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Sufficient Comparison Among Cloud Computing Services: IaaS, PaaS, and SaaS: A Review

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Abstract:
Distributed cloud computing innovation is the best approach to provide everything to customers as services through a web association. Utilizing this innovation, the customers would have the option to lease the necessary services through internet browsers. Cloud computing is aimed mainly at delivering customer services on demand. Cloud computing is a general concept that provides a wide range of infrastructure-based services, through platform as a production tool, via software as a service providing customers with the licenses of an application as an on-demand service. Various service models such as IaaS, PaaS, and SaaS, and many more are used in Cloud Computing. The features of these service models that distinguish cloud computing from other areas of study are proposed to clarify the essential aspect of Cloud Computing. These service models are compared from different viewpoints so that they can better identify their origins. In this article, three key service models are compared and discussed, i.e., software as a service, platform as a service, Infrastructure as a service, and previous studies on these services demonstrated and compared based on methods, objects, and significant results.

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1. Introduction

Cloud computing is an internet-based environment that enables us to utilize software, data, and resources from anywhere on the Internet. It is a modern paradigm that has evolved lately from cloud computing to host and deliver internet applications (Alzakholi et al., 2020; Haji et al., 2020; Hussein & Khalid, 2016). Cloud computing, being one of the fast-growing technologies in computer science, is a scientific and social reality (Bokhari et al., 2016; Shukur et al., 2020; Zeebaree et al., 2020). Cloud is a group of computing tools that provides the customer with a million facilities simultaneously. It concerns the provision of resources such as hardware, software, storage, and Internet infrastructures (Mohan et al., 2017; Shukur et al., 2020; Zebari et al., 2018). It is an online computer that allows the sharing of various services and stored data on computers and other devices. Two kinds of cloud models are available – service models and deployment models. Service models are classified according to the cloud services category, while deployment models are ranked according to how and by whom cloud services are used (Zebari et al., 2019). The benefits of cloud computing for enterprises are that the online services available allow organizations to link and make partnerships possible internationally without building external infrastructures, such as servers, data centers, and more. The environment is flexible to support a significant number of users. The key factors for moving to this model of computation are lowered costs, decreased utilization, efficient data integrity, etc. (Mukundha & Vidyamadhuri, 2017; Subhi R. M. Zeebaree, Haji, et al., 2020). Three types of services are generally categorized by the National Institute of Standards and Technology (NIST): IaaS (Infrastructure as Service), PaaS (Platform as a Service), and SaaS (Software as a Service)(Jaiswal, 2017; Haji et al., 2020). IaaS is a cloud service that provides physical, virtual, and additional storage networking products. Amazon Elastic Compute Cloud (EC2), GoGrid and Rackspace Cloud provide an example of IaaS sale (Hussein & Khalid, 2016; Subhi et al., 2020). PaaS offers an infrastructure or platform for the development of applications and technologies to be distributed over the Internet, without downloading or handling the user interface, examples are Google AppEngine, Microsoft Azure, Yahoo developer Network, MSFT, Heroku, Engine Yard,force.com (Abdullah et al., 2020; Bokhari et al., 2016). SaaS as a service is a software delivery model that has been hosted by a distributor or provider and made available to customers over the internet examples are Gmail, Hotmail, CRM, IBM, and Salesforce (Dino et al., 2017).

In this paper, will explain in detail the cloud computing overview, characteristics comparison of service models of cloud computing (IaaS, PaaS, and SaaS), and demonstrated the previous study of each service model and comparison of them in term of their method used, objective and significant results for each finding.

