Evaluating the Efficiency: A Comparative Framework for Cloud Service Models

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Abstract

The term cloud refers to a network or the internet. In other words, we can say that cloud is something that is present in distance places. Cloud computing is a computing model of providing IT resources, such as application, infrastructure, and platform in the form of service by using Internet. Cloud Computing provides infrastructure for computing and processing of all types of data resources and adopted to deal with the large amounts of data. In this research paper we explain the security issues which is attached to each service models Infrastructure as a service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Network as a Service(NaaS) and Database as a Service (DbaaS).In this research paper, we provide an overall perception on cloud computing and draw attention to its services.

Keywords
Cloud computing, IaaS, PaaS, SaaS, NaaS, DbaaS

1. Introduction

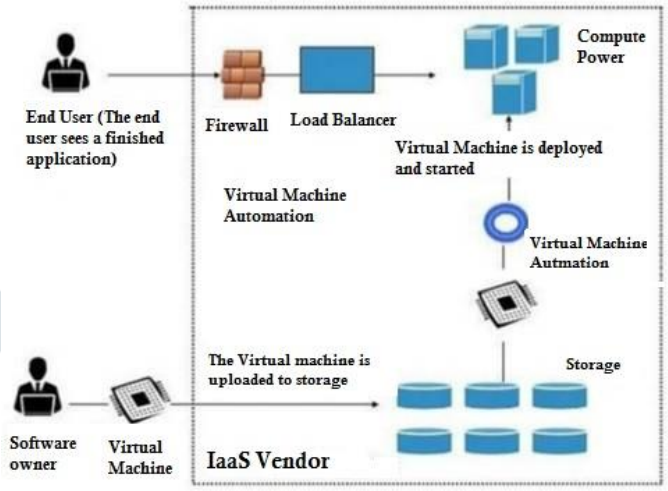
Cloud computing is a technology in which hardware and software resources such as special applications, CPU, Storage and many other are provided to users as a service in basis of pay as you use and through the internet, these resources has the ability of automatic scaled up and down according to the client's demand[1]. Cloud computing is on demand network access to computing resources which are often provided by an outside entity and require slight management. Those resources include servers, storage space, network, applications and services [2] [3]. The cloud services have been use for years before the term "Cloud Computing". In fact, all services available in the cloud have been available since the drawn of computing. But now, the cost of setting up cloud infrastructure has become cheaper, the cloud delivery mechanisms have become more convenient to use, and the related bandwidth has become more general and affordable. Cloud computing has rapid deployment which is used to speed up the time which fastens the workload. It also facilitates low start-up cost which includes the capital investment; costs based on usage or subscription, multi-tenant sharing services and resources, and accelerated deployment[4]. In this rapidly changing world of IT, where technologies like Big Data and Internet-of-things (IoT) are in the rage, to adapt is to survive, so the organizations are moving over to new business models[5].

2.Cloud Services

Cloud services refer to computing resources and services that are delivered over the internet. Instead of owning and maintaining physical servers and infrastructure, users can access and utilize computing resources on-demand through a cloud service provider. Cloud computing service models refer to the types of services and resources offered by cloud providers. The five primary service models are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), Network as a Service(NaaS) and Database as a Service (DbaaS). Each model represents a different level of abstraction and responsibility for users, allowing them to choose the degree of control and management they want over the underlying infrastructure and application development.

2.1 Infrastructure as a Service (IaaS)

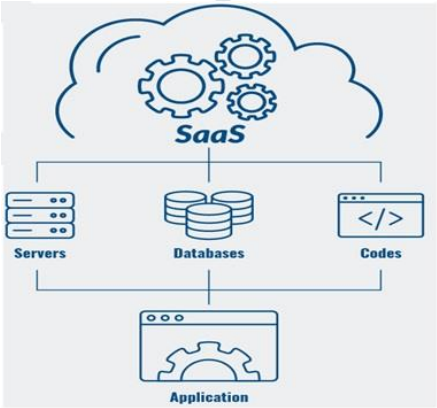
The cloud service providers give infrastructure like storage, computing power etc. to the users through virtualization[6]. IaaS provides basic storage and computing capabilities as standardized services over the network. Servers, storage systems, networking equipment, data centre space etc. are pooled and made available to handle workloads. The customer would typically deploy his own software on the infrastructure. IaaS is a way to deliver a cloud computing infrastructure like server, storage, network and operating system. The customers can access these resources over cloud computing platform i.e Internet as an on-demand service.



Example: DigitalOcean, Linode, Amazon Web Services (AWS), Microsoft Azure, Google Compute Engine (GCE), Rackspace, and Cisco Metacloud.

