Amazon Web Service EC2 and its Features: A Systematic Literature Review

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***Abstract*—"Cloud computing" has become ingrained in the software development world. Moving the computing set-up; from local to cloud decreases time to distribution, reduces costs and enhances performance for many businesses today. "Cloud computing" is an idea of sharing different resources such as servers, storage devices, applications, and services with ample on-demand or on request network access. "Cloud computing" also encompasses a set of rules, tools, and controls that are used to safeguard the data, services, and infrastructure. The Amazon (AWS), Google (Cloud), Microsoft (Azure), IBM (Cloud), Salesforce, Alibaba (Cloud) and others are the foremost cloud providers. The Amazon Web Service is a "cloud computing" environment provided by Amazon that comprises a collection of remote computing services. Amazon EC2 is the furthermost significant and well-known of these services. Compared to setting up a real server farm, the service is significantly faster, scalable, and cost-effective. "Amazon Web Services" (AWS) offers a range of service areas, including Amazon "Elastic Compute Cloud" (Amazon EC2). Amazon EC2 offers centralized management over all services along with a high-performance computing environment. EC2 is advantageous because it offers auto-scaling, which allows resources to be scaled automatically and without friction as needed. We have a fleeting discussion in this article, of numerous services and operations accomplished in the amazon "elastic compute cloud" (EC2).**

***Keywords*—EC2, Amazon, AWS, auto-scaling, cloud computing service, load balancing, security.**

INTRODUCTION

Companies face enormous pressure and additional strain on their IT infrastructure to meet the diverse demands of their customers, who need fast, dependable, and secure services. Companies must update their IT infrastructure to boost processing power and storage capacities to satisfy client demands. Companies spend a lot of money to design and maintain their IT infrastructure so that it is reliable, scalable, and secure. Cloud computing enables businesses to essentially shift away from their own IT infrastructure and engage with subscription-based services and IT infrastructure. When compared to the expense of purchasing additional gear, cloud computing services become affordable. It is a type of internet computer that allows users to share numerous services and data stored on computers and other devices. There are two types of cloud models: service models and deployment models [1].

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Companies face enormous pressure and additional strain on their IT infrastructure to meet the diverse demands of their customers, who need fast, dependable, and secure services. Companies must update their IT infrastructure to boost processing power and storage capacities to satisfy client demands. Companies spend a lot of money to design and maintain their IT infrastructure so that it is reliable, scalable, and secure. Cloud computing enables businesses to essentially shift away from their own IT infrastructure and engage with subscription-based services and IT infrastructure. When compared to the expense of purchasing additional gear, cloud computing services become affordable. It is a type of internet computer that allows users to share numerous services and data stored on computers and other devices. There are two types of cloud models: service models and deployment models [1].

"Cloud computing" refers to a technology that allows data and projects to be stored and accessed without the need for data banks at the client interface. Cloud computing is critical in assisting SMEs (Small and Medium-Sized Enterprises) in utilizing emerging opportunities, providing them a competitive advantage in the marketplace [2]. "Cloud computing" is an internet-based system that allows us to access software, data, and resources from any location with an internet connection. The advantages of cloud computing for businesses include that the internet services offered allow organizations to connect and form international collaborations without having to develop external infrastructures like servers, data centers, and so on. Cloud computing is a large-scale distributed computing paradigm that enables dynamic and elastic resource sharing via delivering software, platforms, or computational equipment. Cloud computing has numerous advantages, including lower application deployment costs, increased capacity of private infrastructures elastically, and reduced power usage owing to resource sharing. "Software-as-a-service" (SaaS), "Platform-as-a-service" (PaaS), and "Infrastructure-as-a-service" (IaaS) are the three layers of abstraction used to access cloud functionality (IaaS). While IaaS provides access to cloud infrastructure, PaaS complements IaaS by providing tools to aid in the development of cloud applications. Finally, SaaS offers the applications and transparently controls the entire computing infrastructure. Multiple linear regression equations representing the influence

of CPU and RAM characteristics in the composition of the price of different types of instances available on the Amazon EC2 provider were found using r analysis for on-demand instances [3]. Cloud computing provides a highly abstracted resource architecture with scalable and flexible shared resources including memory, database, and hardware. Five basic qualities, three service models, and four deployment models are provided by cloud computing [4]. Cloud computing is regarded as a significant step toward realizing the existing idea of computing in the same way as a utility, with the capability to alter a significant portion of the software development sector [5]

Cloud computing is a scientific and social reality [6]. It is one of the fastest-growing technologies in computer science. Amazon Elastic Compute (AWS), Google Cloud Platform, and Microsoft Azure are three cloud platforms that you may utilize to successfully manage your organization's IT needs. Each of these main rivals in this industry has its own set of advantages that allow them to survive in this competitive environment [7]. Consumers of cloud services are sometimes confronted with an abundance of options, making the decision difficult. This is because instance provisioning can be difficult to grasp for a non-technical user, and cloud provider practices are far from transparent, biassing the selection process. Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) are the three main services provided by cloud computing [5]. Virtualization is used in the "cloud computing" paradigm to provide computational resources as virtual machine (VM) instances [6]. Cloud computing capability, such as that provided by "Amazon EC2", has been increasingly used to run a large variety of applications in a variety of areas, including scientific, engineering, consumer, and business [8]. One of the issues in cloud computing is task scheduling, which enables requests for allocating a certain resource to function successfully. Task scheduling is used in resource management when tasks are interdependent. For the scheduling of these jobs, many methodologies and case studies have been created [9]. Data is kept and reclaimed locally from a single system before the introduction of cloud computing, however, the single machine was unreliable due to backup data synchronization concerns [7].

