A Comprehensive Survey on Cloud Computing Related Challenges and Issues

K Sreelatha, V Krishna Reddy

Abstract: *Cloud computing provides scalable, virtualized on demand services to the end users with greater flexibility and lesser infrastructural investment. In recent years, due to the huge growth in using various services provided by the cloud computing, there have been so many issues and challenges faced the cloud computing users and providers. In this work, we surveyed several research works on cloud computing related to challenges and issues. The primary goal of this paper is to provide a better understanding of the challenges of cloud computing and identify approaches and solutions which have been proposed and adopted by the cloud service industry.*

Index Terms: *Cloud Computing, Cloud Framework Resource Allocation, Security*

I. INTRODUCTION

In recent years the usage of Cloud computing has become prevalent that has been receiving considerable attention from both academic and industry for data storage and data-intensive computing power. It presents more benefits as an easy backup, unlimited storage, cost-efficient, automatic software integration, quick deployment, and easy access makes the organizations and other users move towards the cloud computing. Specifically, it provides the opportunity to store a huge amount of data relatively cheaply, since they no longer need to spend large amounts of capital on buying expensive application software or sophisticated hardware that they might never need. Instead, they can perform their tasks using cloud services viz., software, infrastructure or platform services (SaaS, IaaS, and PaaS respectively).

The users need to pay only for the resources (measured service) they consume on-demand basis. Moreover, Cloud Computing provides various characteristics like Board Network Access- provide access to the user regardless of their location. Resource Pooling - Resources are pooled to serve various user applications. Elastically (elasticity) provisioned and released of resources according to the user needs. These characteristics attracted many sectors viz., banking, industry, education and health sectors for building applications on the Cloud infrastructure and making their businesses agile by using flexible and elastic Cloud services. However, cloud computing poses many challenges the primary one, is the data security that may be susceptible as the data handed over to a third party and this make cloud users feeling insecure using the cloud. The secondary issue is the data centers, which are located geographically and growing rapidly that poses data unavailability and energy consumption problems. The third issue is enormous users, competes for the same resource that poses for resource allocation and load balancing problems. Finally Quality of service needs to be maintained by cloud service providers to meet different user's priorities also becomes a big issue.

In recent years a lot of research work has been done on these challenges in the form of various techniques and methods for overcoming the challenges that are faced by cloud computing. This paper presents a survey of issues, challenges, provides a brief study of different challenges and issues that are proposed by various authors by using different techniques and methods.

II. BACKGROUND OF CLOUD COMPUTING

In this section, a brief review of literature is discussed in order to deliver a theoretical background and to develop an indulgent of the consequence and role of important characteristics of cloud. NIST identifies that cloud depicts five vital characteristics that show their likeliness and differences against conventional computing methods. The Figure .1, shows significant aspects of cloud computing as suggested by NIST.
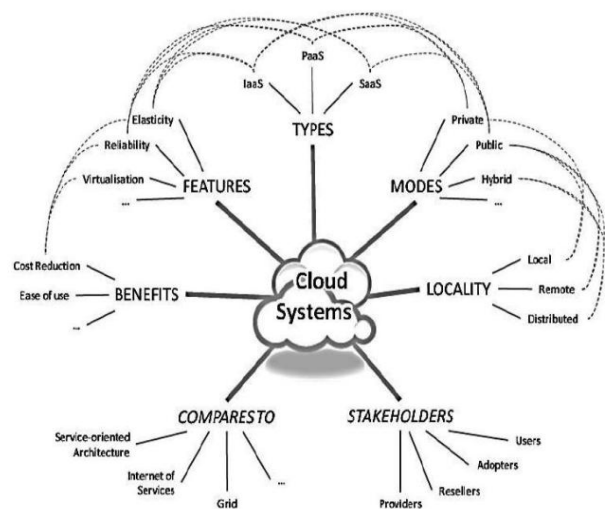

Figure.1 Aspects of Cloud Computing [1]

On-Demand Self-Service: The on-demand Self-Service is acting like a most important characteristic in cloud computing, which provides various services from each provider without human interaction. Some of the cloud service providers provide this service- AWS, IBM, Google etc.

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Table: 1 Summary of Cloud Availability Techniques

S.No.	Authors	Findings	Merits	Demerits
1.	Authors in, [2]	A Dynamic Popularity aware Replication Strategy (DPRS) based on the data access popularity and parallel download criteria. Numerous parts of a file would access simultaneously by using parallel downloading approach.	Reduction in download time, Ensures more availability for popular data and good quality of service (QOS).	It fails to investigate the risk of security and energy efficiency
2	Authors in, [3]	Uses simple regenerating codes (SRC), and perform XORing operation to exact repair of a node in case of node failures.	Have high-rate, very small disk I/O, and minimal repair computation.	No control over the repair bandwidth
3	Authors in, [4]	Proposed a new data replication technique for cloud computing data centers that have capable of optimizing the energy consumption, network bandwidth, and communication delays. However this approach can be suitable for both the individual data center and geographically distributed data centers.	By owing the reduced communication delays thus outcomes an improved Quality of Service (QoS).	In this work there is no discussion regarding the Load balancing, no formal specific mathematical model as well as a testbed application of the proposed solution.
4	Authors in, [5]	Introduced Dynamic Cost-Aware Re-replication and Re-balancing Strategy (DCR2S) for heterogeneous cloud data centers. Also based on the popularity they replicate the data file and knapsack approach is used for replicating the data file.	In this the Cost, response time is decreased to lot extent.	Any approaches to fault tolerance and load balance issues which are not addressed.

