

A Trend toward Virtualization and Cloud Services

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Abstract- Cloud Computing technology has played a significant role and revolutionized the IT industry by delivering IT resources as a Service. Recent studies demonstrate how Cloud Computing can handle sources and overcome the challenges faced by offering high flexibility and cost-effectiveness. One such essential concept is 'virtualization'. In this work, we present an overview of recent research efforts developing different virtualization models for Cloud Computing based environments and classify these different approaches briefly describing them. In addition, we evaluate the approaches based on limitations, benefits, overall performance criteria such as scalability and effective and efficient use of cloud resources and management.

Keywords- Cloud Computing, virtualization, cloud resources, cloud management.

I. INTRODUCTION

The development and use of different cloud computing technologies have been increasing rapidly at present. These technologies have represented a profound change in the field of Information Technology by managing the design and delivery of various IT infrastructures and services. Cloud computing environments support a service on-demand model for resource provisioning which is a primary role of the cloud's management system. The cloud infrastructure basically consists of a number of components (resources) for example hardware components like servers and network components, as well as services and software components like application platforms [1]. There has been an increasing number of resource types that bring complexities, thus requiring a need for different cloud management solutions. There are three main types of cloud computing models: SaaS, PaaS, and IaaS; with three kinds of deployment models: public, community and private [9].

In order to deploy applications, cloud users must choose and utilize the right kind of resources. Many enterprises have relied on public clouds, which however have led to issues like security threats. Similarly, some enterprises invest to develop a private cloud in order to have an independent infrastructure. Therefore, improving resource utilization and reducing costs can become a fundamental problem when working in cloud computing environments and it is essential to develop good resource management schemes for effective performance utilization. In this survey, we will take a look at different approaches formed to address the resource utilization problem. Nowadays, resource provisioning based on virtualization has been widely adopted. Virtualization is the main part of cloud computing which separates physical machines into multiple virtual machines. This concept saves time, introduces portability, reduces work

and costs since many virtual machines can run on a single physical machine. They solve most of the problems caused by adopting Traditional Infrastructure provisioning models [8]. While virtualization has its benefits, there are some important challenges to be faced such as a need for increased security and handling additional costs caused by customization. In this paper, we analyze different models used to achieve cost-effectiveness by virtualization and also study the limitations caused by them.

II. CLASSIFY VIRTUALIZATION STRATEGY IN CLOUD COMPUTING

Virtualization alone can be used to improve the efficiency of physical resources used in the cloud environment. However, a major issue takes place when there are different as us to be performed whether they are input/output bound or are in need of the processor and there are multiple virtualized machines sharing a single physical machine. This will further reduce utility resources of devices in the physical machine and sharing of the cache may affect and slow down performance. This paper introduces a classification virtualization strategy model which focuses on individual virtual machines and the kind of tasks that are needed to be performed.

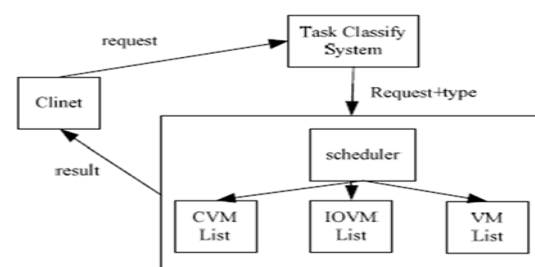


Figure 1 Task Classification Architecture.

Fig. 1 explains the architecture where a client first requests to use a particular service/task. The system classifies the requested task and a predicted algorithm is used to analyze the trend of resource utilization in terms of processor and I/O bound and confirms what type of task it is. The resource pool contains a scheduler which studies the requested information and sorts resource queues with the type of VM it belongs to. In order to classify the tasks to the VM, Xen is used as the virtualization model. The benefits of basing the main function on such a system is that it is highly scalable architecture, has many features such as shared resource pools, is open source and cost-effective. This architecture strongly backs up the Task Classification module and improves resource utilization. However, there is a need for a well-built, logical, efficient and optimized algorithm for the scheduler used to uniformly sort the tasks. Such an algorithm will give proper results if memory utilization is also considered and lead to smooth running of different virtual machines in isolation on the same physical machine [2].

