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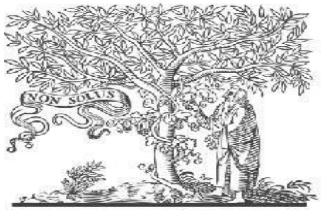

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A study on Cloud Computing

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ABSTRACT
Cloud computing or cloud services is introduced by Amazon in 2006.This is particularly suitable for city like hongkong because of large amount of data being processed in daily life in various sector. But nowadays cloud computing can easily be achieved in computer Science.it is a technique were the delivery of Computer services including server storage database, networking software in presence of internet to offer faster innovation.
Cloud computing is a lifetime dream of computing as a utility, has the capacity to convert a huge part of the IT industries by making software even more attractive as a Services and shaping hardware in design and purchased.
Cloud computing is new technology which deliver a new model for information and Services by means of existing grid-computing technology.
Server in cloud computing can be physical Machine or Virtual machine. Advanced cloud Includes other computing resources such as storage area network (SAN), network Equipment firewall and other Security device.

Keywords: -
1Aws(Amazon Web Services).
2 Microsoft Azure
3.Google cloud platform.
4.Infrastructure.
5.Azure Storage
6.Cloud backup.

1.INTRODUCTION

cloud Computing is the delivery of computing services such as servers, data storage, databases, networking, software, analytics, and intelligence over the internet ("cloud") to offer flexible resources, faster innovation, and economies of scale. In simpler terms, instead of owning data centers, organizations can rent access to someone else's infrastructure like storage, computing servers, and databases from a Cloud Computing service provider and only pay for resources that they use.

You only need to pay for the cloud services that you use, which helps lower your operating costs, run infrastructure more efficiently, and scale your applications as per business needs.

Cloud computing is on the peak of the ten most revolutionary technologies of the upcoming years[1] . It stand for the long-term dream of conjuring the image of computing as a service[2]. where the economy of scale principles help to drive the cost of computing infrastructure effectively down. Big players such as Sun Microsystems, Google, IBM, Amazon and Microsoft have initiated to establish new data centers for hosting Cloud computing applications in different locations around

the world to provide redundancy and make sure consistency due to site collapse or failure. Nowadays, cloud is the superlative elucidation for those who where looking for quick implementation techniques[3].

Cloud computing is a kind of organizational, collateral, distributed, virtual, and flexible systems that refers to provision of applications such as hardware and software in virtual data centers in presence of internet[4]. Cloud computing services are configurable and customers pay fees based on the use of resources and services [6]. Rest of the paper is structured as follows. Section 2 discusses the history of cloud computing. Section 3 explains the characteristics of cloud computing. Section 4 explains the types of clouds. In section 5, the paper give details of main cloud service models .In section 6 cloud platform Microsoft Azure . The section 7 discusses opportunities , future scope and challenges in cloud computing. Finally, the paper is concluded in section 8.

2.HISTORY OF CLOUD COMPUTING

Since the 60**s,** cloud computing has developed along a number of lines, with Web 2.0 being the most recent evolution. However, since the Internet only started to offer powerful bandwidth in the 90s. the arrival of Salesforce.com in 1999, which pioneered the concept of delivering enterprise applications via a simple website is one of the first progress in cloud computing history .The services firm paved the way for both specialist and mainstream software firms to deliver applications over the internet. The next development was Amazon Web Services (AWS) in 2002, which provided a suite of cloud-based services including storage, coma putation and even human intelligence through the Amazon Mechanical TurkThen in 2006, Amazon launched its Elastic Compute cloud (EC2) as a commercial web service that allows small companies and individuals to rent computers on which to run their own computer applications. “Amazon EC2/S3 was the first widely accessible cloud computing infrastructure service,” which provide its SaaS online video platform to UK TV stations and newspapers. In 2008 October Microsoft announced Azure and was released in February 1,2010 as ”Windows Azure” later was to renamed ”Microsoft Azure” in March 25,2014

Microsoft offer more than 600 types of Azure services. Azure datacenter is available in 60+ countries around the world. Microsoft

Has announced an additional four regions.