Services are basic units that are created on their own and Services are basic units that are created on their own and made available over the Internet. For service communication between different computers, standard internet protocols are utilized [6].

There is no precise definition for SOA because it has been defined by many scholars from many angles (such as technology, commercial, and architecture). SOA is neither a technology nor a manufactured goods, and not a quick fix for dealing with IT complexity. The use of SOA-based systems has become commonplace [8]. Several papers have recently emphasized the advantages of using "service-oriented architecture" (SOA) in the creation of new innovative technologies including the "Internet of Things" (IoT), "Cloud Computing" (CC), and "Microservices" [10]. The Service Identification (SI) phase of the Service-Oriented Architecture (SOA) lifecycle is critical because it lays the groundwork for the subsequent phases of SOA development [11]. Service-oriented software engineering refers to the growth of existing software engineering methodologies for developing trustworthy and reusable services while considering the technology's requirements and characteristics. Service-oriented computing (SOC) is a computing paradigm that uses services as the foundation for application development. As a result, utilizing software engineering approaches, service-oriented software engineering strives to design and implement service-based applications following the SOC paradigm and SOA principles [6]. In today's technology world, "Service-Oriented Architecture" (SOA) is one of the truly amazing technologies in information systems structural design. SOA is a way of looking at the world. Everything appears to be a service when viewed through the lens of a service-oriented perspective. SOA's service is a crucial building block. It is a method for gaining access to repeatable business capabilities. SOA adoption is not the same as developing an application in a short amount of time. Indeed, achieving considerable benefits from SOA implementation is a long path for a firm [12]. One of their primary initiatives is the implementation of Service Oriented Architecture (SOA). An effective SOA roadmap that defines the strategies, milestones, techniques, and objective goals is required for successful SOA implementation. SOA adoption is a huge project that necessitates numerous organizational changes. This adventure does not begin and end with a single project. SOA adoption is no different. The SOA Maturity Models (SOAMMs) are a tool for evaluating an organization's level of SOA adoption and creating a roadmap for incremental SOA adoption [13]. Various businesses are confronted with the problem of storing and processing massive amounts of data. Because of the insights and information obtained via the excessive processing of data, Big Data Systems have become a very essential driver for innovation and progress in recent years. Depending on the application domain, the business and application requirements differ. Big data software architectures have been examined sporadically/extensively in the past. However, recommending an appropriate software architecture for big data systems is difficult when considering both application needs and stakeholder concerns [14]. Web apps have mostly replaced traditional applications that ran in isolated environments in various enterprises throughout the world. Microservices have grown from service-oriented architectures in recent years, and they constitute an innovation in application distribution [15]. The cloud is a new paradigm that is paving the way for new techniques and standards. The architectural styles are also evolving in response to the cloud's requirements.

"Microservices are small, self-contained services that collaborate." Microservices are created, deployed, and managed independently. This gives the team autonomy in terms of deciding which technology to utilize based on the current needs of the business behavior [6]. Microservice Architecture (MSA) is an architectural approach that focuses on constructing distributed software systems as a collection of specialized, self-contained services that communicate through well-defined interfaces. A Microservice has a distinct architectural capacity and demonstrates a high level of development and operation independence [16]. Microservices are gaining traction in the enterprise IT world. Every microservice is targeted on a business ability, operates in its process, and connects as well as other microservices in the application as lightweight protocols (e.g., HTTP, FTP). To some level, the microservice architectural approach can be considered as a real extension of "Service-Oriented Architecture" (SOA), which emphasizes the independence and lightweight nature of services [17]. In the software industry, microservices are turn out to be gradually more popular. Microservices are architectural components that are loosely connected and have being capable of deployed independently by entirely automated system. Microservices are a software system that allows multiple web applications and specific measures to work together. Microservices have become the most common-sense technique for disseminating information between applications running on multiple operating systems, languages, and platforms with the least amount of work. Microservices are divided into two categories: intranet and internet microservices. The intranet's services are only available to employees of the company in question and are not open to the broader public, whereas microservices over the Internet are open to anybody [18].

