

## Enhancement of Reliability Attribute for Robust Cloud Environment: A Survey

Mrs. Snehal Ashwin Narale<sup>1</sup>, Dr Pradeep K Butey<sup>2</sup>

<sup>1</sup>(Snehal.narale2012@gmail.com, Dept. of Computer Science, Dharampeth M. P. Deo Memorial Science College, Nagpur, India)

<sup>2</sup>(buteypradeep@yahoo.co.in, Head, Dept of Computer Science, Kamala Nehru College, Nagpur, India)

**Abstract:** Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (networks, servers, storage, applications, and services). Although the rapid demand of highly scalable environment, cloud computing technology is associated with real time applications. It support highly scalable virtual environment which will help to augment the scalability, availability and reliability .cloud computing supports distributed system architecture. Due to distributed approach, every work has to be done on virtual machine. Cloud computing has many advantages like ubiquitous network access, location independent resource pooling, rapid elasticity, pay per use, virtualization and, flexibility. But still it has to face many challenges like security, data migration, interoperability, data availability, performance and reliability. In this research paper Fault Tolerance techniques along with some other techniques were discussed. The adoption of this techniques in cloud environment really help to minimizes error fault and improve the metric like reliability and availability. This paper also discussed various metrics along with their comparison of diverse models.

**Keywords-**Cloud Computing, Cloud metric, Fault Tolerance Techniques, Replication, Virtualization.

### I. INTRODUCTION

NIST 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 is symbol for the internet.

The term cloud computing is innovative technique that appears that appears to be linked to Web 2.0. The user has access to a number of files and programs stored in different, undefined, or virtual places (this is the reason why the term cloud is used), which are permanently available to us wherever we are .Our documents are not physically hosted on our computer and we can have them from anywhere with just an Internet connection. Working in the cloud means that uses don't have the need to depend on a particular program or even an operating system any more [2]. The only need to start working in the cloud is a device with Internet connection. The three service models are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

#### 1.1 Characteristics of Clouds

In the below figure it represents various characteristics of cloud computing including cost reduction, reliability, elasticity, QoS and availability. This research paper shall be focus on reliability and availability issue in detail. Reliability means data rate is low i.e. no loss of data with minimum code during execution of process. If the reliability should consider in cloud computing it will help to exploit the cloud capabilities. Another issue in cloud computing is availability[3]. Availability is the essential capability of cloud system. It lies in the ability to introduce redundancy for services and data. Table 1 indicates different characteristics of cloud computing.

Table 1: Characteristics of cloud computing

Cost reduction	Reliability	Elasticity	Quality of Service	Availability
It is one of the first concerns to build up a cloud system.	It will help to exploit cloud capabilities.	It is s essential & core feature of cloud.	Specific requirement have to be met by the outsourced services & resources.	It is essential capability of cloud system.

It will help to change customer's behavior.	No loss of data.	According to the requirements infrastructure should be changed.	-	It lies in ability to introduce redundancy for services and data.
Easy to maintain cloud infrastructure.	No code reset during execution	It is essential & core feature of cloud.	-	Failures can be masked transparently.

### 1.2 Cloud Computing System

Fig. 1 represents the architecture of cloud computing system which represents deployment model, service model, challenges and benefits of cloud system [3,4].

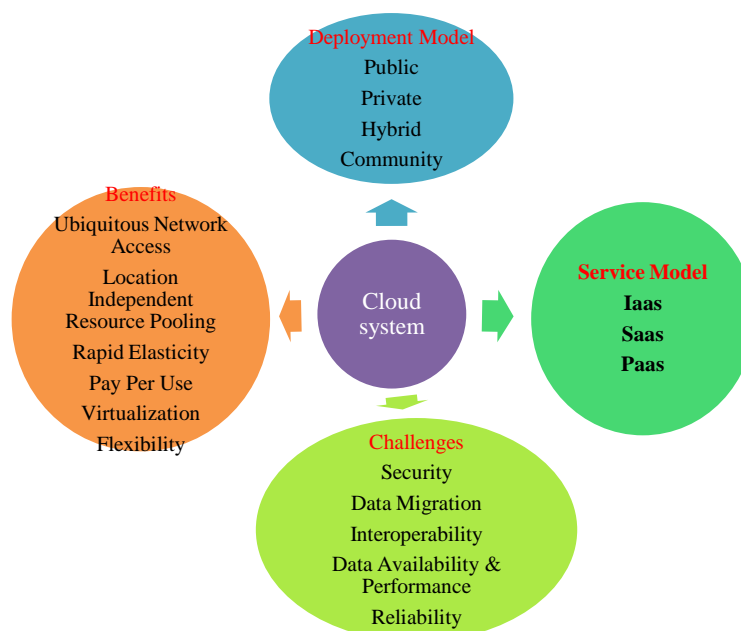


figure 1: cloud computing system

## II. RELIABILITY AND AVAILABILITY IN CLOUD COMPUTING

Now a day the demand for highly scalable virtual environment has increased in cloud computing environment. To fulfill this requirement the scope is to associate cloud computing environment for real time task/applications. When the customer has work in real time environment at that time different tasks were performed on remote virtualized machine, as they are using virtualized machines the chance of increasing error will high due to loss control over these virtual computing nodes during the process of execution. As the probability of error high therefore it poses challenges like reliability, timeliness, QoS requirements and Fault Tolerance. To evaluate these problems this paper should analyzed Fault Tolerance techniques and other techniques which will help to improve the reliability and availability issue in cloud computing environment.