2.2 Software as a Service (SaaS)

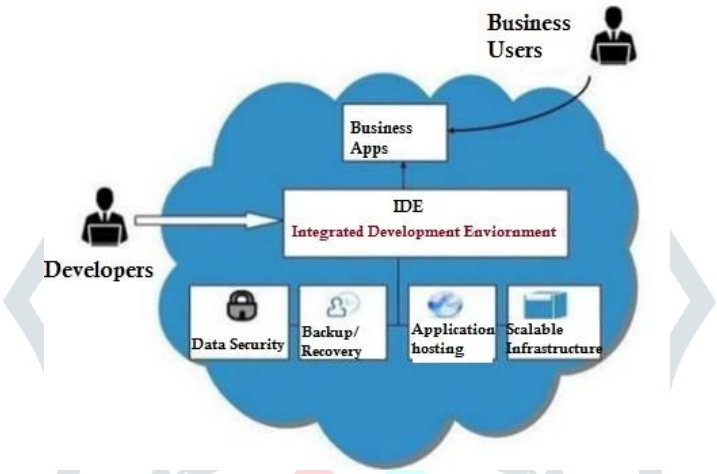
The cloud service providers give various software applications to the users, who can use them without installing them on their computer[5]. In this model, a complete application is offered to the customer, as a service on demand. A single instance of the service runs on the cloud & multiple end users are serviced. On the customers‟ side, there is no need for upfront investment in servers or software licenses, while for the provider, the costs are lowered, since only a single application needs to be hosted & maintained. SaaS is known as **'On-Demand Software'.** It is a software distribution model. In this model, the applications are hosted by a cloud service provider and publicized to the customers over internet. In SaaS, associated data and software are hosted centrally on the cloud server. User can access SaaS by using a thin client through a web browser.



Example: BigCommerce, Google Apps, Salesforce, Dropbox, ZenDesk, Cisco WebEx, ZenDesk, Slack, and GoToMeeting.

2.3 Platform as a Service (PaaS)

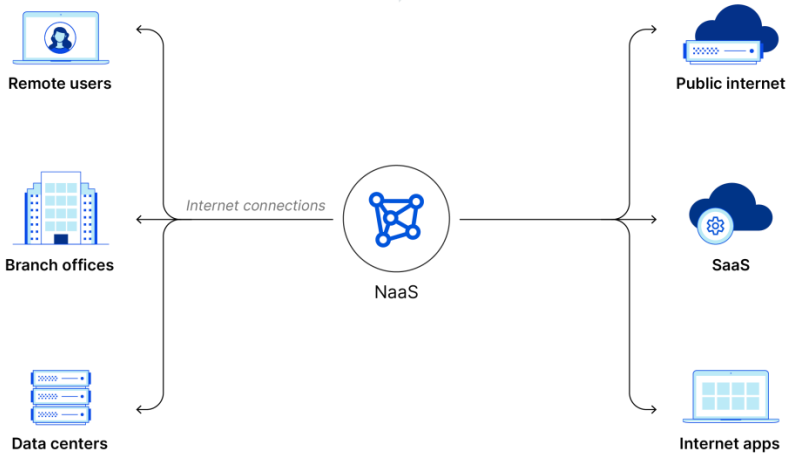
The cloud service providers give platforms, tools and other services to the users[5]. It is a layer of software, or development environment is encapsulated & offered as a service, upon which other higher levels of service can be built. The customer has the freedom to build his own applications, which run on the provider's infrastructure. To meet manageability and scalability requirements of the applications, PaaS providers offer a predefined combination of OS and application servers. PaaS is a programming platform for developers. This platform is generated for the programmers to create, test, run and manage the applications. A developer can easily write the application and deploy it directly into PaaS layer. PaaS gives the runtime environment for application development and deployment tools.



Example: AWS Elastic Beanstalk, Windows Azure, Heroku, Force.com, Google App Engine, Apache Stratos, Magneto Commerce Cloud, and OpenShift.

