

Fault-Tolerance Techniques and its Accomplishment in Cloud Computing Environment:A Study

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ABSTRACT

Cloud computing is actually altering the way, how and where the computing is going to be achieved. Cloud computing is working as computing model in different area of domain application it becomes quite famous. Cloud computing provides different resources to the client and it has lots of benefit but still the people are averse to used for factual instance applications. Today we found systems around us out of which many systems are based on real time applications. Because of this cloud always sustain for factual system which are time constraint and vital. Their applications range from small to larger controls. Many of the systems are which should be reliable. If we want to define the real time system then it can be defined as the system which gives respond to any type of information within specified time and restricted. So that the accuracy of the system is not only depends on the result that can be generated by the system but also depend on the time which will required to deliver the result. During this process if the system is fail and it does not give any response it is equivalent to the wrong response. The factual time related systems have two main characteristics by which they are separated by other general-purpose systems. These characteristics are relevance and error acceptance. In this research paper first we should focus on what is exactly factual time system and other point is that what are existing fault tolerance techniques used in cloud computing surroundings and how they used in detail. In this paper we also discuss an additional significant topic and that is fault tolerance model and procedure model

Keywords

Cloud Computing, Fault Tolerance Techniques,
Fault Tolerance Model, Reliability, Real Time System.

1. INTRODUCTION

Now in the era of computing technology, the most leading/overriding internet based computing is Cloud computing. This technology provides a huge number of services like on-demand access, ubiquitous network access, rapid elasticity etc [1]. The cloud provides different services and resources to the users with location independency in distributed fashion. The technology that has no geographical binding i.e. which is location independently is cloud computing, the services should be access from anywhere in ubiquitous ways. It works in distributed environment hence the technology has suffers from some serious issues like workflow scheduling, security etc.

The foremost problem of employing cloud-computing technology for real time system is fault tolerance [2]. User provides different resources like storage, network, server and services in cloud computing environment. Whatever the

services offered by cloud, user uses them according to their requirement and gets real time support. The cloud provides resources according to the users demand in distributed fashion to manage the resources efficiently.

Most of the systems used in a diversity of field that range from space systems to electronics like mobile phones etc are real time system which gives response quickly. The word real time means which gets the result within specified time and correctly. When user has applied for acquiring any resources from data center of cloud, the cloud will compute the result and then set back to the user again. If this result is correct and within time then that are real time data [3]. The performance of systems not only depends upon the exactness of the rational computations but also on the factor that whether the computation gets carry out in a permitted for an era or not .

Real systems are pore over by two properties that are suitability and fault tolerance. Suitability is the capacity of a system to achieve its proposed task within a time limit that is why that is real in nature. The word fault tolerance means the ability of the system to do his task elegantly even in the occurrence of error. The real time system has to face the problem of high fault tolerance. The system which are being used in real way are very critical in nature due to it's highly fault tolerant. If the systems are doing his work properly in such cases, the system has to face a financial loss [4, 5].

Therefore, the need is to facilitate such systems able to tolerate any kind of fault with cloud. In this research paper, author has discussed various issues like fault tolerance techniques used in cloud computing and relative analysis of procedural models which are based on reliability metric in fault tolerance. Author also make focus on the methods which are used to tolerate fault.

2. LITERATURE SURVEY

The important issues that need to discuss are the role of tolerance of fault in real time application that are using in cloud computing environment. Employing new technology named as cloud computing which is platform independent and cloud infrastructure for factual time application is pretty new. Many of factual allocations want to know about the capability of tolerance error to be provided. For standard real time system, maximum work has done via fault tolerance. In the case of cloud, computing the research scope is on implementation of fault tolerance techniques on cloud for real time applications. Cloud infrastructure has introduced some new problems that are coupling with real time computing. In cloud, the virtual machines are mysterious .The latency can change over period.

According to [1] it is examining that fault tolerance methods are uses for prediction of faults. These methods perform an

appropriate action, before the faults actually occur. This research paper also talks about the classification of errors and execution of the techniques that tolerate those errors. Various fault-tolerance models are accessible and they are comparing in terms of cloud computing in terms of fault tolerance. There are forbearance error models that introduce different fault-tolerance mechanisms to recover the system. However, there are still challenges that necessitate has measure for any framework or model.