Microsoft Azure has customized version of Hyper-v known as the Microsoft Azure Hypervisior to provide virtualization of services. Azure has two portal :Classic Model and Azure Resource Manager(ARM)

Classic portal is retried on Jan 8 ,2018 .

After that in 2009 google play started providing cloud computing enterprise application as the other company start providing cloud services.

3.CHARACTERISTICS OF CLOUD COMPUTING

There has been much discussion in industry and academia about what cloud computing actually means [7], [8], [9]. The US National Institute of Standards and Technology (NIST) has developed a working definition that covers the commonly agreed aspects of cloud computing [10].It epitomize cloud computing as “ Cloud Computing is the on-demand availability and delivery of on-demand computing services - for applications to storage and processing power –typicallly over the internet and on a pay-as-you-go basis” In simple words ,cloud computing is renting out someones’s infrastructure or services to run your business .Microsoft Azure, Amazon Web Services, Google Cloud, Alibaba, Oracle are some of the cloud providers

Rather than owning their own infrastructure or data centers , companies can rent access to anything from applications to storage from a cloud service provider.

Examples of Cloud Computing : gmail , outlook , one drive or the backup of the

photos or content on your phone via internet.

Cloud computing has the five essential characteristics:

1) On-demand self-service.

2) Broad network access.

3) Resource pooling.

4) Rapid elasticity.

5) Measured Service

Cloud computing is be known distributed computing pattern that promises to offer worthwhile extensible on demand services to users, without the need for large in advance infrastructure expenditure[11]. One of the main reasons for the success of cloud computing is the role it has played in eliminating the size of an enterprise as a critical factor in its economic success. An excellent example of this change is the notion of data centers which eliminate the need for small companies to make a large capital expenditure in building an infrastructure to create a global customer base [12].

4 .TYPES OF CLOUD COMPUTING

There are three Form of Cloud computing

1) Public Cloud
2) Private Cloud
3) Hybrid Cloud

According to the recent study conducted by the KPMG [13] found that 81% of businesses were either estimating cloud services, planned a cloud implementation or had already implemented a cloud strategy. Businesses can choose to deploy applications on Public, Private, Hybrid clouds or the newer Community Cloud.

A) Public Cloud : Cloud Computing are owned and operated by third party cloud service providers which deliver their computing resources like servers and storage over the internet . Microsoft Azure is an example of public cloud. You can access these services and manage your account using web browser and internet. public clouds are owned and operated by companies that use them to offer rapid access to affordable computing resources to other organizations or individuals .In public cloud user don't need to purchase software, hardware or supporting infrastructure ,which is owned and manage by the provider. Public

Cloud is available for general public by service provider who manage the cloud infrastructure, Examples of public clouds include Amazon Elastic Compute Cloud (EC2), IBM's Blue Cloud, Sun Cloud, Google AppEngine and Windows Azure Services Platform. A public cloud is the obvious choice when:

- Your standardized workload for applications is used by lots of people, such as e-mail.
- You need to test and develop application code.
- You need incremental capacity.
- You're doing collaboration projects.

B) Private Cloud : Private cloud refer to the cloud computing resources used by a single business or organization .It can be physically located on company's on-site datacenter it provides flexibility,scalability, provisioning, automation and monitoring. The goal of a private cloud to gain the benefits of cloud architecture without giving up the control of maintaining your own data center. Private clouds are more expensive but also more secure when compared to public clouds. Private cloud requires the following criteria

- You need data sovereignty but want cloud efficiencies.
- You want consistency across services.
- Your data center must become more efficient.
- You want to provide private cloud

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services.

C) Hybrid Cloud : Hybrid cloud combines public clouds and private clouds bound together by technology that allows data and application be shared between them. In a hybrid cloud, you can control third party cloud providers in either a full or partial manner; increasing the flexibility of computing. For instance during peak periods individual applications, or portions of applications can be migrated to the Public Cloud.

Suitable environment for Hybrid cloud :

- Your company wants to use a SaaS application but is concerned about security.
- Your company offers services that are tailored for different vertical markets.
- You can provide public cloud to your customers while using a private cloud for internal IT.