Table: 2 Summary of Energy Efficiency Techniques

S.No.	Authors	Findings	Merits	Demerits
1.	Authors in, [7]	A well-organized solution for scheduling problems in Cloud computing. Another important functionality of this approach is to arrange the required resources for proper executing the jobs.	Resource utilization improvement, Energy consumption reduction for executing jobs.	It fails to examine the risk of delay efficiency
2	Authors in, [8]	Restructured energy-aware empirical framework for virtual machine association to attain a better energy-performance	Decrease in the SLA violation, energy consumption, and execution time.	Work concentrated only on the single task with single processing
3	Authors in, [9]	Introduced Dynamic Cost-Aware Re-replication and Re-balancing Strategy (DCR2S) for heterogeneous cloud data centers. Also based on the popularity they replicate the data file and knapsack approach is used for replicating the data file.	Great reduction in the energy consumption of data center and improvement in the QOS.	Any of the sufficient approaches to fault tolerance which are not addressed.
4	Authors in, [10]	It showed the novel QoS-aware VMs consolidation methodology with SLA.	It depicts great trade-off between the energy consumption and QOS.	In this work there are no proper discussions regarding network resources.
5	Authors in, [11]	Explained about clearly the On line virtual machine consolidation algorithms.	Seems to be Marginal Performance overhead in the virtual computing.	More time consumption process

Table: 3 Summary of Cloud security model

S.No.	Authors	Findings	Merits	Demerits
1.	Authors in, [12]	A well-organized solution for scheduling problems in Cloud computing. Another important functionality of this approach is to arrange the required resources for proper executing the jobs.	Confidentiality enhancement, Provides security to data storage in the cloud. In a similar way uses synchronizer for securing the all the keys for authentication.	In spite of having the synchronization capability, there is a chance of delays in the communication session.
2	Authors in, [13]	With the aid of Antispoof GPS approach, one can easily locate the user location and position.	Formulated and additional security layer for encryption purposes to make strong enough.	It doesn't provide useful information of complexity involvement in the extra layer correctly.
3	Authors in, [14]	Implemented an improved security layer for cloud that consists of monitor, data, virtual machine and storage layers.	Continuous monitoring of users behaviour in the cloud with the aid of patching utility.	More probability of existence of business and technical issues that were not deliberated clearly
4	Authors in, [15]	Developed a unique model that have the facility of data validation, user verification, and user data attack detection and prevention mechanism.	Greater identification of security, privacy, threats and attacks in the given framework with less effort.	Unsuccessful to examine the risk involvement and certain measures in cloud computing
5	Authors in, [16]	Designing of more useful analysis that solved several constraints of cloud technology.	Easy accessible and more economical for the user in IT sector.	More affected due to security threats and various attacks present in the cloud.
6	Authors in, [17]	With the new 3 layered approach, there are certain advantages for providing additional security to the storage system in the cloud, virtual machine and network monitoring.	Improvement to three major parameters like integrity, Authority and confidentiality to all the 3 layers.	It provides only the partial improvement and security to the layers in the cloud computing.
7	Authors in, [18]	By supporting 3 layer structure it majorly contains encryption of data, authentication and recovery of data.	Provides facility of one time password for extra security.	Security to the network was not addressed correctly.

Table: 4 Summary of challenges with parameters

Challenges	Energy Efficiency	Reliability	Q.O.S	availability	Security & privacy	Resource utilization	Fault tolerance	Replication	bandwidth	cost	Performance	Throughput	overhead	integrity	flexibility	authentication	repudiation	confidentiality	time	scalability
Availability	✓		✓				✓	✓	✓	✓			✓							
Energy Efficiency			✓				✓		✓		✓									
Load Balancing		✓				✓				✓	✓	✓	✓						✓	✓
Q.O.S	✓	✓		✓	✓					✓	✓		✓	✓					✓	
Resource Allocation						✓		✓		✓	✓					✓			✓	
Security &Privacy										✓	✓			✓	✓	✓	✓	✓	✓	✓

Broad network access: Another characteristic of cloud is broad network access, which provides the obtainability of Cloud abilities over the network, and also restore through classic methods which support need by various client platforms like PDAs, mobile phones.