According to [2] discussed mechanism that is base on fault tolerance for real time data in cloud computing platform. It has all the advantages of forward recovery mechanism. It has a dynamic behavior of reliability configuration. This scheme is highly fault tolerant. The reason behind adaptive reliability is that the scheme can acquire benefit of dynamic scalability of cloud infrastructure. In this paper author describe the scheme has that included the concept of tolerance of errors which are based on VM algorithm reliability. The consequence of the algorithm has high reliability.

According to [3] it has examined that in for all real time application AFTRC is a very good option to be used to tolerate errors. The highly fault tolerant systems can takes advantage of cloud infrastructure over scalability issue. This is possible only using the adaptive reliability method. During this method, there is minimum chance of error occurrence. The checkpoints made at the end of the node when all the results are produce. Nevertheless, with this advantage this model requires some innovation and this can happen only by including reliability factors. Proactive and reactive resource manager try to solve the problems that was occur at the time of node failure.

According to [4] it is examine that the cloud for real time is available when for intelligent machines as robots use complex processing. This processing can do on RTC via request and response model. The complex processing is more desirable as level of intelligence increases in robots towards humans. Complex processing is centralizing via RTC significantly for robot. Specially, when huge amount of robots working on disaster sites where humans reach is not possible at all. RTC based robots will survive to work for longer time due to small authority of utilization as there is no complex processing in robots itself.

According to [5] proposed a model that based on distributed environment for real time system.

According to [6] it is examined that tools which are used for implementation of the fault tolerance techniques in cloud computing environment covers all the drawbacks which occurs in past study. Autonomic fault tolerance is implemented to handle various fault which are related to software used for server applications in cloud computing. If one of the servers set off lose unexpectedly, connection will automatically redirected to the other server. Data replication technique has implement on virtual machine environment.

According to [7] it has examined that to diminish occurrence of the fault that are appeared in the process of execution of the system a variety of types of faults-tolerance and diverse of error bearing techniques are used.

According to [8] it has examined that for tolerance of different types of errors a framework is use. This framework contains various types of proactive fault tolerance mechanisms. It also permits the completion of innovative proactive fault tolerance policies that the user has utilize.

According to [9] discuss various faults Tolerance Workflow Scheduling. These scheduling based on Replication and Resubmission of Tasks in Cloud Computing

According to [10] it has examined that in distributed environment the applications are deploy in cloud data center using replication. The Low Latency Fault Tolerance (LLFT) middleware provides fault tolerance mechanism .The LLFT middleware consists of a Low Latency Messaging Protocol, a Leader-Determined Membership Protocol, and a Virtual Determinate Framework. . To get totally order message delivery service using group-to-group multicast, the Messaging Protocol is use. For fast reconfiguration and recovery of the service, the Membership Protocol is used.

According to [11] it has examined that middle layered approach has proposed if faults are occurs with virtual machine in cloud computing environment. FTM has benefit of user transparency, atomicity, flexibility and agility. Various services offered by cloud providers bearing in mind while designing the system. By means of considering various algorithms, the functionality of every factor in FTM can polished.

According to [12] it has examined some existing models were use in cloud computing environment along with fault tolerance techniques to tolerate faults. This research paper makes a glance on comparative analysis of these fault tolerance techniques by considering with various parameters.

According to [13] highly reliable and minimum duplication of new storage architecture has introduced. This newly introduced architecture is Magi cube which has used for cloud computing to get highly reliable and flexible data. The performance of the magi cube will improve by executing fault-tolerant process in the background. For batch processing jobs magi cube can work well.

According to [14] it has examined that cloud computing is on demand service computing paradigm of large scale distributed computing. It offer a better perception of fault tolerance techniques which are use to tolerate the faults in cloud environments.

3. THE ROLE OF FAULT TOLERANCE TECHNIQUES

Fault tolerance is a mechanism which can be used to minimize the fault. The user has sent demand to acquire resources and services from the cloud data center for the process execution of the query. In this process if user gets result with minimum response time and accurate result.

But while in this process lots of fault may be generated and due to this the rate of accuracy, reliability and scalability reduced. Because of this advantages the fault tolerance method will be used in cloud computing. The main benefit of using fault tolerance in cloud technology is data storage. High quality of data storage plays vital role in cloud.

