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Challenges of Cloud Computing

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Abstract: The cloud computing brings new era for hardware, software development, application deployment and networking. It overcomes the pressure of system configuration at one place and still work at anywhere. Still, it comes with a lot of new research challenges and opportunities. To bring it to implement the better implementation, the challenges should be better studied. In this paper, some important challenges will be discussed.

Keywords: Platform-as-a—services, Infrastructure-as-a-Service (IAAS), Software-as-a-Service (SAAS), Service Level Agreements (SLA).

I. INTRODUCTION

Cloud computing introduced a new user's perspective. The user can manage the resources i.e. computer storage, network, server etc. similar to water, electricity etc. The resources manager will charge the user as per the usage of the resources. The user can also opt to choose the different cloud services providers. Some of cloud service providers are google, Microsoft, apple etc. Cloud computing made it easy to access the data anywhere, anytime. As a new technology develops, new challenges will also come to surface that further need to overcome. The cloud computing made it easy to use data anywhere but, it also raises question whether the data is secured to use at the place [2, 10].

A. Main Characteristics of Cloud Computing

1) There is no human intervention between the user and service providers. The resources will be available to the user as per the requirements. Automatic control will be provided according to consumer right of use.

2) The network access can be increased according to the need of consumer. The consumer can be an individual/a group/ organization. The network can be modified with small/large data centre, bandwidth etc.

3) It overcomes the power of resources limitations. It can provide any resources on the demand of the consumer. The resources can be anywhere in the geographically. Thus, the location independence plays a major role by the cloud computing.

4) The only resources are utilized by the consumer need to be optimized, managed and also billed by the service providers. Thus provides a transparent, controlled, monitored and well managed resource is provided by the service provided.

II. CLOUD COMPUTING ARCHITECTURE

A. There are Some Basic Services of The Cloud as Shown in Fig. 1.

1) Platform-as-a-Service (PAAS): This platform consists of the infrastructure of the software, the database, middleware and the development tools. it is a platform provided for the application development as well as deployment. The development of an application can be less complex as compare to develop in different platform. The deployment of any application due to resources is very costly and complex. This service makes it very easy and simple to develop or deploy any application on any platform.

2) Infrastructure-as-a-Service (IAAS): This service helps to provide hardware such as router, storage, and server. The end user does not need to have all needed configuration at one place. It can notified the supplier for the needed infra and the supplier provides the requisite supervised and organized cloud infrastructure. The supplier bills the end user for the provisions.

3) Software-as-a-Service (SAAS): there is a lot of software needed by the various users and tenants. It is very difficult to maintain all at once. It also increases the cost of the software. This platform overcome the above discussed problem and provides the software needed by the users. The user needs to maintain only one program without any problem. SaaS itself manages all the datacenters and also provides it to every user on needs.

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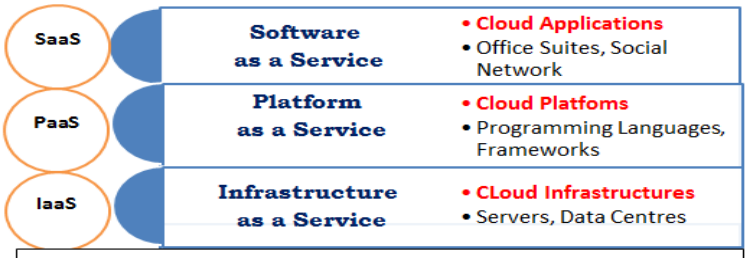


Fig. 1 Cloud Computing Architecture

III. CLOUD DEPLOYMENT MODEL

A. Three Most Common Model for Cloud Deployment are Private Cloud, Public Cloud and Hybrid Cloud [19].

1) *Private cloud:* A private cloud is the structure dedicated to single organization. It can be operated by itself or 3rd party. Private cloud provides flexibility to organization to create its own security measures and thus, more trusted model.
2) *Public Cloud:* An external cloud provides an open access to the public. Normally, it is provided by a large-scale companies or group of organizations. The application hosting on public cloud is least costly. But, there is compromise with the trust within service providers and end users.
3) *Hybrid Cloud:* It is combination of other cloud such as public and private clouds. It is less expensive than private but more than public clouds. Clouds can be privately managed and the data and applications can be exchanged in between the cloud. So, it can create a trust model between service providers and consumers.
4) *Community Cloud:* This cloud is useful when a group of organizations with a common target or goal are working together. It creates a shared datacenters that will be publicly used by the members of group. The cost can be increased than private cloud with the increasing number of members of group. Still, the security needs to be improved as type of organization varies.

