Services of the Cloud Providers Giants

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ABSTRACT-In coronavirus days' cloud services are added with water, gas, electricity and telephony for stay at home strategies. Which is leads to necessity for digitizing our world after Corona virus. There are variety cloud service providers like AWS from Amazon, Azure of Microsoft and many other biggest technology company, that gives infrastructure, computing platform, server-less computing or software as service. This article demonstrates the main features of famous cloud services providers. The tabulated features for comparing and easier selecting of a specified cloud provider as customer needed.

Keywords: Cloud Computing, Network, AWS, Azure, Google.

1. INTRODUCTION

Increased population growth and the consequent explosion in commercial, health and storage services, have pushed many institutions and people quickly towards clouds, especially in light of the spread of coronaviruses. Not only institutions but individuals as well, where massive amounts of data are handled in their various forms to anyone, anywhere. It provides efficient, easy and affordable solutions for managing huge information. Currently the major informatics players such as IBM, Microsoft, Google and Amazon are provide development of many cloud services[1]. National Institute of Standards and Technology (NIST) define cloud computing as (a model for permitting convenient, on-demand network access to a shared group of configurable computing resources like servers, applications, storage, networks and services, that can be hurriedly provided and released with management or service-provider)[2][3][4]. By using parallel progress, distributed and grid computing with combination of virtualization [3]. All resources in the cloud can transparent to the clients, renting and using without having to understand where it is and how it is [5]. Currently many service models are differentiated as: Software as a Service(SaaS), Platform as a Service(PaaS), Infrastructure as a Service(IaaS) [5][6] and more recently added Function as a Service(FaaS)[1]. Some authors considers other models Data as a Service, Service as a-Service or Storage as a Service[7][8]. These models are depending on their particular needs:

1.1 Cloud Services Types

Cloud computing can be divided into four service models:

1– Infrastructure as a Service(SaaS):

It is a backbone for cloud computing. Infrastructure have ability to provide processing, networks, storage and alternative essential resources for computing wherever the user position to run subjective software which incorporates operative applications and operating systems. It offers platform virtualization surroundings as a service. IaaS cast off the want for administration and upkeep of hardware, IaaS provides:

1. Image library
2. Virtual local area network(VLANs)
3. Software bundles
4. IP addresses
5. Virtual Machine disk storage(VM)
6. Load balancers, etc.

2– Platform as a Service (PaaS):

It provides an applications deployment by dropping the complexity, cost of import and bless hardware, software and commissariat hosting capabilities [3]. Additionally, PaaS gives application administrations, like, team coordinated effort, marshaling and of web

service, database integration, storage, scalability, insistence, instruments for apps with network facilitation for developers. The PaaS characteristics are:

1. Permits the designer to generate database and alter the application code either by means of point-and-snap or application programming interface, with tutorials for easy learning.
2. Offers comprehensive tools to identify workflow, approval procedures, with identify business laws.
3. Provides a web services interfaces that enable joining the apps out the platform.
4. Simple to integrate with many applications on platform.

3– Software as a Service(SaaS):

It is a way to provide client the required software via Internet, as it hosts cloud service providers to manage programs and basic infrastructure, in addition to maintenance tasks such as software upgrades with security. Large SaaS organizations got $113.1 billion in 2021 year. There are various SaaS applications, some examples are:

1. Customer Relationship Management (CRM)[9].
2. Billing and Invoicing scheme.
3. Help Desk Applications
4. Human Resource Solutions.
5. Enterprise Resource Planning System(ERP),, etc.

4– **Function as a Service (FaaS):**

Or server-less work environment[1]. FaaS based on building application functions without costing time to manage servers with the lack of infrastructure necessary to do that. It provide manages configuration, server administration and capacity preparation. Their architecture is exceedingly scalable with occasion driven, sources use only when a particular feature or set off happens.

1.2 Cloud Deployment Models

There are four related categories of cloud providers that should be of interest to users [4][5][6][7]:

1-Public cloud:

It is worked by a cloud supplier that is accessible for public utilization. This multi-renter cloud serves an assortment of clients and typically achieve the greatest flexibility of scale and efficiency, such as: Amazon Web Server (AWS), Google Apple Engine, Microsoft Azure, IBM's Blue Cloud, etc. All materials of software, hardware, and other supporting scheme cab be used ordered in a public type [7].

2-Private Cloud:

Their resources completely and solely either by an organization or a single business client. By physically set on the scene information center of the corporate, greatly secure and managed with elevated reliability. Patrons have no information or influence over the position of the infrastructure. like: Hewlett Packard Enterprise (HPE), VMware, Dell's EMC, etc.

