ANALYSIS ON RESOURCE RELIABILITY USING FAULT TOLERANCE TECHNIQUES

[1]Dhara Bhatt, [2]Prof. Gayatri Pandi
[1] Master of Engineering Student, [2]Head of Department
[1] Department of Computer Engineering
[1]L. J Institute of Engineering & Technology (Gujarat Technological University), Ahmedabad, India

***Abstract*:** Cloud computing demand is increasing due to which it is important to provide correct services in the presence of fault also. The resource in cloud computing can be dynamically scaled that too in a cost-effective manner. Fault tolerance is the process of finding the faults and failure in a system. If a fault occurs or there is a hardware failure or software failure then also the system should work properly. Failure should be managed in an effective way for reliable cloud computing. Fault tolerance is a major challenge that should be considered to ensure good performance of cloud computing systems. In this project, the problem of tolerating fault in cloud computing systems is addressed so that failure can be avoided in the presence of faults and the monetary profit of the cloud is maintained. A reliable framework for fault tolerance will be proposed in order to achieve a reliable platform of cloud applications.

IndexTerm: fault tolerance; cloud computing; reliability; proactive tolerance

I. INTRODUCTION

In the cloud computing environment, fault-tolerant based on deadline fixes time limit given to each tasks. If the task does not execute within specified deadline, then it would be discarded to lead performance by increasing execution speed [1]. But the drawback of this approach is Quality of Service (QoS). This approach definitely increases performance but will compromise with QoS issues as few tasks which are not executed within deadline will be discarded. Hence this approach does not provide guarantee to execute 100% execution of allocated tasks on available resources.

In the present scene, there are number of fault tolerance models which provide different mechanisms to improve the system. But still there are number of problems which requires some concern for every frame work. There are some drawbacks, but none of them can fulfil the all expected aspects of faults from the customer side angle. So, might be there is a possibility of being carried over the drawbacks of all previous models and try to make an appropriate model which can cover maximum fault tolerance aspect.

1.1 Resource Reliability Using Fault Tolerance

Tolerance of faults makes an important problem in the scope of cloud environment. Fault tolerance technique activates when a fault enters the boundaries i.e. theoretically these strategies are implemented for detecting the failures and make an appropriate action before failures are about to occur. We have looked after the need of fault tolerance with its various techniques for implementing fault tolerance. To summarize, fault tolerance using Platform as a Service offering provides availability and also reliability of service to the user.

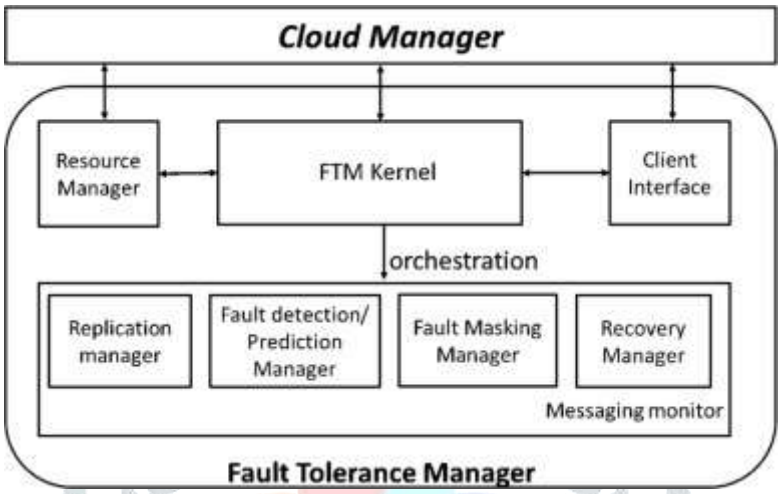

Figure 1: Fault Tolerance Architecture

Fault tolerance is the process of finding faults and failures in a computer system. If a fault occurs or there is a hardware or software failure then also system should work properly. By using fault tolerance technique, failure can be managed in an effective way for reliable cloud computing. Fault tolerance techniques can be classified into two types as shown in Figure 2.