Amazon Web Services (AWS) is a cloud computing platform and cloud storage service that allows businesses, governments, and individuals to store data and provides APIs (Artificial Programming Interface). API is a subsidiary of Amazon, with real data centers all around the world. Most clients choose API since it is more efficient in delivering services. AWS has a serious flaw in the form of denial of service, which can be dangerous for firms that rely significantly on the platform to run their operations. With its seamless interface, AWS helps customers to make their apps better and easier to use, and it provides a seamless structure for any industry. Owning and managing your infrastructure can be complex and expensive [2]. Amazon Web Service (AWS) is a Cloud computing platform provided by Amazon.com that comprises of a set of remote computing services (aka web services). Amazon EC2 and Amazon S3 are the most important and well-known of these services. Compared to setting up a physical server farm, the service is significantly faster, scalable, and cost-effective [19]. AWS has a critical problem called denial of service, which can be dangerous for businesses that rely heavily on the platform to run their operations. AWS helps customers make their apps better and easier to use with its seamless interface, and it provides a seamless structure for every business. It can be difficult and costly to own and manage your infrastructure [2]. Developers may use Amazon EC2 to provision on-demand compute resources, configure them to their specifications, and scale them up or down based on application demands. Developers can pay for their services in one of three ways. They can pay "On-Demand," which allows the developer to pay by the hour for what they use with no "long-term commitments" [9]. The AWS administration console gives you a visual representation of all your AWS actions, for instance working with Amazon storage buckets, creating new instances of EC2, and creating new dashboard of Amazon Cloud Watch for alerts and notifications. Each service has its console which may be accessed from the main console [12].

Amazon EC2 (Elastic Computation Cloud) is a web service that provides cloud computing capability that can be scaled up or down [2]. The streaming of media files over a media server utilizing Amazon Web Services is known as "Cloud-Enabled Media Streaming." For streaming and storing multimedia files, the media server employs an Amazon EC2 server. Amazon Elastic Compute Cloud (EC2) provides elasticity in resource provisioning based on user demand, even if the system is overburdened. When EC2's computing resources are over-provisioned, however, it can rent spare underutilized resources as spot instances (SIs) at a substantially lower cost than On-Demand instances based on an auction bidding mechanism [20]. Amazon EC2 rents virtual computers (also known as instances) using a three-tiered pricing model: reserved, on-demand, and spot. 2 Users that sign up for the reserved pricing plan commit to a long-term commitment (one or three years) and pay a discounted fee. On-demand resources are charged a predetermined amount and are allocated on an hourly basis [3]. In the "Amazon Web Services" (AWS) cloud, Amazon Elastic Cloud Compute (Amazon EC2) supports scalable processing capability. Using EC2, users may set up virtual machines ahead of time without having to invest in computer hardware, allowing them to build and deploy applications more quickly from anywhere [4].

The rest of the paper is structured as follows. The conducted literature review is described in Sect. 2. Section 3 presents and analyzes the results of the review. The service identification challenges are described in Sect. 4. Finally, Sect. 5 concludes the paper and forecasts future research.

LITERATURE REVIEW

Frederico Durao and others in this article summarized that in the cloud computing a major problem is security and privacy. In addition, handling the parallel applications deployment is another challenge in cloud computing. Moreover, both models of cloud charges have strong arguments [21].

Avinash Bandaru in this research paper concludes that amazon web services are the best in the market in terms of cost and efficiency. Moreover, concern is shown regarding security due to data vulnerabilities on the cloud [2].

Author, in this article, explained that IT firms are using the three main services of cloud computing IaaS, PaaS and SaaS; on demand or on request models to reduce their maintenance expenses [22].

Gustavo Portella et al. In this article compare the prices for two types of instances of EC2 by using statistical methods and their findings show that spot instances have lower prices than on demand. Moreover, for the future we need to explore the spot instances used for long term and need to analyze the on-demand types of usage [3].

Dr. P Swetha and others, In this paper have a short discussion on cloud services and find services are sharing resources [4].
Wenqiang Liu et al. in this research paper trying to solve the data centers problem; how to select the best instance types based upon their storage and computing power [5].

Taiyang Guo et al. proposed a framework that is cost effective for instance selection on amazon EC2 based upon their combined clustering algorithm of "Analytical Hierarchy Process" (AHP) and "Parallel K-Means" [23].

Hulya Vural and others in their research finds microservices are going to be popular in the IT industry but raise concern about distributed transactions [6].

Altino M. Sampaio and others created a scheduling algorithm to complete the tasks within deadline and budget by utilizing the spot instances efficiently [8].

Adnan Tahir et al. In this research article introduced an enhanced and cost-effective cloud storage availability with reliability for e-health cloud applications [7].

Nnamdi Ekwe-Ekwe and Adam Barker in this article explored that the spot instance has different price model for different region [9].

V.D. Ambeth Kumar et al. developed a streaming application by using amazon EC2 and S3 services and based upon their experience suggested the services for other online applications [19].

Thanh-Phuong Pham and others analyzed the AWS spot instances availability and they found if SI request is not entertained within four second then you must wait more than 1 minute so the reliability of spot instances is not 100 percent [20].

Pallavi Wankhede and other in this research article has a comparison of "Amazon EC2", Google and "Microsoft Azure" the three big cloud providers. They suggest the user to select the platform based upon their requirements [24].

Aishwary a Anand in this article focused on the Amazon EC2 cloud service and explained how it is best regarding service, availability, security, load balancing, auto scaling, etc [25].

Aida Amini Motlagh et al. in this research paper explained task scheduling techniques in cloud environments and came across some best approaches based upon usage of task scheduling techniques [26].

ZHAO Wei in his research article analyzed that cloud computing has changed the software development paradigm from desktop to web-based applications. Cloud computing will be successful if all the related services like storage, security and software are provided [27].

Shyam Singh Rajput and others conduct a survey and analyzed different algorithms of load balancing for cloud platforms [28].