3-Hybrid Cloud:

By mixing two or more models (public, private or community), their implementation allows applications and data to be joint among them. It makes the business more versatile, provides a wide range of deployment tool and helps automate existing infrastructure, compliance and scalable security by permitting applications and data to emigrate between public and private clouds.

4- Community Cloud:

It is a multi-occupant cloud administration model that is shared between a few clients or organizations with commonly secured by all the associated organizations or a provider that managed the service. It has a hybrid style of private clouds designed and worked for a target cluster. Such groups have common cloud needs

and their ultimate purpose is to operate together to attain their goals.

1.3 The Cloud Architecture

For a century, cloud computing is one of the quickest developing, and conceivably most disruptive information technology (IT) developments for an age. The concrete view of the architecture is shown in Figure 1.

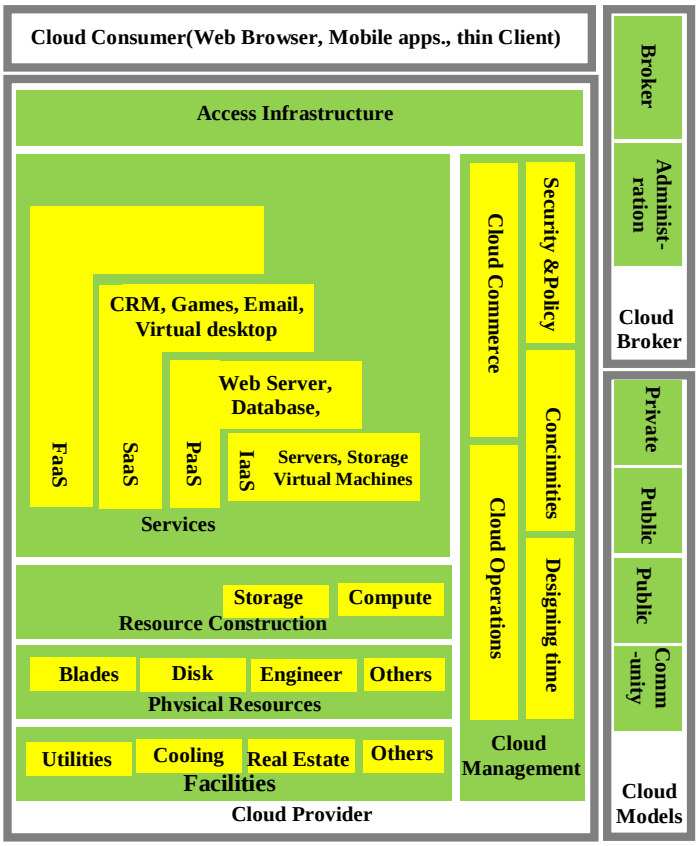

Figure 1: Cloud Concept Diagram

2-GIANTS CLOUD PROVIDERS SERVICES

Recently, the cloud has become more mature and all vendors are competing on the succeed in attracting customers and capturing the market.

2-1 Amazon Web Services (AWS):

Currently AWS supporting more than 245 countries and now have more than 150 million paid members around the world as amazon.com announces. Individual subscription, organization can acquire amazon web in the style of on-request resources based on the pay as you go approach for pricing [11]. It is providing a highly scalable, flexible and cheap process to deliver their applications. AWS provides a seamless migration route to move enterprises virtual machines to the public cloud and vice versa when needed [6]. In virtual mode, client can get merits as if they have quality PC hardware, with Amazon backup system. AWS services cost depend on the mishmash of diverse options like operating system, tools, designing program, establishing merits selected via the sponsor, and required security [11]. AWS always adding a new skills for leveraging the latest technologies to more quickly test and innovate[12][13].

2-2 Microsoft Azure Cloud

Microsoft's investments supplied to more than 10,000 partners and 350,000 professionals. As announced in news.microsoft.com totaling in 61 regions, and available in over 140 countries. Originally Microsoft Azure started as a project called "Red Dog"[14]. It is built upon windows server, virtual machines can be migrated to the public cloud. With Virtual Hard Disks for creating custom image[6]. Microsoft Azure has given the ability for applications owners to use their products online with an unlimited set of resources without prior investment and with limited operating expenses[11]. It have virtual networks(VNets) for addressing spaces, subnets and linked to corporate network utilizing VPN[15]. With connecting different machines in various form (private, public and hybrid infrastructure). New Azure Stack Hub modernizes will simplify cloud, manage resource with enable hastened machine learning procedures, virtual desktop structure and other graphics-heavy situations with GPUs [16].