1. The Study on Data Security in Cloud Computing Based on Virtualization

This paper introduces different virtualization approaches which help in performance optimization in a cost-effective manner; however one of the most important issues in shared virtualized resource provisioning is security risks. For example, in an Operating System based virtualization, the main host kernel supports multiple virtual machines running the guest OS. However, if the kernel is attacked, the hacker can gain access to all virtual machines formed on the guest OS.

Other such problems include too many virtual machines running on a physical machine causing performance which result in limited CPU cycles, problems in the cloud service layer causing an insecure environment, managing authentication policies, and data leakage issues when moving sensitive data to the cloud. One of the central issues is the safety of data stores present in data centers. Since the data is stored at a third party location, it is vulnerable and open to threats caused by hackers. If the hacker gets access to one VM, he can easily get access to all other VMs and can have administrator level license to the hypervisor on the infrastructure environment and can own all the data transmitted between them. The overall study on data security suggests that security threats and safety challenges need to be considered before transferring to the cloud. The essential need for data encryption methods are required that can encrypt databases in the data centers and prevent malicious attacks. Proper use of firewalls and data authentication methods as well as through data security plans and policies are needed to ensure the integrity of data uploaded to virtual machines on the cloud [3].

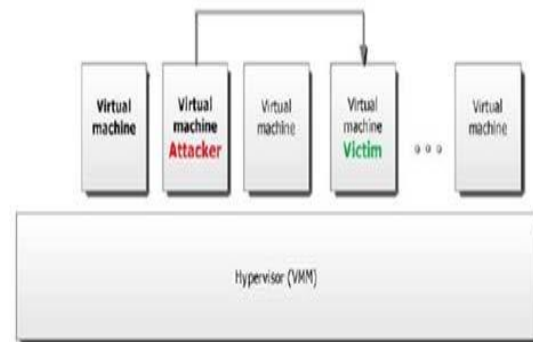


Figure 2 when attackers get into the Cloud system.

2. An Intelligence Virtualization Rule Based On Multi-Layer To Support Social Media Cloud service

The rapid emergence of social media and mobile applications has triggered the use of media sharing tools that focus on user contexts. For this reason, it is important for social media on cloud server so develop a virtualization module to constructer source utilization according to what the user wants. Service platforms are developed in a cloud computing environment which customizes the social media service resources to the user's needs. This is because social media are highly concentrated towards user content and functionalities and it is important to intelligently utilize resources accordingly using different application tools.

The proposed rule [4] automatically distributes resources within the environment according to user context and state by applying multiple layers and information of the resources is recommended to the user and feedback is sent. The results propose that the feedback link had higher values while computing values to the system state. Due to some of these discrepancies, the rule has to be checked to make sure the resource service is matched according to the user's situation. This paper describes an effective way of recommending resources according to the user's situation. However, difficulties arise in making sure normalized information of the user context and state are used so that proper results of virtualized resource utilization are produced.

3. Vft A Virtualization and Fault Tolerance Approach For Cloud Computing

One of the most important issues to tackle in any software/hardware system is fault tolerance; to make sure the system is run smoothly without faults leading to system failures. The same is applied to cloud computing systems. The two main issues are: detecting faults/errors and recovering from them. A Virtualization and Fault Tolerance (VFT) technique is proposed [5], which promise to reduce service time and increase the overall availability of the system. In order to manage the

virtualization process, Cloud Manager and Decision Maker modules are used which handle faults and also caters to load balancing. Fault tolerance is further achieved by various popular techniques such as redundancy and check pointing. The difference of the proposed approach with previous ones is that in this fault handler is included in the virtualization module which stops the unrecoverable faults and detects and removes temporary software faults from the recoverable ones to make them available for future purposes. The proposed approach of VFT tolerates fault based on the values of Success Rate of each virtual node connected to its physical server.

Table 1. The success rate of Virtualization.

Cycle	Task Deadline	Virtual Node 1			
		SC	TDC	Finish Time	SR
Start	-	-	-	-	0.5
1	1700	1	1	1600.0	0.667
2	1602	1	1	1600.4	0.75
3	1601	1	1	1600.8	0.8
4	1605	1	1	1601.2	0.833
5	1600	1	0	1602.4	0.714
6	1900	1	1	1602.0	0.75
7	1700	1	1	1602.4	0.778
8	2100	1	1	1603.6	0.8
9	1700	1	1	1603.2	0.818
10	2000	1	1	1603.6	0.833

Table 1 simulation results of Success Rates of Virtual Node 1. A quantitative analysis of simulated results describes that this particular fault tolerant strategy gives good results. However, more effective load balancing algorithms can be used and further work can be done on the sub-modules which will support virtualization to order to give higher success rates.