Alexis Lê-Quôc and other in this book identified the EC2 performance problem areas and provided some solutions to the problem [29].

Ignacio Bermudez and others analyzed that different datacenter of amazon has unbalanced workload of traffic resulted in poorer performance, but they could not find the main causes [30].

P. Kokkinos and others in this research paper proposed a solution to minimize the cost of EC2 instance and maximize the performance of services and utilization of resources [31].

Emanuel Ferreira Coutinho et al. conducted a survey to explore the elasticity concepts and aspects. Moreover, cloud service providers are still facing some problems so the new elasticity solution should be explored [32].

Tania Lorido-Botran and others have focused the auto scaling and suggested both reactive and proactive scaling techniques. Although scaling problem is related to virtualization infrastructure [33].

Suriya Begum and other in this research paper explained cloud computing has the characteristic of load balancing to achieve best performance and proper resource utilization and to achieve energy efficiency [34].

Shikha Gupta et al. have conducted a survey on load balancing techniques both static and dynamic and discussed load balancing concepts and aspects [35].

K. Ravi Chythanya and others in this research paper discussed security feature provided by cloud providers especially Amazon and IBM and analyzed the security vulnerabilities in open AMI [36].

Abdullah Alqahtani and Hina Gull in this paper described the security feature provided by the Amazon. Moreover, security is the responsibility of both client and cloud provider [37].

METHODOLOGY

To undertake an Amazon web services review, which is the purpose of this report, we performed an SLR according to the methods suggested by Kitchen Ham and Charters. This approach consists of arranging, executing, and reporting phases in which there are many stages in each process. It consists of three levels.

A) Planning / Organization

As mentioned in the above overview, the preparation process began by defining the need for this analysis, as well as setting the targets to be reached. We determined the key goal of the analysis in this process and carried out the following tasks that clarified each move in detail.

Recognition of the necessity for a review

We identified in Step 1 that there was no SLR in amazon web services and EC2 especially. This SLR aims to explain and summarize the current Amazon web service types and their facts. Determining that amazon web services are important. Any of this is useful for future studies. Therefore, due to the findings of the previous tests, we calculated the need to execute an SLR.

Indicate the research question(s)

The overarching goal of this SLR is to identify and review studies relating to Amazon web services and their different features conducted between 2010-2021. To attain a more accurate and systematic view of this subject, the foremost objective was divided into succeeding research issues. This analysis needs to keep the door open for potential updates.

To achieve the objective of this analysis, four key questions were described as follows:

RQ1: What is Amazon Web Services (AWS)? How is AWS better than other services?

RQ2: What is EC2?

RQ3: What are the different types of EC2 instances based on their cost?

RQ4: What are the different features of EC2?

Recognizing the appropriate bibliographic databases.

The available digital libraries were scanned for the appropriate papers as per the research questions: Google Scholar, Science Direct, IEEExplore Digital Library, ACM, and Springer. The foremost motive for choosing these digital reference libraries was they accumulate studies associated with the fields of computer science and technology; they index articles from numerous publication channels like journals, conferences, books, and workshops. In this article, the explorations were narrow to articles published in the 2015-2021 journal and conference proceedings.

Figure. 1. SLR steps and events

B) Conducting the evaluation

The massive coverage can be generated by the search string, but it is a fair scale. Consequently, the keywords matching the study questions were extracted for the fortitude of the search string, and the synonyms linked to the main terms were identified. To merge alternative meanings, the Boolean OR was used and the Boolean AND was used to connect the key pieces. The entire search string collection was planned as follows:

((“Amazon” AND “services”) OR “web services”) OR (“Amazon web services” AND “EC2”) OR (“Cloud computing” AND “Cloud”) OR (“Elastic compute cloud” AND “features of EC2”) OR (“Services provided by amazon” AND “Compute cloud”)

Range of study.

We revised the paper’s abstract, introduction, and conclusion/ finish. We picked those that were written in English among the papers received and that fulfilled minimally one of the following measures:

- Studies should elaborate on Amazon web services and features Papers that address various kinds of hackers.
- Papers that compile EC2.
- Reports discuss cloud computing and its benefits.

The investigator conducted a manual check of the search string results and found that advanced settings such as IEEExplore were required for some of the online databases. The researcher wants to apply to the search string alternate terms and phrases.

The requirements for inclusion and omission for this SLR are based on study questions. As this SLR is based on the test case prioritization methodology, it is important to identify inclusion and exclusion requirements to choose only

appropriate documents. As follows, the inclusion conditions are:

- In English, all articles must be written.
- From 2015 to 2021, all articles must be written.
- All records must concentrate on Amazon web services, EC2, and its manifestations.
- Before being considered for the next step, each of the papers is screened into exclusion criteria. For this SLR, the exclusion requirements are as follows:
- Articles that have not been written in English.
- Duplicate areas of science.
- Papers that comprehend only opinion pieces, perspectives, studies on development, or partial findings.
- Articles with fewer than three pages.
- Papers that do not report any scientific analysis in their study.