Fault tolerance includes all the techniques required for sturdiness and reliability of data. Fault tolerance has related to dependability, Dependability that includes

- Availability
- Reliability
- Safety
- Maintainability

Failure recovery, lower costs, and improved standards in performance are primary features of fault tolerance technique which we use in cloud computing environment by utilizing diverse layers of virtualization, and can provide more flexibility in designing applications [6].

Due to amplified requirement for resources, it had led to rise in the services, and thus establishment of large-scale data centers. To improve the performance of the system the early need is to design the development of large data center.

As today's era of technology requirement of cloud, services were increased. To satisfy the demand of the user the necessities the development of data storage center which is - based on cloud computing technology, while using data center failure is major problem that has to be faced, which can be recognized fairly to the large scales of data stored. As the scale data rises, access to them gets more intricate so that different levels of access may be required for each application or each data item. In each system the strength and reliability can be accomplished by adopting the idea of using fault tolerance. The cloud computing uses list of existing fault tolerance techniques that are discussed below [6, 7, 8]

3.1 Existing fault tolerance techniques in cloud computing

There are list of fault tolerance techniques that are used in cloud computing. Some fault tolerance techniques have been discussed below.

Table 1: Existing Fault Tolerance Techniques in Cloud Computing

Sr. No	Name of Technique	Importance
1	Check pointing	This technique will help to perform task at different level in efficient manner for long running and huge requests. The check pointing will be used after doing every change in system. Checked point state allowed restarting the job from recently checked point instead of beginning at the task failure.
2	Rescue workflow	Rescue workflow permits to continue task to move forward without furnishing the failed task.
3	Job migration	This technique will help when due to some reason when jobs in a queue cannot completely be executed on a specified machine. Due to failure of task at specified machine the task can be moved from one to another machine using HA-Proxy
4	Preemptive migration	Feedback-loop control mechanism will help in calculating Preemptive Migration. By using this technique, the application persistently supervised and scrutinized.
5	Replication	For online service management of applications, the most significant techniques used for data storage center is replication. Replication of data means duplication of data and this duplicated data will be used to get successful execution and optimal result by performing different tasks. HA-Proxy, Hadoop and AmazonEC2 will help for performing unbeaten execution.
6	Self healing	The huge task is broken down into various parts. These Multiplications methods help to get better performance. Self-healing

		automatically handles the occurrences of failure when various applications are running on various virtual machines.
7	Safety bag checks	Overcrowding of command is done by this technique that does not get together the safety possessions.
8	S-guard	The implementation of S-Guard will be held in Hadoop, Amazon EC2. It is based on rollback recovery. As compared to stream, processing it is less unstable.
9	Timing check	The critical function can be supervised by the techniques using watchdog with time.
10	Resource co-allocation	The process of allocation of resources to perform the execution of further task can be done by resource allocation technique.
11	User specific exception handling	In this technique during the failure of task the user has to define a specified solution to resolve the problems

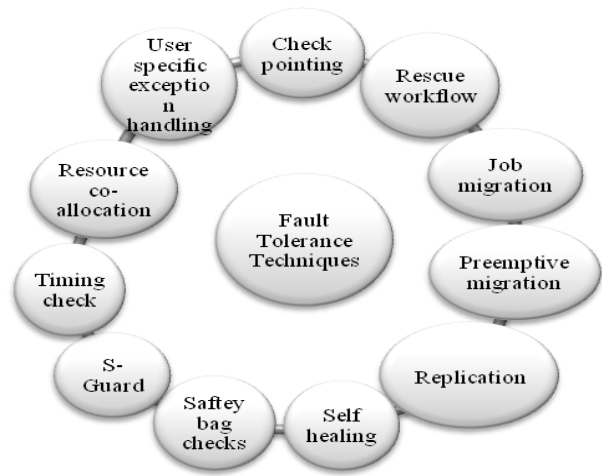


Figure 1: Fault Tolerance Techniques

4. METHOD OF FAULT TOLERANCE

Based on the policies and procedures of fault tolerance, the methods can be divided into two categories: proactive and reactive [8].

Table 2: Methods of Fault Tolerance

Proactive	Reactive.
➤ Proactive will help to recovery of fault, malfunction and error	➤ It will try to minimize the failures before it take place.
➤ It will assist to perceive the objects that are doubtful and those doubtful data will be put back with the correct data.	➤ Reactive method mainly broken into parts first is error processing and second is fault-treatment techniques.
➤ Before problem occurrence, it will help to rectify the problems.	➤ The prevention of reactivation of error is aspiring.