4. Improving Network I/Virtualization for Cloud Computing

As mentioned earlier, virtualization enhances resource utilization and availability, as well as high flexibility and reduces the cost for the overall system. Another issue addressed in this study is the poor network input/output performance and scalability of the VMs due to different limitations. The study[6]successfully demonstrated that the I/O channels prevent from achieving high throughput. Also, not only does it demonstrate poor transmission rates, the communication between the driver domain and guest side is expensive while data is transferred and memory transactions take place. The latency issues lead to a hardware bottleneck which is also possible due to irregular packet transfer. Then at working performance of VMs is evaluated based on the virtualization architecture 'Xen'. Here, clearly, the bottleneck of transferred packets between driver and guest domains is shown along with

latency issues. To overcome this issue, the study proposed an approach where containers of packets are transferred at once Fig. 4.

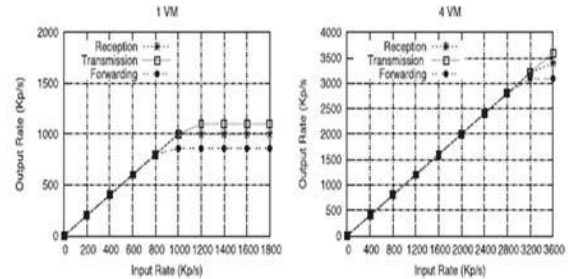


Figure 3 Collective packet transfer results.

Due to this collective packet transfer, a more efficient I/O communication is ensured. To further in vest iGATE the latency issues a proposed model is introduced which enable the tuning of the mechanism to achieve the best value between delay and throughput.

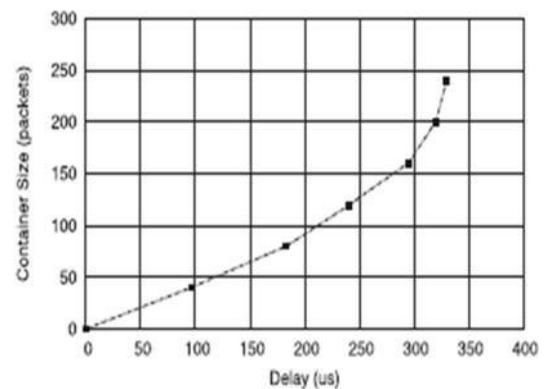


Figure 4. Results of container packets and caused delay.

However, there is a need to further improve the system by extending the model to support higher resource utilization levels. Also, extensive hardware will be combined to make the platform more feasible for cloud computing environments.

4. Role of optical Network Virtualization InCloud Computing [Invited]

Internet applications are becoming network based and require high-performance optimization relying on cloud computing services and optical networks. Therefore, it is important to ensure the high flexibility and efficiency of these infrastructures. This study focuses on the high performance of dynamic optical networks with coordinated provisioning of data centers in general. Here, the proposed approach is a data center as Service architecture. The creation of multiple virtual infrastructures is proposed but all isolated in nature. During this process, distinct optical network characteristics are taken into account by evaluating the applied algorithms. A combination of different features

offered by the cloud infrastructure is perceived which coordinates the data center infrastructure with the required optical network services provided to users as DC a S (DCas a Service). This enables a uniform operation of scalable, flexible and globally distributed data centers along with the creation of virtual DC infrastructures on-demand.

Multiple algorithms with cost-effectiveness and resource-utilization concepts are proposed. Same patterns were noted with aspect to different network topologies. Therefore, a more coordinated virtualization module of the optical network and IT resources is investigated. The end results give guide lines to effectively provision VI services to users and satisfy user requirements. However, it should be kept in mind all algorithms have their impairments and constraints. Therefore, the impact of VI size will affect the restrictions on the required virtual resources and affect the environment. Additional work can be done to provide users to be able to customize VI as services according to their requirements [7].

