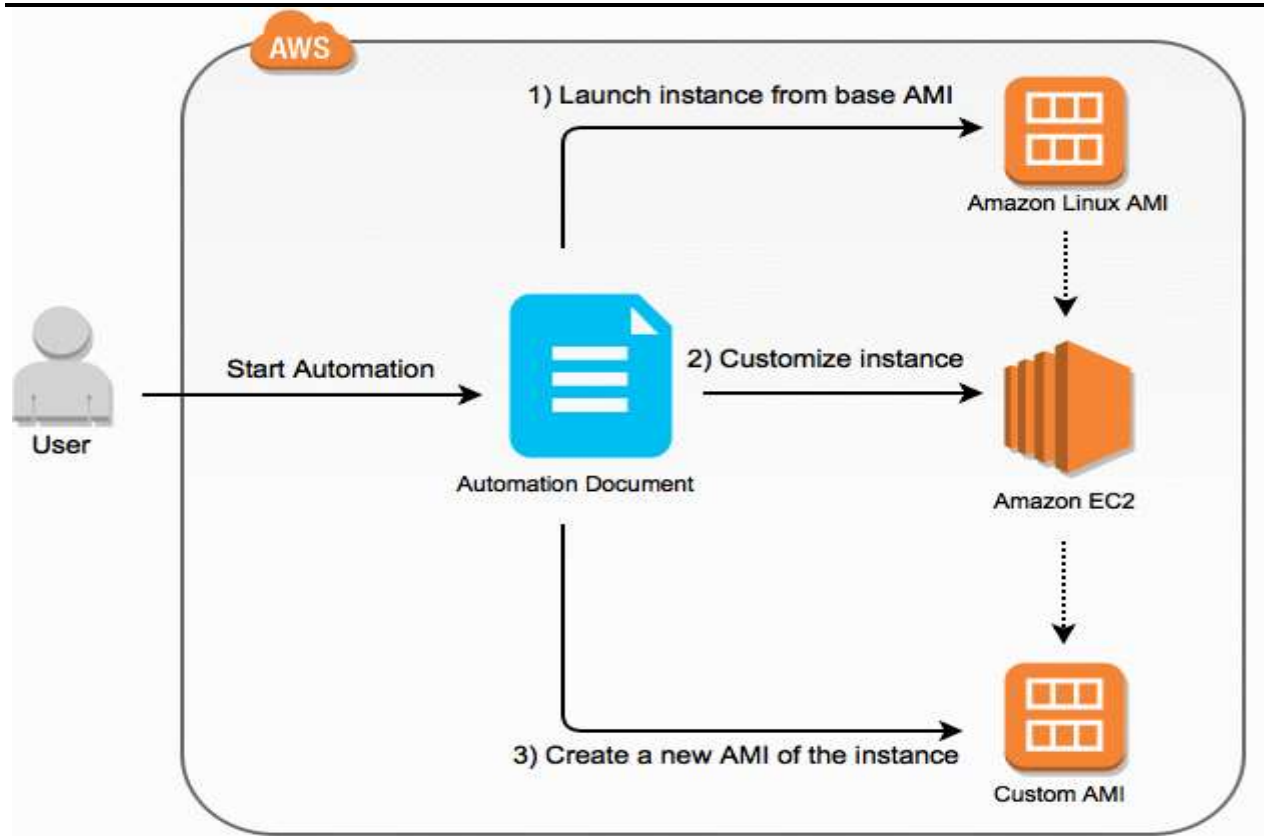
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I. INTRODUCTION

Amazon Elastic Compute Cloud (EC2) is a core service within Amazon Web Services (AWS), revolutionizing the way businesses and developers deploy and manage computing resources in the cloud. Launched in 2006, EC2 allows users to rent virtual servers—referred to as instances—on demand, providing unparalleled flexibility, scalability, and cost-effectiveness. This service enables organizations to efficiently handle varying workloads without the need for significant upfront investment in physical hardware.