IV. ISSUES WITH CLOUD COMPUTING/ RESEARCH CHALLENGES

A. We will Discuss Some of the main Cloud Computing Challenges. These Are

1) *Service Level Agreements (SLA's):* The SLA is a legal agreement between the consumer and service provider. It helps to administrate the resources as the need arises via duplicate the data, prioritize the consumer. Control on the usage of the resources. It also makes a clear view of billing procedure of the resources. The user can easily check about the usage as well as the charged by the service provider. It create transparency between consumer and service providers, but, still there is a lot of other issues keep on rise, such as, data protection, out of resources, pricing structure. The most arising question the clarity in the terms of uptime. The user data will be keeping by the service providers after the agreement expires[17].
2) *Cloud Data Management & Security:* The data managed by cloud is very large, unstructured. The physical data structure security cannot directly access by the service providers. The data security is maintained by the infrastructure providers. So, in the case of private cloud. The service provider does not have clear indication of the data security. So, the main responsibilities of data security in the case of confidentiality, auditability are provided by the infrastructure providers. The data auditability is difficult to maintain while the data is migrate from one machine to other machine[4, 11, 20].
3) *Data Encryption:* Encryption provides a sense of security of the data. It can be either simple or complex according to the requirement. Many questions need to be answered between consumer and service provider. For e.g. the data encryption is done by the service provider or consumer can also do it before uploading the data [9, 12].
4) *Migration of virtual Machines:* it is one of the most beneficial facilities provide by cloud computing. Virtual machines are easy to create and migrate. It make easy to balance the data load and resolve the problem such as hotspots. So, to detect the workload hotspots is not very easy [15].
5) *Interoperability:* When two or more than two systems exchange information is known as interoperability. If two clouds can exchange information and able to use it will increase the performance as well as decrease the cost. The public cloud does not support any exchange in between different public cloud. It is the main hurdle to cloud interoperability. The industries need to create cloud friendly platform so that cloud service providers' task become easier.
6) *Access Controls*
7) *Energy Resource Management:* To follow the government regulation to create sustainable environment hardware architecture with no degradation in performance is a challenge. The turned off the hardware not in use in data Centre will increase the cost of the cloud computing. The pattern produced by GEMC can be used to create an efficient, optimized energy saving infrastructure.

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8) *Multi-tenancy:* The main task of cloud computing to let borrow the required resources to different consumers. But, it also leads to many problems. If one resource is on demand as compare to other resource. It leads to hotspot problems, the direct effect on the performance as well as the response time. It increases the latency time of the machines. In the worst case scenario, the further request will be rejected, until the problem is resolved.
9) *Server Consolidation*: It is an effective approach to maximize resource utilization while minimizing energy consumption in a cloud computing environment. Unutilized servers are consolidating into one server to create an energy efficient server. But the consolidation server is formulated as vector-bin problem that is a NP hard problem. It does not affect the performance of the server. While VM changes its footprint, it also affects the bandwidth, disk I/ O. Still the VM footprints help to observe the variation as well as to improve the server consolidation in the future [13].
10) *Reliability & Availability of Service:* the main purpose of cloud computing to provide the resources on demand. So, the reliability of this service should be available under any conditions. It should able to provide some basic resources under any conditions. Some service should work without internet. It is quite a challenge to increase the reliability of services of cloud computing.