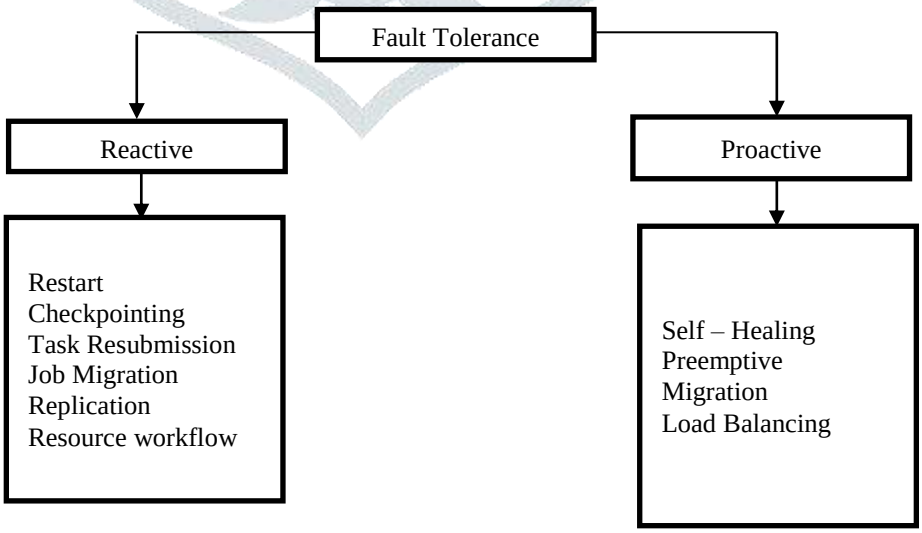

Figure 2: Fault Tolerance Techniques

II. LITERATURE REVIEW

2.1 COMPARATIVE ANALYSIS

Table 1: Comparative Analysis

PUBLICATION & YEAR	TITLE	METHOD/TOOL USED
IEEE 2016	Resource Reliability Using Fault Tolerance in Cloud Computing	-CloudSim simulation tool -5 VM, 1 Data Center and 2 Hosts
IEEE2017	An approach to failure prediction in a cloud based environment	-2 machine learning algo. , Linear Regression & Support Vector Machine with Linear Gaussian kernel
IEEE 2018	Formulating Criticality-Based Cost-Effective Fault Tolerance Strategies for Multi-Tenant Service-Based Systems	-DAG generator tool - WorkflowSim toolkit
IEEE 2017	Cloud Service Reliability Enhancement via Virtual Machine Placement Optimization	-Heuristic algo. - k-fault tolerance metric

2.2 METHODOLOGY

Fault tolerance approaches are widely used for developing the most accurate predictive model for resource reliability. In 2012, Anju Bala and Indrerveer Chana proposed a cloud virtualized system architecture. In the proposed system autonomic fault tolerance has been implemented. If any one of the servers breaks down, system should automatically redirect user requests to the backup server. The server virtualized system consists of VMs (server 1 and server 2) on which an Ubuntu 10.04 OS and database application are running. Server 2 is a backup sever in case of failure. HAProxy is configured on the third virtual machine to be used for fault tolerance. The availability of the servers is continuously monitored by HAProxy statistics tool on a fault tolerant server. HAProxy is running on web server to handle requests from web. When one of the servers goes down unexpectedly, connection will automatically be redirected to the other server.

In 2013, Patra and Singh approached fault taxonomy and need of fault tolerance in cloud computing. Various proposed models for fault tolerance are discussed and compared on the basis of Metrics for fault

tolerance in cloud. In the present scenario, there are number of fault tolerance models which provide different fault tolerance mechanisms to enhance the system. But still there are number of challenges which need some concern for every frame work or model.

Deepak. P.C has provided Robust and Fault-Tolerant Scheduling approach for Scientific Workflows in Cloud Computing Environments [1] in his approach, there is a fix time limit given to each tasks. If the task does not execute within specified deadline, then it would be discarded to lead performance by increasing execution speed. But the drawback of this approach is Quality of Service (QoS). This approach definitely increase performance but will compromise with QoS issues as few tasks which are not executed within deadline will be discarded. Hence this approach does not provide guarantee to execute 100% execution of allocated tasks on available resources. [6]

III. Proposed Method

As we know to handle the fault tolerance in cloud computing is the difficult thing on client side angle nowadays. So to solve this problem we will develop an algorithm for fault tolerance which will be developed using Platform as a Service (PaaS) in cloud computing. It includes the different parameters like CPU, RAM, hard disk, I/O, etc. and it also checks for Software/Hardware faults. It will be beneficial to both customer and the cloud computing. And it will be Proactive fault tolerance.