Quality assessment

Quality testing is typically designed to evaluate appropriate and impartial research. Therefore, to refine our search results and ascertain the relevance and rigorousness of the applicant papers, we determined more or less of the quality assessment metrics. As follows, the questionnaires for quality evaluation are based on other SLRs

- Are the research's objectives and priorities explicitly stated?
- Is the research design specified? Yes/no/partial
- Have the researcher(s) properly carried out the process of data collection? Yes/no/partial
- Did the researcher(s) have adequate evidence to confirm their outcomes and conclusions? Yes/no/partial
- Does the experiment require comparing other techniques? yes/no

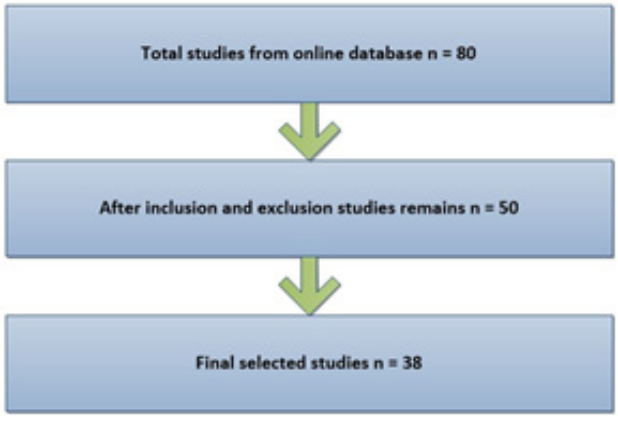

Figure. 2. Studies inclusion and exclusion

Data extraction and synthesis.

A data extraction procedure was introduced to satisfy the research questions to gather the appropriate data from the chosen documents.

RQ1: What is Amazon Web Services (AWS)? How is AWS better than other services?
RQ2: What is EC2?
RQ3: What are the different types of EC2 instances based on their cost?
RQ4: What are the different features of EC2?

To synthesize the collected data and to address the study questions, various techniques were active. A narrative synthesis approach was used entirely to address research questions. In addition, based on research concerns, visualization techniques were applied.

C) Results

Summing up the nominated studies

The investigator classified 80 papers using the specified search words from the first stage of the search process. Just 50 were theoretically important, after screening titles and abstracts. Any of the articles were filtered before being approved for the synthesis of evidence for comparison to inclusion and exclusion criteria. Irrelevant experiments and repeat studies have been removed at this point. If the titles and abstracts were not adequate to categorize the paper applicable to the research field or not, the researchers read the full papers. Finally, to provide answers to the formulated study questions, 38 studies were chosen.

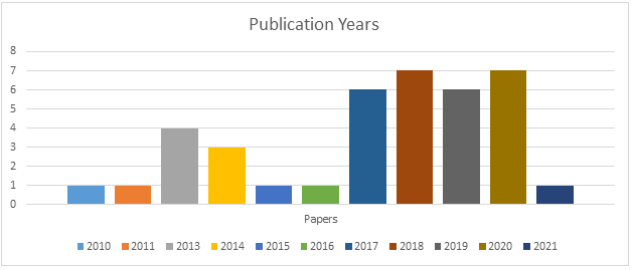

Figure. 3. Publication years

Presenting the evaluation

RQ1: What is Amazon Web Services (AWS)? How is AWS better than other services?

With its seamless interface, AWS helps customers to make their apps better and easier to use, and it provides a smooth structure for any industry. Owning and operating your infrastructure can be challenging and expensive. This issue is no longer an issue for users thanks to AWS's reflection. It provides a platform for users from many industries to make their job more scalable and appealing. Content distribution, e-commerce, media hosting, search engines, web hosting, and other services are among its users. It can be thought of as a collection of services that are all available at the same time [2]. Because of the fragility of data, security is a fundamental concern for all clients. Customers are especially concerned about their personal information being accessed without their permission. However, in addition to its cost, Amazon Web

Services provides a higher sense of security to Small and Medium Businesses. As a result, AWS is the preferred platform for all new and emerging businesses. We discovered that AWS is straightforward to use while constructing a media server.

The features of establishing a media server with AWS are as follows.

- Scalability
- Flexible capacity
- Low on-going costs
- Speed and Agility
- Global Reachability
- Security
- Project focus rather than architecture [19].

RQ2: What is EC2?

Amazon Elastic Computing Cloud (EC2) service, that offers cloud computing capability with scaling features [2]. Even if the system is overcrowded, Amazon EC2 service offers resources with elastic capability, and on user demand computing power can be improved and enhanced quickly [20]. In cloud, EC2 is Amazon's most popular computing web service. It provides a relatively easy service interface through which users may efficiently access and adjust capacity, ensuring that it is used predictably. The amazon provides different options to secure the EC2 instance; it not only protects the secrecy of user information over cloud storage but also provides a "virtual private cloud" (VPC) with a customer-specified IP range. Since 2006, the Amazon have been offering services in areas such as:

- Compute
- Storage and content delivery
- database
- Networking

The Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capability, allowing for speedier deployment by avoiding hardware expenses. Amazon EC2 allows for the creation and management of multiple virtual servers, making the service extremely scalable. Amazon EC2 offers a variety of functionalities, including instances, AMIs, authentication, storage solutions, firewalls, and more [24]. The consumer can choose which events he wants to maintain private and which he wants to share with the rest of the world. Customers can configure and regulate the inbound and outgoing traffic to and from their instance using security groups. Amazon EC2 is reasonably priced since customers pay on an hourly basis with no long-term commitment. It also comes with Auto-Scaling, which relieves customers of the strain of dealing with traffic spikes. On-Demand and reserved instances are both accessible. To use Amazon EC2, simply follow these steps:

- To get up and running quickly, choose a pre-configured template Amazon Machine Image (AMI).
- Configure your Amazon EC2 instance's security and network access.
- Select the instance type(s) you would like, and later launch, stop, and monitor various instances of your AMI as you need. Instances can also have permanent block storage attached to them.
- You just pay for the resources you use, such as instance-hours or data transmission [25].

- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable register capacity in the cloud. It is relying on it to make web-scale dissipated selection easier for producers [36].

RQ3: What are the different types of EC2 instances based on their cost?

Developers may use Amazon EC2 to provision on-demand compute resources, configure them to their specifications, and scale them up or down based on application demands. Developers can pay for their services in one of three ways. They can pay "On-Demand," which allows the developer to pay by the hour for what they use with no "long-term commitments." They can also pay with "Reserved Instance[s]," which allows them to reserve a set of instances for a "1 or 3-year term." Finally, developers can use a "Spot Instance" model to pay for resources, which allows them to bid on excess compute capacity and save up to "90 percent off the On-Demand charge." Overall, the more powerful the instance, the less expensive and more dependable the price in Canada is than in the other three areas. The Asia Pacific region is closely following this. In the EU and US, however, the less powerful the instance, the less expensive and more reliable (in terms of pricing) it is to deploy [9].

RQ4: What are the different features of EC2?

The following features are available using Amazon EC2:

- Instances: Virtual computing environments.
- AMIs: An "AMI" is a set of pre-configured instances that consist of all the elements you will need to run your computing server (system software as well as additional application software).
- Instance Types: For your instances, you can choose from a variety of microprocessor, memory, storage capacity, and networking combinations.
- Key Pairs: Secure login info for your instances (AWS stores the public key, and you store the private key in a secure place)
- Instance Store Volumes: Temporary data storage volumes that are erased when your instance is stopped or terminated.
- EBS volumes: EBS volumes are Amazon Elastic Block Store persistent storage volumes for your data (Amazon EBS) Regions & Zones of Availability: Your resources, as well as instances and "Amazon EBS" volumes (storage), can be stored in many physical locations.
- Security Groups: Security Groups are a type of firewall that allows you to designate which protocols, ports, and source IP ranges are allowed to access your instances.

- Elastic IP addresses: Static IP addresses for dynamic cloud computing are known as elastic IP addresses.
- Tags: Tags are metadata that you can add to your Amazon EC2 resources and apply to them. VPCs (virtual private clouds): You can establish virtual networks that are conceptually separated from the rest of the AWS cloud and that you can connect to your network.

Amazon not merely provides consumers with automated and uniform services but also provides various security systems such as "IAM". Amazon protects data secrecy and integrity via IAM, MFA, and Access keys, as well as "Hash-Based Message Authentication Code" (HMAC) and S3 server-side encryption. Amazon is also recognized for its 99.95 percent EC2 availability. It has an IAM system that handles all the users' access authorizations. It manages the security of users, resources, and user credentials from a central location. The user is provided with a variety of security credentials, including access keys, X.509 certificates, MFA, and others [25].

DISCUSSIONS

Cloud computing has become a vital tool in not just the commercial world, but also in our daily lives. Many organizations have chosen cloud computing because it is believed to be safer and more trustworthy, particularly in inventory tracking. Amazon, with its Amazon Web Services business, is at the forefront of providing cloud computing services around the world (AWS). Customers can save data on the platform using this feature. Cloud computing is critical in assisting SMEs (Small and Medium-Sized Enterprises) in utilizing emerging opportunities, providing them a competitive advantage in the marketplace. AWS is preferred by most SMEs above other competitors of cloud providers because it is more efficient and cost-effective. As a result, new and emerging businesses are more inclined to select AWS as their cloud computing service provider. Regardless Of the benefits of cloud computing, the main concerns about data security and simplicity of usage still exist.

CONCLUSION AND FUTURE WORK

With the creation of new start-ups regularly and the growing utilization of data by users, fast data processing and huge data volumes solutions are critical. Cloud platforms give a solution to these issues through virtualization, which involves establishing multiple virtual machines on a single physical machine. As a result, the processor is more efficient and spends less time idle. AWS has shown to be the best at providing cloud computing services to people, businesses, and organizations. In comparison to its competitors, it is extremely efficient and cost-effective. Because these services are available at a low cost, Amazon Web Services has grown in popularity and now leads the industry globally. The business sector is not the only one that can benefit from cloud computing services. The advantage of EC2 is that it includes features such as load balancing, auto-scaling, and many others. As a result, AWS is the preferred platform for all new and emerging businesses.

REFERENCES:

[1] R. K. Goutam, "CLOUD COMPUTING SERVICE MODELS".

[2] A. BANDARU, "AMAZON WEB SERVICES".