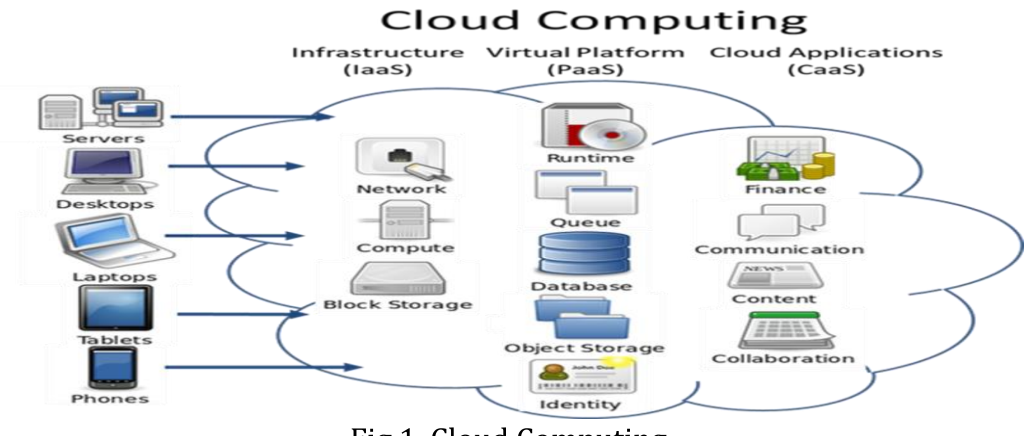

Fig 1. Cloud Computing.

2. Background Theory

2.1 Cloud Computing Overview and characteristics

Cloud infrastructure is the first and foremost principle of shared resource storage and use. The NIST (National Institute of Standards and Technology) describes it as a 'model for allowing universal, easy, on-demand network connectivity to a shared pool of configurable computing resources (e.g. networks, servers, storage, software, and services) that can be easily distributed and delivered with little management effort or service provider involvement (Almubaddel & Elmogy, 2016; Jader et al., 2019; Zeebaree et al., 2020). One main advantage of cloud computing, from many angles, is that it uses a pay-as-you-go model that effectively removes the need for service providers to spend on costly networks at an early level. Instead, services are licensed on an as-required basis, allowing cloud resources to be easily updated as needed (Dino, Zeebaree, Salih, et al., n.d.; Mahmood et al., n.d.). This model results in substantial cost savings for all stakeholders involved and provides more efficient access to services on demand. Infrastructure companies allow services readily available by the use of a data center structure to share resources collectively(Jaiswal, 2017).

Fig 2. Cloud Computing characteristics (Jaiswal, 2017)

The cloud computing characteristics based on describes as leading by the National Institution of Standards and Terminology (NIST) are:

1- On-demand self-service: Interaction with server time and network storage, preparation, and optimization as needed with no service technician required (Almubaddel & Elmogy, 2016; Subhi et al., 2020).

2- Broad network access: Internet connectivity through standard access points such as cell phones, Laptops, and PDAs are made accessible to services and functionality (Diaby & Rad, 2017).

3- Resource pooling: The provider's computer services are combined with supporting multitalented customers. The dynamic allocation and reassignment of different physical and virtual resources comply with user requirements (Diaby & Rad, 2017) (Bokhari et al., 2018).

4- Rapid elasticity: Tools and features may be changed and implemented without much delay or involves realistic hardware interaction. Market resources can also be expanded to almost any capacity if required(Almubaddel & Elmogy, 2016).

5- Measured service: Data services are configured and utilized by different factors, such as the storage level, bandwidth, and the number of user accounts needed. Both suppliers and users should verify reporting and verification with openness(Almubaddel & Elmogy, 2016) (Bokhari et al., 2018).

1.1 Cloud Computing Service models

There are three basic types of cloud computing service models: Infrastructure as Service (IaaS), Platform as Service (PaaS), and Software as service (SaaS) in Figure 3 all service models are shown and a discussion provided in the below (Noor et al., 2018).

