AMAZON WEB SERVICES

TECHNOLOGY EXPLORATION

ASSIGNMENT

Submitted By:
Anusha Kalra (120224184)
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EXECUTIVE SUMMARY

Cloud Computing has evolved as one the most important development in the field of IT. Over the past few years a fundamental change has been induced within the IT services in a way how they are being invented, updated, paid for and maintained. Till 2005, more than a decade Amazon itself had spent millions of dollars to manage large-scale, efficient IT infrastructure to power their largest online retail platform. With the launch of Amazon Web Services or AWS Amazon targeted to provide assistance to other organizations from their experience and convince them to invest in large-scale, transactional IT infrastructure. AWS made it easier to request storage, compute power and other services in minimal time and provide the flexibility to pick up any development platform or programming model in accordance with problems to be solved. With the span of time AWS became the most cost-effective way for organizations to deliver applications allowing them to cut their huge investment costs on IT infrastructure, asking them to pay only for what they used. The paper discusses more insights about AWS which helped in the development and adoption of this technology by the organizations and services provided by it.

INTRODUCTION

Over the past decade the businesses have undergone major ground-breaking changes challenging the organization's IT infrastructure and conventional business architecture applications. The organizations have merely shifted from a desktop-centric installation to client/server based solutions and now moving to web services and service-oriented architectures(Sujarwo, 2010). AWS or Amazon Web Services commonly termed as cloud computing service has been supporting the organizations by providing IT infrastructure in the form of web services. These web services provide organizations an alternative solution to their high cost capital infrastructure expenses with low costs and provide support in the scalability of the business. AWS has emerged as an advanced model for offering on-demand delivery of IT resources and applications via Internet that charges cost according to the usage. It provides a wide range of cloud-based products and does not require organizations to spend huge amounts of money and time on hardware investment. These services have

the ability to turn hundreds and thousands of servers instantaneously and deliver results at a faster pace. It allows saving data in a remote database and fetching it on-demand via Internet. This allows the users to work remotely and work from anywhere in the world. AWS is merely an advanced service that has been used by varied organizations from big to small scale organizations, government and non-profit organizations and individual consumers and have immensely benefitted from it (Ranger, 2018). To be able to completely utilize the potential of cloud service it is crucial to understand the type deployment that best fits the user needs. Cloud can be deployed majorly in three ways namely public cloud which are owned and operated by third-party service provider and deliver services like storage, servers over the internet. Second is private cloud, these are exclusively used by organizations or individual businesses to deliver services which are operated and maintained in a private network (Azure, n.d.). Lastly comes the hybrid cloud which combines the features of both the private and public cloud and allows application and data services to be shared between them(Azure, n.d.). With the growing demand for cloud computing numerous models and deployment strategies have evolved to meet the specific requirements and needs of the users (Web Services, 2021). Different types of cloud service and deployment methods offer varied levels of controls, flexibility and management that help organizations decide which model to use as per their requirements.

CLOUD COMPUTING MODELS

1) INFRASTRUCTURE AS A SERVICE (IaaS)
IaaS often regarded as Hardware as a Service (HaaS) is a comprehensive model that provides immeasurable storage and computing power to its large scale developers without the need of onsite hardware(Sowmya, Deepika and Naren, 2014). It is originally a foundation for cloud computing services, provides a high level of flexibility and management that deals with virtual machines, servers, networks, load balancers and supply these IT resources on demand (Sowmya, Deepika and Naren, 2014).

2) PLATFORM AS A SERVICE (PaaS)
PaaS a computing platform that mitigates the need for organizations to control the underlying resources like operating systems, programming language, and database which allows focusing on the deployment and management of applications thus casting off the

need to buy hardware and software with hosting capabilities, hence reducing the overall cost (Sowmya, Deepika and Naren, 2014) (Web Services, 2021).

3) SOFTWARE AS A SERVICE (SaaS)

SaaS is a third party service provider that offers and manages a complete product primarily referred as end-users applications(Sowmya, Deepika and Naren, 2014). The users don't have to worry about the maintenance and the management of the software all that is required to be done is how the software will be used. The most common example is web based email which is used to send and receive mails every day without any difficulty or stress involved in managing the email servers or including new additions in them (Web Services, 2021).

AWS SERVICE CATEGORIES

AWS offers over 165 services organized into service categories .These services are designed to allow the businesses to move at a faster pace, reduce the IT costs and help in the scalability of the business. Depending on the need these services can be combined to form a custom solution which meets the business requirements. This paper further discusses about four categories of AWS in more detail.

CATEGORY 1: AWS ANALYTICS

The era of analytics has enabled organizations to add value by allowing management to take better decisions. The amount of data being generated is expanding at an enormous level and the analysis and maintenance of this data has become a challenge for many organizations. One of the biggest advantage of big data analytics is it allows pay-as-you-go-model which allows applications to scale up or down according to the requirement(Swensson, 2014). AWS allows the users to easily resize the environment to meet the demand without any additional cost of hardware. Such a system allows the usage of the application in an optimal way. AWS analytics offers a number of cloud services to analyse the data Amazon Redshift, Amazon Elastic MapReduce, Amazon Kinesis, Amazon Dynamo DB to name a few.

