

Virtual Machine Migration Techniques: A Review

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ABSTRACT

The Cloud Computing is the architecture which has decentralized nature. The virtual machines are deployed in the network which are responsible to execute the assigned cloudlets. In the network, uncertainties are caused due to which virtual machines get overloaded. In this paper, various techniques are reviewed which are applied for the virtual machine migration. The techniques are compared in terms of various parameters.

KEYWORDS

Cloudlet, Virtual Machine Migration , Decentralized .

INTRODUCTION

Cloud Computing is used in the Internet to consume software or other IT services on demand. Cloud Computing is a completely a new technology. With the use of Cloud Computing users are able to share processing power, storage space, bandwidth, memory and software. As if somebody is using Cloud computing then their resources get shared along with that the cost is also getting shared. This helps user to spend only less cost as they have to pay on the basis of usage. The provider of Cloud Computing solutions delivers a permission to use its software, hardware, platform, or storage providers like services over the internet [1]. There is such kind of disc or hardware available which user can buy to take the cloud services. Recurring fees is charged by the cloud provider on the monthly basis which is based on the usage by the users.

The evolution of Virtualization, Utility computing, Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) all are combined to make a cloud computing [2]. It is also a development of distributed, parallel and grid computing. Over other existing computing techniques the cloud computing is advantageous and it much improve the availability of IT resources. So with the use of Cloud Computing users are able to use the infrastructure of IT and pay for that only which will save the cost to buy the physical resources that may be vacant when it is not in use. The data, operating systems, applications, storage and processing power will be active on use basis. The cloud is just like a space available on web where computing has been already installed to get advantage of it in different services.

A decentralized server networks provides different services and computing software both combined to make a cloud computing. Now a day's cloud has been used in number of different applications like Yahoo, Gmail web based email clients, Wikipedia, YouTube and it has also been used in Skype, Bit Torrent like peer to peer networks. In Cloud environment there is no control over it by any centralized organization there is only need of internet connection along with one web browser nothing more is required to utilize its services. For business world there is enterprise Cloud Computing. There is need of hardware and centralized infrastructure for running Microsoft, SAP, or Oracle like applications. The office space, power, networks, servers, storage, cooling, and

bandwidth are types of infrastructure that is required to run or install it. The complexity of above mentioned database has been reduced to much extent with the use of cloud that also reduces the total required expenditure.

Essential Characteristics of Cloud Computing

There are numbers of characteristics of Cloud computing out of them the main characteristics of cloud computing are given below [3]:

- **On-demand self-service:** Without any human interaction with each provider of services a consumer can A consumer can independently have provision of computing capabilities, such as server time and network storage as needed.
- **Broad network access:** The available capabilities over the network are available and can be accessed through the use of standard mechanism. This promotes the use of heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and personal digital assistants (PDAs)).
- **Resource pooling:** According to customers demand different virtual and physical resources can be assigned or re-assigned using multi-tenant model. These are some cases in which subscriber will only be able to specify the provider location at higher level of abstraction but it unable to know exact location of provided resources. The storage, processing, memory, network bandwidth, and virtual machines are all examples of its resources.
- **Rapid elasticity:** To quickly scale in and scale out the capabilities can be rapidly, elastically and automatically provisioned. At any time and in any quantity the capabilities can be purchased by customers.
- **Measured Service:** In same level of abstraction use of metering capability helps in automatically controlling and optimizing resources that should be appropriate for cloud systems required services. The utilized service customer and provider both resources can be controlled by monitoring it then a transparency report need to provide.

Issue in Cloud Computing

As day by day the amount of information is getting placed in cloud by different companies or users. By this the concern of data security in the environment is getting increase. There are number of issues in cloud computing out of all some issues are summarized below [5]:

- **Privacy:** When using cloud-based services, one is entrusting their data to a third-party for storage and security. Virtual computing technology is utilized in the Cloud computing. In which the personal data of users may be scatter in number of virtual data centers rather than keeping it in only one physical location. When cloud computing services are accessed by the users at that time they sometimes leak the hidden information. Because of this attackers can analyze the critical task depend on the computing task submitted by the users.
- **Reliability:** As our local servers the cloud servers are also experience downtime and slowdowns.
- **Legal Issues:** Worries stick with safety measures and confidentiality of individual all the way through legislative levels.