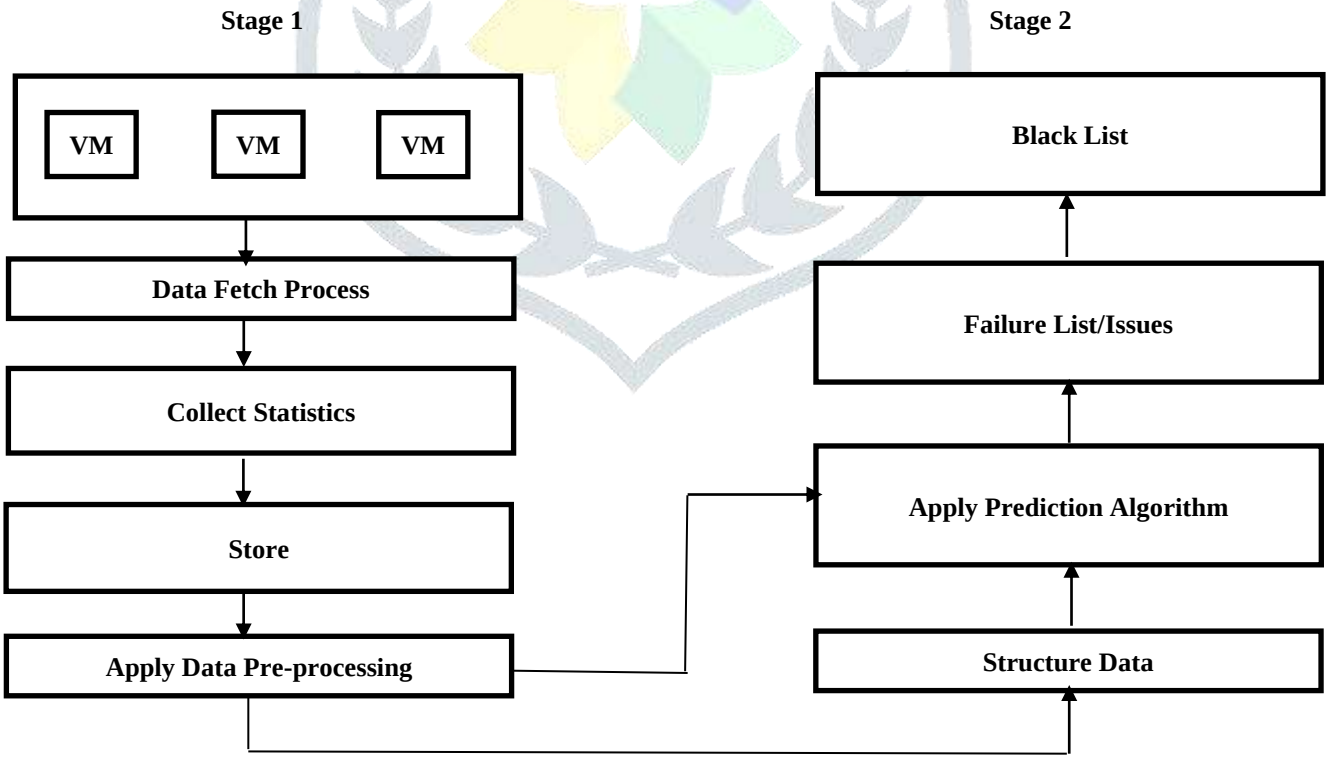

Figure 3: Flowchart of Proposed System

3.1 STAGE 1: Monitoring

At this stage, monitoring is done. First of all data is fetched of the virtual machine and collect and store the statistic information of virtual machines. And then it goes to the second stage that is prediction stage.

3.2 STAGE 2: Prediction

In this stage, pre-processing is applied to the data and then data will be structured. After that prediction algorithm is applied to predict the fault or failure and if fault or failure occur in system then it will block listed.

IV. CONCLUSION AND FUTURE WORK

The proposed system will definitely help in improving the prediction of fault or failure and improving its reliability as well as the prediction capability with reduced cost. The existing systems are focused on some resources only whereas the proposed system is working with additional risk factor attributes which is quite advantageous for improving the resource reliability. The future research may focus on hybrid approaches as well as ensemble fault tolerance approach to improve the prediction capability.

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VI. REFERENCES

[1] Talwana Jonathan Charity, Gu Chun Hua "Resource Reliability using Fault Tolerance in Cloud Computing", IEEE 2nd International Conference on Next Generation Computing Technologies, 2016, pp. 65-71.