The ability of EC2 to autonomously scale resources up or down in response to dynamically changing application demands is one of its main features. Users can customize their computing environment to match specific requirements by choosing from a variety of instance types that are optimized for different use cases, including as GPU-powered jobs, memory-optimized workloads, and compute-intensive applications. Its accessibility is further improved by the pay-as-you-go pricing model, which lets companies pay only for the resources they use. This is very advantageous for startups and large companies.

Apart from its cost-effectiveness and adaptability, EC2 also works well with other AWS services including server less computing with AWS Lambda, database management with Amazon RDS, and storage with Amazon S3. This connection streamlines processes and enhances the development of micro services architectures and complicated applications.



1.1 Some facts about EC2

Seven times less downtime than competing cloud providers
 Having 69 availability zones and being accessible in 22 locations
 Add the startup.

1.2 What is Amazon EC2?

Amazon EC2 is AWS's service that provides secure, scalable computing capacity in the cloud. It offers a broad selection of instance types optimized for different use cases, with choices of processor, storage, networking, operating system, and pricing models. Since a customer can use the processing power as needed, the Amazon Elastic Compute Cloud aids in offering scalable computing capability. Considering the amount of users, he is free to use the resources as much as he likes. When resources are in high demand, he has the option to both raise and decrease them. Amazon offers an online service known as Amazon EC2.



Figure: instance

For designers as well as for end users, Amazon EC2 is particularly helpful because it reduces the need to purchase hardware, allowing for quicker application deployment. Since an instance on Amazon's Elastic Compute Cloud is a virtual server used to run applications or APIs, we can define it. An instance can alternatively be thought of as a little component of a larger computer, made up of the operating system, hard drive, RAM, memory, network adapters, and drivers. But in the realm of actuality, they are nonexistent. They are digital. A user can have an instance—a collection of n smaller computers—on a single physical system.



Figure: working of instance

1.3 Why AWS EC2

With over 750 instances and a choice of the fastest processors, storage, networking, operating systems, and pricing options to help you best match to the needs of your workload, Amazon Elastic computational Cloud (Amazon EC2) provides the broadest and deepest computational platform known. We are the first cloud provider with 400 Gb Ethernet networking, the first major cloud provider to support AMD, Intel, and Arm processors, and the only cloud delivering on-demand EC2 Mac instances. We provide the lowest cost per inference instance in the cloud along with the highest pricing performance for machine learning training. AWS supports more workloads related to Windows, SAP, high-performance computing and deep learning than any other cloud.

1.4 Some beneficial properties of the Amazon EC2 service

- It is made up of preset templates, which we refer to as Amazon Machine Images, or AMIs.
- The user's ability to customize the CPU, RAM, and hard drive, bandwidth and network adapters to suit his needs is by far the biggest benefit.
- On-demand, there is no minimum commitment
- Scalability - Auto scaling to match your workloads
- Elasticity - .The ability to acquire resources as you need them and release resources when you no longer need them.
- Reliability - AWS servers are located in 11 regions and with 28 availability zones
- Value for money
- Ease of Management

1.5 EC2 Pricing

When a new user registers for Amazon AWS, they can take advantage of the limited-time AWS free tier, which allows them to utilize EC2 for free. Following purchase instance option is available.

1.5.1 On-Demand Instance

In this case, the user must pay for the quantity of instance he uses for a specific amount of time.

1.5.2 Saving Plans

If we accept that Amazon will use a fixed amount of storage, we can lower the cost of Amazon EC2. The cost will be determined by pay peruse.

1.5.3 Reserved Instances

Users can also lower the cost of Amazon EC2 if he forms an agreement with Amazon which says to use some certain configuration of instances which includes which sort of instance he can use and in which region and for how much time.

1.5.4 Spot Instances

With the goal to lower the cost of Amazon EC2, this user seeks the unused EC2 instances.

1.6 How to see billing

The Billing and Cost Management Dashboard on Amazon EC2 is where users can view their bills and usage. It can be found in the console for cost and billing management. A thorough report detailing the resources you are utilizing and how long you were using them will be included in your bill.