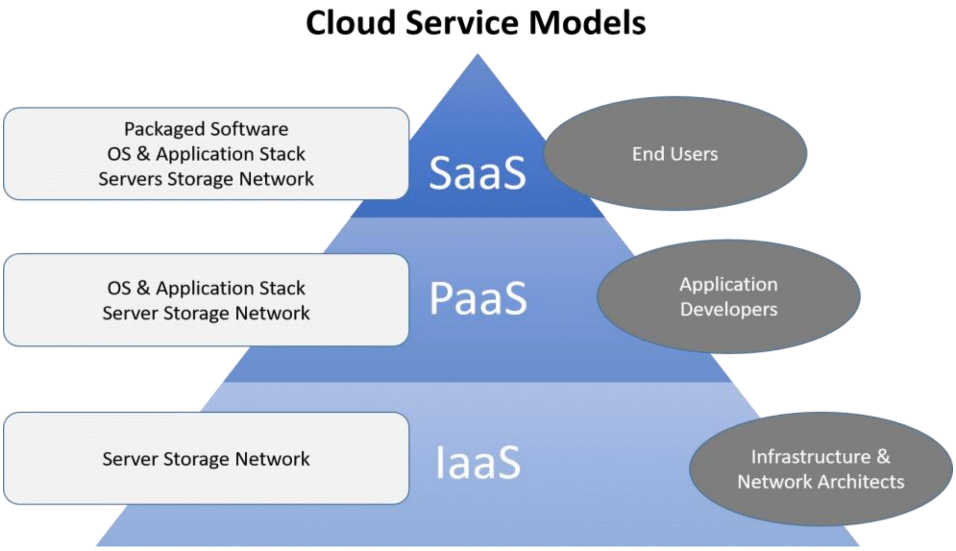

Fig 1. Cloud Service Models (IaaS,PaaS, and SaaS) (Noor et al., 2018)

1.1.1 Infrastructure as service (IaaS)

The customer's ability to deliver computing, storage, networking, and other primary computer services through which the consumer can install and manage virtual machines, including operating systems and applications (Zryan et al., 2018; Zryan et al., 2018; Zeebaree, et al., 2019). The user does not handle the cloud infrastructure but may have control over operating systems, storage, and apps, and may have little control over selected networking components (e.g. firewalls)(Miyachi, 2018). Example: Amazon (EC2) delivers physical and virtual services to customers includes consumer specifications, memory, OS, and storage (Abdullah et al., 2020; Obaid et al., 2020). As a service provider, IaaS provides the virtual server with one or more central operating units running different options (IaaS), a centralized, fully automated package, which owns and hosts a service provider and provides customers with computing services accompanied by storage and networking facilities on request(Mohan et al., 2017). Characteristics of IaaS (Almubaddel & Elmogy, 2016) are (i) infrastructure services are distributed, (ii) dynamics are permitted, (iii) has a variable cost, (iv) model price of utility, (v) requires multiple users in a resource pool, and (vi) self-service and auto-supply

1.1.2 Platform as Service (PaaS)

It provides an acceptable framework or medium for the developer to build applications and programs and distribute them on the network without getting the production environment installed or managed. To run available software or to build and test the latest, PaaS allows clients to rent software-defined servers and attached resources (Haji et al., 2018; Osanaiye et al., 2019). The client is not in charge of the hardware of the cloud, such as servers, networks, storage, and OS. However, the client controls the applications and their configuration(Bokhari et al., 2016). Google application engine and Microsoft Azure are the most recent examples of PaaS. It is focused on the creation and usage of cloud software by deployers and developers. The multi-layer architecture is highly scalable, e.g. Salesforces.com and Azure. This model uses tools and/or libraries that act as the framework(Hussein & Khalid, 2016). Characteristics of PaaS(Almubaddel & Elmogy, 2016) are: (i)architecture for multi-tenants, (ii) security/sharing granular access (permissions model), (iii) motor/capacity robust workflow, (iv) built-in device scalability, (v) including load and failover balancing, (vi)user Interface Customizable/Programmable, (vii) Customization of limitless database, (viii) scalable integration platform "services-enabled.", (ix) self-service and auto-supply, and (x) middleware stack pre-constructed

1.1.3 **Software as a service (SaaS)**

The opportunity to use apps of the provider that operate on a cloud platform provided to the consumer. Applications can be accessed by a web application interface, such as a web browser (e.g. a web-based email) or the application interface, from separate client devices (AL-Zebari et al., 2019; Subhi & Karwan, 2015; Zeebaree et al., 2019). With the potential exception of a small range of device setups for consumers, the customer does not handle or monitor the cloud infrastructure, including the network, servers, operating systems, storage, or even specific applications. SaaS primarily focuses on the end-user interface, as end users can use and manage this cloud-built software. Examples of SaaS are CRM, Google apps, Deskaway, and Wipro w-SaaS(Miyachi, 2018). Characteristics of SaaS(Almubaddel & Elmogy, 2016) are: (i) applications that are open to consumers at any time, (ii) SaaS suppliers do not have their applications hosted in the client's premises, but host software themselves to third parties, (iii) the programs are then accessible by a web interface, which delivers the functionality and related data from virtually any point where an internet connection is accessible, This arrangement also enables several users to be flexible, It still places some customer discretion in the hands of the customer, For example, they can split the application with their clients and spend much better on them, and The SaaS model also helps users to accept both app upgrades and repairs simultaneously easily.