2-3 Google Cloud

Google Cloud (GCP) is a leading provider of cloud resources for organizing and working containerized requests. It continues to grow rapidly: recently available in 200 countries and

territories as noted in cloud.google.com, and is moving to serve its 200 million users. Through google platform, the customer can achieve numerous clod administrative jobs easily, such as information amassing, imagining of information, testing data, end-user services like Google search, YouTube, and machine learning [11]. In addition to Google Docs, Google Talk, Gmail, and Calendar [17]. Dealing mainly with distributed computing management, just hiring G Suite, Chrome OS, industry editions of Android and, with Application Programming Interfaces (APIs[16]) remarked at Artificial intelligence (AI) and activity arranging management [18]. Premium video conferencing with Google Meet, real-time collaboration and manage content with Google Docs, Slides, Sheets, and Drive, with grade reliability and security. Recently, added more online set of courses to people for deeper training looking and skills in an evolving discipline of cloud computing.

2-4 IBM Clouds

It was started since 1911 with the American multinational technology company headquartered in Armonk, New York as the Computing-Tabulating Recording Company (CTR) and was changed the name to International Business Machines(IBM) in 1924. IBM technologists were started with a system called "Blue Cloud" [19]. IBM provides a cloud migration services to migrate effort load from a source leveraging a hybrid clouds, by using automated facilities to stream line migration [6]. IBM offers a variety mapping keys to diverse industries containing Electronics, Automotive, Banking and Retail. Which are enabled by cognitive abilities that added by the Watson platform and vendor’s information adaptable with various businesses[20]. Newly, it provides open healthcare industry, secure and companies environment to support workloads.

It is hard to choose the best cloud service provider, there are multiple parameters for each enterprise. Each platform has its own fortes and weaknesses. Each platform has its fortresses and weaknesses, which makes it suitable for different types of products. There are very wide uses for customers' needs. In the table 1, the important features provided by major cloud service providers are listed.

Cloud technologies continue to advance for enterprises Technologists have faced a new set of challenges since 2019, namely:

- Stay-at-home orders as a result of the Covid-19 pandemic and the need of remotely work led to a move towards cloud computing services such as videoconferencing. It has become a digital change engine and business continuity tool [36]. Stay-at-home working and learning jobs were broadly done on cloud infrastructure, and their apparatus such as G suite coupled Google Meet, Zoom and Microsoft team became cogs in the companies' wider cloud ecosystem [37][38].
- Internet of Thing, Artificial intelligence, edge computing and analytics will be the distinguishing factors between the best cloud service providers, as well as server-less managed services [39][40][41]. Ability of AWS to drive sales of IoT, AI, and analytics will be critical. Azure of Microsoft is also looking forward differentiate through AI and machine learning. And Google Platform has grabbed the market to its knowledge of machine learning.
- The use of multiple withdrawals is a selling point and target for giant service providers. Where their applications need abstraction in order to transfer them between clouds, multiple clouds can be connected as in VMware or Red Hat[42].
- The win is around data acquisition. Increasing corporate data that resides in a cloud makes the customer more committed to the vendor. The cloud computing vendors are pitching originalities on spending their platforms to house data for everything[43].