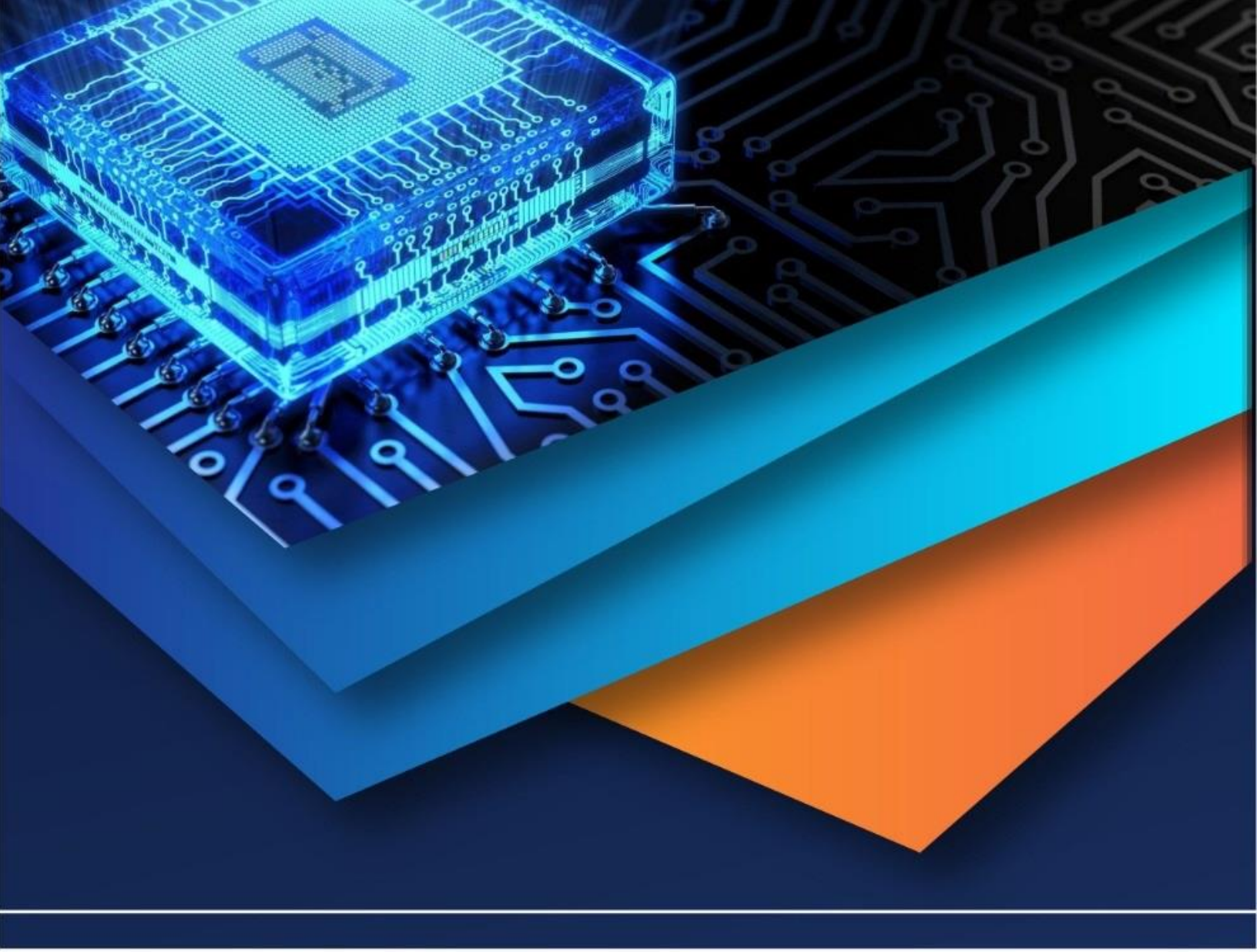
V. CONCLUSIONS

Cloud computing introduced a new era to next generation of architecture in IT industry. It is one of the most dominating and competitive to coming years. There are very challenges that are discussed in this paper. Cloud computing gives new challenges and research area for researchers. It is a first step towards virtualization, Internet of things, mobile computing etc. The cloud computing does have a lot of hidden research challenge. This paper will help to explore some of the challenges.

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