D) Community Cloud : The Community cloud is designed to meet the need of community. Such communities involve people or organization that has shared interests. This includes industrial groups, research groups, standards groups, and so on. Community clouds are a hybrid form of private clouds built and operated specifically for a targeted group. These communities have similar cloud requirements and their ultimate goal is to work together to achieve their business objectives. The goal of these clouds is to have participating organizations realize the benefits of a public cloud with the added level of privacy, security, and policy compliance usually associated with a private cloud.

Situations where a community cloud is best:

- Government organizations within a state that need to share resources .
- A private HIPAA compliant cloud for a group of hospitals or clinics.
- Telco community cloud for Telco DR to meet specific FCC regulations.

5.SERVICES OF CLOUD COMPUTING

Nowadays Cloud computing has become a well-known buzzword .Cloud services are infrastructure ,platforms, or software that are hosted by third – party providers and made available to the users through the internet. Cloud services provide the flow to user data from front-end clients eg. Users servers, tablets,desktops,laptop-anything on the user end via internet to the service provider .Cloud computing services are used by government and companies to deal with a variety of application and infrastructure needs such as database, CRM, data storage, and compute. Cloud computing services have several common attributes like – Multi-tenancy, Elastic, Network-access, On demand, Virtualization and Metering/chargeback. Cloud Computing has many advantages in comparing to those existing conventional service providers, such as tremendous fault-tolerance capability, high availability, reduced investment, infinite scalability, probable performance and so on and therefore followed by most of the IT companies, such as Google, Microsoft, Salesforce, Amazon [14]. High -tech companies like Microsoft in software industry, Google and Amazon in Internet technology field are joining to develop cloud services [15], [16]. The most

comman cloud computing services offered internally or by third party providers are:

1) Software as a Service (SaaS).

2) Platform as a Service (PaaS).

3) Infrastructure as a Service (IaaS).

A) Software as a Service (SaaS) :

Software as a Service (SaaS) is a method of delivering software applications over the internet on demand and typically on a subscription basis. This free ourselves from maintenance of comlex hardware and software. Recent reports show that SaaS will soon become common in every organization and it is important that buyers

and users of technology understand what SaaS is and where it is required . Example of SaaS yahoo,gmail,onedive etc

characteristics of SaaS includes :

- Software delivered in a "one to many" model.
- Users not required to handle software upgrades.
- Web access to commercial software.
- Software is managed from a central location.
- APIs allow integration between pieces of software.

B) Platform as a Service (PaaS) :

It refer to the Cloud Computing services

That supply on-demand environment for developing , testing , delivering and managing software application like web application .we can also called it serverless

Computing . It can easily designed without the complexity of buying and maintaining the software and infrastructure is defined as Platform as a Service. PaaS is comparable to SaaS except that, rather than being software delivered over the web, it is a platform for the creation of software, delivered over the web. Here the service provided by the company includes basic standards of development and how user can distribute them effectively . The environment would contain an OS, a database, an environment where programming language can be executed and a web server. The Google App Engine and the Microsoft Azure is a good example of this service model.

Characteristics of PaaS

- Built in scalability of deployed software including load balancing and failover.
- Web based user interface creation tools help to create, modify, test and deploy different UI scenarios.
- Integration with web services and databases via common standards .
- Support for development team collaboration.

C) Infrastructure as a Service (IaaS) :

Infrastructure as a Service (IaaS) is a way of distributing Cloud computing infrastructure servers, storage, network and operating systems as an on-demand service. Instead of buying servers, software, datacenter space or network equipment, clients can buy those resources as a fully outsourced service on demand [17].Internet Engineering Task –Force(IETF) has defined the IaaS model to be the most basic service model. This model is related with a virtual engine [18] and users can access to infrastructures with virtual machine [19]. The line between PaaS and IaaS is becoming more blurred as vendors introduce tools as part of IaaS that help with deployment including the ability to deploy multiple types of clouds [20]. IaaS is generally accepted to comply with the following:

- Resources are distributed as a service .
- Includes multiple users on a single piece of hardware .
- Has a variable cost, utility pricing model .
- Allows for dynamic scaling.