[3] G. Portella, G. N. Rodrigues, E. Nakano, and A. C. M. A. Melo, "Statistical analysis of Amazon EC2 cloud pricing models," Concurrency Computat Pract Exper, vol. 31, no. 18, Sep. 2019, doi: 10.1002/cpe.4451.

[4] D. P. Swetha, V. Bhupathi, and G. S. Reddy, "SURVEY ON AWS SERVICES IN CLOUD COMPUTING," p. 3 .

[5] W. Liu, P. Wang, Y. Meng, Q. Zhao, C. Zhao, and Z. Zhang, "A Novel Model for Optimizing Selection of Cloud Instance Types," IEEE Access, vol. 7, pp. 120508–120521, 2019, doi: 10.1109/ACCESS.2019.2937511.

[6] H. Vural, M. Koyuncu, and S. Guney, "A Systematic Literature Review on Microservices," in Computational Science and Its Applications – ICCSA 2017, vol. 10409, O. Gervasi, B. Murgante, S. Misra, G. Borruso, C. M. Torre, A. M. A. C. Rocha, D. Taniar, B. O. Apduhan, E. Stankova, and A. Cuzzocrea, Eds. Cham: Springer International Publishing, 2017, pp. 203–217. doi: 10.1007/978-3-319-62407-5_14.

[7] A. Tahir et al., "A Systematic Review on Cloud Storage Mechanisms Concerning e-Healthcare Systems," Sensors, vol. 20, no. 18, p. 5392, Sep. 2020, doi: 10.3390/s20185392.

[8] A. M. Sampaio and J. G. Barbosa, "Constructing Reliable Computing Environments on Top of Amazon EC2 Spot Instances," Algorithms, vol. 13, no. 8, p. 187, Jul. 2020, doi: 10.3390/a13080187.

[9] N. Ekwe-Ekwe and A. Barker, "Location, Location, Location: Exploring Amazon EC2 Spot Instance Pricing Across Geographical Regions," in 2018 18th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGRID), Washington, DC, USA, May 2018, pp. 370–373. doi: 10.1109/CCGRID.2018.00059.

[10] N. Niknejad, W. Ismail, I. Ghani, B. Nazari, M. Bahari, and A. R. B. C. Hussin, "Understanding Service-Oriented Architecture (SOA): A systematic literature review and directions for further investigation," Information Systems, vol. 91, p. 101491, Jul. 2020, doi: 10.1016/j.is.2020.101491.

[11] B. Bani-Ismail and Y. Baghdadi, "A Literature Review on Service Identification Challenges in Service Oriented Architecture," in Knowledge Management in Organizations, vol. 877, L. Uden, B. Hadzima, and I.-H. Ting, Eds. Cham: Springer International Publishing, 2018, pp. 203–214. doi: 10.1007/978-3-319-95204-8_18.

[12] N. Niknejad, A. R. C. Hussin, and I. S. Amiri, "Literature Review of Service-Oriented Architecture (SOA) Adoption Researches and the Related Significant Factors," in The Impact of Service Oriented Architecture Adoption on Organizations, Cham: Springer International Publishing, 2019, pp. 9–41. doi: 10.1007/978-3-030-12100-6_2.

[13] S. Pulparambil and Y. Baghdadi, "Service oriented architecture maturity models: A systematic literature review," Computer Standards & Interfaces, vol. 61, pp. 65–76, Jan. 2019, doi: 10.1016/j.csi.2018.05.001.

[14] C. Avci, B. Tekinerdogan, and I. N. Athanasiadis, "Software architectures for big data: a systematic literature review," Big Data Anal, vol. 5, no. 1, p. 5, Dec. 2020, doi: 10.1186/s41044-020-00045-1.

[15] K. Chavez, P. Cedillo, M. Espinoza, and V. Saquicela, "A Systematic Literature Review on Composition of Microservices through the Use of Semantic Annotations: Solutions and Techniques," in 2019 International Conference on Information Systems and Computer Science (INCISCOS), Quito, Ecuador, Nov. 2019, pp. 311–318. doi: 10.1109/INCISCOS49368.2019.00056.

[16] F. Rademacher, S. Sachweh, and A. Zundorf, "Differences between Model-Driven Development of Service-Oriented and Microservice Architecture," in 2017 IEEE International Conference on Software Architecture Workshops (ICSAW), Gothenburg, Sweden, Apr. 2017, pp. 38–45. doi: 10.1109/ICSAW.2017.32.

[17] J. Soldani, D. A. Tamburri, and W.-J. Van Den Heuvel, "The pains and gains of microservices: A Systematic grey literature review," Journal of Systems and Software, vol. 146, pp. 215–232, Dec. 2018, doi: 10.1016/j.jss.2018.09.082.

[18] I. Ghani, W. M. N. Wan-Kadir, A. Mustafa, and M. Imran, "Microservice Testing Approaches: A Systematic Literature Review," vol. 11, no. 8, p. 16, 2019.

[19] V. D. A. Kumar, V. D. A. Kumar, H. Divakar, and R. Gokul, "Cloud enabled media streaming using Amazon Web Services," in 2017 IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), Chennai, Aug. 2017, pp. 195–198. doi: 10.1109/ICSTM.2017.8089150.