Cloud computing working on distributed environment so it has diverse advantages but still it suffers from lots of problem. Out of this problem some are major issues which need to investigate in future. The reliability and security are an issue that reflects the performance of the system and hence this two are most important. Cloud computing appears as a novel model of computing whose aims to provide reliability, and quality of service to the end users. Reliability depends on the operations of the services [4]. If the services operates without failures within specified time and condition it will help to achieve the reliability. Reliability defined on the times which indicate the failure to promise by the Cloud provider and preceding failures experienced by the users. It is also defined as the ability of performance of the system component consistently according its specification.

Availability is depends on the accession time. The accession time is a time in which the customer can access the service. Availability is the proportion of time in which component is functional to the total time it is required or expected to function. Sometimes availability is expressed in terms of quality, indicating the extent to which a system can continue to work. In the time at which the availability of the system is good it means the functionality of the system is good. A module which that execute its operation within precise time consistently is nothing but the Reliability. When hardware or software has not successfully compiled its running means it has

failed to complete its task is called a failure. In cloud computing environment, if the resources are unavailable to the customer as per the request then failure arises. Due to this failure it affects the lack of reliability. One of the methods to enhance the reliability is by using fault tolerance mechanisms and monitoring service.

The data is stored on cloud data center due to its large scalability and dynamic in nature. Apart from his feature cloud data center provides other characteristics, still t has to face some challenging issue like to high reliability and efficient data access from cloud data center [5]. To achieve the reliability and availability in cloud computing infrastructure the following techniques were help to meet this requirement. Some of which techniques discuss as below.

### III. TECHNIQUES USED IN CLOUD COMPUTING ENVIRONMENT

- Fault tolerance
- Replication
- Resource provisioning
- Virtualization

#### 3.1 Fault tolerance techniques

The fault tolerance is a technique which help to detect faults occur in system. For the establishment of large data center the necessity is increased demand for resources. Due to increased demand of resources affects on increased in the services, and thus establishment of large-scale data centers. In the past, high performance was considered as the main criteria in the design of data centers [6]. Today, in the development of cloud computing paradigm because of increased demand for services request by the user the data center has to face the problem of data failure. The scale of data increased As the scale data rises, access to them gets more complicated, so that different levels of access may be required for each application or each data item.

It is required to implement in the system due to following reasons: a) The nodes which are defined by user in cloud are cheaper, less authoritative and less reliable, b) The communication faults like connection time out impact the reliability of cloud. The main aim of using fault tolerance techniques is to achieve reliability, robustness and availability in every system of cloud computing environment [7]. The following Fig.2 indicates different fault tolerance techniques use in cloud computing environment.



figure 2: fault tolerance techniques

##### 3.1.1 Types of faults

A fault can be categorized on the basis of computing resources and time different types of fault like network fault occurs due to network partition, packet loss& corruption etc, processor fault occurs due to os crashes, media fault happened due to media head crashes, physical fault occurs due to fault in cpu & memory, service expiry fault occurs when applications are using and process fault occurs due to shortage of resource, software bugs, etc. [7, 8]

### 3.1.2 Metrics for Fault-tolerance in Cloud Computing

In cloud computing environment various fault tolerance techniques are used. The existing fault-tolerance technique in cloud computing consider miscellaneous parameter including different type of fault-tolerance like proactive, reactive and adaptive. It also considers performance, response-time, scalability, throughput, reliability, availability, usability, security and associated over-head. Table 2 summarized the Comparison among various models based on the metrics element [9].