II. RESEARCH METHODOLOGY

2.1 What is performed?

To show how Amazon EC2 functions, what steps are required, and how to set it up, a practical implementation is carried out. Each and every question was answered, and every point was taken into account.

2.2 AWS Sign Up

As Amazon Web Services is a single sign-on platform, users may access and utilize all of Amazon's services, including Amazon EC2, once they register. For a restricted period, a new EC2 customer can utilize the resources at no cost.

2.3 AWS Account creation steps

The first step is to go to www.portal.aws.amazon.com/billing/signup, which is the AWS website. The next step is to adhere to the instructions that are shown on the screen. The user will get an OTP via text message or phone call, which they must enter for verification. The completion of the subsequent task is necessary for the effective configuration of Amazon EC2:

- The user must register with AWS.
- It is necessary to build a key pair.

Next on the list is setting up a security group.

2.4 Creation of Key Pair

For example, public-key cryptography is used by Amazon Web Services to secure login credentials.

2.5 Create a security group

For the instances connected to AWS EC2, the security group serves as a firewall, or as an IDPS (Intrusion Detection Prevention System), and it also manages traffic at the instance level.

2.6 Running of the system in EC2

Initially, the user must click on AWS EC2 after logging into his AWS account. After clicking on Launch Instance, we will see the Create Instance option. The user must then choose an Amazon Machine Image (AMI) in the following step. AMIs are essentially operating system templates that have already been setup and contain the data required to run an instance. Assume a user needs to choose the appropriate AMI in order to launch an instance. The AMI could be Windows, Linux, or any other operating system. We have the option of starting with the default or pre-configured settings or configuring the AMI to suit our needs. During configuration, there will be a step where we have to choose an Elastic Block Storage choice. We utilize EBS as a storage volume with EC2 and AWS.

2.7 EC2 Computing Instance Types

The kind of computing we choose depends on our task's nature, or more accurately, its type. Amazon EC2 provides five different types of instances.

2.7.1 Broad Example

This kind of instance is used in applications where cost and performance must be balanced. For instance, a response-prompting acknowledgement system that doesn't require a lot of processing power or money.

2.7.2 Calculate an instance

Certain applications require a significant amount of processing power and effort. For instance, data analysis using the dataset.

2.7.3 Memory-Based Instance

We choose this example because there may be applications that need a lot of RAM or memory. For example, multitasking refers to the ability to execute many apps simultaneously in the background.

2.7.4 Instance of Storage

When applications require a significant quantity of system space, this kind of instance is required.

2.7.5 GPU Instance

Applications may require a high volume of images, or effects. Thus, we employ this example there.

2.8 Linux EC2 Instance Creation

Logging into the Amazon Management Console. We'll navigate to the My Account area of the AWS management portal.



Once we are in the AWS administration console, we must choose the desired region—that is, the region in which we wish to use EC2—from the drop-down menu. The user must click on the EC2 option in the compute area in order to choose the services of EC2 in the following phase. This action will launch the EC2 dashboard. The next step is for the user to select the launch instance option.



fig: selection of instance

In the next stage the user needs to select the AMI. We will choose the Ubuntu option because we are building an instance of Linux, as this paper is about Linux instances. The name of the Ubuntu Server version will be chosen. Following, we will select an instance, which is the following step. In this we will choose t2. micro instance because it is readily available.

Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)
General purpose	t2.nano	1	0.5	EBS only
General purpose	t2.micro	1	1	EBS only

fig: instance selection

We will configure the instance that we generated in the following step. Thus, we will join the store with that instance and specify the previously created details. We shall select Next: Add storage following configuring in order to add the storage.

2.9 Adding a Tag to an Instance

In the designated space, we must give our AWS EC2 instance a name in this stage. This name, which is referred to as a Tag, will show up on the console when the instance launches. Tag facilitates the maintenance of records on devices operating in complex environments. We can quickly identify and recall our machines by using this name. After that we will create the security group and do its configuration so we will add a security group name by clicking on create a new security group and we will further click on review and launch.

2.10 Review and launch of instance

In this phase, we will study the details and we will verify them that they are correct or not and after that we will commence the launching of an instance.

