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Analysis of Cloud Computing and Its Challenges

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***Abstract* -** Cloud Computing is a new paradigm that offers computing resources such as network, storage, servers, applications and services whenever there is a demand based on pay-as-you go standard. It is about sharing of resources among cloud customers. Cloud provides computing infrastructure with a development platform on which users can develop their own applications. Besides the advantages of Cloud, it has certain challenges to be resolved. In this article, the challenges of Cloud computing in various aspects are discussed.

Keywords – cloud computing, resources, services, cloud service provider, internet, data, storage, applications, security.

I. INTRODUCTION

The National Institute of Standards and Technology defines Cloud Computing as "A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" [1]. Cloud computing has five essential characteristics such as On-demand self-service, broad network access, Resource pooling, rapid elasticity and measured service.

Fig. 1.1 Cloud Computing

The cloud offers primarily three types of services such as SaaS (Software as a Service), PaaS (Platform as a Service), IaaS (Infrastructure as a Service). Furthermore, the services are broadly classified into MaaS (Monitoring as a Service), C-MaaS (Cloud Migration as a Service), CaaS (Communication as a Service), STaaS (Storage as a Service), GaaS (Graphics as a Service), SECaaS (Security as a Service), DaaS (Data as a Service), BPaaS (Business Process as a Service), TEaaS (Test Environment as a Service), DaaS (Desktop as a Service), APIaaS (API as a Service) [2].

The cloud can be deployed in four different ways [3]: a) Private Cloud: The private cloud is meant solely for an organization. b) Public Cloud: General public can have access to this type of Cloud. Example: Google, Microsoft, etc. c) Community Cloud: Similar types of organizations can have a same cloud. d) Hybrid Cloud: Any combination of Private, Public and community clouds is known as Hybrid Cloud. Thus, the deployment models are distinguished by ownership, size and access.