Table 2: Comparison of various models based on the metrics element

Metric name	Functionality	Aft rc	Ll ft	Ft ws	Ft m	Ca nd y	Ft- clo ud	M ag i cu be
Performance	This is used to check the efficiency of the system to be improved at a reasonable cost.	h	h	a	a	A	H	h
Scalability	This is the ability of an algorithm to perform fault-tolerance for a system with any finite number of nodes. This metric should be improved.	h	h	l	l	H	H	h
Throughput	It help to calculate no of tasks to be calculated. It should be high to improve the performance of the system.	h	a	l	a	H	A	h
Reliability	This aspect aims to give correct or acceptable result within a time bounded environment.	h	h	a	a	H	h	h
Availability	The probability that an item will operate satisfactorily at a given point with in time used under stated conditions. Availability of a system is typically measured as a factor of its reliability as reliability increases it also increased.	h	h	a	h	H	a	a

### 3.2 Replication in cloud computing

Replication is process of offering unusual duplication of the identical service at diverse nodes. This is one of the useful technique which helps to improve the availability and reliability in distributed system. This technique used in different cloud architecture such as GFS and HDFS. In the cloud computing the replication or duplication of data is accomplished via the pool of data resources. During the process of data replication many data replicas are created and these data replicas are set based on history and experience. The replication of data is not allowed for every data file. The replicas are not created for though files which are frequently in used or which are recently in used [10].

In cloud computing environment reliability and availability are the major issues of research. The replicas are used in cloud computing which will help to reduce user waiting time, increased data availability and minimize system bandwidth consumption. Many replication techniques are being used which are classified into static and dynamic. In static replication the copy of replica means the duplicated data are set initially on their locations. On the other hand in dynamic replication the replicas are created dynamically i.e. according to the changing environment of loading conditions. Different replication algorithms like Caching PP, Cascading-PP, Fast Spread-PP, Cascading-Enhanced, and Fast Spread-Enhanced are used in the process of replication of data in cloud computing environment. Although the copies of data files are used in distributed file system so it is very easy to access the data from anywhere with minimum problems, and hence it will help to increase the availability of data different types of replication techniques are used in cloud environment like Active, passive, Quorum Replication, Primary Backup Replication, Lazy Replication and Chain Replication [11]. The goals of replication:

- Decrease latency time.
- Reduce the bandwidth.
- Balance the workload, minimize execution time and minimize the maintenance cost.
- Achieve high scalability and availability.
- Fault tolerant.

### 3.3 Resource Provisioning

The cloud computing is a distributed computing. The most demanding problem in distributed system is Resource Provisioning. Resource provisioning means providing maximum resources to the users. It will help to increase resource utilization. The cloud computing has to face the same important problem of resource provisioning. There are two resource provisioning techniques in used first is static and second is dynamic [12]. This resource provisioning technique will help to meet parameters of Quality of Service like availability, throughput, response time, security, reliability etc.

In this research paper we proposed to use resource provisioning technique in cloud computing to increase the reliability and availability of data. A major challenge in resource provisioning technique is to maximize the resource utilization and from users perspective minimize the financial cost required for right amount of resources utilize for the execution of the work..Cloud computing is one of the solution for it. By considering SLA, resource provisioning providing services to the cloud users. Cloud computing offers services to the users vigorously and elastically [13]. Depending on the requirement of the user the resource provisioning techniques are classified into three basic categories as static, dynamic and user self provisioning.

### 3.4 Virtualization

Virtualization is a technology which has ability to create complete virtual machines. These virtual machines are independent of physical resources /infrastructure to their physical locations. We can specify the computing, network and storage resources for each logical server (virtual machine) and even move workloads from one virtual machine to another in real-time (live migration). In fact, virtualization offers functional isolation therefore enabling multiple views over the same physical hardware. For the maximum use of computing resources Cloud computing and Virtualization are technologies are developed [14]. Virtualization has several benefits for enabling cloud computing. It will help to reduce the difficulty by reducing the number of physical hosts but it still involves purchasing servers and software and maintaining infrastructure.

#### 3.4.1 Benefits of virtualization

- ✚ Functional execution isolation
- ✚ Easier management
- ✚ Server consolidation.
- ✚ Improve security affects on enhancement of reliability.
- ✚ Dynamic provision of VMs to services by allowing resources to be allocated to applications.
- ✚ Performance isolation.

## IV. CONCLUSION & FUTURE WORK

In this research paper various issues of cloud computing will discussed along with its characteristics and challenges. Cloud computing has several advantages and benefits but still it has to face some challenges like reliability, availability, data migration and interoperability etc. out of this challenges ,the research paper focus on reliability and availability issues. There are different techniques which will help to improve this issue. The research paper study some techniques like fault tolerance, replication, resource provisioning and virtualization. Fault tolerance technique detect the type of fault along with tolerance techniques like check pointing ,rescue overflow, replication etc. These techniques help to improve reliability of data in cloud system. Replication is one of the useful technique which help to improve the reliability and availability in cloud computing. Resource provisioning and time scheduling techniques really help to enhance utilization of resources correctly in time. By adopting these technologies in cloud computing it will definitely improve the response time and availability of the resources that are required for users. Virtualization is also effective technique in cloud computing in which all work has to be done with virtual machines. We also discussed Comparison of various models based on the metrics element. The studies of these issues are not limited. In future more focus given on the other metrics of cloud computing. The necessity of the work is to study more challenges of cloud computing.

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