III. Steps to add the key

3.1 Establishing a pair of keys

This stage requires us to choose the option to "Create a new key pair" and to provide the key pair's name. We will then download that to our system so we may use it later. We will generate a new key pair, give it a name, download it, and store it securely for later use. After that, we'll start the instance.

3.2 Examining the launched instance's details

We'll verify if the adjustments we made are reflected back or not, whether the settings we made are accurate, and whether all of the changes we made—such as those to the instance type, instance name, and instance—are visible.

3.3 Conversion of Private key by the help of PuTTYgen

The Amazon-generated private key format (.pem) is not supported by PuTTY. PuTTY comes with an integrated utility called PuTTYgen that facilitates the conversion of the key into the required PuTTY format (.ppk). Before attempting to connect to the instance using PuTTY, private keys must be converted to this format. Next, we must click Load; at this point, only files with the extension pf (.ppk) will be displayed. To view the extension, the user must choose Display Files of All Types. The user must now choose his.pem file for the key pair he gave when launching the instance, and he must then click the open option. Clicking the OK option is the next step towards confirmation. The user must now click on Save private key in order to save the key in the format that PuTTY requires. Because PuTTYgen displays a warning screen without the passphrase, the key must be saved alongside it. Yes, the user must click the option and provide the identical key name that he provided for the previous key pair.

3.4 Connection of EC2 instance using SSH and PuTTY

PuTTY.exe must open as the initial step. The public IP address of the instance must be entered in the hostname box that appears. SSH needs to be added to the category list in the following step. Auth must be selected in the following step, after which the user must locate and double-click the downloaded PPK file.

This step must be completed in the Private Key authentication box. The user must select Open in the following step. Now the user needs to input his login ID in the ubuntu when he will see the terminal window.

IV. Functionality of AMAZON EC2

4.1 Reliable

Due to its excellent service reliability, Amazon EC2 is an excellent choice in terms of dependability. There are relatively few outages and 99% availability across all Amazon EC2 regions using this service. In terms of reliability, EC2's service is excellent and has a very strong SLA agreement. When a vendor purchases an instance, he can rely entirely on the EC2.

4.2 Secure

With Amazon EC2 employs end-to-end encryption, SSH techniques, and a high security system to ensure the protection of the resources, it offers exceptional security features. A manufacturer has the ability to independently define the security settings, choose the IP range to utilize, and establish connections to diverse IT infrastructure through a range of encryption techniques. It offers the benefit of seclusion as well. Because of its huge complexity, the encryption technique makes it difficult for a bad user to trace.

4.3 Elastic

Amazon EC2's best characteristic is its elasticity. With the help of this capability, the user or vendor can increase storage capacity in less than a minute and lower it as needed. The application can be scaled up or down based on the user's needs, and multiple instances can be launched continuously. The CPU configuration, memory type, TAM size, and a number of other features are accessible by the user. A user has the option to select the operating system type.

4.4 On-demand Instance

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4.5 Reserved Instance

In addition to receiving a discount on the hourly rates, a user has the option to pay for each instance he uses and reserve that for use. A user won't pay if the resources aren't used; he will only pay when he uses the instance.

V. RESULTS AND DISCUSSION

5.1 The successful launch of EC2

At last, a successful EC2 Ubuntu instance launch succeeds. By using the control panel, also known as the EC2 console, the user can further adjust the settings to suit his needs. You can assign resources whatever you like, and the cost will reflect that. The most significant advantage of paying for each consumption is this. Service Level Agreements (SLAs) and End-user License Contracts (EULAs) are the strict rules that Amazon EC2 services have to conform to. An SLA agreement is a document that informs the client that the provider provides these services. In addition, the service provider must provide to provide every service mentioned in a SLA.

In conclusion, the successful EC2 launch has demonstrated that cloud-based platforms like AWS EC2 offer an optimal solution for researchers, combining computational power, flexibility, scalability, and cost-effectiveness. Future work may involve exploring hybrid cloud environments and further optimizing instance usage for specific project requirements.

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