[2] Hussaini Adamu, Bashir Mohammed, Ali Bukar Maina, Irfan Awan "An approach to failure prediction in cloud based environment", IEEE 5th International Conference on Future Internet of Things and Cloud, 2017, pp.191-197.

[3] Yanchun Wang, Qiang He, Dayong Ye, Yun Yang "Formulating Criticality-Based Cost-Effective Fault Tolerance Strategies for Multi-Tenant Service-Based Systems", IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, VOL. 44, NO. 3, MARCH 2018, pp. 291-307.

[4] Guangshun Yao, Yongsheng Ding, Senior Member IEEE, Kuangrong Hao "Using Imbalance Characteristic for Fault-Tolerant Workflow Scheduling in Cloud Systems", IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS, VOL. 28, .O. 12, DECEMBER 2017, pp. 3671-3683.

[5] Ao Zhou, ShangguangWang, Member, IEEE, Bo Cheng, Member, IEEE, Zibin Zheng, Member, IEEE, Fangchun Yang, Senior Member, IEEE, Rong N. Chang, Senior Member, IEEE, Michael R. Lyu, Fellow, IEEE, and Rajkumar Buyya, Fellow, IEEE "Cloud Service Reliability Enhancement via Virtual Machine Placement Optimization", IEEE TRANSACTIONS ON SERVICES COMPUTING, VOL.10, NO.6, NOVEMBER/DECEMBER 2017, pp. 902-913.

[6] Himanshu Agarwal, Anju Sharma "A Comprehensive Survey of Fault Tolerance Techniques in Cloud Computing", IEEE Intl. Conference on Computing and Network Communications,Dec.16-19, 2015, pp. 408-413.

[7] Dr. Lakshmi Prasad Saikia, Yumnam Langlen Devi "FAULT TOLEREANE TECHNIQUES AND ALGORITHMS IN CLOUD COMPUTING" , International Journal of Computer Science & Communication Networks, Vol 4(1),01-08.

[8] Felix C. Gartner, "Fundamentals of Fault-Tolerant Distributed Computing in Asynchronous Environments", ACM Computing Surveys, Vol. 31, No. 1, March 1999.

[9] N. Chandrakala and Dr. P. Sivaprakasam, " Analysis of Fault Tolerance Approaches in Dynamic Cloud Computing ", International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277 128X , Vol. 3, Issue 2, February 2013.

[11] BanM. Khammas, "Design a Fault Tolerance for Real Time Distributed System", Al-Khwarizmi Engineering Journal, Vol. 8, No. 1, PP11 -17, 2012.

[12] AnjuBala, InderveerChana, "Fault Tolerance- Challenges, Techniques and Implementation in Cloud Computing", International Journal of Computer Science (IJCSI) Issues, Vol. 9, Issue 1, No 1, January 2012.

[13] Ravi Jhawar, Vincenzo Piuri and Marco Santambrogio, Member of IEEE, "Fault Tolerance Management in Cloud Computing: A System-Level Perspective ", IEEE, 2012 .

[14] Prasenjit Kumar Patra ,Harshpreet Singh &Gurpreet Singh, "Fault Tolerance Techniques and Comparative Implementation in Cloud Computing" International Journal of Computer Applications , Vol. 64, No.14, February 2013.

[15] Sourabh Dave and AbhishekRaghuvanshi, "Fault Tolerance Techniques in Distributed System", International Journal of Engineering Innovation & Research Vol. 1, Issue 2, ISSN: 2277 – 5668, 2012.

[16] Anjali D. Meshram, A.S.Sambare and S. D. Zade , "Fault Tolerance Model for Reliable Cloud Computing ", International Journal on Recent and Innovation Trends in Computing and Communication, ISSN 2321 – 8169, Vol. 1, Issue: 7, July 2013.

[17] Krish Jamsa, "Cloud Computing", First India Edition, Jones and Bartlett India Pvt. Ltd., 978-93-80853-77-2, 2013.

[18] Deepak Poola ChandrashekarRobust and Fault-Tolerant Scheduling for Scientific Workflows in Cloud Computing Environments August 2015.

[19] Sagar C. Joshi, Krishna M. Sivalingam, Fault tolerance mechanisms for virtual data center architectures, K.M. Photon Netw Commun (2014) 28: 154, 2014.

