M.I.C. Computing Architecture Model

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Abstract : This paper presents how the process of storing humongous data by organisations has been revolutionised through the introduction of cloud computing. Since, the cloud computing is being done by third party vendor it has opened the pandora's box where Transparency, cost, portability of data remains the major issues. However, different models can be adopted in order to enhance the optimisation of cloud computing such as; Multitenant computing model, Resource provisioning, and No data center architecture. Light on the related work has also been thrown.

Based on the comprehensive review need for further research has been observed, and the references are provided for further research work.

Index Terms **- Infrastructure Scaling, Cloud Computing, Resource Pooling, Resource Utilisation, Cloud Stack Management Server.**

I. INTRODUCTION

With the increase in the number of Information Technology (IT) users, there has been an abundance of valuable data. The primary concern of any organisation with the current trend of increasing data is the storage of such data. These organisations use data centers for storing its data. In order to meet the fast-prevailing IT demands organisations need to keep on scaling up their IT infrastructures such as hardware, software and services. However, with the on-premises IT infrastructure of data centers the scaling up is usually a time consuming and a high capital expenditure task. Cloud Computing turned out to be a paradigm shift for organisations to meet the ever-changing business needs of scaling up their IT infrastructure.

The off-premise cloud-data center model provides a greater flexibility and scalability which the tradition data center model lacked, as it offers an on-demand remote accessibility to a shared pool of computer resources that include storage, network, servers, applications and services. It offers a broader network access as any device that's connected to the network may it be PC's, laptops, mobiles, or tablets could enjoy the services of the cloud. Unlike the traditional on-premise data center cloud computing offers elasticity, this means the client can quickly scale or shrink their cloud. This provides the client with a pay per use model. The added advantage is an ongoing maintenance facility along with regular security updates at a much faster rate.

RELATED WORK

Anderson [1] put forward an Open Infrastructure for Network Computing. The model aims at resource sharing among Autonomous public-resource computing projects. It offers an incentives based relationship between projects and participants. The model is a self-initiative driven model where participants willing share their resources to these projects resulting in a better resource optimization of the computer resources which are available worldwide.

Shang et al [2] devised a free from error resource allotment computing model. The model is effective as it uses a deadline-driven algorithm for resource allocation. The algorithm aids the Virtual Machine Manager for maximizing the system-wide performance.

Rodrigo et al [3] formulated a method for workload prediction for SaaS providers to aid them to meet the load changes of the client they offer their services to. It uses the traces left by clients onto the the web servers as an Input to their ARIMA model. The model provides a high efficiency rate in terms of resource utilisation without disturbing the Quality of Service.

Gabriel et al [4] designed a context-aware Architecture for the continual and undisrupted availability of resources to the mobile computing nodes using methods of Autonomic Computing. The model uses an election algorithm to augment the Service oriented architecture(SOA) and for activation/deactivation of the service replicas.

Linthicum [5] felt the need of a device to provide portability of applications among the various clouds. Containers have successfully render the application portability service. These containers work at a common abstraction level and does successful creation of data bundles for automated and self-configured portability.

Guan and Melodia [6] suggested a Multi-Broker Cloud Computing model for the reduction in cost of resources to the client. The model aims at formulating a shared community of servers which follow certain guidelines to eliminate the non-convex cooperative problems. The model make noticeable cooperative gains.