TABLE 1: FOUR CLOUD PROVIDERS' FEATURES COMPARISON

Cloud	Amazon	Microsoft	Google	IBM
Name(Year)	AWS (2006)	Azure (2008)	GCP (2008)	2013
Services	[PaaS and IaaS]	[IaaS, PaaS and SaaS]	[IaaS, PaaS and FaaS]	[IaaS, PaaS and SaaS]
Operating Systems[21]	Linux: –SUSE Linux Enterprise Server (SLES) 12 – Red Hat Enterprise Linux (RHEL) 7.0 - 7.4, 6.5 - 6.9 – Amazon Linux 2015.03 - 2018.03, 2012.03 - 2017.03 – CentOS 7.1, 6.5and later – Raspbian Jessie – Raspbian Stretch – Ubuntu Server 18.04, 16.04, 14.04 Windows: –Windows Server 2016 including R2 Versions. – Windows Server 2012 – Windows Server 2008	Linux: –SUSE Linux Enterprise Server 11 (x86/x64), 12 (x64) – CentOS 6 (x86/x64), 7 (x64) – Red Hat Enterprise6(x86/x64) and 7(x64) –Ubuntu 14.04, 16.04 (x86/x64). Windows: –System Center 2012 Windows Intune and Windows Azure – –Windows Server 2008 R2 RTM –Windows Server 2008 R2 SP1 and later –Windows Vista –Windows 7	Linux: – Centos 7, 6 – CoreOS [stable, beta, alpha] –Container-Optimized OS from Google [69-lts, stable, beta, dev] –RHEL for SAP[rhel-7-4-sap ,rhel-7-6-sap-ha]] – Red Hat Enterprise Linux (RHEL) 8, 7, 6 – Debian 9 – SUSE Enterprise Linux Server (SLES) 15, 12 – Ubuntu 19.04, 18.10, 16.04, 14.04 – SLES for SAP like [sles-12- sp4-sap, sles-12-sp3-sap, sles-12- sp2-sap, sles-12-sp1-sap and sles-15-sap] Windows: – W S 2019 for containers – Windows Server 2019, 2016, 2012 R2, 2008 R2 – Windows Server Core2019.	Linux: – CentOS 7, 6 – RedHat Enterprise 7, 6 – SUSE Linux Enterprise Server 12, 11 –Ubuntu Minimal 18.04, 16.04, 14.04 Windows: – Windows Server 2008 R2, 2012 R2, 2016R2
Supported Languages	Java, JavaScript, C++, Perl, Node.js, Python, Go, Net.Core, PHP, Ruby,,,etc.[22]	VB. NET, C#, PHP, BASIC, JAVA, Python, .NET and Node.js, etc.[23]	Java, C, C#, C++, Python, Visual Basic .NET, JavaScript, Perl, Assembly, PHP, Delphi/ object pascal, Ruby, Go, Swift, R, Shell, PowerShell, Kotlin, Node.js [24].	C/C++ , Fortran, Sell script, Java, NodeJS, Go, PHP, Swift, Python 2.7, Python 3, Ruby Sinatra, Ruby on Rails, etc.[25]
Compute	• Amazon Elastic Container Service • Amazon Elastic Kubernetes Service • Amazon [EC2 Auto Scaling, EC2, and Elastic Container Registry. • Amazon Lightsail • AWS [Elastic Beanstalk , Lambda[3] , Batch , Serverless Application Repository , Fargate , Outposts and VMware Cloud][26].	• App Services. • API Apps. • Web Apps • Azure Functions • Service Fabric • Azure Cycle cloud • Batch • Azure Dedicated Host • SAP HANA on Azure Large Instances • Azure Kubernetes Services(AKS) • Spring Cloud • Virtual Machine Scale Sets • Vmware Solution • Cloud Services • Container Instances. • Linux Virtual Machines • SQL Server on Azure Virtual	• General purpose (E2, N1, N2, N2D) machine. • Accelerator optimized (A2) machines are based on the A 100 GPU. • Memory optimized(M2) machines. • Compute optimized(C2) machines [28].	• IBM Cloud Virtual Servers • IBM Cloud Functions • IBM WebSphere® Application Server on Cloud • IBM Cloud Red Hat® OpenShift® • IBM Cloud [Kubernetes Service, Bare Metal Servers, Cloud Foundry and VMware Solutions. • IBM [Power Systems Virtual Servers on IBM Cloud, Hyper Protect Virtual Servers. • Container registry • VMware Horizon on IBM Cloud[29]

		Machines • Static Web Apps. • Windows [Virtual Desktop, Virtual Machines] [27].		
Containers	• Amazon Elastic Container Service(ECS) • Amazon [Elastic Kubernetes Service (EKS), Elastic Container Registry. • AWS App2Container and Fargate [26].	• Azure Functions • Azure Container Instances • Azure App Service • Azure Red Hat Open Shift • Azure Kubernetes Service (AKS) • Azure Spring Cloud[27].	• Google Kubernetes Engine(GKE) • Managing Docker containers into Mesopshere[30].	• IBM Cloud Kubernetes Service. • OpenShift Container Platform(OCP)[29].
Storage	• Amazon S3[1] Glacier[4] • AWS [Backup, Snow Family, and Storage Gateway]. • Amazon Elastic Block Store (EBS)[7] • Cloud Endure Disaster Recovery • Amazon Elastic File System(EFS) • Amazon FSx for Windows File Server • Amazon(S3) Simple Storage Service • Amazon FSx for Lustre [26].	• File Storage • Azure Data Explorer • Blob Storage • Azure NetApp Files • Disk Storage • Active Storage • Azure Backup • Azure Data Lake Storage • Data Box[27].	• Google Cloud Storage (GCS) • Firebase Cloud Storage • Persistent Disk • Data transfer services • File store • Suite Essentials[28].	• IBM [Cloud File Storage , Block Storage , Object Storage , Backup , and Mass Data Migration[29].
Storage Capacity Overall size: Limits[21]	• Unlimited • 5 TB per S3 object	• 500 TB per Storage Account • 200 Storage Accounts per Subscriptions	• Unlimited • 5 TB per individual object	• Unlimited • 25 GB per month of object storage (Unlimited for standard plan)
Databases	Relational DB[13] • MySQL • Amazon Neptune • PostgreSQL • Amazon ElastiCache • MariaDB • Microsoft SQL Server • Amazon Aurora • Oracle Non-Relational DB • Amazon DynamoDB[12] • Redis • MemCached • Data Warehouse/Big Data • Amazon Redshift[15] • Amazon Athena • Amazon EMR (Hadoop, Spark, • HBase, Presto, etc.) • Amazon Kinesis[8] • Amazon Elasticsearch Service • Amazon Quicksight[21]	Relational DB • Azure SQL Database • Microsoft SQL Server • Azure Database for PostgreSQL • Azure Database for MySQL • Azure Database for Maria DB Non-Relational DB • Azure Cosmos DB • Azure Table Storage • Redis Data Warehouse/Big Data • SQL Data Warehouse • HDInsight (Hadoop, Hive, Spark, Kafka, LLAP, Storm, R.) • Azure Data Factory • Azure Databricks(Spark) • Azure Stream Analytics[21]	Relational DB • Google Cloud Spanner • MySQL • PostgreSQL Non-Relational DB • Google Cloud[Datastore, Big Table] Data Warehouse/Big Data • Google Cloud [Big Query, Dataflow • Google Cloud[Dataproc (Hadoop/Spark), Datalab and oog Dataprep[21]]	Relational DB • Db2 on Cloud • PostgreSQL • MySQL Non-Relational DB • Cloud ant • MongoDB • Scylla DB • Redis • Janus Graph • etch • Elastic search Data Warehouse/Big Data • Db2 Warehouse on Cloud[29].
Total data base price/ month	• € 114.13/$ 128.13[21]	• € 142.29/$ 159.50[21]	• € 121.43/$ 138.75[21]	• € 103.04/$ 136.00[29]