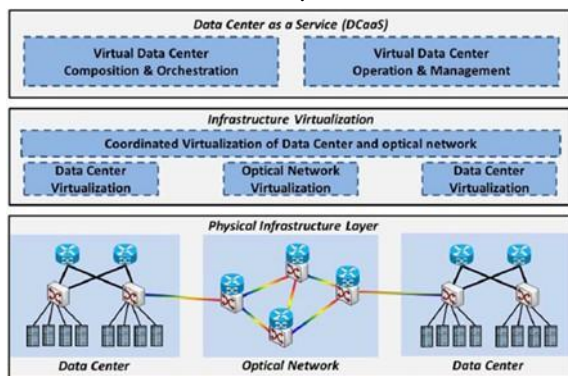


Figure 5 DCaaS Architecture

III. ECONOMIC ASPECTS OF VIRTUALIZATION

In the above, we saw the process of virtualization process reduces the requirement of physical machines like a number of computers, servers storage amount, etc. The companies which provide data centers use this process for storing data, software's, etc. which in turn increases the profit of the companies. This concept reduces the requirements of large numbers of servers and associated parameters like electricity, cooling costs, etc. which results in benefit for the clients also as there will be huge cost reduction in the cloud usage. Requests, virtualization must be ensured Virtualization technique ensures the availability of hardware and gives every application running on top of it. The details of the virtual, simulated environment are kept transparent from the application. The advantage here is the reduced cost of maintenance and reduced energy wastage which is

not very surprising. So virtualization reduces the number of physical servers as a result of which one needs to maintain a few servers, this becomes much cheaper and easier. The amount of energy wasted is a function of the number of physical servers that is reduced in a virtualized environment. In case of desktop virtualization updates may now be made available much sooner as a single firmware update does not update one client machine, but several instances of the same.

IV. CONCLUSION

Different problems pertaining to virtualization, resource utilization, and cloud management and their solutions were discussed. It is important to keep in mind to give the cloud users the option of letting them prefer the resources they want to utilize. An optical network based cloud system was proposed, along with introducing individual virtualized machines, a cloud virtualized system for social media, a fault tolerant system in the cloud computing environment, an improved network performance optimized cloud system and a cloud environment with better data security policies were described. Each has their limitations but mostly provide benefits and smooth utilization of resources leading to cost-effective and high-performance through put results.

REFERENCES

- [1] Anup H. Gade, "A Survey paper on Cloud Computing and its effective utilization with Virtualization," International Journal of Scientific & Engineering Research, Volume 4, Issue 12, December-2013 357 ISSN 2229- 5518.
- [2] T. CHEN, Z. Shanjie, "Classify Virtualization Strategy in Cloud Computing" The 7th International Conference on Computer Science & Education (ICCSE 2012) July 14-17, 2012. Melbourne, Australia.
- [3] W. Fu, L. Xiang, "The Study on Data Security in Cloud Computing based on Virtualization", 2011 IEEE.
- [4] Hyogun Yoon, Hanku Lee, "An Intelligence Virtualization Rule based on multi-layer to support socialmedia Cloud Service", 2011 First ACIS/JNU International Conference on Computers, Networks, Systems, and Industrial Engineering.
- [5] Pranesh Das, Dr.Pabitra Mohan Khilar, "VFT: A Virtualization and Fault Tolerance Approach for Cloud Computing", Proceedings of 2013 IEEE Conference on Information and Communication Technologies (ICT2013).
- [6] M.Bourguibalnes, E.Korbi, "Improving Network I/O Virtualization for Cloud Computing", IEEE Transactions On Parallel and Distributed Systems, Vol. 25, No. 3, March 2014.

- [7] Shuping Peng, Reza Nejabati, Dimitra Simeonidou
“Role of Optical Network Virtualization in Cloud
Computing [Invited]”, A162, VOL. 5, NO. 10/
OCTOBER2013.
- [8] E Ahmed, I Yaqoob, IAT Hashem, J Shuja, M
Imran, N Guizani, ST Bakhsh, Recent advances and
challenges in mobile big data, IEEE
Communications Magazine 56 (2),102-108.
- [9] ST Bakhsh,B Shahzad,STahir,Risk Management
Approaches for Large Scale Software Development,
Journal of Information Science and Engineering