AMAZON REDSHIFT

Amazon Redshift offers a petabyte –scale data warehouse service that makes it simple and cost-effective to execute high performance queries of semi-structured and structured data using the existing business intelligence(BI) tools (Services, 2021). Millions of customers use

Amazon Redshift to analyse exabytes of data on a daily basis to strengthen the analytical workload (Services, 2021).Amazon Redshift being a managed service offers automation provision for frequent administrative tasks related to provisioning, configuring, monitoring and backing up a secure data warehouse, thus make it highly feasible for easy and cost effective maintenance(Swensson, 2014).This automation enables the customer to make peta-byte scale data warehouse in few minutes unlike which would have conventionally taken months or years for onsite implementation(Swensson, 2014). Amazon Redshift ideally utilizes online analytical processing (OLAP) using the conventional BI tools. Organizations are primarily using Amazon redshift to analyse large global sales for numerous products, to analyse ad impressions and clicks, social trends and lastly to quantify clinical quality , operational efficiency and financial performance in health sector(Swensson, 2014).

AMAZON REDSHIFT PERFORMANCE

In order to obtain high performance Amazon Redshift makes use of creative innovations on datasets ranging from hundreds of gigabytes to petabyte and even more(Services, 2021). Amazon Redshift attains exceptionally quick query execution by implementing the performance features named Massively Parallel Processing (MPP) that enables quick execution of complex queries on large amount of data by parallelly distributing workload across various nodes while at the same time reading from multiple files (Services, 2021). Second feature supported by Amazon Redshift is columnar data storage that radically lowers the input-output requirements and plays a crucial role in optimizing query performance. One of the best advantages offered in columnar data storage is that it stores data in a columnar fashion which reduces number of disk I/O requests and amount of data needed to load from a disk (Services, 2021). This structure or arrangement of data in the database allows to process out large subset of data blocks. Other features supported by Amazon Redshift are data compression that reduces storage requirements which lowers disk I/O, thereby improving performance (Services, 2021).

CATEGORY 2: AWS COST MANAGEMENT

As the customers migrate their data workloads to AWS, it increases the utilization of the numerous AWS services, therefore it becomes crucial to have an overall picture of the value of AWS, to be able to track and effectively manage cost and usage (Services, 2021). Cost management helps provide organizations a comprehensive business value and primarily the

first aspect the business considers when turning to cloud services(Services, 2020). Every organization has varied requirements; the cost savings are generally categorized into two main varieties firstly companies can avoid spending money on the first place , cutting down cost on data-centre related (capex) and operational expenditure on hardware , networking facilitates and up gradation(Services, 2020). In order to maximize cost saving it is crucial to build a cost optimization culture. Under the cost management service categories there are four aspects described by AWS namely AWS cost explorer, AWS Budgets, AWS cost and usage report and lastly Reserved Instance Reporting (RI).

In the AWS cost explorer, it lets the user to understand and visualize and manage cost and usage over a period of time. It possess an easy-to-use interface which makes use of charts and tabular data and makes customised reports which allows the user to keep a track on the cost(Varia and Mathew, 2014). To solve the issue of over budgeting AWS gives a provision for customizing the budgets which provides customers an alert option and he becomes vigilant when the cost or usage exceeds the budgeted amount. These alerts are mainly send to the consumer via email or Amazon Simple Notification Service(SNS)(Varia and Mathew, 2014). These budgets can be followed up monthly, quarterly or on a yearly basis and can be accessed via AWS budget dashboards or budgets API. Third category is the AWS cost and usage report which is the single location where all AWS costs and usage report can be accessed. It lists down AWS usage for each service category utilised by an account and its IAM users in hourly or daily routine items(Varia and Mathew, 2014). Lastly under the Reserved Instance (RI) reporting AWS provides numerous out of the box effective cost management solutions to manage the RI's.

CATEGORY 3: AWS STORAGE

AWS is primarily a hybrid cloud storage that provides access to virtual unlimited cloud service that provides low-cost data storage with high durability and availability(Amazon Web Services, 2016).

AMAZON S3

Amazon Simple storage service commonly named as Amazon S3 is an object storage service which offers organizations with high level scalability, data availability, security and performance (Amazon S3, 2021). Industries of all sizes, even individual customers can use it

to store and protect any amount of data for a number of use cases like websites, mobile applications, enterprise applications, IOT devices and big data analytics to name a few (Amazon S3, 2021).Amazon S3 services allow to easily manage and configure the data to be able to meet specific business, organizational requirements (Amazon S3, 2021).Amazon S3 focuses on simplicity and robustness and offers numerous advantages. Amazon S3 makes uses of fundamental containers for data storage called buckets which authorises the user to create and name a bucket which stores the data (Amazon S3, 2021). The consumer can upload as many objects he wants to the Amazon S3 buckets. Each object in the bucket can contain up to 5TB of data and can be retrieved using a unique developer assigned key. Also, AWS S3 lists down bucket policies that provide centralised access control to buckets and objects grounded on a number of conditions namely Amazon S3 operations, requesters, resources and aspects of request (Amazon S3, 2021). These policies are communicated in access policy language and allow centralised management of permissions. These permissions apply to all the bucket objects which are owned by the bucket owner account (Amazon S3, 2021).