Analytics	• **Amazon Kinesis** • **Amazon Managed Streaming for Apache Kafka.** • **Amazon EMR** • **Amazon(Athena, Elasticsearch Service, Redshift)** • **Amazon Cloud Search** • **Amazon QuickSight** • **Aws (Data Exchange, Glue, Data Pipeline).** • **AWZ Lake Formation[26].**	• **Azure Synapse Analytics** • **HDInsight** • **Machine Learning** • **Azure Data Lake Storage** • **Event Hubs** • **Azure Databricks** • **Data Factory** • **Azure Stream Analytics and Analysis Services[27].**	• **Cloud Composer** • **Google Data Studio** • **Dataflow** • **Google Marketing** • **Pub/Sub** • **Data prep** • **Big Query** • **Looker** • **Dataproc** • **Cloud Data Fusion** • **Data Catalog** • **Cloud Life Sciences[28].**	• **IBM Analytics Engine** • **IBM Decision Optimization** • **IBM Streaming Analytics** • **IBM InfoSphere Information Server on Cloud** • **IBM Data Management on Cloud** • **IBM Db2 Warehouse on Cloud And Cloud SQL Query [29].**
Network	• **Amazon[API Gateway, CloudFront[6], VPC[9] and Route 53]** • **AWS[Cloud Map, Direct Connect, Transit Gateway, PrivateLink, App Mesh, Global Accelerator[26].** • **Elastic Load Balancing (ELB).**	• **Traffic Manager** • **Load Balancer** • **Virtual Network** • **Azure DNS** • **Content Delivery Network** • **Azure DDoS Protection** • **Application Gateway** • **VPN Gateway** • **Azure ExpressRoute**	• **Network Telemetry** • **Cloud Armor** • **Virtual Private Cloud** • **Cloud CDN** • **Hybrid Connectivity** • **Cloud NAT** • **Network [Intelligence Center and Network Service Tiers]** • **Cloud [Load Balancing and DNS]** • **Traffic Director** • **Service Directory[28].**	• **IBM Cloud Internet Services Network security** • **Domain name services** • **IBM Cloud Virtual Private Cloud Load balancer** • **IBM Cloud Content Delivery Network** • **Network appliances** • **IBM Cloud Direct Link[29]**
Security	• **AWS[Artifact, Identity and Access Management(IAM), resources, Shield, Security Hub, Secrets Manager, Resource Access Manager, Directory Service, Firewall Manager, WAF, Certificate Manager, CloudHSM, Single Sign-On, Key Management Service].** • **Amazon[Detective, Cognito, GuardDuty, Inspector, Macie].** • **DDoS protection [26].**	• **Azure Sentinel** • **Security Center** • **Key Vault** • **VPN Gateway** • **Application Gateway** • **Azure Information Protection, Active Directory, DDoS Protection, Dedicated HSM** • **Azure Active Directory Domain Services [27].**	• **Confidential Computing** • **Titan Security Key** • **Cloud Key Management** • **Managed Service for Microsoft Active Directory** • **Cloud IAM** • **Assured Workloads** • **Cloud Data Loss Prevention** • **Access Transparency** • **Security Command Center** • **Secret Manager [28].**	• **IBM Cloud [Security Advisor, App ID, Data Shield and Hardware Security Module].** • **Network security** • **SSL certificates** • **IBM Key Protect IBM Cloud Certificate Manager** • **IBM Hyper Protect Crypto Services [29]**
Internet Of Things	• **AWS IoT[Events, Device Defender,** • **1-Click, SiteWise, Core, Device Management, Button, Analytics and Things Graph].** • **AWS[Greengrass, Partner Device Catalog].** • **FreeRTOS[26].**	• **Azure Time Series Insights** • **Azure IoT[Hub, Edge, Central, solution accelerators].** • **Azure[Digital Twins, Maps, Time Series Insights RTOS[27 and Sphere].**	• **Cloud IoT Core** • **Edge TPU[28].**	• **Waston IoT Platform[29].**

