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A Study on Web Services in Healthcare

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ABSTRACT: Healthcare services are now offered with just one touch on your devices. Nowadays healthcare is different from it was a few years back. Now the things have gone online and so has healthcare. Patients are now just a few clicks away from the doctors. They can now meet virtually and the doctors are now able to diagnose the patient's diseases (minor cases) from afar with the help of cloud computing and the services provided by the cloud. this helps both saving time and effort. This paper provides an in-depth knowledge of various web services used in healthcare.

KEYWORDS:Web services, healthcare, AWS (Amazon Web Services), cloud

I. INTRODUCTION

Cloud computing is a new and fast-growing area of development in healthcare [2]. It aims to improve the diagnosis of diseases and their causes, quality of medical supplies, medical treatment, and to set up prevention plans on a global scale.

Cloud computing is a ubiquitous innovative paradigm that provides users with on-demand access to a shared pool of configurable computing resources such as servers, storage, and applications with a pay-per-use model provides a new way of delivering, developing, and using services [3,6]. Researchers state that IT (Information Technology) services delivered via the cloud computing paradigms (i.e., cloud computing services) provide considerable advantages for health care [3].

Nowadays doctors are using mobile applications with the cloud computing system to reduce response time to save and treat patients' lives and provide them the best professional healthcare services. Patients can apply for operations or consulting services from their mobiles which can help them in having saved their time to find the nearest medical center or specialist in any emergency case. They can also review the data, find nearby specialist or medical centres, book appointments, and conduct medical counsel. They can use their data wherever they are, regardless of location and time, and allow doctors to often contact their patients and communicate through the phone applications using cloud computing by exchange of messages and photos for the accident or emergency. Cloud computing enables the doctors to share and analyse patient data.

IoT (internet of things) [4], Big data [6], block chain [5], mobile applications with integration to cloud are nowadays used in the healthcare industry. There are many cloud service providers which have now appeared into the market to offer their services such as Amazon web services, Google, Microsoft and many more [8].

II. AWS (AMAZON WEB SERVICES)

AWS is an example of IaaS i.e., infrastructure as a service which provides people the necessary computing environment, including CPUs, storage, memory (RAM), networking, and operating system through the internet[7]. IaaS is sought after by computational biologists as it offers more flexibility for astute projects ad hoc[7].

Amazon EC2(Elastic Cloud Compute), S3(simple storage solution), SQS (Simple Queue Service),RDS (Relational Database Service),ELB(Elastic Load Balancer) SageMaker, DeepLens, Cloud Formation, Directory Service, Virtual Private Cloud (VPC), Route 53, Simple Notification Service, and Data Pipeline. are some of the services offered by Amazon Web Services which are used in the healthcare industry to deploy healthcare solutions [1,9]. These services combined with other services are used to create different prototypes and software for the healthcare systems. Some of them are discussed below.

III. WEB SERVICES USED IN HEALTHCARE WEBSITES AND/OR WEB APPLICATIONS

Amazon EC2(Elastic Compute Cloud) is a compute service. It provides secure and resizable compute ability within the cloud. It is an internet service interface which allows you to get and configure ability with minimal friction. It offers wide-ranging and huge compute platform with choice of processor, storage, networking, OS, and purchase model. Amazon EC2 virtual images allows you to use web service interfaces to instigate instances with a variety of operating systems, bundle them with your custom application environment, manage your network access assent, and run your image using as few or as many systems as you wish.
Implementation: Servers for web application [8].