5. FAULT TOLERANCE MODEL AND PROCEDURE MODEL.

Fault tolerance model and procedural model has discussed below.

5.1 Afttc

For better implement of real time applications the real time systems i.e. factual system can take the advantage of fault tolerance model. The fault tolerance model integrate with cloud computing technology which has work out capacity, and scalable virtualized surroundings .If a virtual machine manages to provide an accurate result within the time limit, then it becomes more reliable and if it fails to propose the result within time or incorrect result, then its reliability decreases. In AFTRC model explain how the system tolerates the error proactively and build the elocation based on dependability of the dispensation nodes [9].

5.2 Ftm

This model examined that how to conquer the restriction of presented methodologies of the on-demand service. By using innovation and perception on creating and managing fault tolerance the FTM model accomplish the consistency and flexibility .In this specific methods user can state and pertain the desire level of fault-tolerance without requiring any acquaintance about its accomplishment [10,11].

5.3 Ft-Cloud

FT-Cloud is a position of the module based mostly framework for building fault-tolerant cloud applications to attack the challenge of providing extremely reliable cloud applications. FT Cloud employs module incantation structures and therefore the incantation frequencies to spot the many parts in a very cloud application. An efficient algorithm is designed to mechanically verify the optimal fault tolerance strategy for these vital components [12].

5.4 Magi-Cube

This is high dependable and small redundancy storage structural design for cloud computing. For read and write operation of metadata management of file we use the storage system. This system is build with Magi-cube on the top of HDFS. This architecture built a file scripting and repair component to work in the background independently. High consistency, performance and low cost are three most important factors that are pillars of this model of storage system. Magi cube is a model that facilitates all these characteristics [13].

Figure 2 represents the comparison of different models that are depends on protection against the type of fault and procedure model.

Type of model	Protection Against Type Of Fault	Applied Procedure For Tolerate The Fault
AFTRC	Reliability	1.Delete node depending on their reliability 2.Back word recovery with the help of checkpointing
FTM	Reliability, Availability, on Demand Service	1. Replication users application and in the case of replica failure use algorithm like gossip based protocol
FT-CLOUD	Reliability, Crash & Value Fault	1. Significant component is determined based on the ranking. 2. Optimal ft technique is determined.
MAGI-CUBE	Performance, Reliability, Low Storage Cost	1. Source file is encoded in then splits to save as A cluster. 2. File recovery procedure is triggered is the original file is lost.

Figure 2: Comparison of various models based on protection against the type of fault and procedure model name

6. CONCLUSION AND FUTURE WORK

In this research paper author studied already existing model as (AFTRC), FTM, FT-Cloud and Magi-Cube. These models are comparing based on protection alongside the fault and procedure model. This also discussed authentic system and factors that are required to authenticate system. It also makes glance on time constraint issues that help to improves security and reliability. Various fault tolerance techniques help to achieve different measures of cloud computing system for real time applications. Two types of fault tolerance methods proactive and reactive. Proactive will help in recovery of fault, malfunction and error. Reactive method will try to minimize the failures before it take place. The methods which are use to tolerate the fault are fault tolerate methods. The methods are based on types of fault occurs in the system. To tolerate the fault the boundary of system need to cover. This paper discussed various error tolerance techniques. Different fault-tolerance models and their comparative analysis in terms of reliability metric issue are also considered. The future scope of this study is implementation of these fault tolerance techniques to get different measures of robust cloud. In addition, with this different algorithms are used. Necessity of makes focus on various issues and challenges of cloud computing. By studying these various fault tolerance models next step is to avoid error occurrence in system and try to find out cause of error. Although study different issues of metrics to reduce the fault type. This matrices help to recover the reliability by using different scheduling algorithm [14]. AFTRC is a very good option to be use for all the applications that are use for real time computing. This is extremely fault tolerant. This type of scheme takes benefit over the dynamic scalability of cloud communications that is why using the adaptive reliability method. The foremost issue to consider is inclusion of more reliability factors on which decisions are completed and it will be more effective. Adoptions of fault tolerance technique in future really help for enhancement of system.

7. REFERENCES

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