[20] T.-P. Pham, S. Ristov, and T. Fahringer, "Performance and Behavior Characterization of Amazon EC2 Spot Instances," in 2018 IEEE 11th International Conference on Cloud Computing (CLOUD), San Francisco, CA, USA, Jul. 2018, pp. 73–81. doi: 10.1109/CLOUD.2018.00017.

[21] F. Durao, J. F. S. Carvalho, A. Fonseka, and V. C. Garcia, "A systematic review on cloud computing," J Supercomput, vol. 68, no. 3, pp. 1321–1346, Jun. 2014, doi: 10.1007/s11227-014-1089-x.

[22] Mohammed, Chnar Mustafa and Zeebaree, Subhi R. M., "Sufficient Comparison Among Cloud Computing Services: IaaS, PaaS, and SaaS: A Review," Jan. 2021, doi: 10.5281/ZENODO.4450129.

[23] T. Guo, R. Bahsoon, T. Chen, A. Elhabbash, F. Samreen, and Y. Elkhatib, "Cloud Instance Selection Using Parallel K-Means and AHP," in Proceedings of the 12th IEEE/ACM International Conference on Utility and Cloud Computing Companion - UCC '19 Companion, Auckland, New Zealand, 2019, pp. 71–76. doi: 10.1145/3368235.3368845.

[24] P. Wankhede, M. Talati, and R. Chinchamalatpure, "COMPARATIVE STUDY OF CLOUD PLATFORMS -MICROSOFT AZURE, GOOGLE CLOUD PLATFORM AND AMAZON EC2," jreas, vol. 05, no. 02, pp. 60–64, Apr. 2020, doi: 10.46565/jreas.2020.v05i02.004.

[25] Aishwarya Anand and GD Goenka University, "Managing Infrastructure in Amazon using EC2, CloudWatch, EBS, IAM and CloudFront," IJERT, vol. V6, no. 03, p. IJERTV6IS030335, Mar. 2017, doi: 10.17577/IJERTV6IS030335.

[26] A. Amini Motlagh, A. Movaghar, and A. M. Rahmani, "Task scheduling mechanisms in cloud computing: A systematic review," Int J Commun Syst, vol. 33, no. 6, p. e4302, Apr. 2020, doi: 10.1002/dac.4302.

[27] W. Zhao, "An Initial Review of Cloud Computing Services Research Development," in 2010 International Conference on Multimedia Information Networking and Security, Nanjing, China, 2010, pp. 324–328. doi: 10.1109/MINES.2010.75.

[28] S. S. Rajput and V. S. Kushwah, “A Review on Various Load Balancing Algorithms in Cloud Computing,” IJARCSSE.

[29] A. Lê-Quôc, M. Fiedler, and C. Cabanilla, “The Top 5 AWS EC2 Performance Problems,” p. 24, 2013.

[30] I. Bermudez, S. Traverso, M. Mellia, and M. Munafo, “Exploring the cloud from passive measurements: The Amazon AWS case,” in 2013 Proceedings IEEE INFOCOM, Turin, Italy, Apr. 2013, pp. 230–234. doi: 10.1109/INFCOM.2013.6566769.

[31] P. Kokkinos, T. A. Varvarigou, A. Kretsis, P. Soumplis, and E. A. Varvarigos, “Cost and Utilization Optimization of Amazon EC2 Instances,” in 2013 IEEE Sixth International Conference on Cloud Computing, Santa Clara, CA, Jun. 2013, pp. 518–525. doi: 10.1109/CLOUD.2013.52.

[32] E. F. Coutinho, F. R. de Carvalho Sousa, P. A. L. Rego, D. G. Gomes, and J. N. de Souza, “Elasticity in cloud computing: a survey,” Ann. Telecommun., vol. 70, no. 7–8, pp. 289–309, Aug. 2015, doi: 10.1007/s12243-014-0450-7.

[33] T. Lorido-Botran, J. Miguel-Alonso, and J. A. Lozano, “A Review of Auto-scaling Techniques for Elastic Applications in Cloud Environments,” J Grid Computing, vol. 12, no. 4, pp. 559–592, Dec. 2014, doi: 10.1007/s10723-014-9314-7.

[34] S. Begum, “Review of Load Balancing in Cloud Computing,” vol. 10, no. 1, p. 10, 2013.

[35] S. Gupta and S. Sanghwan, “Load Balancing in Cloud Computing: A Review,” vol. 4, no. 6, p. 6, 2015.

[36] K. R. Chythanya, G. Sunil, K. S. Kumar, S. N. Korra, and A. Harshavardhan, “Security and Safety in Amazon EC2 Service – A Research on EC2 Service AMIs,” IJITEE, vol. 8, no. 6S4, pp. 736–738, Jul. 2019, doi: 10.35940/ijitee.F1149.0486S419

.

[37] A. Alqahtani and H. Gull, “Cloud Computing and Security Issues—A Review of Amazon Web Services,” vol. 13, no. 22, p. 8, 2018.

[38] K. Avila, P. Sanmartin, D. Jabba, and M. Jimeno, “Applications Based on Service-Oriented Architecture (SOA) in the Field of Home Healthcare,” Sensors, vol. 17, no. 8, p. 1703, Jul. 2017, doi: 10.3390/s17081703.