[20] Hayashibara, N., Defago, X., Yared, R., & Katayama, T. (2004, October). The φ accrual failure detector. In Reliable Distributed Systems, 2004. Proceedings of the 23rd IEEE International Symposium on (pp. 66- 78). IEEE.

[21] Kaushal, V., & Bala, A. (2011). Autonomic fault tolerance using haproxy in cloud environment. Int. J. of Advanced Engineering Sciences and Technologies, 7(2), 54-59.

[22] Patra, P. K., Singh, H., & Singh, G. (2013). Fault Tolerance Techniques and Comparative Implementation in Cloud Computing. International Journal of Computer Applications, 64(14).

[23] Bala, A., & Chana, I. (2012). Fault Tolerance Challenges, Techniques and Implementation in Cloud Computing. International Journal of Computer Science Issues (IJCSI), 9(1).

[24] Tchana, A., Broto, L., & Hagimont, D. (2012, March). Fault Tolerant Approaches in Cloud Computing Infrastructures. In ICAS 2012, The Eighth International Conference on Autonomic and Autonomous Systems (pp. 42-48).

[25] D. Fall, T. Okuda, Y. Kadobayashi, and S. Yamaguchi, "Risk Adaptive Authorization Mechanism (RAdAM) for Cloud Computing," *J. Inf. Process.*, vol. 24, no. 2, pp. 371–380, 2016.

[26] C. Guo, Y. Liu, and M. Huang, "Obtaining Evidence Model of an Expert System Based on Machine Learning in Cloud Environment," *J. Internet Technol.*, vol. 16, no. 7, pp. 1339–1349, 2015.

[27] Z. Amin, N. Sethi, and H. Singh, "Review on fault tolerance techniques in cloud computing," *Int. J. Comput. Appl.*, vol. 116, no. 18, pp. 11–17, 2015.

[28] A. Pellegrini, P. Di Sanzo, and D. R. Avresky, "Proactive Cloud Management for Highly Heterogeneous Multi-cloud Infrastructures," in *2016 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*, 2016, pp. 1311–1318.

[29] S. P. P. K.S. Thakur., T. R.Godavarthi., "10.1.1.416.6042," vol. 3, no. 6, pp. 698–703, 2013.

[30] A. Bellet, A. Habrard, and M. Sebban, "A Survey on Metric Learning for Feature Vectors and Structured Data," 2013.

[31] P. Mell, T. Grance, and T. Grance, "The NIST Definition of Cloud Computing Recommendations of the National Institute of Standards and Technology," *Natl. Inst. Stand. Technol. Spec. Publ. 800-145 7 pages*, 2011.

[32] M. Fu, L. Zhu, D. Sun, A. Liu, L. Bass, and Q. Lu, "Runtime recovery actions selection for sporadic operations on public cloud," *Softw. - Pract. Exp.*, vol. 39, no. 7, pp. 701–736, 2016.

[33] D. Gnanavelu and D. G. Gunasekaran, "Survey on Security Issues and Solutions in Cloud Computing," *Int. J. Comput. Trends Technol.*, vol. 8, no. 8, pp. 126–130, 2014.

[34] B. Wang, Y. Zheng, W. Lou, and Y. T. Hou, "DDoS attack protection in the era of cloud computing and Software-Defined Networking," *Comput. Networks*, vol. 81, pp. 308–319, 2015.

[35] M. Amoon, "A Framework for Providing a Hybrid Fault Tolerance in Cloud Computing," pp. 844–849, 2015.

[36] R. Jhawar, V. Piuri, and I. Universit, "Fault Tolerance Management in IaaS Clouds," *2012 IEEE First AESS Eur. Conf. Satell. Telecommun.*, pp. 1–6, 2012.

[37] Z. Pantic and M. Babar, "Guidelines for Building a Private Cloud Infrastructure," *ITU Tech. Rep. - TR-2012-153TR 2012-153*, 2012.

[38] C. Pahl and H. Xiong, "Migration to PaaS clouds - Migration process and architectural concerns," *2013 IEEE 7th Int. Symp. Maint. Evol. Serv. Cloud-Based Syst.*, pp. 86–91, Sep. 2013.

[39] O. Sefraoui, M. Aissaoui, and M. Eleuldj, "Cloud computing migration and IT resources rationalization," *2014 Int. Conf. Multimed. Comput. Syst.*, pp. 1164–1168, Apr. 2014.