Mobile	• **Amazon[API Gateway and Pinpoint user].** • **AWS[AppSync, Device Farm, and Amplify[26].**	• **Notification Hubs** • **Visual Studio App Center** • **Xamarin** • **Azure[Maps, Cognitive Search and Cognitive Services].** • **API Management** • **Spatial Anchors** • **App Service[27].**	• **Cloud Console Mobile App.** • **Mobile app backend services[28].**	• **IBM [Mobile Foundation, Push Notifications[29]].**
Artificial Intelligent AI & Machine Learning ML	• **Amazon[Augmented AI, Personalize, Textract, Translate, SageMaker, Elastic, Forecast, Transcribe, CodeGuru, Polly, Rekognition, SageMaker Ground Truth and Comprehend].** • **Deep learning inference acceleration** • **Easily implement human review of ML predictions** • **Build, train, and deploy machine learning models at scale** • **Find your expensive lines of code** • **Discover insights and relationships in text** • **AWS [Deep Learning AMIs, Deep Composer , Inferentia, Deep Learning Containers, DeepRacer , and DeepLen]** • **PyTorch on AWS** • **Apache MXNet on AWS** • **TensorFlow on AWS.**	• **Azure[Cognitive Services, Databricks, Bot Service and Cognitive Search[27]].** • **Machine Learning.**	• **Speech-to-Text/Text-to-Speech** • **AI Artificial Intelligent** • **Cloud [ranslation, Natural Language].** • **Auto ML Machine Learning** • **AI-Platform** • **AI-Video and Vision.** • **AI--Infrastructure** • **Dialog flow** • **ML Auto Tables[28].**	• **IBM[Watson Personality Insights, Watson Natural Language Understanding, Watson Machine Learning, Watson Studio, Watson Tone Analyzer,and Watson Visual, Watson OpenScale™, Watson Knowledge Catalog, Watson Natural Language Classifier, Watson Speech to Text, Watson Discovery for Salesforce, Watson AIOps, Watson IoT® Platform, Watson Language Translator, Watson Text to Speech, Watson Knowledge Studio, Watson Discovery and Watson Assistant[29]].** • **Deep learning.**
Developer Tools	• **AWS[X-Ray, Cloud, CodePipeline, Code Deployt, Device Farm, Tools and SDKs, Command Line Interface Cloud Development Kit(CDK), CodeArtifact, CodeCommit,and CodeStar and CodeBuild[26]].** • **Amazon[CodeGuru, Corretto].**	• **Azure[Test Plans, Monitor, Repos, DevOps, Pipelines, Borads, DevTest Labs, Artifacts[27]].** • **DevOps tool integrations**	• **Cloud[Code, Build, SDK, Source, Scheduler, Tasks and Code for IntelliJ[28]].** • **Tools for [Eclipse and Visual Studio].** • **Container Registry** • **Tekton.**	• **IBM Cloud[Event Management,** • **Messages for RabbitMQ, SQL Query, CLI, Shell, Continuous Delivery, Developer Console for Apple [29]].** • **Availability monitoring** • **Tekton** • **HPCaaS from Rescale.**
Media Services	• **Amazon[Kinesis Video Streams, GameLift, Elastic Transcoder, Interactive Video Service, and Lumberyard].** • **AWS[Elemental MediaPackage , Elemental MediaTailor , Elemental MediaConnect, Elemental MediaConvert, Elemental MediaLive, Elemental MediaStore, Elemental Appliances & Software][26].**	• **Media Services** • **Encoding** • **Video Indexer** • **Azure Media Player** • **Live and On-Demand Streaming** • **Content Protection** • **Live Video Analytics** • **Content Delivery Network[27].**	• **Zync Render** • **OpenCue** • **Game Servers** • **Media and Gaming** • **Anvato[28].**	• **IBM Watson Media[29].**