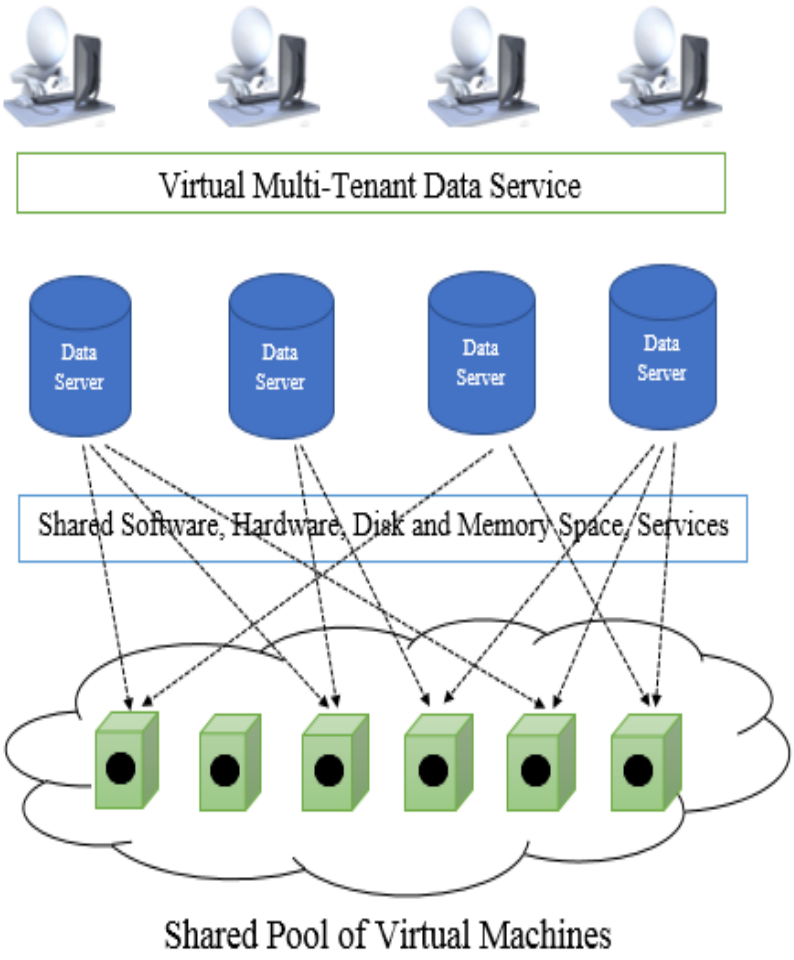
CLOUD COMPUTING CONCERNS

However, because these cloud-data centers are outsourced by some third-party vendors there often emerges certain security concerns about the leakage of the client's data. Loss of physical control, Cloud provider viability, Disaster recovery and business continuity, Network Availability and Transparency are the major concerns in Cloud Computing [7]. Albert et al [8] suggested that the resource stranding and fragmentation is leading to low utilization of resources. Majority of the cost computed for cloud computing is due to servers yet only 10% of it is actually utilized. The cost for power distribution and computing amounts for 25% which does not amount for any throughput at the client's end.

The conventional Cloud Computing model lacks agility as it limits the elasticity of the cloud due to Resource Fragmentation and poor server to server connectivity. For such reasons the cloud-data center model does not outdo the traditional data center model in terms of its cost to throughput ratio. Patricio et al [9] showed that only 0.26% to a 0.51% of the network resources are being utilized. These figures show that the optimality of the network is yet far to achieve with the current model. A grid computing model could achieve a higher resource optimality rate as it will reduce the idle time for resource nodes within the network.

MULTI-TENANT COMPUTING MODEL

Resource Pooling and Multitenancy has been the driving features of cloud computing. A multi-tenant architecture has facilitated in optimizing the performance efficiency as the different elements in the technology stack are shared, it makes it easier for the vendor to assess and make certain upgradations and deploy maintenance updates to a vast number of tenants. It offers a boost to the workload-scaling capability for an organisation by successful and affordable deployment of Virtual machines.



However, a multi-tenant environment provided from a public cloud keeps the client away from installing host-level utilities. The client is refrained from installing some backup software or antivirus software. Certain low-level changes made by the service vendors to the cloud infrastructure can cause great impact to the customer's workload. Moreover, since the resources are being shared amongst the clients within the same pool the reliability of a continuous availability of resources is still questionable.

RESOURCE PROVISIONING

Anna et al[10] provided with a Resource Allocation model for avoiding over-utilization or under-utilization or the over-Provisioning or under-Provisioning of SaaS offerings. The concept behind the model is mapping the data of geo-caching services to measure density of resources needed to be deployed. The model aims at eliminating the need of manual mapping of load changes by integrating a Social-Media adapted progression model. This helps in generating a forecasting model for the load generation density and the resource consumption which aids in a better resource allocation. An algorithm is deployed at several participating node which accepts the past state of node as the input to predict the upcoming load. A similar model could be implemented for an IaaS architecture.

NO DATA CENTER ARCHITECTURE

Tessema et al [11] proposed a no data center model of cloud computing for providing a more optimal computing methodology. The objective was to convert the spare/idle nodes sharing the same resource pool to act as the new data center. The objective is to eliminate the third-party service vendor's data center and use the existential resources of the other nodes within the similar cloud pool.

Dunren and Wen-Chi [12] proposed a co-operative, self-provisioned cloud community of the clients known as the Credit Union model. The model looked at resources as credits to be offer and to be enjoyed. These resources might be memory or disk spaces. The implementation of such a model needs the deployment of some certain software/application for the successful extraction of

resources from the idle nodes without rendering its local session data and work. Virtual Machines (VM's) are deployed at all member nodes for the particular task.