Resource pooling: Cloud computing offers a multitenant model where service provider's computing (physical and virtual) resources are combined to serve various users by dynamically assigns and reassigns the resources

based upon consumer on-demand. This mechanism derives as resource pooling whether the consumer typically has no authority or awareness about the specific location of the provided resources like memory, network bandwidth etc.

Rapid elasticity: In cloud computing services are elastically provisioned and released in addition by on-demand resources are scaled quickly inward and outward automatically. Furthermore, the cloud capabilities suitable for supplying are always seemed to be limitless and can be adopted in any portion at any moment to the consumer with the quality of service. This can be attained by using the rapid elasticity of cloud computing.

Measured service: In cloud computing for providing transparency between the service provider and the consumer resources can be organized, measured, and described. For this cloud provides a facility, to fix for resource use is called as pay -per -use capability and this is one of the advanced characteristics of cloud computing.

Advantages of Cloud Computing:

Cost Efficient: Conventional desktop PC software increases companies finance and summing up the approval cost to various users are valuable for the establishment. While cloud usable at reasonable rates for the purpose of reducing financial expenses of IT companies, where Cloud offers pay-as-you-go and other extensible options.

Almost Unlimited Storage: Cloud provides almost unlimited storage efficiency so nobody needs to worry about executing insufficient respiratory space and or present respiratory space accessibility.

Backup and Recovery: Backing up the information and restoring is much easy in cloud storage than storing on a substantial device and also most cloud providers are usually competent enough to not release from the recovery of data.

Automatic Software Integration: There is always no need for extra efforts to personalize and merge the data in the cloud where cloud provides software integration automatically and permits to customize options easily.

Easy Access to Information: While having an internet connection, one can access data from everywhere after registering in the cloud, by this useful feature user can get benefit from moving above time zone, geographic area concerns.

Quick Deployment: Cloud computing having the advantage of quick deployment thus by the time option for this technology, the whole system can be fully operational in less time, and that time taken depends on the type of technology that is used for business.

Combined Unicode and Color Code (CUCC) Algorithm provides a good yet new encryption methodology. In summary, the possible scenarios addressed in this study show that CUCC use in the cloud is beneficial and prominent documents continue supporting both these claims. Moreover, this inquiry is almost over. The outcomes are only the thin end of the wedge. It can sometimes lead us easily to new and different instructions / use of this algorithm.

Table: 5 – Encryption Time (in ms)

Input Size (KB)	Encryption Time		
	AES	DES	CUCC
45	50	25	30
55	44	29	56
96	76	45	67
236	113	39	89
319	155	89	121
560	171	131	134
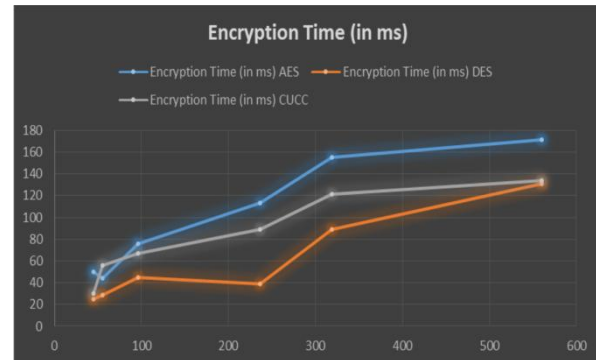
Figure.2 Aspects of Cloud Computing

Table: 6 – Encryption Time (in ms)

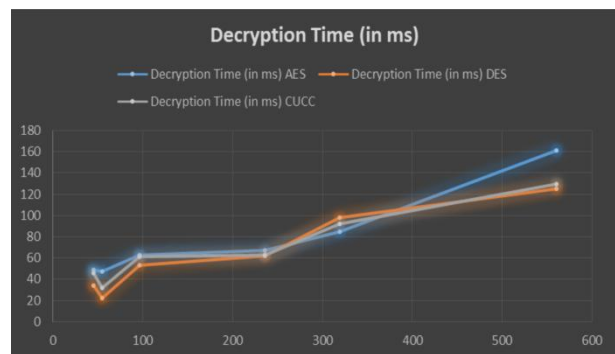| Input Size (KB)	Decryption Time		
	AES	DES	CUCC
45	49	34	46
55	47	22	32
96	63	53	61
236	67	62	63
319	85	98	92
560	161	125	130

Figure.3 Decryption Time (in ms)

III. CONCLUSION

The revolution of cloud computing has provided opportunities for research in all aspects of cloud computing. In this paper we presented the five essential characteristics of cloud computing, three cloud service models, and four cloud deployment models with cloud application areas. In the same way we are concentrated on advantages and challenges still facing by cloud users as well as cloud providers. The main focus of our study is the different solutions and methodologies presented for these challenges by different authors. We also mentioned advantages and disadvantages of those methodologies. Finally, we gave a summary based on the parameters considered for each and individual challenge.

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