Integration	• **Amazon[AppFlow, Amazon EventBridges, Simple Notification Service(SNS[5]), MQ, Simple Queue Service:SQS[10]** • **AWS[Step Functions and AppSync[26]].**	• **Logic Apps** • **API Management** • **Services Bus** • **Event Grid[27].**		• **IBM[MQ on Cloud, App Connect, Cloud Pak for Integration, Aspera on Cloud, Event Streams, Cloud for Skytap Solutions, API Connect, Lift [29].** • **Secure gateway**
Migration and Transfer	• **Migration Evaluator (formerly TSO Logic)** • **AWS [Transfer Family, Server Migration Service, Cloud Endure Migration, Migration Hub, Data Sync, Application Discovery Service, Database Migration Service and AWS Snow Family[26].**	• **Azure[Migrate, Site Recovery,** • **Database Migration Service, Cost Management + Billing[27]].** • **Data Box**	• **Migrate for Anthos** • **VM Migration** • **BigQuery Data Transfer Service** • **Cloud Data Transfer** • **Migrate for Compute Engine** • **Cloud Foundation Toolkit** • **Transfer Service** • **Transfer Appliance[28].**	• **Veeam on IBM Cloud** • **Zerto on IBM Cloud[29].**
Management & Governance	• **AWS[Chatbot, Systems Manager Management Console, Control Tower, Personal Health Dashboard, Auto Scaling, Config, Managed Services, Cloud Formation, Command Line Interface, Console Mobile Application, License Manager, Cloud Trail, Organizations, Compute Optimizer, Service CatalogC and Trusted Advisory].** • **Amazon Cloud Watch** • **OpsWorks and Well-Architected Tool[26].**	• **Microsoft Azure portal** • **Cloud Shell** • **Azure[mobile app, Backup, Advisor, Policy].** • **Cost Management + Billing** • **Log Analytics** • **Azure Site Recovery ..etc.[27].**	• **Cloud[Console, Shell, Deployment Manager, APIs and Mobile App].** • **Management Tools** • **Private Catalog** • **Cost Management[28].**	**Management** • **IBM[IT operations management, Edge Application Manager, Cloud Pak for Multi-cloud Management, Cloud Automation Manager, Telco Network Cloud Manager, Netcool Operations Insight and Cloud App Management Istio[29]].**
Education	**AWS Educate** • **Students Ages 18+** • **K12 Students** • **Educators** • **Cloud Degree Program** • **Employers** • **U.S. Veterans**	**Azure Lab Services**	**Google Classroom, G Suite Google Meet[31].**	
SDKs & Toolkits (Software Development Kit)	• **AWS[Cloud Development Kit(CDK), Command Line Interface(CLI), Crypto Tools, SDK for Go, SDK for Java, SDK for Python(Boto 3), Code Examples Repository, Toolkit for JetBrains, Toolkit for Visual Studio Code, Server-less Application Model(SAM), SDK for C++, SDK for Ruby, SDK for JavaScript, SDK for PHP, Toolkit for Eclipse, Visual Studio, SDK for .NET, Tools for Powershell, Toolkit for Azure DevOps, Tool anfd SDKs shared**	• **Azure SDK for[.NET, Go, Java, node.js, PHP, Python, Ruby].**		

	Configuration and Credentials Reference Guid]. • **AmazonCorretto.**			
Robotics	**AWS RoboMaker**	**Sawyer from Rethink Robotics (Paul-E)**	**Google's Cloud Robotics Core: Administer infrastructure essential to building and running robotics solutions for business automation. Cloud Robotics Core mange robot fleets easy for developers, integrators, and operators.**	**IBM Robotic Process Automation(RPA)**
Satellite	**AWS Ground Station**			**IBM Cloud Satellite[32]**
Game Development	• **Amazon GameLift** • **Amazon Lumberyard**	• **Azure[PlayFab, DevOps, Cognitive Services, Spatial Anchors, DDoS Protection].** • **Visual Studio** • **Visual Studio App Center** • **Kubernetes on Azure[34].**		**IBM Cloud Bare Metal Servers[33].**