Fig. Amazon EC2 Logo

Image reference: https://www.instana.com/supported-technologies/aws-ec2-monitoring/

Amazon S3 (Simple Storage Service) is an object storage service. It offers industry-leading scalability, security, data availability, and performance. It means that customers of assorted sizes and industries can use it to store and protect any amount of data for a range of use cases such as mobile applications, backup, websites& restore, archive, IoT devices, data lakes, enterprise applications, and big data analytics. Here data is stored as object in resources called buckets and the size of the object could be up to 5TB and can be accessed directly through the bucket hostname or through S3 Access Points.
Implementation: Storage of patient data (which is acquired from lab records or are the general medical records of the patient from the past consulting)[8]

Fig. Amazon S3 Logo

Image reference:https://www.cloudsavvyit.com/577/how-to-sync-files-from-linux-to-amazon-s3/

Amazon SQS (Simple Queue Service) is a fully supervised message queuing service.It enables you to decouple and scale distributed systems, serverless applications and microservices. Itends the intricacy and charges related to control and operating message-oriented middleware, and entitles developers to concentrate on differentiating work.[10]

Fig. Amazon SQS Logo

Image reference:*https://www.mparticle.com/integration/amazon-sqs*

Amazon Elastic Load Balancing (ELB) is a load balancing service which helps in distributing load or traffic to different servers or EC2 instances. It can also detect unhealthy instances and not distribute any load to it to prevent disruption of connection [8].
Implementation: Takes distinct types of traffic for different instances and distributes them.

Fig. Amazon ELB Logo
Image reference: https://pedalsup.com/amazon-elb/

Auto Scaling is a service which enables automatic scaling of EC2 capacity according to user-defined conditions[8]. Implementation: Used to ensure quality of performance [8].

Other services which are used in research purposes are related to machine learning (in AWS, GCP and Azure) such as: Amazon Lex, Amazon EBS (Elastic Block Storage) Amazon Rekognition, Azure Machine Learning (Azure ML) Services,Google Cloud AutoML, Google Cloud Machine Learning Engine, etc; to run test cases based on the given data and process information in huge sets of data fast and accurately in decision-making, forecasting and treatment of diseases.

By using these services, we can get insights as to make proper decisions in the future, to predict possible risks and threats before they appear, it makes analysing and working with huge data sets easier, it can reduce the number of medical errors significantly, its cost effective and the sharing of information is made easier, they are easy to scale, the sharing of data is made easier and simpler, the cost is reducing as the cloud works on the pay-as-you-go model and it is flexible.

However, there are some drawbacks of this as well: not many companies work with this innovative technology (i.e., with cloud technology and healthcare combined) [2]; there is limited functionality as they require devices, artificial intelligence and there might be security related issues due to unprofessional software providers, there is a lack of control by the organization as it will be monitored and managed by service provider.

IV. SECURITY IN CLOUD

*Restricted user accounts:*Amazon IAM (Identity and Access Management) is a service offering control and management of multiple users. The permissions and credentials granted to the various users in healthcare would be different and there would be no need of exchanging the credentials into distinct groups hence restricting access to various information to various users.[7]

Fig. AWS IAM Logo
Image reference: https://www.cloudsavvyit.com/3019/iam-users-vs-iam-roles-which-one-should-you-use/

Accessing Instance Using Secure Connection: For security of data and encryption of data transfers, it is essential that access to an instance is via a secure protocol such as Secure Shell (SSH) or Secure Copy (SCP). AWS console provides a simple interface to generate key pairs when launching an instance. The public key is automatically installed onto an instance, and the private key can be used on a computer that will SSH into that instance.[7]

*Control Access Using Firewalls:*AWS has security group that defineset of rules that govern how traffic (data or communication) reaches the AWS instance. By default, the security group allows all outbound traffic, restricts all inbound traffic, and allows other instances within the group to communicate. These rules are completely customizable.

V. CONCLUSION

Cloud computing and health monitoring is increasingly being employed together because the healthcare apparatuses are giving proper monitoring and collection of patient health record is being transferred and picked up using cloud computing services like PaaS (Platform as a Service), SaaS (Software as a Service)and IaaS (Infrastructure as a service). Nonetheless, there's a disharmony betwixt the actual phenomenon in practiceand our conceptual understanding of cloud computing for health care many a times. Cloud health care services can supply variety of the central standardized data componentsneeded for self-regulating clinical trial matching. Investigators consider cloud computing should follow a process of categorizing cloud costs, assessing technical resources, and making project decisions that balance scientific, technical, and cloud expertise with their research needs.

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