3. Literature Review

Cloud computing provides several services to support and be part of the distribution system using software and hardware systems; the three services below discussed observations, based on prior studies and findings.

3.1. Infrastructure as a Service (IaaS)

(Calinciuc et al., 2016) explained in their study how docker can operate as a hypervisor and how the novadocker plugin built can be used to supply computing resources within an OpenStack Iaas rapidly. Therefore, developed an application for immersive social media that includes virtual machines and containers for docker. Containers have a significant advantage over virtual machines (VMs) due to performance improvements and shortened start-up time. What remains is the prefiguration of Docker container images on device nodes. To do something that solved the problem and made the boot time much lower, they created a patch for the nova-docker driver that pulls all Docker images on any Docker node with a hypervisor. Both pictures are already on the device nodes with this unit so that the installation of a Docker container will take place without delay. (Chang et al., 2016) proposed a heterogeneity of real IaaS Cloud data centres (CDCs) prevails not only among physical machines but even amongst workloads. The heterogeneity of IaaS CDCs is also more difficult for successful modelling. This paper considered the situation in which each client job can have a different number of virtual CPUs. A hierarchic stochastic simulation methodology for performance analysis under IaaS CDC was proposed under this heterogeneity. Numerical results derived from the proposed analysis model are checked in several device parameters by discrete event simulations.

(Raja & Rabinson, 2016) In their paper, concentrated in particular on the IaaS cloud computing concept. All private and public users have been equipped with a host system IP address based on all operating systems' functionalities. Openstack, a powerful tool for cloud development, was used to construct the IaaS environment. Some gadgets like laptops, tablets, and smartphones can be shown to access the chosen Operating System (OS), so you can have virtual hardware for the user. This device enables the user to view several OSs anywhere without any setup or installation procedures. Both the time and expense of hardware use have been saved further using this IaaS concept. The results show that the resource was shared by different users using the OpenStack tool where any instance of the client can be tracked. (T. Wang et al., 2016) proposed a monolithic paradigm for IaaS Cloud Data Centre (CDC), using the continuous-time chain of the Markov (CTMC). That (1) consists of physical devices (PMs) active and standby, (2) helps PM to migrate between standby and active PM pools, (3) all work is accurate, and (4) if a PM operates for this job fails, a job will continue to run with idle working PMs. While the IaaS Cloud performance measurement monolithic CTMC model faces scale and rigidity, it can be implemented to evaluate the estimated scalable model. The state transformation rules for the proposed model are presented in-depth, and the computing metric formulas include the immediate likelihood of operation, the average response time, etc. Numerical analyzes and calculations are conducted to validate the exactness of the model proposed. (Gupta & Amgoth, 2019) In this work, a new virtual machine (VM) placement algorithm was built in the IaaS cloud with a semi-programmed background for expected VMs. The semi-scheduled context enables a short-term request to be received by scheduled VMs before VM placements are determined, and the resource needs of VMs are fulfilled regularly in real-time. They adopted a Modified Particle Swarm Optimization (MPSO) strategy with a semi-scheduled background for programmed VM placements in the IaaS cloud. The algorithm is Step-Optimized Particle Swarm Optimization (SOPSO). In terms of different performance metrics, such as the servers' active time, power usage, resource wastage, and the numbers of active servers in the cloud, IaaS is showed in greater depth than the current algorithm. Finally, they demonstrated the benefits of the semi-programmed background for performance appraisal, in which minor increases in the time window allow optimal goals to be reached more improved.