. Big-Data-as-a-Service (BDaaS)

BDaaS provides a cloud based structure that presents endto-end big data solutions to companies. It is a combined structure of Hadoop as a Service (HDaaS), Data-as-a-Service (DaaS) and Data Analytics as a Service (DAaaS). The extensive growth of data is one of the key drivers prevailing in this space. The global Big-Data-as-a-Service (BDaaS) market is likely to grow from $1.8 billion in 2015 to $7 billion by 2020, at a CAGR of 31.5 % during the forecast period. On the basis of type of solutions, BDaaS to follow submarkets:

- Hadoop-as-a-Service (HaaS/HDaaS)
- Data-as-a-Service (DaaS)
- Data Analytics-as-a-Service (DAaaS)

E. Hadoop-as-a-Service (HaaS)

Hadoop is a keystone technology for many big data projects and applications. This is a data storage processing system that enables data

storage, file sharing, data analytics etc. With growing of social media and Internet communication, Hadoop is being largely used by companies ranging from Facebook to Yahoo. According to Research and Markets, the Hadoop-as-a-service market will grow approximately by 85% year by year from 2014 to 2019. HaaS has emerged as a replacement to On-premises Hadoop. The following points help distinguish the variety of HaaS options.

- Data Scientists and Data Center Administrators needs must be satisfied
- HaaS Should Store "Data at Rest" in HDFS
- HaaS Should Provide Elasticity
- HaaS Should Support Non-stop Operations
- HaaS Should Be Self-Configuring

HaaS companies offer a "fully baked" version of Hadoop. It is usually their own version of Hadoop that follows closely to the original Apache Hadoop version. Following is a list of benefits of HaaS.

- Managed Hadoop – No need to hire a system admin
- Ease of use – Built to get started quickly
- No hardware/infrastructure – Just add/remove servers as you need it
- Support – Each company has a team of Hadoop experts to help when needed

6. CLOUD COMPUTING PLATFORM MICROSOFT AZURE

Microsoft Azure storage is a Microsoft manage cloud storage service, that provides highly available ,durable, scalable, and redundant storage , at a fraction of cost. It is a service to store files ,messages ,tables, and other types of information .Azure storage also used for Virtual Machines which included disks and files.

Azure Storage is generally used in Three categories :

1) Storage for Virtual Machine (like disks and files)
2) Unstructured data (like blobs and datalake stores)
3) Structured data(like tables , azure SQL Db and cosmos DB)

A) Azure provides the storage services with the help of storage account .There are 4 types of storage uses .

1) Blobs : Azure Blob Storage is a Microsoft object's Storage solution of cloud . Blob storage is optimized for storing massive amount of unstructured data such as text or Binary data. Blob storage is ideal for Server images or document directly to a browser, Storing files for distributed access, Streaming videos and audios , Storing data for backup and restore,disaster recovery and archiving, Storing data analysis by an on-premises or Azure hosted service.
2) Files : Azure File enables you to set up highky available networks files shares that can be accessed by using the Standard Server Message Block (SMB) protocol from anywhere in the world. That means that multiple VMs can share the same files with both read and write access .Use case for this if you want to migrate the application or the data into azure.
3) Tables

   Allow you to store structured NoSQL data in the cloud, providing a key/attribute store with a schema less design.
4) Queues

   The Azure Queue services is used to store and retrieve messages. Queue message can be up to 64 KB in size, and a queues can contain millions of messages queues are generally used to store lists of message to be processed asynchronously.

B) Azure Virtual Networks :

An Azure Virtual Network (VNet) is a representation of your own networks in the cloud . it is a logical isolation of the Azure cloud dedicated to your subscription . Vnet enables many types of Azure resources , such as Azure Virtual Machines (VM), to securely communicate with each other , the

internet , and on-premises networks . VNet is similar to a traditional network that you 'd operate in your own data center , but brings with it additional benefits of Azure's infrastructure such as scale , availability and isolation.

C) Azure Network Security :

You can use Azure network securing group to filter network traffic to and from Azure resources in an Azure virtual network . A network security group contains security rules that allows or deny inbound network traffic to , or outbound network traffic from ,

Several types of Azure resources . For each rule , you can specify source and destination ,port and protocol.

You can apply NSG to subnet other network interface. ASG provide a mechanism to simplify networking rules of your virtual machines by logically grouping them rather than managing them using explicit IP addresses and subnets.

