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Review and Analysis on Fault Tolerance in Cloud Computing

A Research Paper Writing Proposal
Submitted by

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To

School of Computer Applications

In partial fulfilment of the Requirement for the
Award of the Degree of

Master of Computer Applications
Under the guidance of

Deepak Asija

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CERTIFICATE

This is to certify that Digvijay Singh (Reg No: 11303496), Pranjal Jain(Reg No: 11301918), and Akhtar Raza (Reg No:11300561) have completed their MCA Research Paper Writing Proposal titled "Review and Analysis on Fault Tolerance in Cloud Computing" under my guidance and supervision. To the best of my knowledge, the present work is the result of their original investigation and study. No part of the dissertation proposal has ever been submitted to any other degree or diploma.

The proposal is fit for the submission and the partial fulfillment of the conditions for the award

of the degree of Master in Computer Applications.

Date: --

                                                           Signature of the Advisor

                                                           Asst. Prof: Deepak Asija

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DECLARATION

We, the undersigned **Digvijay Singh**, **Pranjal Jain**, and **Akhtar raza** are the student of MCA Sem-4 hereby declare that our research paper "**Fault Tolerance in Cloud Computing"** presented in this report is our own work and has been carried out under the supervision of Asst Prof: Deepak Asija of computer Applications study.

This work has not been previously submitted to any other university for any examination.

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A Comparative Study of Fault Tolerance Techniques in Cloud Computing

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Abstract Cloud basically means the internet. Computing is the method of using computer technology in order to implement all our daily task. So we can say that the concept Cloud computing is internet based computing. With the help of cloud computing any number of end users can have the access over the data base without thinking or worrying for the structure of database, basically the storage and maintenance part of the database. So it is very necessary to have a fault free system. So in this paper we are comparing that which mechanism is suitable at which condition.

I.   INTRODUCTION -

Cloud computing is a type of resource which is used on a larger scale for cost effective purpose. With the help of cloud the vendor or the users can implement any type of services **[3]**. Through the cloud facility various necessary software's and on demand tools can be shared in various IT industries. The Amazon was the first company in implementing the concept of cloud computing. **Examples networks, servers, storage, applications, and services.**

Cloud Computing emerges itself as a new paradigm in the field of computing for storing all the data on the server which is located somewhere else.

It's aim is to provide the quality of the services provided by the cloud. The increase in the demand of cloud computing facility is totally flexible in obtaining and releasing the resources acquired by it in such a cost effective manner that result in a wide adoption of the cloud computing services.

So in cloud computing we share the recourses on a large scale. This can be implemented by any vendor and the provided facilities are used by the client users

Infrastructure as a Service -

It can also be termed as Resource Clouds, it provides services to user so

that the enhanced virtualization capabilities can be implemented and accordingly **[1]** all the different types of resources can also be provided by service interface: Data and Storage in clouds deals with the reliable access to data of different variable size. **Examples: SQL Azure, Amazon S3**

Platform as a Service -

Paas uses some dedicated API to manage the behaviour of a server hosting engine which runs and duplicates the execution as required by the user. Paas gives computing resources with help of a platform on which any app and services are given a platform to be developed. **Examples: Windows Azure (Platform), Google App Engine**

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Software as a Service -

This also referred to as a Service or any Cloud application which is offering implementing of some business tools which are provided with any cloud facility, which means they give some application software or simply they use services of a cloud, rather than providing cloud features them. Sometimes, within a cloud service some standard application software function are provided.

Examples: Salesforce CRM, SAP Business, Google Docs.

II. TYPES OF FAULTS

Fault of Network: The fault which occurs on a network because of network problem, link failure, destination failure, Packet corruption, Packet Loss, etc.

Any physical fault: This kind of fault can happen because of any hardware fail like any processor failure, any primary memory failure, Failure of storage, etc.

Some Media faults: Some fault can happens because of media head crashes in clouds.

Any Process faults: Any fault happens because of any kind of limitation of resource, software error etc.

Faults due to Service expiry: The time out of a resource may happen when any software is trying to use it.

III. Categorization based on computing resources

Sometimes a failure may happen in time of computing on system resources so they can be divided as:

Timing, omission, crash, response failure etc:

Permanent failure: They can happen accidentally like because of power failure or cut on a wire, etc. The reproduction of these failures are easy. Sometimes these failures may create major disturbance and may be some system parts may not be function as they are designed to function **[3]**.

Transient failure: These kind of faults are caused due to some faulty component in the cloud. But, these faults are recovered by a rolling back the system to any previous stage such as stopping and resuming the software or resending any message which was sanded previously.

Intermittent failure: These failures appears sometimes. Normally these kind of failures can be pushed aside at the time of test of the systems and they only visible when the system operation **[4]**. And hence, it is difficult to tell the damage in advance which they can do.

IV. SOME FAULT TOLERANCE METHODS WHICH ARE USED IN CLOUD COMPUTING

Some of the fault tolerance methods which are being used now a days are:-

Task Resubmission: Sometimes job can fail now and any time some aborted task may be found, **[6]** In this case at runtime the task is resented to the same or to any resource for running.

By Job Migration: In this when a task is failed at the same time that task is migrated to any other system. Many time it happens because of any reason for that a job cannot be successfully run on a system.

By Replication- It simply means mirrors or copy. Various tasks are copied and then they are running on various kind of resources, and for the successful running and for getting any desired output **[8]**. With help of any one of the tool like Hadoop and ha-proxy, and other replication tools can be used.

Retry- In this method we run a task again and again. This is one of the easy method that restarts the failed or aborted task on a similar kind of resource.