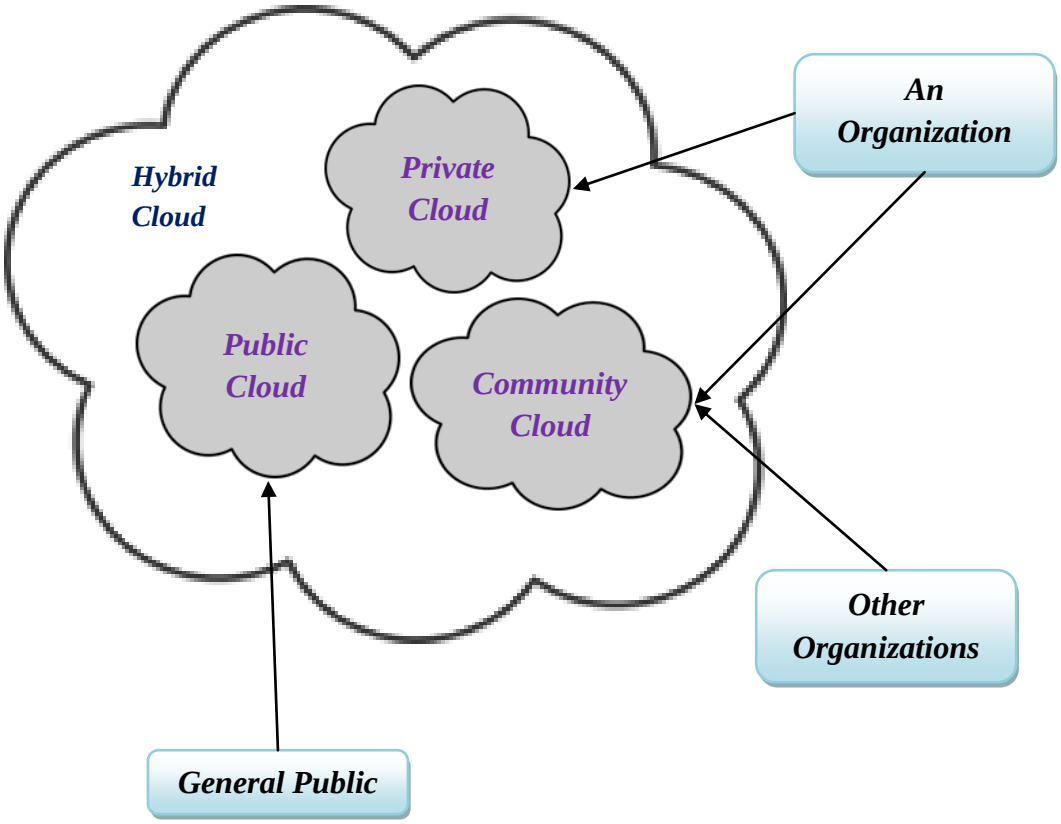

Fig. 1.2 Cloud Deployment Models

Besides the general issues, every cloud model has certain challenges [3]. The challenges in Private Cloud are Security control and compliance. In Public Cloud, the challenges are assessment of the cloud service provider, security of the communication channels, transparency of security processes, compliance with regulations and data loss. The Hybrid Cloud model has following challenges: absence of data redundancy, Compliance, poorly constructed Service Level Agreements (SLA), risk management and security management.

II. ANALYSIS OF CLOUD COMPUTING ISSUES

A. Downtime

Expansion of number of cloud users requires large number of resources to be available to all the users at all the times.

B. Security

The data transacted through internet are exposed to malicious attacks. The unencrypted data can easily be broken by hackers and the security of the data is violated.

C. Vendor Lock-in

It is the customer's choice selecting the Cloud Service Provider (CSP). The customers or organizations can switch to different cloud environment as they wish. The problem is it cannot be ensured that they will have the same cloud infrastructure in the new cloud. On the other hand, some CSPs may restrict the cloud customers to not switch the clouds.

D. Limited Control

Since the cloud customers depend on the third-party's infrastructure and resources, they will not have complete control over the infrastructure.

E. Interoperability

While switching from one cloud to another, the compatibility issues on applications may arise.

F. Natural Disaster [5]

Cloud customers cannot determine where their data are actually stored, which physical machine and which place it is located. If a natural disaster occurs, the customers' data may be damaged or corrupted.

G. Data theft [5]

Cloud users store their official, personal and sensitive data in the cloud. This may lead to a risk of data theft.

H. Data Loss [5]

While working with cloud environment, if power shut down happens suddenly, the data would be lost. Because the data stored in third-party servers, there may arise data loss issue.

I. Data-at-rest [6]

In this case, the cloud would be in loss of control. The encryption and decryption keys that are used to protect the data would be easily compromised by hackers.

J. Data-in-transit [6]

The data-in-transit issue affects the confidentiality and integrity of data. It's because of poor encryption technology and network protocols.

III. OBSERVATIONS

When the demands for resources are high, only then the customers experience downtime of resources. The CSPs should have a compatible infrastructure and resources for the customers who want to switch over from a cloud. The customers can be provided a complete control over the cloud infrastructure and resources. The cloud vendors should offer good safety measures for the protection of data from natural disasters. The Cloud vendors must ensure the recovery of data when there is a data loss. Also, they have to make sure that the data in the cloud cannot be hacked by any malicious users. Among all the challenges, the security is considered as the major challenge to be resolved. Though various security algorithms were proposed, still there exist loopholes that are to be rectified.

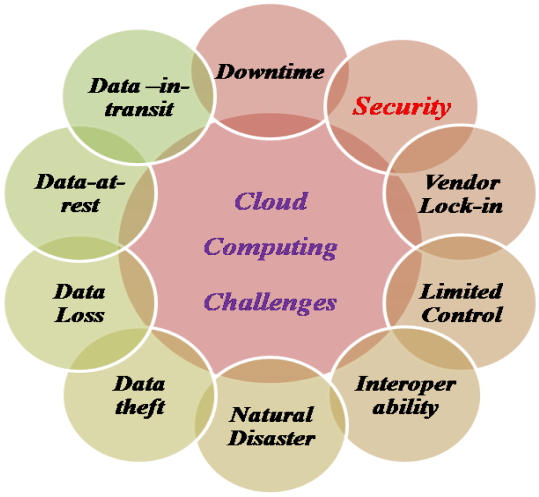

Fig. 2.1 Cloud Computing Challenges

IV. CONCLUSION

Cloud computing is the brilliant concept that explores new way of computing and optimized utilization of resources which is considered as an effective computing methodology. It implements the idea of everything can be accessed from anywhere round the clock. So the people can work from anywhere in the world with no physical company infrastructure. Though the cloud computing has more advantages, there exist certain challenges to be mended. By rectifying all the challenges it will become a secure cloud computing.

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