Devarajan & Muthu (2020) proposed a Stock Optimization System (SOS), which intended to minimize the use of stock size in the cloud system. The deductibility is used in the algorithm. The pattern of file access categorized the files. The test methods were performed on ten files of objects of a range of 0,10 MB to 1,00 MB in the specified cloud environment. By way of the proposed SoS framework, file transfer performance enhancement has been measured as an 11.91% decrease in disk size use relative to the current system, while bandwidth consumption decreased by 4.28%. It helps to reduce the costs of IaaS use in the cloud. The suggested framework would also allow for the use of any file combination with minimal access delays. Nazarov et al. (2020) developed a method to establish conditions for separating the necessary IaaS info-communication services between clients based on a step-by-step hierarchical bit traffic model for content across different categories. The science problem is conceived and officialized to approximate the number of virtual IaaS links for various user groups. The findings of this Issue are being exploited to obtain a new device optimization model "sources of information for various categories of content – a fragment of IaaS" To automate multivariate IaaS fragments' computational rationale pre-project process, the obtained scientific findings can be used.

3.2. Platform as a Service (PaaS)

Gao et al. (2018) indicated a stable PMIPv6 access authentication scheme in Vehicular Ad-hoc Networks (VANETs). The identity-based signature is finely embedded into their hierarchical architecture to achieve distributed shared authentication between Mobile Node (MN) and Mobile Access Gateway (MAG). The robustness of primary authentication protocols in PaaS is illustrated by security proof under SVO logic. PaaS is useful both for user authentication and for intradomain authentication by performance analysis and results.

Lovas et al. (2018) provided the second, private platform-as-a-service (PaaS) version of Connected Cars' platform IoT back-end architecture and its flexible services that build upon expertise in creating the first OpenNebula technology Infrastructure-as-a-Service variant (IaaS). The Platform Cloud Foundry PaaS, installed at the premises of a car supplier corporation, was used during the design and production processes. The new Entry Implementation allows vehicle data to be controlled, evaluated, and viewed in different use cases such as Eco driven, weather/predictions, cloud parameter coding, Control Area Network (CAN) data collection, system flashing remotely. (Klymash et al., 2019) studied the Issue of connectivity to information located in distant areas and access time from the endpoint user's view. They were incredibly competitive in offering a cloud service to the platform using the Content Delivery Network (CDN). They explored procedures for accessing static information and loading durations under the terms of PaaS configuring for the Azure Cloud service. Researchers intended to minimize the time of distribution of content during service CDN PaaS approach concerning the collection of shared positions of customer and content. Analysis results found that the load from the endpoints is significantly faster than the load from the base server and that the loading times are around four times lower. The method (Verginadis et al., 2019) based on the widespread Extensible Access Control Markup Language (XACML) standard of access control was proposed, implemented, and evaluated. It provides the policy formulation, attribute assembly, and policy assessment process with semantic reasoning capability. In this approach, the disparity between syntactically distinct yet semantically equal attributes important to policy appraisal can be bridged. This strengthened the regulation federation and the associated selection of attributes in various administrative areas. In the first series of tests, PaaSword was less slow than the Balana WSO2 system.

Zhong & Yuan (2019) proposed an intelligent elastic scaling algorithm for the PaaS container cluster based on the rare and non-periodical hybrid historical load model. It can approach a more detailed cloud network resource planning forecast. Experiments have shown that the algorithm is robust and performs well overall. It can be used for smart load estimation based on historical data and adaptive load preparation based on a forecasted load on the Cloud platform of PaaS. Ramesh et al., (2020) discussed the Integration which developed between the private cloud and the public cloud. The orchestrator conducts automation of the availability of services. The sample applications introduced are progressive and fulfill the need to play the orchestrater's role in supplying computing tools. The services are de-allocated after use, and the Aneka cloud has been granted access. Services are easily used economically by combining private and public clouds. The hybrid cloud approach allows both public and private clouds to improve. In low-computer cases, the program requires no downtime. Aneka allows resources to be tracked for optimizing and charging for the utilization of resources on request. Wen et al. (2020) discussed the complexities of existing platform transformation failure virtualization and high availability on the cloud model and the architectural platform for microservices. The architecture of the PaaS platform, therefore, is planned to have high availability and usability. The PaaS framework implementation model has also been designed on the virtualization platform. The service unavailability arising from the physical host downtime can be eliminated, and consistency is maintained by deploying the highly available Nodes on various physical hosts. Experimental evaluations reveal project efficacy. However, the automated service migration could fail if the business system is completely loaded, and the host resource pool loads are high. In the study of Zhong & Liu (2020), PaaS's container mechanism, PaaS typically secures the containers that cover Linux applications. It also offers a view of container separation and networking, showed how container traffic rules are customized by PaaS managers for deployment and described how PaaS protects containers by operating scientific and practical circumstances rather than hardening disadvantaged containers.