- **Compliance:** Regular reporting and audit trail are requiring as there are number of regulations that pertain to the use of required data and its storage. There is need of compliance in cases where data centers are maintained by cloud providers it is special requirement of customers.
- **Freedom:** The stored data can be physically used by users the control of data storage is in cloud providers hand to give access or not.
- **Long- Term Viability:** In case when the when the cloud computing provider go broke or it get acquired and swallowed up a larger company at that time the data which we have enter should have the capabilities to stay for long and never become invalid by the time.
- **Cost:** As there is need of using large amount of data back in house and also there is requirement of always on connection which leads to high cost.

Literature Review

Talwana Jonathan Charity, et.al, (2016), have recommended the use of existing fault tolerance techniques such as job migration, self-healing, static load balancing and replication. In the cloud computing environment these existing techniques are failed to be fully effective and reliable. In this paper [6], a processing power, Memory and Network parameters based fault tolerance pro-active approach has been proposed by authors. This approach is help in increasing resource reliability for this the authors have first calculated a reliability of each Virtual Machine (VM) based on the success rate of task execution. Then schedule the task on high reliable VM. From the simulation results it has been seen that the proposed approach provides good results for VM reliability and system reliability comparatively to other existing approaches. In this paper the authors have only work on resource reliability. In future the work can be done on other parameters.

Bashir Mohammed, et.al, (2016), have critically analyzed the IVFS model and conclude that it is not able to tolerate faults that reduces each computing node reliability. In this paper [7], a new model has been proposed by authors that will be able to remove the drawback of existing model based on computing or Virtual Machine reliability. The proposed model has been testing by performing simulation on it that shows it is better as compared to existing one. A diverse software tool has been used for forward or backward recovery that results in improves pass rates. A critical analysis experiment results shows that this model is prove to be efficient to use in fully fault tolerant IaaS cloud environment. There are some drawbacks of this paper such as they didn't work on different challenges of fault tolerance that can affect the performance in terms of checkpoint overhead, recovery time of checkpoint and re-computing time.

Bashir Mohammed, et.al, (2015), have introduced an optimal fault tolerance mechanism to deal with the problem and to minimize the risk of failure. Where fault tolerance was achieved using the combination of the Cloud Master, Compute nodes, Cloud load balancer, Selection mechanism and Cloud Fault handler. In this paper [8], the authors have proposed an optimized fault tolerance approach where a model is designed to tolerate faults based on the reliability of each compute node (Virtual Machine) and can be replaced if the performance is not optimal. Preliminary test of their algorithm indicates that the rate of increase in pass rate exceeds the decrease in failure rate and it also considers forward and backward recovery using diverse software tools. Their results obtained are demonstrated through experimental validation thereby laying a foundation for a fully fault tolerant IaaS Cloud environment, which suggests a good performance of their model compared to

current existing approaches. In this paper the authors didn't work on fault tolerance challenges mainly in a large-scale high performance environment and in a real life scenario.

Ashima Garg, et.al, (2015), have introduced an autonomic prospective on managing the fault tolerance which ensure scalability, reliability and availability. HAProxy has been used to provide scaling to the web servers for load balancing in proactive manner. It also monitors the web servers for fault prevention at the user level. The framework used in this works with autonomic mirroring and load balancing of data in database servers using MySQL master- master replication and Nginx respectively [9]. Administrator keeps an eye on working of servers through Nagios tool 24X7 monitoring can't be done manually by the service provider. The proposed work has been implemented in the cloud virtualization environment. Experimental results show that our framework can deal with fault tolerance very effectively. In this paper the authors have not utilized the database effectively. For their effective use various DB blocks can be used.

Parveen Kumar, et.al, (2015), have [10] proposed a model for real time cloud environment name it HAFTRC that will help in getting high adaptive fault tolerance. The cloudlets, MIPS, RAM and bandwidth have been considered in new virtual machines reliability computing based model. The best virtual machine will be the one which have highest reliability and in case of having same reliability by two virtual machines the winning will be chosen on the basis of assigned priority to it. In case of cloud environment the novel techniques not prove to be good.