[1] **S3**: Data Storage and Movement, amazingly secure infrastructure with intelligently distributing data in different physical regions
[2] **CE2**: Server Configuration and hosting, In minutes bring VM and administer other servers such as ports, storage, security, etc.
[3] **Lambda**: To run code without any server.
[4] **Glacier**: Low cost online web storage service, effective security for archival and data backup.
[5] **SNS Stands for Simple Notification**: delivers, administer the messages to the clients from any cloud stage.
[6] **Cloud Fron**t: Delivers data, videos, images, and applications to the clients with low latency and soaring speed.
[7] **Elastic Block Store EBS**: transfer data without losing the stored data at EBS.
[8] **Kinesis**:to handle big data in real-time
[9] **VPC**: Virtual Private Network
[10] **SQS**: Simple Queue Service
[11] **Elastic Beanstalk**; orchestration service.
[12] **Dynamo DB**: is document database that give us single-digit millisecond performance.
[13] **RDS**: Relational Databases Service.
[14] **AWS ElasticCache**: memory cache service
[15] **Redshift**: data warehousing service
[16] **APIs**: Application Programming Interface

- SNS Service: manages the messages and notifications to the users from any cloud platform.
- There are two types of clients in SNS, 1) subscribers, and 2) publishers.
  Publishers: make and send a message to the subscriber instance through the communication channels.

- Sales policies that play to uncertainty, fear, and doubt will be prevail [2]. With technology trends as distance learning, online shopping, 5G communications, digital payments, robot deliveries and Telehealth[44][45]. All these makes the competition fierce in the technology market that has come to the fore in the time of the pandemic.

3. DISCUSSION

With increasing the number of companies offering a variety of prodigious cloud solutions, choosing the most suitable one becomes a daunting task. Therefore, the paper presents ten steps for choosing the best cloud provider for your specific needs.

1. Define the Cloud Services offering by the Company?

Understanding the needs of cloud computing gives an idea of the type of service we are looking for. Many organizations offer range of cloud computing solutions for various purposes, such as an information technology network infrastructure along with accessing software, applications and virtual servers upon request, AWS services, Microsoft Azure, Google cloud and IBM etc.

2. Safety in the cloud Service?

Online security is one of the most important factors, especially when it comes to storing data in the cloud. Cloud computing providers must have many necessary security measures in place. In addition to constantly updating it to thwart all attacks that could happen every day. Before entering into any agreement, you must make sure providing the excellent security service.

3. Is the data center secure and where is it located?

The location server's immunity and data centers are very important as security online. So that sensitive data cannot be accessed.

4. What is the pricing structure for the required service?

Often times the pricing is the deciding factor as one must know how to pay for what is used. To avoid the massive advance fees. From the outset, the payment pricing should be on a pay-as-you-go basis, with the ability to add services if required. Depending on the providers, costs are usually billed annually, semi-annually, quarterly and monthly, in hours. Pricing can vary widely, from $1/month to over $100/month depending on service providers.

5. What is the down time history?

Downtime often occurs for a period of time during which the service is not effectively available to users. It is best if the answer is never, but this is not realistic. Even the largest and most respected cloud service providers experience downtime from time to time. Since a cloud service outage is costly and quite disruptive to any activity, it's best to opt out of a resource that has a number of outages. It is also imperative that the company take a transparent and open approach when discontinued. It is best to look for providers who publish logs of their website downtime. If they lack these reports, make sure to inquire about the track record, it usually recording online.

6. How to access the service?

The customer must be able to access business data in the cloud from anywhere, whatever, at any time, by logging in to the customer designated by the cloud provider and using any device, including a laptop, smart phone or tablet.

7. What are the provisions for importing and exporting important customer data?

Couldn't transferring data from one provider to another make trouble. The best provider is the one that provides data export and import for free or as cheap as possible because the service that lacks this may be very expensive especially if the conversion is very cumbersome, takes a long time or is risky, so it is necessary to know

the true cost of this service? Data portability is the most overlooked issue that cloud service customers fail to verify adequately.

8. **Can modified the cloud provider's services in filed with the customer's expansions needs?**

The customer should consider expanding their cloud service needs at any time. To secure the future of the user, he/she must choose a good and flexible seller by learning about the additional capacity and cost from the beginning. Ideally the service would be cheaper on a per unit basis as the expansion is an exemplary service.

9. **What customer support services do cloud computing providers offer?**

To choose the best, always search for a very efficient and available support system with online access to customer support without any exceptions even on holiday. It is free at some vendors and others charge uneven amounts for it and must be obtained if we put any important commercial services in the cloud. So it is imperative to verify this before purchasing any service. Keep in mind the estimated response time and solution. Checking if technical support is provided by experienced engineers or support service representatives who only read or copy scripts rather than addressing your issue individually.

10. **How does the on-boarding procedure done?**

After picking and signing with a cloud vendor, usually sign in and create the account was done, that requires the addition of employees as users. Cloud service providers guide the users through installation process. Others, such as Amazon and Google, provide online introductory guides only.

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