3.3. Software as a Service (SaaS)

(Han et al., 2016) suggested a system of layered business configuration. This approach can be adapted for business processes. Then suggested that the user follow the user's business criteria to implement the most estimated resident business model. This study introduced a layered business-process configuration approach, evaluating the business process structure, which divided the business procedure into a business layer, service layer, and data layer first and then configured the operating processes and supports the single instance multi-tenant SaaS application model. This approach addresses consumers' flexible needs, lowers the degree of coupling, and improves the versatility in configuration. This approach was visualized, and the setup was simplified for personalized project management. Naseer & Nazar (2016) suggested in their study a method for evaluating the SaaS Freemium model's attributes for choosing high-quality services. For this resolution, multiple quality factors were derived from models of software quality. A reference structure is proposed based on consistency variables and review the available SaaS and select one that satisfies the most demands. Analytical Network Process (ANP) is used to test SaaS for various criteria decision-making strategies. This approach chooses SaaS according to criteria will be accompanied by the expertise and domain awareness of participating holders. the researchers Song & Wang, (2016) suggested a SaaS framework model for service selection. Smart agent and Quality of Service (QoS) algorithm of selection based on the proposed tenant standard. The customer feedback factor and the intelligent agent surveillance factor were specified to pick a service. They also suggested a noise-reduction approach to make QoS effective. This proposed model also achieves better results than homogeneous models, for the SaaS system's multi-part climate. The proposed model often achieved greater efficiency in the multi-purpose framework of SaaS compared with homogeneous models.

Mathlouthi et al. (2019) suggested a SaaS model based on the SoS paradigm, which supports SaaS's quality of Services (QoS) efficient Integration. This model was used to provide an approach to improve the collection of integrated SaaS applications. Such optimization not only depends on "classical" QoS attributes (time of reply and price) but also on the parameter "membership − degree" motivated by the consideration of SaaS integration as SoS. The findings of the experiment reveal that the property belonging has a positive effect on overall QoS performance. Lokawati & Widyani (2019) This research proposed a multi-tenant System as a Service management system (SaaS) that covers resource utilization, service usage, SLA (service level agreement), billing, and performance monitoring. The device's design contains four separate components: middleware StatsD, Telegraf, Monsant, and Dashboard. This system can be used with five metrics to serve the service provider's interests in managing tenants and facilities in a SaaS multi-tenant application. Naresh et al. (2019) addressed the risks posed by the distributed programming paradigm. The impacted components of the Software-as-a-Service (SaaS) security display were studied at this stage. It suggested a novel strategy with RBAC instrument and a robust cloud shape, as demonstrated by SaaS defence's current status. This approach helps build an experimental SaaS mode. Liu et al. (2020) proposed education training centres are the target customers of the system. While the centres rent the same computing infrastructure and share one storage system, they use independent software. The deployment and execution of software are more important than software features and efficiency in enterprise application software such as Enterprise Resource Planning (ERP). Once the implementation stalls, all prior attempt is in vain, which is a danger that any user wishes to prevent. In general, ERP and Customer Relationship Management (CRM) project deployment will take at least 1-2 years, while SaaS model deployment will take just 0.5-1 year. In comparison, SaaS app consumers do not have to spend on software and hardware licenses, and the software will be periodically updated. Traditional software frameworks should be constrained on a fixed platform by space and position. The SaaS application can be used anytime, anywhere, as long as the Internet is open.