A Virtual Machine Manager checks for idle nodes and informs the asking nodes about it. This operation is done at the Cloud Stack Management Server. A System Information Sensing device is integrated at the nodes. These Sensing Devices/components detects and gathers the CPU's performance measures, when the CPU is idle, the CPU clock rate and it looks for idle disk or memory space and sends this information to the Cloud Stack Management Server. A kernel level Virtual Machine makes such a task possible. McGilvary et al [13] shows the deployment and integration of an ad-hoc network to the Cloud Stack Server. This ensures a spontaneous and coordinated flow of data/requests from the client nodes.

CONCLUSION AND FUTURE WORK

The optimality of a cloud computing model has been increased using a no data-center architecture model.

The utilisation of the client's resources has made the cloud computing model into a green computing model. The "vendor-independent" cloud Architecture has tapped the under-employed resources within a communal network of tenants/nodes sharing a common pool in an aim to eliminate the dependency on third party cloud vendors for their services. This can aid organisations in scaling up their IT infrastructure at a lower cost for a better throughput to capital invested ratio. However, for this current "vendor-independent" Computing model the resource utilisation by nodes is a dynamic process and there is no fixed procedure for mapping which resources are being utilized by which clients. There is a need for a structured flow of resources in the shared pool.

The paper enlightens an important aspect of the no data center cloud computing model about the need of a smart managing algorithm for scheduling the resources and resources allocation to work on a deadline concept.

A particular node should be offered with choices for where his data/application reaches. This will aid the clients with a dedicated resource provider for a trusted and compatible computing.

Therefore, the paper opens regions for researchers to work for a more reliable, secured, optimal computing model.

REFERENCES

[1] D. P. Anderson, "BOINC: a system for public-resource computing and storage," *Fifth IEEE/ACM International Workshop on Grid Computing*, Pittsburgh, PA, 2004, pp. 4-10.

[2] S. Di and C. Wang, "Error-Tolerant Resource Allocation and Payment Minimization for Cloud System," in IEEE Transactions on Parallel and Distributed Systems, vol. 24, no. 6, pp. 1097-1106, June 2013.

[3] R. N. Calheiros, E. Masoumi, R. Ranjan and R. Buyya, "Workload Prediction Using ARIMA Model and Its Impact on Cloud Applications' QoS," in IEEE Transactions on Cloud Computing, vol. 3, no. 4, pp. 449-458, 1 Oct.-Dec. 2015.

[4] G. Guerrero-Contreras, J. L. Garrido, S. Balderas-Díaz and C. Rodríguez-Domínguez, "A Context-Aware Architecture Supporting Service Availability in Mobile Cloud Computing," in IEEE Transactions on Services Computing, vol. 10, no. 6, pp. 956-968, 1 Nov.-Dec. 2017.

[5] D. S. Linthicum, "Moving to Autonomous and Self-Migrating Containers for Cloud Applications," in IEEE Cloud Computing, vol. 3, no. 6, pp. 6-9, Nov.-Dec. 2016.

[6] Z. Guan and T. Melodia, "The Value of Cooperation: Minimizing User Costs in Multi-Broker Mobile Cloud Computing Networks," in IEEE Transactions on Cloud Computing, vol. 5, no. 4, pp. 780-791, 1 Oct.-Dec. 2017.

[7] T. Francis and S. Vadivel, "Cloud computing security: Concerns, strategies and best practices," 2012 International Conference on Cloud Computing Technologies, Applications and Management (ICCCTAM), Dubai, 2012, pp. 205-207.

[8] A. Greenberg, J. Hamilton, D. A. Maltz, and P. Patel, "Thecost of a cloud: Research problems in data center networks, "SIGCOMM Comput. Commun. Rev., vol. 39, no. 1, pp. 68–73, Dec. 2008.

[9] P. Domingues, P. Marques and L. Silva, "Resource usage of Windows computer laboratories," 2005 International Conference on Parallel Processing Workshops (ICPPW'05), Oslo, Norway, 2005, pp.469-476.

[10] A. Schwanengel, M. C. Jaeger and U. Hohenstein, "Resource allocation for cloud SaaS offerings based on Social Web applications," 2012 IEEE 1st International Conference on Cloud Networking (CLOUDNET), Paris, 2012,pp.179-181.

[11] T. Mengistu, A. Alahmadi, A. Albuali, Y. Alsenani and D. Che, "A "No Data Center" Solution to Cloud Computing," 2017 IEEE 10th International Conference on Cloud Computing (CLOUD), Honolulu, CA, 2017, pp. 714-717.

[12] D. Che and W. C. Hou, "A novel "credit union" model of cloud computing," in International Conference on Digital Information and Communication Technology and Its Applications. Springer,2011, pp. 714–727.

[13] McGilvary, Gary & Barker, Adam & Atkinson, Malcolm. (2015). Ad Hoc Cloud Computing. 1063-1068.