Author	Year	Description	Outcome
Talwana Jonathan Charity	2016	In the cloud computing environment these existing techniques are failed to be fully effective and reliable. In this paper , a processing power, Memory and Network parameters based fault tolerance pro-active approach has been proposed by authors	From the simulation results it has been seen that the proposed approach provides good results for VM reliability and system reliability comparatively to other existing approaches
Bashir Mohammed	2016	In this paper a new model has been proposed by authors that will be able to remove the drawback of existing model based on computing or virtual machine reliability. The proposed model has been testing by performing simulation on it that shows it is better as compared to existing one. A diverse software tool has been used for forward or backward	There are some drawbacks of this paper such as they didn't work on different challenges of fault tolerance that can affect the performance in terms of checkpoint overhead, recovery time of checkpoint and re computing time.

		recovery that results in improves pass rates.	
Bashir Mohammed	2015	In this paper , the authors have proposed an optimized fault tolerance approach where a model is designed to tolerate faults based on the reliability of each compute node (virtual machine) and can be replaced if the performance is not optimal. Preliminary test of their algorithm indicates that the rate of increase in pass rate exceeds the decrease in failure rate	Their results obtained are demonstrated through experimental validation thereby laying a foundation for a fully fault tolerant IaaS Cloud environment, which suggests a good performance of their model compared to current existing approaches
Ashima Garg	2015	It also monitors the web servers for fault prevention at the user level. The framework used in this works with autonomic mirroring and load balancing of data in database servers using MySQL master- master replication and Nginx respectively . Administrator keeps an eye on working of servers through Nagios tool 24X7 monitoring can't be done manually by the service provider	In this paper the authors have not utilized the database effectively. For their effective use various DB blocks can be used.
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Table 1: Comparative Analysis

Conclusion

In this paper, it is concluded cloud computing has the decentralized nature in which Virtual Machines are responsible to execute assigned cloudlets. In the network, uncertainties are caused due to which virtual

machines are overloaded. In this paper, various techniques are reviewed for the virtual machine migration. Future technique will be proposed which reduce number of migrations in the network.

References

- [1] George Suci, Cristina Butca, Victor Suci, Alin Geaba, Alexandru Stancu, Stefan Arseni. Basic Internet Foundation and Cloud Computing. IEEE 2015 10th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing, 56(2016), 278-284.
- [2] Bharath Balasubramanian, Mung Chiang, and Flavio Bonomi. Introduction. IEEE, 41(2015), 304-313.
- [3] Hang Liu, Fahima Eldarrat, Hanen Alqahtani, Alex Reznik, Xavier de Foy, and Yanyong Zhang. Mobile Edge Cloud System: Architectures, Challenges, and Approaches. IEEE SYSTEMS JOURNAL, 99(2017), 1-14.
- [4] L. Yang, J. Cao, S. Tang, T. Li, and A. Chan, "A framework for partitioning and execution of data stream applications in mobile cloud computing," in Proc. IEEE 5th Int. Conf. Cloud Comput, 20(2012), 794–802.
- [5] Rakesh Bhatnagar, Dr. Jayesh Patel, Nirav Vasoya. Dynamic Resource Allocation in SCADY Grid Toolkit. IEEE International Conference on Computing, Communication and Automation (ICCCA-2015), 45 (2015) 15-16.
- [6] Talwana Jonathan Charity, Gu Chun Hua. Resource Reliability using Fault Tolerance in Cloud Computing. IEEE, 27(2017), 65-71.
- [7] Bashir Mohammed, Mariam Kiran and Irfan- Ullah Awan, Kabiru M. Maiyama. An Integrated Virtualized Strategy for Fault Tolerance in Cloud Computing Environment. 2016 Intl IEEE Conferences on Ubiquitous Intelligence and Computing, Advanced and Trusted Computing, Scalable Computing and Communications, Cloud and Big data Computing, Internet of People and Smart World Congress, 16(2016), 542-549.
- [8] Bashir Mohammed, Mariam Kiran, Irfan-Ullah Awan and Kabiru M. Maiyama. 2016 IEEE 4th International Conference on Future Internet of Things and Cloud, 56(2016), 363-370.
- [9] Ashima Garg Sachin Bagga. An Autonomic Approach for Fault Tolerance using Scaling, Replication and Monitoring in Cloud Computing. 2015 IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE), 35(2015), 129-134.
- [10] Parveen Kumar, Gaurav Raj, and Anjandeeep Kaur Rai. A Novel High Adaptive Fault Tolerance Model in Real Time Cloud Computing. 214 5th International Conference- Confluence The next Generation Information Technology Summit (Confluence), 25(2015), 138-143.