López-Viana et al. (2020) provided an architectural model and a Continuous Delivery (CD) flow for personalized SaaS solutions and demonstrated its viability on an IoT-based farming prototype. The instantiation is focused on the Microsoft Azure Platform. It validates the adoption of Continuous Integration (CI)/CD practices with the edge of runtime devices described in this report in highly distributed IoT systems. The design and CD flow describe the necessary services and components; the retrieval of version control system program upgrades, the advancement of container images software and creation, publish the pictures in a repository container, and lastly, the installation in edge devices of these images. In data protection of the Blockchain and decentralized technology-centred SaaS network has been discussed (W. Wang, 2020). The data processing method can be broken down into SaaS resources, developed, picked, gathered, processed, analyzed, and distributed. To judge this process, the data must be structured to ensure the reliable and rapid flow of information. Data standardization covers four aspects: standardization of data components, consistency of architectures of databases, standardization of data stock, input, and output standardization. The built core platform helps create this stable framework based on this inspiration.

4. Discussion

In this section after we discussed in the section of a literature review regarding the previous study for each service by authors, Table (1) demonstrates the compression and discussion among methods, objectives, and results of the prior studies of cloud computing service models (IaaS, PaaS, and SaaS)

Table 1: Comparison of the previous studies.

Author(s)/ Date(s)	Services Model	Algorithm /Method	Objective	Significant Results
(Calinciuc et al., 2016)	IaaS	OpenStack and Docker	Novadocker plugin can be designed to deliver machine resources quickly within OpenStack.	The progress accomplished through the nova-docker patch has created an IaaS framework for fast-scale applications of interactive social media.
(Chang et al., 2016)	IaaS	Heterogen eous	A stochastic model to measure impact on jobs	Numerical results derived from the proposed analysis model are

		Workload	arrival rate variance, buffer size, maximum vCPU numbers on a Physical Machine (PM)	checked in several device parameters by discrete event simulations.
(Raja & Rabinson, 2016)	IaaS	Openstack	An IP address is used by private and public users, providing operating systems that are the basis for all the operations.	This framework enables users to run many OS anywhere without any setup or installation procedures.
(Wang et al., 2016)	IaaS	CTMC	a monolithic paradigm is proposed for IaaS Cloud Data Centre (CDC), using the continuous-time chain of the Markov (CTMC).	It can be implemented for evaluating the estimated scalable model. Numerical analyzes and calculations are conducted to validate the exactness of the proposed model.
(Gupta & Amgoth, 2019)	IaaS	MPSO and SOPSO	A new virtual machine (VM) placement algorithm was built using the Modified Particle Swarm Optimization (MPSO) technique followed by the SOPSO algorithm.	In terms of different performance metrics, such as the servers' active time, power usage, resource wastage, and the numbers of active servers in the cloud, IaaS is showed in greater depth than the current algorithm.
(Devarajan & Muthu, 2020)	IaaS	SOS	Suggested a Stock Optimization Method (SOS) Minimizing the use of cloud storage size	The suggested framework would also allow for the use of any file combination with minimal access delays.
(Nazarov et al., 2020)	IaaS	stepwise bit dynamic model	Developed a method to establish conditions for separating the necessary IaaS info-communication services between clients.	The models allow you to approximate the number of virtual links as bit or packet speed values of information sources of various types. They are the most significant and the least estimate.
(Gao et al., 2018)	PaaS	PMIPv6 and VANETs	The secure authentication of access PMIPv6 in VANET has been indicated (PaaS).	The findings and performance analysis indicate that PaaS is Successful authentication of both intra-domain and inter-domain.
(Lovas et al., 2018)	PaaS	CDN, CAN and Eco-driving	PaaS-based Linked Vehicles IoT platform uses cases.	The new model can manage, interpret, and view vehicle data. Eco-drive, weather report/projection, and cloud coding parameter.
(Klymash et al., 2019)	PaaS	CDN and Azure Cloud	Increased Static Content Usability by CDN Networks	The research results showed that endpoint loads are slightly faster than the base server loads and are about four times reduced load periods.
(Verginadis et al., 2019)	PaaS	XACML and Balana WSO2 system.	Context-aware policy enforcement for access control allowed by PaaS	In the first series of tests, PaaSword was less slow than the Balana WSO2 system.
(Zhong & Yuan, 2019)	PaaS	Elastic scheduling	Intelligent elastic algorithms focused on load estimation for the PaaS Cloud Platform.	It can be used for smart load estimation based on historical data and adaptive load preparation.
(Ramesh et al., 2020)	PaaS	Orchestrat or Aneka	Optimizing the role of Aneka PaaS orchestra for AWS Cloud integration	Aneka allows services monitoring to be configured and paid for the utilization of resources on request.
(Wen et al., 2020)	PaaS	Virtualizat ion Platform	Developing High availability PaaS platform architecture and deployment	The delivery of highly accessible nodes to multiple physical hosts avoids the operation generated by