S-Guard- S-Guard is completely based on rollback so is less turbulent to normal streaming. S- Guard can be used in, HADOOP, Amazon EC2.

Safety-bag checks: The commands which can not satisfy the safety properties there blocking of those commands is done.

Self- Healing approach- A big task can divided into parts .This Multiplication is done for better performance. When various components of an application are running on various virtual systems, then the failure of application instances it automatically handled **[5]**.

Check pointing method–for very big applications which are running from a long time so in that case after doing every change in system a check point is generated **[3]**. This is a task level fault tolerance method and when a task fails, rather than from the beginning it is has to be restarted that task from the latest created check points.

Timing check: Time checking is performed with the help of watch dog. Which is having time function supervision technique.

Masking: After doing the recovery from the error new state is generated and that needs to be recognized as a transformed state [5].

Reconfiguration: it remove all of the bad component causing faults from the cloud

Several models are implemented based on these types of techniques. We will summarize the Comparison among various models based on protection against the type of fault, and procedure.

AFTRC- A Fault Tolerance Model for Real Time Cloud computing based on the fact that any of the real time system can take advantage of the computing capacity, virtualized, and scalable environment of cloud computing for better performance and implementation of real time application. In this proposed model the model tolerates the fault proactively and makes the diction on the base of reliability of the processing nodes.

LLFT- is a propose model which contains a low latency fault tolerance (LLFT) which is a kind of a middleware for providing fault tolerance to the cloud computing environment as a service. It tolerates the faults of distributed applications offered by the owners

of the cloud. This model is based on the thinking that one of the main challenges of cloud computing is to make sure that the applications which are currently executing on the cloud without a hiatus. This middleware replicates application by the using of semi-active replication or semi-passive replication process to provide protection to the application against various types of faults.

FTWS is a proposed model which contains a fault tolerant work flow scheduling algorithm for providing fault tolerance by using replication and resubmission of tasks based on t he priority of the tasks in a heuristic matric. This model is based on the fact that work flow is a set of tasks processed in some order based on data and control dependency. Scheduling the work flow included with the task failure consideration in a cloud environment is very challenging. FTWS replicates and schedule the tasks to meet the deadline.

Candy- is a component base availability modelling framework, which constructs a comprehensive availability [5] model semi automatically from system specification describe by systems modelling language. This model is based on the fact that high availability assurance of cloud service is one of the main

characteristic of cloud service and also one of the main critical and challenging issues for cloud service provider.

Magi-Cube- a high reliable and low redundancy storage architecture of cloud computing. The build the system on the top of HDFS and use it as a storage system for file read /write and metadata management. They also built a file scripting and repair component to work in the back ground independently. This model based on the fact that high reliability and performance and low cost (spac

e) are the 3 conflictingcomponent of storage system. To provide these facilities to a particular model Magi cube is proposed.

The table below is showing a comparative study of all the models discussed above

TABLE 1

Model name	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 check pointing
LLFT	Crash-cost trimming fault	Replication
FTWS	Dead line of work flow	Replication and resubmission of jobs
CANDY	Availability	1.It assembles the model components generated from IBD and STM according to allocation notation. 2. Then activity SNR is synchronized to system SRN by identifying the relationship between action in activity SNR and state transition in system SRN
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.

V. PARAMETERS FOR FAULT TOLERANCEIN CLOUD COMPUTING

The existing fault tolerance technique in cloud computing consider various parameter. The parameters are like there type of fault tolerance (proactive, reactive and adaptive), performance, response-time, scalability, throughput, reliability, availability, usability, security and associated over-head.[10]

Proactive fault tolerance policy is to prevent recovery from fault, and failure by predicting them and proactively replace the sus pectedcomponent means detect the problem before it actually come.

Reactive fault tolerance policies reduces the effect of failures when the any type of failure occurs. This technique provides robustness to a system.[6]

Adaptive - All the procedure done automatically according to the situation.

Performance - This parameter is used to check the efficiency of the system. Reduce response time while keeping acceptable delays. e.g. It has to be improved at a reasonable cost,

Response Time is the amount of time taken to give reply [8] it should be minimized the time taken to respond by a particular algorithm is called response time. This parameter.

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.

Throughput This is used to calculate the no. of tasks which are successfully executed. [10] More the throughput higher the performance is

Reliability This aspect aims to give correct or acceptable result within a time bounded environment.

Availability The probability of a resource will be there for use at a given place with in time used under stated conditions.[10] Availability of a system is the major component which affects its reliability more the availability is more the reliability.

Usability The extent to which a product can be used by a user to achieve goals with effectiveness, efficiency, and satisfaction.

Table 2 summarized the Comparison among various models

TABLE 2

Model Name	AFTRC	LLFT	FTWS	CANDY	MAGI-CUBE
Proactive	√	X	X	X	X
Reactive	X	√	√	√	√
Adaptive	√	X	X	√	√
Performance	√	√	--	--	√
Response time	--	--	--	--	--
Scalability	√	√	X	√	√
Through put	√	--	X	√	√
Reliability	√	√	--	--	√

VI. Conclusion

Fault tolerance mechanism vary from one system architecture to another. But here we have selected some of the common techniques which can be used commonly. And after comparing in both the tables we come to the conclusion that some methods are good at something some at another like we have found that AFTRC is best as a proactive methods and magi-cube is best for reactive technique.

VII. Future Work

This comparative study is very helpful for future work like it may help to eliminate some of the problems of current methods or it can help to formulate a new method which can improve cloud system and also lead us to a fault tolerant cloud system.

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