2.4 NaaS (Netwok as a Service)

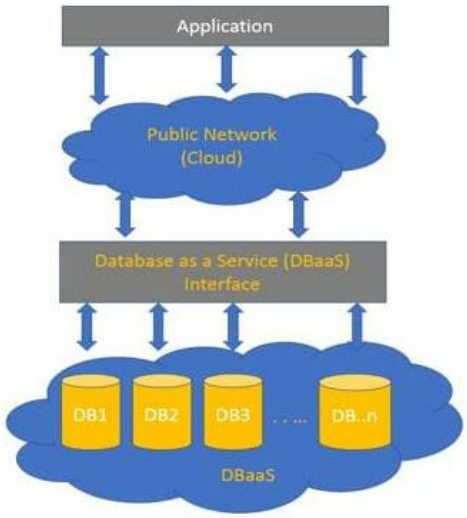
The network as a service provides networking infrastructure to the customers, who don't want to build their own application. The third party can deliver the network infrastructure. NaaS includes services such as Wide Area Networking Connectivity, Datacenter Connectivity, Bandwidth on Demand, and other applications. It includes the optimization of resource allocations by making network and computing resources as a unified whole. NaaS uses virtualized network infrastructure to provide network services to the customer. It is the responsibility of NaaS provider to maintain and manage the network resources. Having a provider working for a customer decreases the workload of the customer. Moreover, NaaS offers network as a utility. NaaS is also based on pay-per-use model.



Examples:
Aryaka and Pertino offer WAN and secure Virtual Private Networks (VPN) as a service, Akamai offers CDN as a service, Amazon offers web-hosting, private cloud, and storage as a service, and many service providers offer Bandwidth On Demand and hosted networks as a service.

2.5 Database as a Service (DBaaS)

For all enterprise applications, Databases are an essential component. Database services for on premise applications are configured using internal, purchased servers and database. Large organizations have a shared infrastructure for an internal teams, where the database may be shared service and used for different applications. Database as a service (DBaaS) is a cloud computing managed service offering that provides access to a database without requiring the setup of physical hardware, the installation of software or the need to configure the database. Most maintenance and administrative tasks are handled by the service provider, freeing up users to quickly benefit from using the database.



Examples
Amazon (Amazon Aurora, DynamoDB, Amazon RDS, SimpleDB) , Google Cloud (GC Bigtable, Google Cloud Datastore, GC Spanner, Google Cloud SQL), Microsoft Azure (Microsoft SQL Database, MA Table Storage, Microsoft DocumentDB) , Compose (IBM), IBM Cloudant, MongoDB Atlas , Oracle Database Cloud Service

COMPARISON BETWEEN IAAS, PAAS , SAAS, NAAS AND DBAAS

Parameters	**IaaS**	**PaaS**	**SaaS**	**NaaS**	**DBaaS**
Full Name	Infrastructure as a Service	Platform as a Service	Software as a Service	Network as a Service	Database as a Service
Who uses it?	System administrators	Developers	Developers	Network engineer	DBA
Which Service users get?	**Virtual data center** to store information	**Virtual platform and tools** to create, test	**Web software and apps** to complete	**Web software and tools** to check the service	**Web software and tools** to check the database

	and create platforms for services and app development, testing and deployment	and deploy apps and services	business tasks		and it's connections
Providers Control What?	Servers, Storage, Networking, Virtualization	Servers, Storage, Networking, Virtualization, OS, Middleware, Runtime	Servers, Storage, Networking, Virtualization, OS, Middleware, Runtime, Applications, Data	Servers, Storage, Networking, Virtualization, OS, Middleware, Runtime	Servers, Storage, Networking, Virtualization, OS, Middleware, Runtime, Applications, Data
User controls what?	OS, Middleware, Runtime, Applications, Data	Applications, Data	-	-	-
Cost	Most expensive	Mid level cost	Cheapest	Mid level cost	Mid level cost
Flexibility	Very flexible	Flexible but with some limitations	Lowest modifications	Flexible but with some limitations	Flexible but with some limitations
Security	Most control over data, but need advanced knowledge in security	Secure but higher level of risk than SaaS	Secure but can be accessed by provider	Secure but can be accessed by provider	Secure but can be accessed by provider

References

[1] Qahtan M. Shallal and Mohammad Ubaidullah Bokhari, "CLOUD COMPUTING SERVICE MODELS: A COMPARATIVE STUDY", IEEE-March-2016.

[2] N. Sadashiv and S. D. Kumar, "Cluster, grid and cloud computing: A detailed comparison," 2011 IEEE 6th International Conference on Computer Science & Education (ICCSE), pp. 477–482, 2011.

[3]N. I. of Standards and Technology, "NIST Cloud Computing Program,"http://www.nist.gov/itl/cloud/, 2011.

[4] S. Vijayarani Mohan*, S. Sharmila Sathyanathan," Research in Cloud Computing-An Overview" Article in International Journal of Distributed and Cloud Computing · January 2015

[5] Karandeep Kaur, " A Review of Cloud Computing Service Models" International Journal of Computer Applications (0975 – 8887) Volume 140 – No.7, April 2016

[6]Zissis, Dimitrios, and Dimitrios Lekkas. "Addressing Cloud Computing Security Issues." Future Generation Computer Systems 28.3 (2012): 583-92. Web.