			Virtualization Based Platform	the physical host inactivity and guarantees business continuity.
(Zhong & Liu, 2020)	PaaS	PaaS' container mechanis m	It explained how PaaS secures containers that typically host Linux application instances.	Showed how container traffic rules are customized. by PaaS managers for deployment.
(Han et al., 2016)	SaaS	Business process customizat ion	Method of adaptation for SaaS focused business process analysis	This methodology has been visualized, and the setup for customized project management has been enhanced.
(Naseer & Nazar, 2016)	SaaS	Freemium Model and ANP	Using SaaS selection system for Freemium model quality evaluation	Implementing the proposed mechanism would create a structure that will benefit all stakeholders.
(Song & Wang, 2016)	SaaS	QoS and Intelligent agent	Model service discovery and SaaS device selection algorithm for achieving better efficiency	This proposed model often achieves greater efficiency in the multi-purpose framework of SaaS compared with homogeneous models.
(Mathlouthi et al., 2019)	SaaS	System of Systems (SoS) and Quality of Service (QoS)	SaaS integration: a newness and first performance SoS paradigm presented.	The results of the experiment show that the belonging property has a positive impact on QoS overall performance.
(Lokawati & Widyani, 2019)	SaaS	Multi-Tenant System as SaaS	The study recommends a multi-tenant Software as a Service (SaaS) management scheme to assist utility providers and consumers' requirements.	It can be used to manage tenant and facility management by a SaaS multi-tenant application with five indicators to support the service provider's purpose.
(Naresh et al., 2019)	SaaS	RBAC instrumen t	The study addressed the risks posed by the distributed programming paradigm	This method tends to establish an advanced SaaS model, as shown by SaaS protection's current status.
(Liu et al., 2020)	SaaS	ERP and CRM	Design and Implementation of the University Continuing Education Informatization Platform Based on the SaaS Model	The SaaS applications as ERP and CRM can be used anytime, anywhere, as long as the Internet is open.
(López-Viana et al., 2020)	SaaS	Continues Delivering (CD), IoT Edge	Continuous distribution in highly distributed IoT networks of personalized SaaS Edge applications	The CDs' architecture and flow define resources and components used for the retrieval, updating, advancing applications, and creations for container files.
(W. Wang, 2020)	SaaS	Blockchain and Decentrali zed technology	data protection in the SaaS network studied based on Blockchain and decentralized technologies.	The built core platform helps create this stable framework, based on this inspiration.

5. Conclusion

Cloud computing delivers promising customer capabilities. Consumers can use these services on request at any expense. Cloud computing provides three types of services: Infrastructure as Service (IaaS), Platform as Service (PaaS), and Software as Service (SaaS). This article reviews cloud computing facilities and characteristics. It compares each service among various aspects. SaaS helps the user run a software program on the Internet without installing it on its device, thereby simplifying everything and reducing maintenance costs. PaaS offers on-demand platforms that provide a computer interface and solution stack as a customer service. The infrastructure provider supplies software engineers with tools and libraries, hosting, servers, databases, storage, networks, user interactions, and frameworks. IaaS offers organizations leased facilities relating to servers, computers, network equipment, hardware, and applications. These cloud platforms are thought to be commonly adopted by enterprise organizations to fulfil their IT requirements soon as well as to redefine new cloud computing principles and protocols.

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