D) Azure Load Balancer :

An Azure load balancer is a layer-4 (TCP , UDP) load balancer that provides high availability by distributing incoming traffic among healthy VMs . A load balancer health probe monitors a given port on each VM and only distributes traffic to an operational VM. By default load balancer user 5-tuple hash algorithm which consists of Source IP address, Source port , Destination IP , Destination port , IP protocol .

Configuration required in load balancer

- Load balancing rules :

  You can define the rules like what ports 80 or 443 on which the request will come.

- Health Probes:

  Health probes are used to detect failure of an application on the port 80 or 443 or any other port on which the application is communicating

- Frontend IP Address:

  Front IP is must be configure to access the application as the application address the request will be directly come into the frontend IP rather than VMs.

  This can be public IP or Private IP.

- Backend Pool :

  It defines the set of virtual machines on which the application is running and to define where the traffic should route. As per rules defined in load balancer.

- Inbound NAT Rule:

  It is used for forward traffic from a specific port of the frontend IP address to specific port of backend VM.

  Run Command :

  The run commands features uses the virtual machines (VM) agent to run powershell scripts within an azure windows VM.

  You can use these scripts for general machine or application management . run commands can run scripts on your virtual machines remotely by using VM agent. Its one of the only way to troubleshoot and remediate a virtual machine that doesn't have the RDP or SSH code open because of improper networks or administrative user configuration

  Following restrictions apply when you are using run command.

- Output is limited to last 4,096

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bytes (4kb).

- Scripts run as a system on windows.
- One scripts at a time can run.
- You can't cancel a running scripts.
- The maximum time scripts can run is 90 min after that it will timeout.
- Outbound connectivity (port 443) from the VM is require to run the results of the scripts.

E) Application of Microsoft Azure in big data:

Microsoft Azure is widely used in big data applications. It provides services like Azure Data Lake Storage and Azure HDInsight, which allow businesses to store and process large volumes of data. With Azure's scalable infrastructure and powerful analytics tools, organizations can gain valuable insights from their data and make data-driven decisions. It's a great platform for handling the challenges of big data.

7. SCOPE OF CLOUD COMPUTING .

Cloud computing has a bright future ahead! It's becoming increasingly popular due to its scalability, cost-effectiveness, and flexibility. As technology advances, more businesses will adopt cloud solutions for their IT infrastructure and application needs. With the continuous growth of data and the demand for faster processing, cloud computing will play a crucial role in enabling innovation and driving digital transformation. So, the future looks promising for cloud computing!

a) Applications of Cloud Computing :

Cloud computing has a wide range of applications! It's used for hosting websites, storing and analyzing big data, running virtual machines, and developing and deploying applications. It's also utilized in areas like artificial intelligence, Internet of Things, and machine learning. The flexibility and scalability of cloud computing make it suitable for various industries, including healthcare, finance, and e-commerce. It's revolutionizing the way businesses operate and enabling new possibilities in the digital world.

b) Challenges of Cloud Computing :

One of the challenges of cloud computing is ensuring data security and privacy. It's important to protect sensitive information and prevent unauthorized access. However, cloud service providers like Microsoft Azure have robust security measures in place to address these concerns. By implementing encryption, access controls, and regular security audits, they strive to maintain the integrity and confidentiality of data stored in the cloud.

c) Opportunities of Cloud Computing :

Cloud computing offers numerous opportunities for businesses and individuals alike! It provides the ability to easily scale resources, access data and applications from anywhere, and reduce IT infrastructure costs. With cloud computing, businesses can innovate faster, improve collaboration, and enhance their agility in a rapidly changing digital landscape. It also opens up possibilities for new services and business models, empowering organizations to focus on their core competencies and drive growth. Overall, cloud computing presents exciting opportunities for efficiency, innovation, and success.

8. CONCLUSION .

In conclusion, cloud computing is a game-changer in the digital world. It offers scalability, cost-effectiveness, and flexibility, making it a valuable asset for businesses. With its wide range of applications and the ability to handle big

data, cloud computing is paving the way for innovation and digital transformation. However, it's important to address challenges such as data security and privacy. Overall, cloud computing presents exciting opportunities for businesses to thrive and succeed in today's technology-driven landscape.

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