AMAZON ELASTIC BLOCK STORAGE

Amazon Elastic Block Storage or EBS offers high-performance, block storage services made to use simultaneously with the Amazon Elastic Compute Cloud (EC2) to allow throughput and transaction exhaustive workloads at any scale (Amazon Elastic Block Store (Amazon EBS), 2021). EBS provides block-level storage volumes along with EC2 instances which can be mounted as devices on these instances (Amazon EBS), 2021. Here EBS volume is a block level storage device which can be connected to an instance and can be used for primary storage of data that needs periodic updates (Guide, 2012). EBS allows the consumer to dynamically alter the configuration of a volume attached to the instance (Amazon EBS), 2021).Moreover, these EBS volumes are primarily used to store file systems, databases or any application that requires access to raw, unformatted and block level storage and can rely on random long reads and writes (Amazon EBS), 2021).Amazon EBS is commended for data that can be easily accessed and need long lasting persistence and allow live configuration updates while in production (Guide, 2012).

CATEGORY 4: AWS COMPUTE SERVICES

AMAZON EC2

Amazon Elastic cloud compute or EC2 is a web service which holds cloud computing capacity which is secure and resizable, mainly designed for developers to make web-scale computing efficient and easy (Varia and Mathew, 2014). EC2 offers the customer to procure and configure capacity with minimum difficulty and provides a complete control over the computing resources (Varia and Mathew, 2014).It enables the user to make as many virtual serves as required and boot new server instances which are commonly called as EC2 instances in few minutes and allow the user to increase or decrease the server number as per the business requirement (Varia and Mathew, 2014). This gives users the flexibility to pay only for what they are actually utilizing. It provides failure resistant applications to developed by the system administrators and developers.

 EC2 offers three types of instances namely on-demand instances, reserved instances and spot instances. On-demand instances do not have long term commitments and asks the customer to pay for the computing capacity price on an hourly basis for the instances being used (Varia and Mathew, 2014). This prevents the organizations or individual businesses from investing in complex hardware systems and allows variability with the cost depending on the usage (Varia and Mathew, 2014). On the other hand reserved instances are much cheaper than on-demand instances and offer a remarkable concession of approximately 75% as compared to on-demand instances and offers flexibility to replace families, operating systems and at the same time get benefited from reserved instance pricing (Varia and Mathew, 2014). Lastly spot instances is an unutilized EC2 instance and offers a 90% comcession on the computing pricing as compared to the on-demand instance(Varia and Mathew, 2014). It lets the coustomer get benefit from the unused EC2 capacity in AWS cloud and allow him to launch instance immediately if the spot request is active and capacity is available(Spot Instances, 2021).In case the capacity is not available the spot request repeatedely make launch request till the capacity is made available(Spot Instances, 2021).

AWS LAMBDA

AWS Lambda is compute service that allows the user to execute the code without the need of managing servers with zero administration(Amazon AWS, no date). All that customers' needs to do is to write and upload the code to Lambda as a zip file or a container image. It executes the code on high-availability compute infrastructure and carries out the administration services which include server and operating system maintenance; security, code and security patch deployment, automatic scaling and code monitoring and logging (AWS Lambda Features, 2021). The code gets executed only when it is required and can be scaled spontaneously thus entertaining from few request per day to thousands of request per second(Amazon AWS, no date). AWS lambda allows the customer to pay only for the time when the code is running. The code that is executed on AWS Lambda is known as the Lambda function (AWS Lambda Features, 2021).As the Lambda function gets created it is always prepared to get executed as soon as it is triggered. Lambda functions are mainly termed as stateless as they have no affinity to basic infrastructure which allows it to launch instantly as many copies of the function to scale the rate of approaching events (AWS Lambda Features, 2021). Once the code is uploaded to Lambda it can be associated with specific AWS resources like Amazon Dynamo DB, Amazon S3 bucket or Amazon SNS notification, so when the resources are altered the lambda function will launch and manage the compute resources as required in order to serve the upcoming request (AWS Lambda Features, 2021).

CONCLUSION

AWS offers highly scalable and efficient cloud based solutions to support any amount of data workload. It is one of the most reliable and secure cloud computing platform nearly serving millions of customers and partners all over the world. All the services in AWS are designed to work in sync to develop sophisticated and creative applications. The pay-as-you-go model used by AWS has highly persuaded the organizations to invest in cloud services and save upon their on-premise hardware cost. This reduces or even completely eradicates the responsibilities of the staff to set up physical servers thus increasing the staff productivity and add more business value to the customers. One of the most crucial services provided by AWS is security that protects any amount of data of the customers whether

high or low importance and offer mechanisms that reduces the occurrence of software issues that could lead to outages. Data protection, flexibility, multiple storages, auto scaling, regulatory compliance are some of the benefits offered by AWS. It has made its place in almost every industry ranging from retail, manufacturing, supply chain and many more, offering them high quality services at affordable cost. The cloud computing services continues to grow at an enormous level with the coming years as the businesses become more and more digital.

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